CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
520-770-3500
http://www.azgs.az.gov
inquiries@azgs.az.gov

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REPORT ON THE GOLD DRY PLACERS OF THE SOUTHWESTERN, UNITED STATES

August 1, 1960

Charles A. Lee and Kelsey Boltz
Consulting Geologists

Gladstone 4-8059

Charles A. Lee
CONSULTING GEOLOGIST
Pacific Palisades, California

837 Alma Real Drive

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REPORT ON THE GOLD DRY PLACERS

OF THE SOUTHWESTERN, UNITED STATES

Gladstone 4-8059

Charles A. Lee
CONSULTING GEOLOGIST
Pacific Palisades, California

837 Alma Real Drive

SUPPLEMENT REPORT ON THE GOLD DRY PLACERS OF THE SOUTHWESTERN, UNITED STATES

The importance of the development of a method to recover the free gold from the dry placer deposits is unlimited.

If one looks at a map of the world, having in mind the World's climatic environments, it will be found that there are many millions of square miles of deserts where there is insufficient water available for wet gold placer operations. In many of these desert areas it is known that free gold occurs in the sands and gravels that are amenable to this type of dry operation.

In the southwestern part of the United States, and in northern Mexico, dry placering has been carried on intermittantly on a small scale by many individuals using shakers and blowers of one type or another. None of these operations were efficient or had sufficient volume in operation to be important in themselves.

The development of the Clint Air Float Table that takes advantage of the electrical properties of the gold particles, and their attraction to the table, along with the specific gravity of the heavy materials, now makes it possible to run large volumes of material, and thus attain low costs of operation. Those gold placer deposits containing approximately 0.50 cents or more in gold per yard will pay to handle along with materials of better value, if an overall average of approximately $1.00 per yard can be maintained, a profitable operation is assured.

The testing of the placer gravels of the Wickenburg, Arizona area have been carefully carried out as outlined in the general report. In addition much detailed information regarding costs of recovery of this gold on a volume scale are now known. Thus since we know that the method works, and the cost of recovery or processing the materials are approximately known, the only remaining factor unknown is the availability of capital to further develop the process, acquire and test additional placer ground, and to set-up plants for extraction.

Respectfully submitted

Charles A. Lee

Charles A. Lee
Consulting Geologist

Roswell, New Mexico
August 8, 1960

Gladstone 4-8059

Charles A. Lee
CONSULTING GEOLOGIST
Pacific Palisades, California

837 Alma Real Drive

REPORT ON THE GOLD DRY PLACERS OF THE SOUTHWESTERN, UNITED STATES

A INTRODUCTION

The presence of numerous, undeveloped placer gold deposits in the arid regions of the Southwestern United States for many years since their discovery, has been the cause of many attempts at economic recovery of the gold without the benefit of water.

The tremendous profit potential presented by successful technoligic and economic solutions to this recovery problem, has resulted in concentrated and subsequently effective programs conducted during the past seventeen months by MacDonald Construction Company along with the valuable aid and assistance of other firms and engineers. This report presents the prominent data and results obtained by these combined programs.

B HISTORY

During the past six years in the capacity of Professional Mining and Geological Engineering Consultant, this writer has had the opportunity to investigate numerous dry placer deposits with their associated recovery problems. Study of these problems revealed the general lack of sufficient engineering data and equipment necessary for such an operation. Through the special and successful efforts of Mr. Walter A. Martin of MacDonald Construction Company, that Company, in June, 1959, initiated and undertook the program of developing a process to economically recover gold particles from placer deposits by a dry method. During the entire program, this writer was continuously retained to investigate, test, analyze, and recommend the various methods, procedures, and equipment utilized. In August, 1959, after preliminary tests, design and subsequent construction of a versatile mill was underway on a favorable portion of the San Domingo Placer Field near Wickenburg, Arizona. After completion of the first stage of the preparation and screening sections, tests were begun on numerous gold saving devices. Of the many devices tested, the Clint Air Float Tray Mineral Concentrator, was quickly determined to be far superior.

After selection of the Clint table as the extracting device, it became necessary to initiate two simultaneous programs:

1. To enlarge, modify and install the Clint table for high volume production, and

2. To test the various dissimilar placer beds to determine the methods, procedure, and equipment required to properly prepare these materials as feed to the Clint Tables.

During this period, laboratory and field tests were conducted by other firms and engineers from whom valuable cooperation, assistance and complete exchange of information was obtained. Hirsch Brothers Engineering Company of El Paso, Texas, under the direction of Mr. Ray Jenkins, mining engineer, and Mr. Donald Wright, consultant, performed numerous successful tests and experiments on material preparation and Clint table recovery on the Ortiz Grant near Albuquerque, New Mexico, and on the Weaver Placer Field near Octave, Arizona. Simultaneously, Mr. Andy Zinkl, Mining Engineer of Prescott, Arizona, performed similar successful tests on deposits near Quartzite, Arizona. The technologic success of these processes is the direct result of the investment, diligence, and effort of MacDonald Construction Company aided by the information contributed by the above mentioned firms and personnel.

At the time of this writing, MacDonald Construction Company is installing the final preparation equipment necessary to obtain volume production.

C THE CLINT TABLE

In selecting the extracting device of the circuit, it was determined that the device must exhibit simultaneously the following characteristics:

1. High percentage (greater than 95%) recovery of the freed gold particles.

2. High rate of flow of material

3. Low maintenance cost

4. Simplicity of operation

5. Portability.

Of the numerous devices tested, only the Clint table met the above itemized characteristics. The principle of its operation is extremely simple. An evenly

Gladstone 4-8059

Charles A. Lee
CONSULTING GEOLOGIST
Pacific Palisades, California

837 Alma Real Drive

distributed flow of air, passing thru a specially constructed tray, "floats" the waste material off while building up a slight electrostatic charge which attracts and holds the gold particles to the surface of the tray.

At the MacDonald site, six Clint tables were installed and were tested daily under production conditions for a period of five months. The results of these tests gave the following conclusions:

1. After the proper balance of feed and air flow through the table is established, the performance of the Clint table is directly proportional to the efficiency of preparational treatment of the table feed.

2. The table will approach 100% efficiency the more ideally the field is prepared.

REQUIRED TABLE FEED CHARACTERISTICS:

1. The gold particles must be physically free from waste particles.

2. The material must be dry enough to prevent gold particles from adhering to waste, and in general 3% moisture is maximum for optimum recovery.

3. For most deposits 3/32 inches is the maximum size of feed.

4. In most placers, greater than 90% of the gold particles are less 0.090 inches, so that screen analysis of gold particles of each deposit explored will determine optimum feed size.

The use and tests of the Clint Table has revealed the presence in several areas of abundant amounts of gold of extremely small particle size. These tests show that when the material is properly prepared the Clint Table will make a high recovery of gold particles of sizes finer than 300 mesh.

During the installation and operation of production size Clint Tables, details were worked out concerning the following:

1. Feed distribution

2. Tails elimination

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Charles A. Lee
CONSULTING GEOLOGIST
Pacific Palisades, California

837 Alma Real Drive

3. Dust control

4. Air flow distribution

5. Cleanup efficiency.

MATERIAL PREPARATION

Most placer deposits of the Southwest consist of relatively unsorted gravel, sand, silt, clay, some of which are cemented by caliche. The method of preparation of these beds for Clint table extraction is determined by the relative amounts of the mentioned constituents and the degree to which these beds are compacted and/or cemented. The preparation process consists of screening and/or disentegration and, if necessary, drying.

In the operation of a placer it is necessary and advantageous to eliminate from the plant circuit as quickly as possible the maximum amount of waste material. In loosely consolidated beds this can be accomplished by a simple screening process. In general, for most deposits this screening process will have the effect of upgrading the material from 3:1 to 10:1 thereby increasing the capacity and reducing the operation costs of the preparation equipment.

As the degree of compaction and cementation of the beds increase the more inefficient the screening process becomes. Since most of the gold particles will be included in the cementing material, it becomes necessary to break down the cemented material in order to free the gold particles before screening. Thus, the disintegration equipment, under extreme cementation conditions, requires that it be put into the circuit before screening; otherwise, gold particles contained within oversized cemented material, and particles adhering to oversized pebbles are lost. After screening and/or disentegration to free the gold and eliminate maximum amount of waste, the material must be reduced to a maximum of 3% moisture content. Various types of manufactured driers can accomplish this with a high degree of efficiency. In most deposits of the Southwest the moisture content will not exceed 8%. A rotary drier has some advantage in that the attrition action in the rotating

Gladstone 4-8059

Charles A. Lee
CONSULTING GEOLOGIST
Pacific Palisades, California

837 Alma Real Drive

kiln assists greatly in the disentegration of the waste material. Also, it is possible to remove and collect from a rotary drier a large percentage of dust.

PLACER BED CLASSIFICATION

For mining and milling purposes, the placer beds of the Southwest are herein classified with respect to composition insofar as such composition materially affects the preparation treatment. Because of the extremely variable nature and composition of the San Domingo Placer Field, MacDonald Construction Company worked on almost every type of preparation problem that would be encountered in dry placers. The following bed classification and explanation is based upon the amount of preparation of the material necessary to utilize Clint Table recovery.

TYPE A

1. Description: Recent wash material consisting primarily of unsonsolidated gravel, sand, soil with minor amounts of clay.

2. Preparation: Screening, Drying.

3. Screen Up-Grading: 4:1 - 10:1 This is the simplest type of material in that no disentegration is necessary other than that amount which it normally receives in the screening and rotary drying processes. The sample tests of this material indicate that from 93% to 98% recovery of the free gold can be attained with no further preparation.

TYPE B

1. Description: Bench gravels, loosely consolidated, composed of gravel, sand, soil, and some clay.

2. Preparation: Screening, drying.

3. Pit Up-Grading: 2:1 - 5:1 Preparation of this material is similar to Type A except that care must be taken to select initial screen with sufficient size openings and action to

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Charles A. Lee
CONSULTING GEOLOGIST
Pacific Palisades, California

837 Alma Real Drive

permit some disentegration and passage of the minor amounts of loosely consolidated sand and soil. The further disentegration necessary can be accomplished in the rotary drier. Samples tested indicate that from 85% to 95% of the free gold is recoverable depending again upon the efficiency of the preparation circuit.

TYPE C

1. Description: Bench gravels, moderately cemented with caliche and clay. Large percentage of the gold particles confined to loose, reddish-brown gravel lenses.

2. Preparation: Disentegration, screening and drying.

3. Pit Up-Grading: Unknown.

This material is variable in that the amount of gold contained within the caliche cement is not consistent. Therefore, the amount of disentegration necessary will vary with the amount of gold contained within the caliche cement. It is also necessary to check sample constantly to determine whether the amount of additional gold recovered would be justified by the additional cost of separate disentegration. This question of operation economics will be determined to apply to each specific deposit explored. The probable degree of efficiency of preparation of this material is estimated at falling somewhere in the range 50% - 90% depending upon the equipment used.

TYPE D

1. Description: Bench gravels, well cemented, with caliche and some clay.
2. Preparation: Disentegration, screening, drying.

Tests on this material indicate that a considerable percentage of the gold particles is contained within the caliche cementing material. The samples indicate that as much as 70% of the gold may be thus contained. Therefore, it is necessary that maximum efficiency be obtained from the disentegrating section of the circuit. Again, the recovery of

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Charles A. Lee
CONSULTING GEOLOGIST
Pacific Palisades, California

837 Alma Real Drive

the free gold would depend primarily upon the efficiency of the disintegrating circuit and justification of its additional operating cost.

TYPE E

1. Description: Mixture of soil, clay, sand and occasional gravel.

2. Preparation: This material presents a special problem in that very little gravel is contained in the dirt. The gravel constituents in the materials assist in the attrition action of the dryer. Therefore, with such a lack of gravel, this material may be blended with other adjacent gold-bearing material containing a high percentage of gravel. Without disintegrating, the percentage recovery in the material would be very low.

Since operations will vary somewhat for each deposit exploited, no exact operation cost figure can be given, until thoroughly tested with a pilot unit. However, detailed cost analyses indicate that costs of operation of large volume dry placer milling units will exceed those of comparable dragline wet dredge operations only by the cost of drying, keeping in mind that from 50% to 80% of the waste material will be eliminated from the circuit before reaching the dryer.

These analyses are based upon the long experience and cost records of many firms utilizing almost identical screening and drying processes.

CONCLUSIONS

The long experience of the aggregate screening industry and the industries using material drying, combine with the foregoing research to lead to the conclusion that solid operational principles properly applied will result in a profitable, large scale, dry placer gold operation.

PROPOSED PROCEDURE

A. Construct portable pilot-test unit. This test unit having approximately ten cubic yards per hour capacity will be utilized to obtain the following necessary information:

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Charles A. Lee
CONSULTING GEOLOGIST
Pacific Palisades, California

837 Alma Real Drive

1. Determine placer districts, and areas within districts, with simple, low cost metallurgy.

2. Determine actual recoverable unit value of beds.

3. Give data necessary to select proper pieces of equipment for 200 - 500 a yard per hour plant.

4. Supply data for accurate unit cost projection, which in turn permits accurate profit projection.

For each of the above listed items, a generalized answer can be given at present. However, before initiation of the construction and operation of the production unit, these items must be determined in accurate detail, by utilizing the pilot - test unit. Application of the production unit can then proceed on the solid foundation of engineering data.

Respectfully submitted

Kelsey Boltz

Kelsey Boltz,
Consulting Geologist

Wickenburg, Arizona
August 1, 1960

Gladstone 4-8059

Charles A. Lee
CONSULTING GEOLOGIST
Pacific Palisades, California

837 Alma Real Drive

WESTERN KNAPP ENGINEERING
DIVISION OF ARTHUR G. McKEE & COMPANY
ENGINEERS AND CONTRACTORS
650 FIFTH STREET
SAN FRANCISCO, CALIF. 94107
CABLE ADDRESS
WKECO

October 1, 1964

Mr. E. C. Taber, Exploration Manager
Shell Canadian Exploration Company
1020 Holcombe Boulevard
Houston 25, Texas

Subject: Dry Placer Processing Plant Study
WKE Job 909

Dear Mr. Taber:

We take pleasure in presenting herewith eight copies of the study "Placer Gold Recovery by Dry Concentration." Two copies have been sent to the attention of Mr. W. F. Bates of the Special Projects Division in Los Angeles.

This study covers dry concentration in two plant sizes, alternate fixed and portable facilities, and alternate drying and sizing operations. Wet concentration has been included for comparison purposes. Although based on a hypothetical deposit and location, the data will expedite Shell's evaluation of similar deposits and provide a basis for selection of optimum plant size.

We wish to express our appreciation for the opportunity to perform this work and thank you and the members of your staff for excellent co-operation.

We look forward to your comments on the report, and future discussions on plant design for placer gold recovery. Continuing consulting work on this job will be carried out under our Consulting Agreement No. 877 unless it is mutually agreed that major studies are involved.

Very truly yours,

WESTERN KNAPP ENGINEERING
Division of Arthur G. McKee & Company

R. K. Young
Manager Engineering

JHJ:RKY:ws

APPENDIX A

PLACER GOLD RECOVERY BY DRY CONCENTRATION

A STUDY

prepared for
SHELL CANADIAN EXPLORATION COMPANY
Houston, Texas

September 1964
WKE Report 909-1
Copy Number 10

WESTERN KNAPP ENGINEERING
Division of Arthur G. McKee & Company
San Francisco, California

TABLE OF CONTENTS

		Page
1.	Introduction	1 - 1 to 1 - 2
2.	Summary	2 - 1 to 2 - 4
	Table 1	2 - 2
3.	Mining Operations	3 - 1 to 3 - 6
4.	Process Plant	4 - 1 to 4 - 14
	Figure 1	4 - 4
5.	Housing	5 - 1 to 5 - 2
6.	Utilities	6 - 1 to 6 - 2

Appendices

A Cost Tables and Criteria

B Process Equipment List, Utility Company Rate Schedules, and Reference Item

C Sketches and Drawings

1. INTRODUCTION

The purpose of the present exploratory study is to provide guidance for a program of evaluation of processes and equipment for the recovery of gold from desert placers, and guidance for determination of the quantity of ore reserves needed to support an economic plant.

The study was made for Shell Canadian Exploration Company (Shell) by Western Knapp Engineering Division of Arthur G. McKee & Company (WKE), and consists of development of estimates of capital and production costs for the following:

1) Mining at rates of 1,000,000 and 2,000,000 bank yards per year using

   Ripper-scraper
   Power shovel and truck
   Dragline (with portable processing plant)

2) Dry concentration at rates of 1,000,000 and 2,000,000 bank yards per year in a fixed plant by a process that includes feed drying and separation into three screen fractions. An alternative process is considered that omits the drying and intermediate size separation. The beneficiated feed is concentrated in Morgan units and the gold is recovered by amalgamation.

3) Dry concentration as in (2) above, but using a portable plant with dragline feed.

4) Wet concentration (fixed plant only) at rates as shown above.

5) Utilities, specifically for the Randsburg-Atolia area, to include

   Gas (Pacific Gas and Electric Co.)
   Power (Southern California Edison Co.)
   Water, captive well and pipeline.

6) Housing costs and recommendations.

The capital cost estimates are factored from lists of equipment based on outline flowsheets, material balances, and informal sketches of the proposed plants.

The production costs are based on labor costs for the California desert, utility costs as developed, and WKE experience in this field. Costs are shown in some detail.

This study was authorized on 11 August 1964 by Mr. D. E. Broussard of Shell on the proposal by WKE dated 31 July 1964, and was supplemented by Mr. E. C. Taber's letter of 11 August 1964. A meeting was held in San Francisco on 20 August at which the criteria and concepts to be used were discussed. Some changes were made, including the addition of the portable plant alternate, as reported in the minutes of the meeting of that date issued on 26 August 1964.

Recommendations concerning minimum plant sizes, suggested development work, and other points pertinent to the program have been made in this report.

2. SUMMARY

This is a study of mining and processing costs for a hypothetical placer gold ore deposit. For the purpose of fixing labor and utility costs, it has been assumed that the deposit is in the Randsburg-Atolia area of the Mojave desert of California. Design and economic criteria for the study are listed in Table 2 in Appendix A.

Cost estimates resulting from this study are summarized in Table I on the next page. The fixed and working capital costs in the table include all the necessary investment except the costs of the deposit and the land, the cost of development of the process, and the cost of proving the deposit. The production costs given are complete through the local office expenses, but do not include interest, home office expenses, or research and development. Depletion credit has not been considered. Royalties have been included at a cost of $0.05 per bank yard.

The data of Table I can be used to prepare profitability predictions for placer ore of various gold values. Profitability determination is beyond the scope of this study. However, $1 per yard gold values were mentioned in some preliminary discussions between Shell and WKE engineers, and it seems apparent that these would be economic in a 1,000,000 yard plant only if the process alternate is used that omits drying and multiple size separation. The outlook is better for the 2,000,000 yard plant. No value has been assigned for the efficiency of gold recovery in processing and this value would materially affect profitability.

TABLE I

COST SUMMARY*

	Plant Capacity a 1,000,000 yd per yr	Plant Capacity b 2,000,000 yd per yr
Fixed and Working Capital		
1 Dry Process, Fixed Plant	$1,482,000	$2,251,000
2 Alternate**	1,049,000	1,537,000
3 Dry Process, Portable	1,720,000	2,647,000
4 Alternate**	1,220,000	
5 Wet Process, Fixed Plant	1,224,000	1,890,000
Production Cost per Bank Yard		
1 Dry Process, Fixed Plant	$0.86	$0.69
2 Alternate**	.67	.54
3 Dry Process, Portable	.85	.61
4 Alternate**	.66	
5 Wet Process, Fixed Plant	.74	.59

*This table is a summary of data in Tables 3, 4 and 5 (Appendix A).

**The alternate process omits the drying operation and multiple size separation.

Capital and production costs for the mining operations are summarized in Tables 15 and 16 (Appendix A). The production cost for each operation is developed in Tables 17 to 23 and the operations are described in Section 3, Mining. Scraper mining costs are from 31 cents per bank yard in the 1,000,000 yard plant down to 28 cents in the 2,000,000 yard plant. These costs may appear high, but it should be noted that they include the cost of returning waste to the pit. Shovel and truck mining costs are from 37 down to 33 cents, and dragline operation are from 21 to 14 cents. For dragline operation, a portable processing plant is needed. One such that has been devised for this study carries a stacking conveyor that returns waste to the pit.

Mining with bucket wheel excavators, using belt conveyors for haulage, was considered but rejected because of the limited size of the operation, and the difficult digging conditions of the hypothetical area.

Production cost estimates for the ore processing are developed in Tables 24 to 29, 32 and 33 (Appendix A). The processes are described in Section 4, Process Plant. Informal plant layout sketches are in Appendix B.

The dry processing plant is divided into feed preparation, and concentration and amalgamation. Feed preparation costs are from 28 cents per bank yard for the 1,000,000 yard plant to 22 cents for the 2,000,000 yard. Concentration and amalgamation costs are from 12 to 8 cents. Wet process costs for all three operations are 28 and 20 cents. The cost of the water for the wet process operation is high for reasons discussed in Section 6, Utilities.

Production costs in the portable plant are 49 and 36 cents. These costs in the alternate dry process plants, fixed and portable, are 19 cents less for capacities of 1,000,000 yards and 15 cents less in the 2,000,000 yard fixed plant. See Tables 3, 4 and 5. The alternate omits drying of the ore and separation into intermediate sizes. Gold recovery efficiency could be low by the alternate process.

Capital costs and operating costs are not expected to be significantly affected by equipment changes as long as the basic processing scheme is maintained.

Because the Morgan Dry Concentrator is the heart of the dry processing method, it is strongly recommended that the capacity of this equipment be tested under sustained feed rate conditions. This type of equipment is notorious for showing abnormally high capacity when fed sporadically.

It is further recommended that placer deposits under consideration be carefully checked for values and recoveries using a small pilot concentration unit. Careful checking of the deposits is required, since low-grade California placers are frequently segregated or spotty in values. This can cause a deposit to indicate values that are as false as if the deposit had been intentionally "salted".

3. MINING

For the purposes of determining possible mining methods and mining costs for this operation certain ground conditions were assumed to exist. These conditions are as follows:

1. The deposit is an alluvial sand and gravel with only occasional boulders to 10 inches diameter.

2. The deposit is sufficiently compacted that walls may occasionally stand vertically, but the gravels are not cemented.

3. The surface topography is fairly level, but the bedrock under the deposit is highly irregular.

4. The deposit has a rectangular shape in plan, and a length to width ratio of 5 to 1.

5. Depth of the deposit will average 20 ft, but will vary from zero to a maximum of 50 ft.

6. The bedrock is sufficiently weathered that it can be ripped to clean up the bottom of the pit and the top of the bedrock.

7. The tailings from the recovery plant must be returned to the worked-out portions of the pit for disposal.

8. There is not enough water available to establish and maintain a pond for the use of a floating dredge.

Mining Methods Considered

Based upon the assumed mining conditions as outlined, two methods were considered to be practicable for mining the pit, transporting the material to a recovery plant located outside the pit, and returning the tailings to the worked-out portions of the pit:

1. The use of self-propelled, self-loading scrapers

2. The use of a power shovel and trucks

A third method of mining of the deposit was considered practicable provided a portable dry processing plant is developed: the use of a dragline, or possibly a power shovel, loading into the hopper of the portable recovery plant. The portable plant would move with the loading unit as mining progressed in the pit, the tailings being disposed of by a stacking conveyor. This operation would resemble a floating dredge, and would be a lower cost mining operation than the others considered.

A fourth mining method was given some consideration, but was rejected as not being suitable for this particular operation: the use of bucket wheel excavators, with belt conveyor haulage. The method was rejected for these reasons:

1. The volume of material to be moved daily is small for efficient use of this system.

2. The depth and size of the deposit would require long conveyors with frequent moves and extensions.

3. The material is relatively hard digging for a small bucket wheel excavator.

Self-loading Scrapers

Mining by the use of self-loading scrapers appears to be the most economical method if a stationary dry processing plant is used. The gravel would be ripped by a caterpillar D8 tractor

in advance of the pickup by the scraper. This tractor can ordinarily rip about 500 cubic yards of material in an eight-hour shift.

After the scraper has removed the material to bedrock, the same Caterpillar unit would rip the top of the bedrock, and use a dozer blade to clean up the ripped bedrock. The material would be pushed into piles or windrows, then picked up by the scraper and transported to the processing plant.

With a scraper operation it is necessary to have a second tractor for use as a pusher unit to assist the scraper in the loading operation. With a scraper cycle time as anticipated for this operation, one pusher unit could normally handle up to four scrapers. For the 1,000,000 yard per year operation, therefore, the cost per yard for the pusher is high as the pusher must be operated three shifts just to serve the one scraper required. As it must be available immediately upon the return of the scraper to the pit, its use for other purposes during idle time is very limited. It was felt advisable to have this second tractor unit equipped with both a blade and a ripper so that the units can serve for either required operation, and can be alternated for the two services. Also, as the tractor-ripper unit can work several days in advance of the scraper, down time on one unit will not delay the operation.

The scraper will have to stop to dump the material from the mine into the plant feed hopper, but can pick up tailings at the plant and discharge them in the mined-out portion of the pit without stopping. The necessity of hauling the tailings means that for every yard of material mined, the scraper units must move two yards of material. This results in a higher-than-normal scraper cost per yard of material mined.

For a million yard per year operation, one scraper unit in service can handle the mined yardage, and also move the tailings, but another standby unit must be available to maintain a continuous operation. For a two million yard per year operation, two scraper units are required in service, plus one for standby. No increase is required in the number of tractors for ripping, clean-up and pusher-loading.

Power Shovel and Trucks

The second method of mining considered for this deposit uses one three yard shovel and two trucks for a one-million-yard-per-year operation. A three-yard shovel could handle more than the required volume of material, but is needed to match the truck size, while at the same time shovel performance is limited by the number of trucks and by the truck cycle time. A smaller capacity shovel could be used if matched with a larger number of smaller capacity trucks, but this would not lower the mining cost.

If truck haul units are used, it will be necessary that the tailings from the processing plant be discharged into an overhead bin for low cost, rapid loading into the trucks. The trucks will dump the tailings in the mined-out portion of the pit. The tailings dumped by the trucks will have to be spread and leveled daily by one of the pit tractor units. Since two yards of material must be hauled for each yard of material mined, the trucks have a long cycle time, and the hauling cost is high per yard of material mined.

Only one tractor unit is required for the shovel and truck operation. The tractor unit rips and cleans bedrock, cleans out the irregular pit bottom, spreads tailings dumped by the trucks and maintains haul roads.

Mine Production Costs

Production costs for the mined placer gravel have been estimated separately for each unit operation employed. Total mining costs for any one mining method are obtained by adding the separate costs of the unit operations. Tables 17 to 23 in Appendix A give the elements of the production costs for each unit operation, and Table 16 summarizes these costs for three different mining methods, as applied to the two production rates considered; namely, 1,000,000 and 2,000,000 yards of placer gravel per year. The total cost per bank yard in each case is the cost of the material placed in the feed hopper of the processing plant.

The lowest production cost at the rate of 1,000,000 yards per year, $0.21 per bank yard, is possible when dragline loading in the hopper of a portable plant. Scraper mining gives the low cost of $0.31 per yd for a fixed plant; shovel and truck mining is high at $0.37 per yd. As would be expected, these costs for 2,000,000 yard plants are lower; namely, $0.14 for the portable plant and $0.28 and $0.33 for the fixed plants.

The costs of supervision of mining operations, and of service and maintenance of the mining equipment are lumped together under the heading "Supervision, Service, Maintenance" for each of the three cases in Table 6. The costs include allowance for one pit foreman or superintendent to supervise and plan mining operations. Depreciation and other fixed costs are also included for the following capital cost items: a minimum shop building equipped for maintenance of the mining equipment, one pickup truck, a service and maintenance truck with a hydra lift, and a portable welding machine. The shop and shop equipment are depreciated over the ten-year assumed life of the mining operation, and the mobile service equipment is depreciated fully in three years.

Recommendations

1. The data indicates that mining must be done at rates over 1,000,000 yd per yr in order to have a sufficiently profitable operation.

2. The use of a ripper-scraper combination is recommended for mining for a 1,000,000 or 2,000,000 yard fixed plant. A portable plant of the size considered here should use a dragline. A wheel excavator would only be attractive for mining larger deposits with favorable digging characteristics.

3. Placers can be expected to be somewhat irregular in gold and heavy mineral content. It is essential to drill

such properties on relatively closely spaced grid intervals to obtain accurate estimates of ore reserves and the detailed information needed to plan future mining.

4. Knowledge of the distribution of values, particularly with respect to size range, makes it possible to reduce the handling of barren fractions and thereby achieve minimum plant costs.

4. PROCESS PLANT

The objective in both the dry and wet concentration plant designs is to provide relatively simple mills that will operate at a reasonable profit with minimum power, water, operating labor and supervision. In developing the flowsheets, maintenance has been carefully considered. It will be noted that conservative power ratings have been used throughout, based on long experience with the high ambient temperature of the desert and its adverse effect on electric equipment.

The simplified method of estimating costs by factoring, as used in this study, is not intended to equal the accuracy of preliminary estimates based on formal layout drawings or sketches. However, it does provide approximate capital costs that are sufficiently accurate so that production costs based on them can be used to evaluate return on the investment, or to ascertain if a deposit is of sufficient size or value to warrant further exploration. The flowsheet data (WKE drawings 909-G1 and G2 in Appendix C) and the process equipment lists (Appendix B) were supplemented by informal sketches (Appendix C) to establish equipment locations and conveyor lengths. The capital costs estimated under these conditions should fall within 10 to 15 percent of the costs determined by the conventional "preliminary estimate."

Factored plant cost estimates are generally made on the basis of delivered equipment cost and weight. Thus the cost of freight, local delivery and handling at the site has been factored from the equipment weights shown in the process equipment lists, using

an estimated average figure of $6.00 per hundredweight. Taxes are averaged at three percent of equipment cost. The total equipment cost, ready to install, is thus estimated as $244,000 for the Feed Preparation Section, $104,000 for the Dry Concentration and Amalgamation Section, and $256,000 for the Wet Process Plant. The Capital Cost (Installed Cost) is calculated as indicated at the end of the Process Equipment List for each plant section (Appendix B) by multiplying the ready-to-install cost by the factor 2.65 and adding the cost of equipment not requiring installation.

In order to estimate the capital cost for a plant with increased capacity, the cost of the smaller plant is multiplied by a factor which is the 0.72 power of the ratio of capacity increase. For example, the cost of a plant with twice the capacity is estimated as equal to the cost of the smaller plant multiplied by two to the 0.72 power, or 1.65. This particular value of the power exponent is peculiar to this kind of plant, but applies to any small ratio of increase or decrease in size.

It should be understood that other items that fulfill the same functions can be substituted for any particular item or group of items in these process equipment lists. For example, screw conveyors can be substituted for drag or belt conveyors, chain elevators for belt elevators, and so on without upsetting the accuracy of this evaluation.

The cost of the water system for the wet process plant is not included in the total plant capital costs. Table 14 (Appendix A) gives water system capital costs as $275,000 for the 1,000,000 yard plant, and Tables 30 and 31 give the process water production cost estimates of $1.11 and $0.83 per thousand gallons, respectively, for the one and two million yard plants considered. The need to write off this utility investment in the relatively short span of ten years, as well as the small volume pumped, makes the cost per thousand gallons of water unusually high.

Dry Process Plant

The dry process plant consists of three principal sections:

a) Feed preparation

b) Dry concentration using Morgan concentrators

c) Amalgamation

The sequence of operations and the equipment required are shown in the flowsheet, WKE drawing 909-G1 (Appendix C). Cost, weight and connected horsepower for each item of equipment are given in the Process Equipment List, Sections 200 and 300, (Appendix B).

An alternate feed preparation section in which drying and intermediate sizing have been eliminated has also been studied. This is discussed farther on under the heading "Dry Process Alternates."

Gravel and sand sizes in the deposit are assumed to be such that the material treated in the process plant will consist of these US standard sieve sizes:

Over 4 mesh	35 percent
Under 4 on 30 mesh	30 percent
Under 30 on 60 mesh	20 percent
Under 60 mesh	15 percent

This assumed sieve analysis is plotted in Figure 1. The curve is projected above and below the given points to roughly approximate the norms for such materials.

Dry Process - Feed Preparation (Section 200)

The placer gravel feed is received by scraper and dumped on a stationary grizzly (8 inch bar spacing) on top of a feed hopper, Item 200. One operator per shift is stationed at the receiving

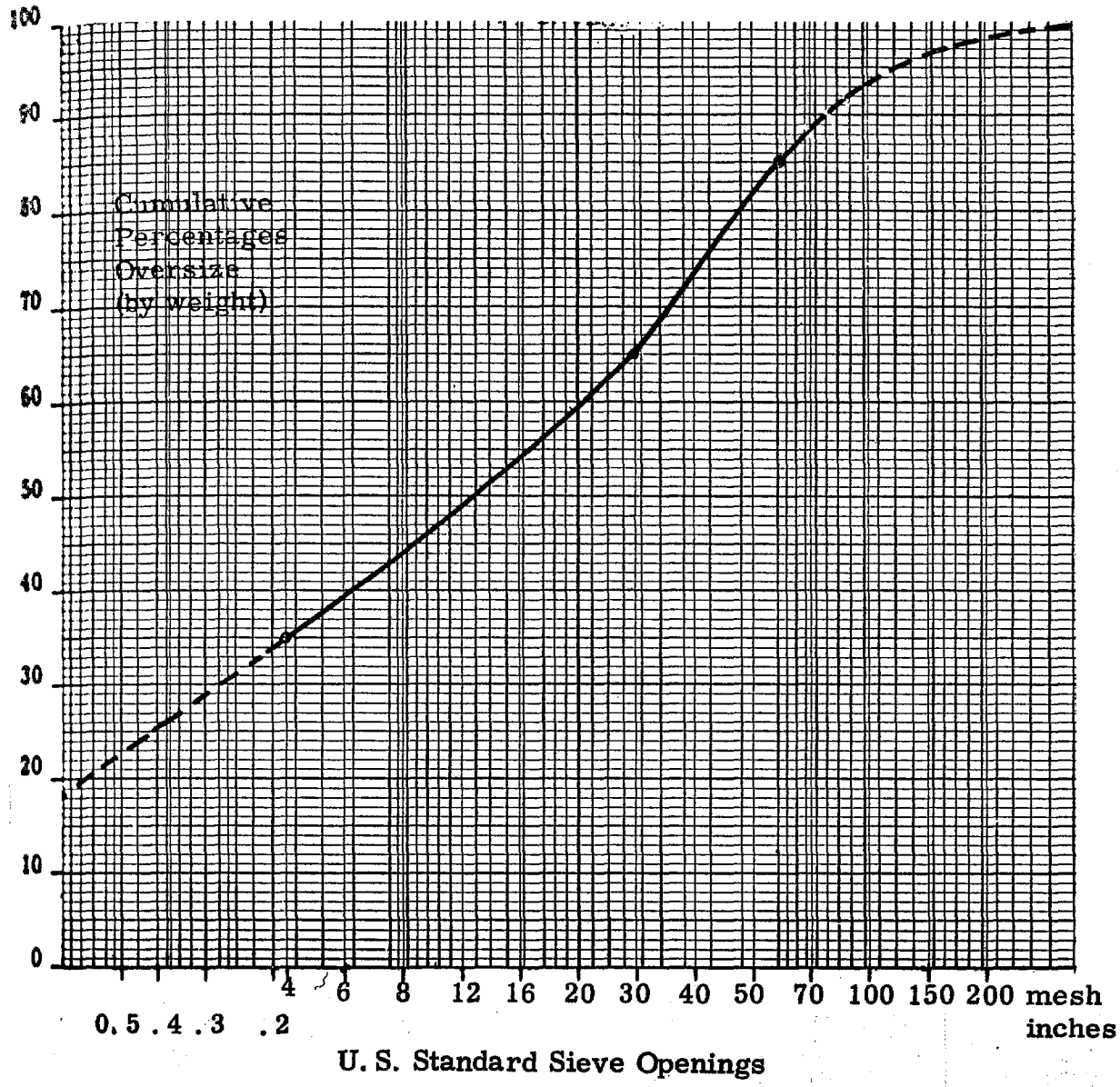


FIGURE 1

Assumed Particle Size Distribution of Plant Feed (Placer Gravel)

hopper, his duties being to regulate the feed to the plant and assure that tramp oversize pieces are removed from the grizzly.

Gravel is removed from the hopper by the apron ore feeder, Item 202, delivering to the scalping screen (grizzly), Item 207, by belt conveyor, Item 205. The top bar deck of the scalping screen removes 4-inch material, and the lower deck removes plus one inch, all of which drops to the conveyor belt, Item 208, for transfer to the tailings surge bin, Item 210. All tailings report to this bin for pickup by the scrapers and backhaul to the worked out sections of the mine pit.

The underflow from the screen (minus one-inch size) is conveyed to the dryer, Item 220, in which its moisture content is reduced from an average of three percent to approximately 0.5 percent. The one-inch pebbles provide the necessary attrition, through the tumbling action of the drier lifters, to completely liberate any gold particles in the gravels. A dry product assures high capacity in the screening to follow and also prevents buildup of moisture balls on the deck of the dry concentrator.

For the purpose of this study, a gas-fired dryer has been assumed. The gas rate used is from Schedule G-50, an interruptible rate available in the Randsburg area of California. A copy of this schedule has been included, (Appendix B) as well as the applicable schedules for larger installations. No standby oil system has been provided, as the history of the interruptions in the area is such as to make the additional investment difficult to justify.

The dryer heat requirements were calculated by WKE and confirmed by Standard Steel, the vendor supplying the cost for the unit. It should be noted that the proposed dryer, although a standard asphalt unit, has been reinforced for a ten-year life expectancy. The dryer is complete with firing controls and a dust-collection cyclone from which dust is returned to the tailings conveyor. Periodic sampling is necessary to assure that no fine gold is being lost in the dryer dusts.

In the alternate in which the dryer is eliminated, a Pennsylvania Impactor is proposed to disintegrate the minus-one-inch material and assure liberation of the gold. A dry trommel would be equally effective and the cost difference between the two units is small.

Material from the dryer (or impactor) is conveyed to three 5 by 12 ft screens, Items 230A, B and C, which scalp off a plus-4-mesh fraction which is dropped on the stacking conveyor, Item 208. It should be noted that the plant arrangement is such that fines are placed on the stacking conveyor to cushion the oversize from the primary scalper. This increases belt life and increases the size of lump which can be carried.

The minus-four-mesh material is then elevated either to screens, in the alternate in which multiple sizes are desired, or fed directly to a bin, Item 250 or 250A, which serves the concentrators. In either case the receiving bin on which the screens are mounted is essentially the same. For the alternate without intermediate sizing, feed preparation is complete at this point.

Five parallel 5 by 12 ft, single-deck screens, Items 245A, B, C, D, and E, are used to provide the first fraction for the alternate in which three different sized fractions are desired: minus 4 plus 30 mesh, minus 30 plus 60, and minus 60 mesh. The 30-mesh undersize fraction is then picked up in a common hopper and brought to two 14 ft-diameter Raymond air separators, Items 260A and B. These provide the screen cuts requested, (efficiency approximately 90 percent), and the products are elevated to the feed bins serving the concentrator section of the plant.

All screens, bins and elevators are connected to the dust collection system, Items 393-395, which is included with the concentrator section.

One operator, three shifts, is suggested for the feed preparation section, in addition to the man located at the receiving hopper. One laborer has been included, on days only, for cleanup and general assistance.

Dry Process Alternate

In the dry process alternate in which both drying and sizing below 4 mesh are eliminated, substantial capital and operating cost savings can be achieved. The magnitude of the cost components can be appreciated by referring to Tables 8 and 9 (Appendix A) in which these figures are detailed. The plant flowsheet and tentative layout have been prepared in such a way that the changes may be easily made. As has been stated, where the drier is eliminated, it is necessary to add an impactor unit to achieve the necessary degradation of particles to liberate the gold.

The feed preparation section has 650 connected horsepower for the drying and multiple sizing process, and 320 connected horsepower for the alternate without this equipment. The differences in capital and operating costs are summarized in Tables 3, 4 and 5.

Dry Processing - Concentration (Section 300)

Sized feed from the surge bins in the Feed Preparation Section is delivered by feeders, Items No. 300, 310 and 320, to the Morgan Dry Concentrators, Items No. 305A and B, 315A and B and 325. Constant weight feeders were chosen for this particular application, and serve two purposes:

1. Provide a check on the weight fed to the concentrating section, and

2. Provide an even flow of material to the tables.

Variable bed depths in the concentrator could adversely affect its separation characteristics, and the latter feature is believed to be important in preventing this.

The Morgan dry concentrators have been sized on the basis of 25 yards per hour of sand feed. Inasmuch as this rate was developed by the vendor on the basis of a 10 second run, it is

recommended that it be rechecked under actual service conditions. Air supply to the tables is provided by a centrifugal blower. The air is filtered to remove particulate matter above ten microns. Air from the concentrator tables is picked up by the exhaust and dust collection system. The concentration ratio assumed in the rougher circuit is 200 to 1.

In the case of the fixed plant, the concentrates are dropped into drums or portable bins which are picked up periodically by a fork lift truck and delivered to the cleaner section. Tailings drop from the concentrators either directly to the tailings belt or to an intermediate conveyor feeding to the tailings belt.

Rougher concentrates are elevated to Surge Bin Item 335, which is divided into three sections to accommodate these fractions: minus 4 plus 30 mesh, minus 30 plus 60, and minus 60 mesh. Operation of the cleaner section is on a campaign basis when three mesh sizes are used. Feeder Item 340 delivers the concentrates from the surge bin to a magnetic separator, of rotating field or similar type, designed especially for the separation of highly magnetic materials. The magnetics drop into a drum or portable bin and can either be brought to the amalgamation section for treatment to recover the gold or can be recycled to the magnetic separator to produce a barren magnetic fraction.

Non-magnetics drop into the Surge Bin, Item 350, a second three-section unit. Feeder Item 355 picks up the non-magnetic concentrates and delivers them to the Morgan Dry Concentrator, Item 360. This concentrator operates at a conservative 10 to 1 concentration ratio to produce a clean concentrate, which is brought by drum or portable bin to the amalgamation section. The barren tailings drop onto the intermediate tailings conveyor, Item 380.

One operator per shift is proposed for the operation of the concentration section.

Dry Processing - Amalgamation

Amalgamation is proposed as the method of recovering the gold from the gravity concentrators. By using mercury, the gold forms an amalgam, from which it is extracted by the following steps:

Amalgam collection
Cleaning
Pressing or filtration
Distillation or retorting
Melting

The concentrates are amalgamated in separate fractions by light grinding in an amalgam barrel. The Denver amalgamation unit, described in the Process Equipment List, is proposed.

It should be noted that it may not be necessary to amalgamate the magnetite fraction if a good clean split can be achieved in the magnetic separator. This can possibly be done by two passes over the separator, discarding the final barren fraction. In this case it may be possible to eliminate one amalgam barrel. If a barren fraction cannot be prepared and the residue has sufficient value, it can be shipped to smelters specialising in recovery of values from heavy mineral sands.

The amalgamation section operates on days only and is under the direct supervision of a responsible technical assistant. Labor required is one operator and one helper. It may be necessary to grind over a period of more than one shift, but this can be accomplished by the use of timing devices.

Mercury losses are taken as one pound per batch of 1500 to 2000 pounds and lime requirements of ten pounds per batch have been assumed. Lime and other chemicals may or may not be necessary, depending on the concentrate.

The cost of the amalgamation section is included in the cost of Section 300 - Concentration and Amalgamation - in Appendix B.

Dry Process - Portable Plant

The portable feed preparation and concentration plant contains the elements included in the permanent plant, Sections 200 and 300. Treatment on the trailers includes the rougher and cleaner operations of the Morgan Dry Concentrator and magnetic separation of the magnetite. Amalgamation is done at a fixed location, however, probably adjacent to the office-laboratory. This adds to the security of the operation.

It is proposed to mount the portable plant on two trailers equipped with crawlers. The trailer units would be moved by D-8 tractors equipped with winches. These tractors have a secondary service of preparing the grade and trimming the tailings piles.

The first trailer is approximately twenty-five feet wide by sixty feet long and will mount the feed preparation equipment shown on the flowsheet, WKE drawing 909-G1, from the hopper, Item 200, through the screw conveyor, Item 232. This conveyor delivers to the elevator, Item 235, mounted on the second trailer unit. The first trailer will carry a stacking conveyor equivalent to Item 208 for tailings disposal.

The equipment weight of the first trailer is approximately 75 tons and the gross weight, excluding running gear, is 120 tons. The unit will be carried on four pairs of Athey 7F crawler tracks having a capacity of 30 tons each. Following movement of the unit, it will be leveled with four fifty-ton jacks and blocked into position. Since movements would be frequent, even daily if the deposit thins out, the unit must be capable of rapid changeover from operating order to movement order.

Present planning calls for all-electric motor drives using power brought to the unit by cable from a local power company source. The total connected horsepower is 800 for the drying alternate. Fuel gas for the dryer would be brought by hose from a header. Oil fuel could be handled similarly from a tank trailer.

The capital cost for the first trailer is $377,000 on a turnkey basis. The basic equipment cost is $142,000 delivered at the site, ready for installation. Two men would operate the trailer unit, with a laborer, days only, to assist in cleanup and trailer movement.

The second trailer unit carries the screening and separating equipment necessary to produce three sizes of concentrator feed, as well as the rougher and cleaner concentrator units. Included are Items 250 through 360. The proposed trailer for this service is 25 feet wide by 70 feet long and 25 feet high. The equipment weight is approximately 102 tons and the gross weight (excluding running gear) is 180 tons. It is proposed to support this unit on four triple Athey 7F units rated at 45 tons each. Leveling would be accomplished with four built-in fifty-ton hydraulic jacks, as in the first trailer. The unit would be moved while empty. Under some circumstances it may be advisable to consider using powered shovel tracks under the units, but this alternate has not been investigated at this time.

The equipment cost for the second trailer is $278,000, and the turnkey erected figure is $735,000. The cost of portable units is slightly higher than for the conventional fixed plant. This increase results from the additional conveyors, needed to move concentrates because the lack of space precludes portable bins; the necessity for heavy construction to prevent wracking in movement; and the heavy duty equipment needed to move the trailers.

Operation of the second trailer unit requires the services of one man per shift.

The concentrates from the Morgan cleaner-concentrator and the material from the magnetic separator are picked up in a covered hopper-trailer and transported to the amalgamation section, located in the combination office and laboratory building. Locating the amalgamation section at a central point greatly reduces problems of water supply, raw materials handling, and security. With an average of five tons per day of concentrates, two 1.5 ton trailer units would be adequate, dumping two loads each shift.

Operation of the amalgamation section is identical to that described for the fixed dry process plant.

In summary the costs of the several sections of the portable 1,000,000 yard plant are as follows:

Trailer No. 1	$ 377,000
Trailer No. 2	735,000
Amalgamation Section	69,000
Miscellaneous Equipment	25,000
Total process plant	$1,206,000
Dozers, truck, trailers	129,000
Total capital cost	$1,335,000
Rounded	1,340,000
(Total connected horsepower is 800)	

From the data presented for the conventional fixed plant, it appears reasonable to assume that a saving of about $500,000 can be made in the portable plant by eliminating drying and three-size sand separation. The net capital cost for this alternate would be $840,000. This would result in a production cost savings of about twenty cents per bank yard.

A 2,000,000 yard plant, on a factored basis, would cost approximately $1,990,000 for the process plant (see Table 33). Dozers, truck and trailers would cost the same as for the smaller plant, making the total capital cost $2,119,000.

The estimated production costs for the 1,000,000 and 2,000,000 yard plants are detailed in Tables 32 and 33. For the 1,000,000 yard plant the estimated production cost is 48 cents per bank yard, not including mining and indirect charges, and for the 2,000,000 yard plant it is 35 cents.

Wet Process Plant (Section 400)

In the wet process plant, large volumes of water are used to assist feed preparation and concentration. The concentration step is performed in jigs, widely used on placer gold deposits

and known to show almost complete saving of the recoverable values. With proper adjustment, concentration ratios reduce the volume of concentrates so much that they can be collected, cleaned, and amalgamated in an area small enough to be well enclosed and locked. This is an advantage that helps to reduce losses from theft.

If the slimes discharged from the jigs should be found to be carrying fine gold, such losses can be further reduced by causing them to flow over blankets or corduroy fabric. The extent of such losses influences the choice of a method.

Water is introduced into the process at the trommel screen, Item 420, where material larger than 0.31 inch mesh is removed as clean waste. Water is conserved by recovering it from the concentrate product and the various tailings streams and recycling it to this initial point of use in the trommel.

The outline flowsheet, WKE drawing 909-G2, and the Section 400 layout sketch (both in Appendix C) illustrate the process. The process equipment list for Section 400 (see Appendix B) lists the weight, connected horsepower and factory cost for each major equipment item.

As in the dry process, pieces larger than 4 inches are rejected by a grizzly. The dry material then drops into the revolving trommel screen and mixes with a large stream of water. The trommel washes and rejects oversize solids that will not pass 0.31 inch mesh. This waste drops to a belt conveyor, Item 421, and is carried to the tailings conveyor, Item 425. The tailings conveyor has already received tailings from conveyors, Items 475 and 494, and is protected to some extent by this finer material from the coarse oversize of the trommel and grizzly.

The efficiency of the jigging operation is affected by the degree of dilution of the feed slurry. It is expected to be highest when the feed slurry has been thickened to 45 to 50 percent by weight. To accomplish this thickening, the slurry of undersize solids from the trommel is pumped to a settling cone, Item 430, before being fed to the jigs. Water overflowing from the cone is recycled to the water recovery sump, Item 435.

Two-stage jigging is proposed. For the purposes of this study it can be assumed that the first or "rougher" jigs will have a coarse bed of high capacity. The single second or "cleaner" jig will have a fine bed that will recover small grains effectively and produce a clean concentrate.

Ten rougher jigs, Items 445A to J, in parallel, are assumed to perform the initial 500 to one concentration of values. The concentrate goes to a cleaner jig, Item 450, in which the concentration is assumed to be 20 to one. An estimated 75 gallons per minute of make-up water for the plant is brought in at this jig and the rougher jigs.

The concentrates from the jigging operation are accumulated in a surge tank, Item 460. The supernatant water is periodically decanted from the tank and the concentrates treated in an amalgamation unit, Item 465. This is similar to the operation described for dry processing, except that the quantity of concentrates to be treated is much smaller and only one amalgamating drum is needed.

Both rougher and cleaner jigs discharge tailings to a 30 mesh dewatering screen, Item 470. The solids that remain on this screen are assumed here to have eight percent water. A belt conveyor, Item 475, deposits them on the tailings conveyor, Item 425. The screen undersize is pumped to a 100 ft thickener, Item 490, which recovers water for re-use and produces a tailings slurry. The slurry is assumed to have 40 percent solids by weight. It is filtered on a rotary vacuum filter, Item 496. The filter cake is assumed to have 10 percent water and goes to the tailings conveyor via belt conveyor, Item 494. The water filtrate returns to the water recovery sump, Item 435, and to the jigs.

5. HOUSING

At the Shell-WKE meeting of 20 August in San Francisco, it was decided that housing accommodations are to be assumed to be available to key employees. Recent prices and details from Northland Camps, Inc., supplemented by estimates by WKE, are suggested as being realistic and applicable to a desert area where housing for hourly employees can be obtained in neighboring towns or trailer parks within reasonable commuting distance (25 to 40 miles).

For this estimate, four home units have been assumed, of three-bedroom contemporary style, 20 by 55 ft, complete with all kitchen, laundry equipment, coolers, heaters, etc. The cost is $15,000 each, or a total of $60,000, erected on the owner's property with connections to power, water and sewer lines provided by the owner. The site costs, not including property, but including the houses, grading, roads, septic tanks, water lines, etc., would be approximately $20,000 each, or a total of $80,000 for the suggested housing program.

If trailer spaces are provided, provisions for a central laundry facility, connections for water, sewer, electricity, streets, etc., can be expected to run between $3,000 and $4,000 per site, not including property.

It is anticipated that a nominal rental would be charged for housing units, sufficient to cover caretaking and capital charges, hence no charge for the housing units has been made against plant operations.

In view of the fact that costs will vary widely with location and the present report does not cover a specific site, the above figures must be considered as order-of-magnitude only.

6. UTILITIES

The hypothetical placer gold deposit of this study has been assumed, for the purpose of determining utility and labor costs, to be located in the Randsburg-Atolia area of the Mojave desert of California.

The area is served by a natural gas pipeline of the Pacific Gas and Electric Co. (P G & E), and by power lines of the Southern California Edison Co. (SCE Co.) The gas rates that apply are in P G & E schedules G-50 and G-56, and the electric power rates are in the SCE Co. A-7 General Service schedule. Copies of these schedules are in Appendix B. Tables 12 and 13 (Appendix A) show the method of calculating the average rates that correspond to various estimated plant loads. Gas costs range from 46.9 cents per thousand cubic feet for the 1,000,000 yard plant down to 43.8 cents and 39.4 cents for 2,000,000 and 3,000,000 yard plants, respectively. Electricity costs range from 1.00 down to 0.94 cents per kilowatt-hour in 1,000,000 and 2,000,000 yard plants.

The water costs for the wet process plant are based on a hypothetical water system consisting of a 12-inch well, 300 feet deep; an 8-mile pipeline delivering 150 gallons per minute against a rise of 1200 feet; and a 150,000 gallon reservoir at the plant site. The estimated capital cost is detailed in Table 14 (Appendix A) and totals $275,000. Tables 30 and 31 give water production cost details and show a total of $1.11 per thousand gallons for the 1,000,000 yard plant, and $0.83 for the 2,000,000 yard plant. These high costs result mainly from the

required ten-year depreciation of the investment. Water system investments are normally depreciated at one-half to one-third that rate. Another boost to the water cost comes from handling such a small volume of flow in a long pipeline with a high rise.

The cost of the water system is not included in the capital costs of the wet process plants, but the water costs from Tables 30 and 31 (Appendix A) were used in preparing the wet process production costs of Tables 28 and 29.

In discussing water costs and water availability at desert sites, it seems appropriate to quote the following from "Geology of Placer Deposits" by Olaf P. Jenkins (as reprinted in Mineral Information Service, September 1964, page 166):

> "Only quite recently have the geologic processes in the desert been given much consideration; so also has much serious thought only lately turned toward the possible development of desert placers on a larger scale than mere 'dry washing'. The fact that adequate supplies of water may usually be derived from underground sources in the desert, and the fact that these sources may be found through geological investigation and geophysical surveying, are gradually being accepted."

Bill Finch (Denver) has some ideas along this line according to D.E. Brownard.

APPENDIX B

APPENDIX A

COST TABLES AND CRITERIA

Table No.	Title
1	Cost Summary (See text at page 2 - 2)
2	Design and Economic Criteria (4-page table)
3	Summary of Capital and Production Costs 1,000,000 yards per year
4	Summary of Capital and Production Costs 2,000,000 yards per year
5	Summary of Capital and Production Costs Portable plants
6	Controllable Indirect Costs - Process Plant
7	Non-process Capital and Operating Costs for Wet or Dry Process
8	Dry Process Alternates - Production Cost Adjustments
9	Dry Process Alternates - Capital Cost Adjustments
10	Working Capital Requirements
11	Personnel Summary - Dry and Wet Processes
12	Utilities - Gas Costs
13	Utilities - Electric Power Costs

Appendix A - continued

Table No.	Title
14	Process Water System Capital Cost
15	Summary of Mine Capital Cost Estimates
16	Summary of Mine Production Cost Estimates

Production Cost Estimates

17	Mining Equipment - Scraper Load and Haul Unit
18	Mining Equipment - Ripper-Dozer Unit
19	Mining Equipment - Pusher Unit
20	Mining Equipment - Shovel Unit
21	Mining Equipment - Truck Haul Units
22	Mining Equipment - Dragline
23	Mining - Cost of Supervision, Service and Maintenance
24	Section 200 - Dry Process Feed Preparation - 1,000,000 yd Plant
25	Section 200A - Dry Process Feed Preparation - 2,000,000 yd Plant
26	Section 300 - Dry Concentration and Amalgamation - 1,000,000 yd Plant
27	Section 300A - Dry Concentration and Amalgamation - 2,000,000 yd Plant
28	Section 400 - Wet Feed Preparation, Concentration, and Amalgamation - 1,000,000 yd Plant

Appendix A - concluded

Table No.	Title
29	Section 400A - Wet Feed Preparation, Concentration, and Amalgamation - 2,000,000 yd Plant
30	Process Water for 1,000,000 yd Plant
31	Process Water for 2,000,000 yd Plant
32	Portable Plant - Dry Process - 1,000,000 yd Plant
33	Portable Plant - Dry Process - 2,000,000 yd Plant

TABLE 2

DESIGN AND ECONOMIC CRITERIA

Mining

1. Deposits of two sizes are to be considered: 10,000,000 and 20,000,000 yards.

2. Two mining rates are to be considered: 1,000,000 and 2,000,000 yd per yr.

3. Operating time is to be 20 hr per day, 340 days per yr, for a total of 6800 hr per yr.

4. The ratio of length to breadth for the deposit is assumed to be 5 to 1, and the deposit is without overburden.

5. The depth of the deposit is assumed to range from ten to sixty feet, and average twenty feet, with irregular bed rock base.

6. Material in place is to be considered as having a density of 3000 lb per cu yd and an average moisture content of three percent.

7. The following screen analysis is assumed: (see Figure 1)

On U. S. Standard 4 mesh.	35 percent
Minus 4 plus 30 mesh	30
Minus 30 plus 60 mesh	20
Minus 60 mesh	15
Total	100 percent

8. The deposit is considered to be a compacted alluvial gravel and sand with very few rocks over 10 to 12 inches in size. It is assumed to be a tough digging ground which can be ripped or dug with a power shovel or heavy duty dragline.

(Table continued on next page)

Table 2 - continued

9. Top of bedrock can be ripped for cleanup, but it is not intended to remove waste horses to level the floor. A small loader is needed for cleanup on one shift per day.

10. Open cuts made by extraction of the gold-bearing gravels will be backfilled with mill tailings, regardless of the final mining plan selected. About 99.5 percent of the material mined will thus be returned. Reclaiming or rehabilitating the area after mining is not considered, since the area has been assumed to be waste land. One dozer, part time only, is allowed for trimming waste piles.

11. Royalty is to be figured at $0.05 per yard of bank run material.

Feed Preparation - Dry Process

1. Operating time as for mining.

2. Two feed rates are to be considered for both the fixed and the portable plants: 1,000,000 and 2,000,000 yd per yr. The project has a life expectancy of ten years.

3. No values in the plus 4 mesh material.

4. Size distribution as shown under Mining.

5. An alternate will be considered for a dryer to dry scalped feed from three to approximately 0.5 percent moisture, using one inch top size material for attrition in the dryer unit. Dryer fuel to be natural gas. If the dryer is not used, a trommel or impactor will be substituted for the grizzly to provide attrition.

6. The feed will be screened to remove plus 4 mesh material, with an alternate air separator system to separate the minus 4 mesh product into plus 30, minus 30 plus 60, and minus 60 mesh streams.

(Table continued on next page)

Table 2 - continued (Appendix A)

Concentration and Amalgamation

1. Operating time same as for Feed Preparation.

2. Production rates as for Feed Preparation.

3. No recovery or efficiency figure will be assumed in this study.

4. Feed rates will be 25 yards per hour per Morgan unit.

5. A concentration ratio of 200 to 1 in the rougher and 10 to 1 in the cleaner will be used, and gold recovered down to 200 mesh. The distribution of values is unknown, except for the assumption of no values in the plus 4 mesh material.

6. An allowance of $30,000 will be made for the laboratory, including assay equipment, retorts, panning equipment, etc.

7. The Morgan Dry Concentrator units cost $6,000 each at the factory, not including air supply or exhausters. Maintenance is assumed to cost $1200 per yr per unit. Each machine uses 0.75 hp.

8. Air is needed at a pressure of 8 in. of water for the Dry Concentrator. The rate is 100 cu ft per min per sq ft of table area.

9. All concentrates will be treated in the amalgamator.

Wet Process

1. Operating time same as for Mining.

2. Feed rates same as Mining: 1,000,000 and 2,000,000 yd per yr for both the fixed and portable plants.

3. The feed is to be screened to 0.31 in. mesh in wet trommel, using a screen with tapered holes in AR metal.

(Table continued on next page)

Table 2 - concluded (Appendix A)

4. Two stage jigging will be used in place of tables. The jigs will be Pan Am or Yuba, placer type, with feed at 45 to 50 percent pulp density, feeding from a cone separator.

5. Concentration ratios will be 500 to 1 in the rougher jigs and 20 to 1 in the cleaner jig. Adequate amalgamator capacity will be provided: 1500 to 2000 lb capacity. Mr. Daily suggested cleaner ratios between 20 and 30 to 1 and was to confirm the figure.

6. Tailings from the rougher jigs are to be rejected. Cleaner jig tailings will be rejected, not recycled.

General

1. Dust collection is to be provided, with all screens, elevators, concentrator units, etc. connected to a central dust control system.

2. All motors will be totally enclosed, fan-cooled, and electric enclosures dust and water-tight.

3. Instrumentation will be limited to samplers, pressure gages, thermometers, bin level indicators, etc.

4. All belt conveyors shall be the same width, in interest of minimum spares.

Economic

1. Indirect operating costs, including taxes, insurance, and other controllable items, are to be estimated by WKE.

2. Depreciation is to be lineal and for 10 years, except for mining equipment, which is depreciated according to vendors recommendations and general practice in earth-movement projects.

3. Capital investment costs are not to include interest charges.

4. Estimates of working capital are to be prepared by WKE.

Table 6
CONTROLLABLE INDIRECT COSTS
PROCESS PLANT

1,000,000 Yards per Year of Bank-run Placer Gravels

Office Personnel	No. of men	Annual Cost with Fringe Benefits	Annual Cost
Superintendent	1	12,000	
General Foreman	1	9,000	
Clerk, timekeeper	1	6,000	
Clerk, warehouse	1	6,000	
Technical Assistant	1	9,000	
Laborer	1	6,000	
Total	6		48,000
Maintenance (Process Plant Only)			
Supervisor	1	8,380	
Mechanic	1	8,050	
Welder	1	8,050	
Helper	1	6,900	
Laborer	1	6,000	
Total	4		37,380

Other Costs:	Annual Cost	
Maintenance and Depreciation (Table 7)	10,000	
Allowance for communications, travel, vehicles, office charges, etc.	3,000	
Power and Heating	2,500	
Total		15,500
		100,880
Cost per yd plant feed, 1,000,000 yd per yr		0.100

2,000,000 Yards per Year

Cost per ton, from 1,000,000 yd plant, 1/2 of 0.100,	0.050
Add for maintenance labor, one more mechanic	.008
Add for extra facilities	.002
Total	.060

Table 7

NON-PROCESS CAPITAL AND OPERATING COSTS FOR WET OR DRY PROCESS

1,000,000 Yards per Year of Bank-run Placer Gravels

	Capital Cost		Operating Cost[1]
	dollars	dollars	$ per yr
Office and Laboratory Bldg.: includes furnishing, equipment, safe, etc., also heating and air conditioning	30,000		4,500
Warehouse and Shop Bldg, (Includes bins, racks), as incremental part of Mining Section 100.			
Prefab steel.	10,000		1,200
Total Non-Process Bldgs.		40,000	5,700
Tools and Equipment	15,000		1,500
Truck Crane	10,000		1,500
Pick-up	2,400		800
Portable Welder & Misc.	1,500		500
Total Tools and Equipment		28,900	
Total Capital and Operating Costs		68,900	10,000
Rounded		70,000	10,000

2,000,000 Yards per Year of Bank-run Placer Gravels

Total Capital and Operating Costs		85,000	12,000

1/ Maintenance and depreciation.

Table 8
DRY PROCESS ALTERNATES
PRODUCTION COST ADJUSTMENTS

1,000,000 yd per yr Plant

Dry process, with alternates that omit drying and screening.
Capital cost reduction of $433,000. (Table 9)

		Production Cost Savings	
	$ per yr	$ per yr	$ per yd
Labor			
Deduct one man per shift	29,640		
Benefits at 15 percent	4,450		
		34,090	0.034
Electric Power			
$(330\,hp)(0.8)(0.746\,\frac{kw}{hp})(6800\,hr)(\frac{\$0.00984}{kwhr})$		13,160	.013
Fuel		76,000	.076
Maintenance (0.03)($433,000)		12,990	.013
Factory Supplies		2,000	.002
Depreciation (0.10)($433,000)		43,500	.044
Non-controllable indirect costs (0.025)($433,000)		10,880	.011
Total Production Cost Saving		192,620	.193

2,000,000 yd per yr Plant

Total production cost saving

$$\$0.193 \times \frac{*0.221}{*0.281} \qquad .152$$

* Feed preparation costs from Tables 24 and 25

Table 9

DRY PROCESS ALTERNATES
CAPITAL COST ADJUSTMENTS

Alternate: Without Drying. (1,000,000 yd plant)

		Power hp	Cost at Factory dollars
1. Retain Grizzly-Screen, item 207, but scalp at one inch. Use conveyor, item 217 to feed an impactor. No weight change.		no change	no change
2. Delete equipment items 220, 222 and 223. Weight decrease of 61,500 lb		-130	-42,000
3. Add impactor item 224, Pennsylvania CDL 9-38, or equal. Disintegrate 166 ton per hr of minus 1 in. placer sand. Weight increase of 12,700 lb		+150	+ 9,200
4. Retain equipment item 225 but use to distribute disintegrated material to screens, item 230. No change in weight.		no change	no change
5. Freight and Tax saving: Net Weight decrease 48,800 lb			
Freight, handling, $6 per 100 lb	$2,928		
Taxes, (0.03)(-42,000 + 9,200)	984		
			- 3,912
Total adjustment, before installation		20 hp increase	36,712 saving
Installed Cost Saving: 2.65 x 36,712			97,000

(Table continued on next page)

Table 9 - concluded

Alternate: Without Air Separation (1,000,000 yd plant)

		Power hp	Cost at Factory dollars
1. Retain equipment items 200 to 240, incl., and Surge Bin 250		no change	no change
2. Deduct equipment items 255 through 290 and item 245		-350	-109,000
3. Freight and tax saving:			
Weight decrease of 244,000 lb			
Freight, handling, $6 per 100 lb	$14,640		
Taxes, (0.03)(-109,000)	3,270		
			- 17,910
Total adjustment, before installation		350 hp decrease	126,910 saving
Installed Cost Saving: 2.65 x 126,910			336,000

Total Capital Cost Adjustments

Alternate without drying	97,000	
Alternate without air separation	336,000	
Total saving with both alternates (Total Power Saving 330 hp)		433,000

2,000,000 yd per yr Plant

Total saving with both alternates $433,000 x *1,070,000/*650,000	714,000

* Section 200 and 200A capital costs, Tables 24, 25.

Table 10
WORKING CAPITAL REQUIREMENTS

1,000,000 Yards per Year of Bank-run Placer Gravels

Dry Process Plant	Cost
Accounts receivable for 30 days production	$ 68,000
Raw materials inventory for 15 days production	1,000
Spare parts, one percent of Process Plant Capital Cost	14,000
Startup costs, one percent of Process Plant Capital Cost	14,000
Misc.: personnel recruitment, supervision by Shell engineers, etc.	20,000
Total Working Capital	$ 117,000
Rounded	120,000
(For 2,000,000, say	200,000)

Wet Process Plant	
Accounts receivable for 30 days production	$ 68,000
Raw materials inventory for 15 days production	1,000
Spare parts, one percent of Process Plant Capital Cost	11,000
Startup costs, one percent of Process Plant Capital Cost	11,000
Misc.: personnel recruitment, supervision by Shell engineers, etc.	30,000
Total Working Capital	$ 121,000
Rounded	120,000
(For 2,000,000, say	200,000)

(Appendix A)

Table 11

PERSONNEL SUMMARY

DRY AND WET PROCESSES

1,000,000 ton per yr Plants

	Number of Men Required			
	Dry Process		Wet Process	
Plant Office		6		6
Mining (Scraper)				
Supervisor	1		1	
Operators	12		12	
Maintenance	6		6	
		19		19
Feed Preparation				
Supervisor	0.5		1	
Operators	8		9	
Laborer	1		1	
		9.5		11
Concentration and Amalgamation				
Supervisor	0.5			
Operators	5			
Laborer	1			
		6.5		
Maintenance (Plant)				
Supervisor	1		1	
Mechanic	1		1	
Welder	1		1	
Helper	1		1	
Laborer	1		1	
		5		5
Total Personnel		46		41

TABLE 12

UTILITIES - GAS COSTS

Gas in the Atolia area, within one-half mile of the P G & E pipeline from Kramer Junction to Trona, is available under two meter schedules, G-50 and G-56. Gas fuel rate calculations for process plant capacities of 1,000,000 to 3,000,000 yards per year are illustrated in this table. It is assumed that a 1,000,000 ton per year plant has a heat load of 26,000,000 Btu per hr. for drying. Using gas rated at 1100 Btu per cu ft, the gas consumption is

$$\frac{26{,}000{,}000 \text{ cu ft}}{1100 \text{ hr}} \times \frac{6800 \text{ hr}}{12 \text{ mo}} \quad \frac{13{,}523{,}000 \text{ cu ft}}{\text{mo}}$$

or 13,523 Mcf per month

(This table continued on next page)

Table 12 - Concluded

Monthly Gas Costs

Gas Used Mcf	Sched G-50 Rate, cents per Mcf	Plant Capacities, yd per yr 1,000,000	2,000,000	3,000,000
First 1000	54.7	$ 547		
Next 2000	50.4	1008		
Next 3000	48.7	1461		
Next 4000	47.2	1888		
Subtotal		$4904	$4904	$4904
Last 3523	40.7	1434		
Next 10,000	40.7		4070	4070
Last 7046	40.7		2868	
	Sched G-56			
Last 20,569	33.9			6973
Total Monthly Use				
13,523 Mcf		$6338		
27,046 Mcf			$11,842	
40,569 Mcf				$15,947
Overall Gas Rate, cents per Mcf		46.9	43.8	39.4

The minimum meter charge for Schedule G-56 is $16,000. The last 20,569 Mcf used by the 3,000,000 yd plant, if figured by G-56, costs $6973 and makes the total cost $15,947 per month. By Schedule G-50, the last 20,569 Mcf costs $8372, the total is $17,346 and the overall rate 42.8.

APPENDIX B

EQUIPMENT LISTS AND UTILITY COMPANY RATE SCHEDULES

		Page
1.	Process Equipment List - Section 200	1
2.	Process Equipment List - Section 300	6
3.	Process Equipment List - Section 400	10
4.	Pacific Gas & Electric Co. Gas Rate Schedules	
5.	Southern California Edison Co. Electric Power Rate Schedules	
6.	Reference Item: "Dry Dredge Taps Desert Gold"	

(Appendix B)

PROCESS EQUIPMENT LIST

SECTION 200

Feed Preparation Section, Dry Process Plant. Capacity 1,000,000 yards per year.

Item Number	Description	Power hp	Cost at Factory
200	Hopper, capacity 43 yards, suitable for dumping 25 yd scraper units, 8 in. grizzly deck. Hopper unit of steel, set on concrete foundation which forms mount for feeder. Weight of steel, approx. 11,000 lb.	1	$2,200
202	Feeder, Ore, Denver Apron Type J, or equal, 36 in. by 10 ft unit capacity 25 to 375 t per hr at 20 ft per min. Includes motor and drive. Weight 8600 lb Duty: Feed 225 t per hr of 111 lb per cu ft placer gravel.	2	5,800
205	Conveyor, Belt. 24 in. conveyor 80 ft long, 20 ft lift, complete with bolt, idlers, pulleys, bearings, take-ups, motor and drives. Duty: 225 t per hr of 111 lb per cu ft. placer gravel. Weight 4000 lb.	20	3,500
207	Grizzly, 4 in. bar Telsmith scalper or equal, with 1 in. screen bottom. (See Item 215). Duty: Scalp plus 4 in. rock and screen out plus 1 in. material. Feed 225 t per hr, plus 1 in. material is 56.3 t per hr. Gravel at 111 lb per cu ft. Unit: 5 by 10 double deck, with drive. Weight 8500 lb.	15	7,500

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
208	Conveyor, Belt. 24 in. conveyor 180 ft long with 35 ft. rise, complete with belt, idlers, pulleys, bearings, take-ups, motor and drives. Duty: 220 t/hr of minus 8 in. material to surge bin, item 210. Weight 6000 lb.	25	$6,300
210	Bin, surge, 50 t capacity, steel, on legs. Weight approx. 10,600 lb.	1	2,100
212	Feed gate, double rack and pinion 30 x 36 in. with cylinder.	1	500
215	See Item 207.		
217	Conveyor, Belt. 24 in. by 15 ft. with raise of 3 ft to discharge end. Complete with belt, idlers, pulleys, bearings, take-ups, motor and drives. Duty: 170 t per hr at 3000 lb per cu ft 1 in. minus gravel. Weight 2500 lb.	10	2,000
220) 222) 223)	Dryer, dust collector and fan. Duty: Dry 170 t per hr of minus 1 in. placer gravel from 3 percent to 0.5 percent water. Unit proposed is Standard Steel 6 x 28 ft unit complete with appurtenances and stack, drives, motors and firing equipment. Saw tooth lifters for maximum attrition. Heat required is 24 x 10^6 Btu per hr plus 7-1/2 percent radiation loss or 26,250,000 Btu. Fuel is 1100 Btu natural gas. Area 18 x 40 x 40 ft high. Weight dryer 40,000 lb. Weight dust concentrator 21,500 lb. Fob Los Angeles.	130	42,000
225	Drag Conveyor, Stephens Adamson, 18 x 8 in. flight, 60 ft long, 10 ft lift. Duty 166 t per hr gravel at 111 lb/cu ft. Temperature 180 F, weight 2500 lb.	15	2,000

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
230	Screens A, B and C (3) Telesmith or Denver-Dillon 5 x 12 ft single deck, complete with drive and dust cones. Duty: Separate 144.25 t per hr of minus 4 mesh from 166.75 t of minus 1 in. feed. Weight each 9800 lbs for total of 29,400 lb. 3 units	25	$19,500
232	Conveyor, 24 in. by 35 ft length, complete with belt idlers, drive, take-ups, etc. Duty: 145 t per hr minus 4 mesh to Elevator, Item 235. Weight 3000 lb.	10	2,500
235	Elevator, height 35 ft, complete with drive, all steel casing. Buckets 16 x 8 x 8-1/2 with 22-3/4 x 54 in. casing. Duty: 144 t per hr minus 4 mesh material. Weight 5600 lb.	15	3,500
240	Conveyor-Distributor, 18 in. x 60 ft heavy duty trough and screws. Complete with motor and drive. Duty: 144.25 t/hr of minus 4 mesh delivered to surge or screens. Weight 8200 lb.	30	6,200
245	Screens, single deck 5 x 12 ft Telesmith, Denver-Dillon or equal. Five units required (ABCDE). Dust cover required. Complete with motor and drive. Duty: Feed 144 t/hr minus 4 mesh. Product 67.5 t/hr minus 4 mesh plus 30 mesh. Weight 27,500 lb (5 units) 5 units	50	27,500
250	Surge Bin - used with either alternate. 120 ton design, 100 t nominal capacity steel bin with roof and spouts. Weight 16,000 lb.	-	3,200

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
250A	Alternate Bin, same as Item 250		
255	Conveyor-Splitter. Two units in series each 50 ft long. Stephens-Adamson Class II 16 in. diam. totally enclosed, TEFC gear motor. Duty: 76.25 t per hr of minus 30 mesh material. Weight 12,000 lb.	30	$7,700
260 A & B	Air Separator, Raymond mechanical single whizzer 16 ft unit, 2 required. Heavy duty with abrasion-resistant liner. Including 600 rpm motor direct-connected. Duty 76.25 tons per hr feed: minus 30 plus 60 mesh, 45 t per hr; minus 60 mesh, 31.75 t per hr; bulk density 110 lb per cu ft. Approx. 90 percent of -30+60 will be in that size range. Weight 60,000 lb. 2 units	250	60,000
265	Conveyor, 12 in. x 50 ft, screw type, complete with gear motor and coupling. Duty: 45 tons per hr of -30+60 sand with a bulk density of 111 lb per cu.ft. Weight 3500 lb.	5	2,300
270	Elevator, 10 in. x 6 in. x 35 ft, Ersham BB4 or equal, belt type. Duty: 45 t per hr of -30+60 mesh sand at 111 lb per cu ft. Weight 3540 lb.	5	2,500
275	Surge Bin 50 tons capacity, made of 3/16 in. steel plate, supported on steel legs, 10 x 10 x 28 ft high. (Can be cylindrical). Weight 10,600 lb.	-	2,100
280	Conveyor - same specifications as Item 265, for purpose of minimizing spares. Weight 3500 lb.	5	2,300

Item Number	Description	Power hp	Cost at Factory
285	Elevator - same specifications as Item 270 for purposes of minimizing spares. Weight 3540 lb	5	$2,500
290	Surge Bin. 50 tons capacity, same specifications as Item 275. Weight 10,600 lb	-	2,100
Totals		650	$217,800

Total Weight 320,680 lb

Freight, delivery, handling at site 320,680 x $6.00/100	19,240
Sales taxes, 3 percent of factory cost	6,530
Equipment cost, ready to install	$243,570
Rounded	244,000
Capital cost for Section 200 (Installed) 244,000 x 2.65	650,000

PROCESS EQUIPMENT LIST

SECTION 300

Dry Concentration and Amalgamation Section, Dry Process Plant. Capacity 1,000,000 yards per year.

Item Number	Description	Power hp	Cost at Factory
300 A,B	Feeders, Variable Rate (2). Duty: feed 34 t per hr, each, of 4 by 30 mesh sand, bulk density 110 lb per cu ft. Hardinge Size C Constant Weight Unit, or equal, ratio 3:1. Total weight 800 lb.	1	$3,450
305 A,B	Concentrators, Morgan Dry (2). Duty: concentrate 25 yds per hr of sand each in ratio of 200:1. Sand feed is 4 by 30 mesh. Complete with motor, drive and dust covers. Air supply by others. Total weight 5000 lb.	1.5	13,200
310 A,B	Feeders, Variable Rate (2). Duty: feed 22 t per hr of 30 by 60 mesh sand. Same specifications as 300A, B, except total weight 700 lb.	1	3,450
315 A,B	Concentrators, Morgan Dry (2). Duty: concentrate 22 t per hr each of 30 by 60 mesh sand feed. Same specifications as Item 305A except total weight 2500 lb.	1.5	13,200
320	Feeder, Variable Rate (1). Duty: 32 t per hr of minus 60 mesh material. Same specifications as 300A except weight 700 lb.	0.5	1,725

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
325	Concentrator, Morgan Dry (1). Duty: 32 t per hr of minus 60 mesh sand. Same specifications as Item 305A except weight 2500 lb.	1	$6,600
330	Elevator. Duty: lift 2 t per hr of concentrates, bulk density 135 lb per cu ft. Evsham Size B1, or equal, 4 t per hr capacity, 35 ft centers. Complete with drive and guards. Weight 3000 lb.	1	1,800
335	Surge Bin, 3-compartment, 20 ton capacity (1 day), for rougher concentrates. Complete with roof, ladder, etc. Weight of steel 7000 lb.	-	1,400
340	Feeder, Variable Rate. Duty: feed concentrates to magnetic separator at rates up to 2 tons per hr, concentrate density 135 lb per cu ft. Hardinge Size B constant weight unit, or equal, ratio 3:1. Weight 500 lb.	0.25	1,300
345	Magnetic Separator. Duty: remove magnetite and other magnetic sands from gold concentrates at feed rate of 4000 lb per hr. Carpco Rotating Field, Model RF 118, or Dings Model FA Drum, or equal, designed especially for separation of highly magnetic materials. Dust tight. Complete with hopper and drive. Weight 500 lb.	1	1,300
350	Surge Bin. Duty: contain 1 ton of non-magnetic concentrate, bulk density 111 lb per cu ft. Approx. 4 x 4 x 4 ft, steel. Weight 1000 lb.	-	200

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
355	Feeder, Variable Rate. Same specifications as Item 340. Weight 500 lb.	0.25	$1,300
360	Concentrator, Morgan Dry. Cleaning ratio 10:1. Same specifications as Item 305A except that unit runs intermittently, serving as a cleaner for non-magnetic sands. Weight 2500 lb.	0.75	6,600
365	Elevator. Same specifications as Item 330. Weight 3000 lb.	1	1,800
370	Surge Bin. Capacity 5 tons of sand with bulk density 135 lbs per cu ft. Weight 2250 lb.	-	450
375 A,B,C	Amalgamation Units (3). Duty: amalgamate 4.9 tons of gold concentrates in one 8 hour shift. Denver 42 x 48 in., or equal, with motor and drive. Weight 25,300 lb (3 units)	22.5	16,500
380	Belt Conveyor. Duty: move tailings and waste sands to conveyor Item 208. Size 24 in. x 15 ft, complete with belt, idlers, motor, drive. Weight 2500 lb.	2	2,000
385	Fork lift truck, barrel type, capacity 2000 lb. Gasoline motor drive. Weight 4000 lb.	-	3,500
386	Amalgamation Equipment, Miscellaneous. Includes small water tank, pumps, blanket table, etc. Weight 1500 lb. Allowance:	3	1,000
390	Air Filter. Four (4) Air Maze P116, or equal, 20 x 25 inch, including holding frames. Weight 150 lb.	-	450

Item Number	Description	Power hp	Cost at Factory
392	Centrifugal Blower. Duty: 3500 cfm of air at 2 psi, inlet temp. 110 F, maximum. Elevation 3500 ft above sea level. AC type "C", single stage, direct coupled. Complete with motor, baseplate, check valves, inlet butterfly. Weight 5000 lb.	50	$12,000
393	Cyclone, Dust Collection. Duty: 10,000 cfm at 3.5 in. pressure drop. American Blower Series 311, design 13, size 22, or equal. Steel shell 3/16 in., complete with 30 cf hopper and type F seal flapper valve. Weight 3040 lb.	-	2,240
395	Fan, Dust Collection Service. Duty: 10,000 cfm at 6.5 in. American type 21AH, Series 106, with TEFC motor and drive. Weight 1500 lb.	20	1,100
Totals		108.25	$96,565

Total Weight 75,440 lb

Freight, delivery, handling at site 75,440 x $6.00/100	4,530
Sales taxes, 3 percent of factory cost	2,900
Equipment cost, ready to install	$103,995
Rounded	104,000
Capital cost for Section 300 (Installed) 104,000 x 2.65	$275,000
Miscellaneous Equipment not requiring installation	15,000
Total Capital Cost	$290,000

PROCESS EQUIPMENT LIST

Section 400

Feed Preparation, Concentration, and Amalgamation Section of Wet Process Plant. Capacity 1,000,000 yards per year.

Item Number	Description	Power hp	Cost at Factory
400	Hopper, capacity 43 yards, with 8 in. grizzly deck. Suitable for dumping 25 yd scraper units. Steel construction, on concrete foundation that also supports feeder. Weight of steel 11,000 lb	1	$2,200
405	Ore Feeder. Duty: Feeds 220 t per hr of 111 lb per cu ft placer gravel. Denver Apron Feeder, Type J, or equal, 36 by 111 in. Includes motor and drive. Weight 8600 lb	2	5,800
408	Belt Conveyor. For 220 t per hr of mine-run ore, 110 lb per cu ft, largest lump 8 in. Conveyor width 24 in., length 30 ft, lift 8 ft. Complete with motor and drive. Weight 3205 lb	15	3,090

Item Number	Description	Power hp	Cost at Factory
410	Grizzly. Capacity 220 t per hr of placer ore, rejects plus 4 in. material. (Telsmith heavy duty scalper, or equal, 5 by 10 ft single plate or bar deck.) With motor and drive. Weight 7000 lb	10	$5,500
415	Belt Conveyor. For 220 t per hr of placer ore, 110 lb per cu ft, all minus 4 inch. Conveyor width 24 in., length 42 ft, lift 12 ft. Complete with motor and drive. Weight 3092 lb	10	2,980
420	Trommel Screen. Washes and screens 220 ton per hr of minus 4 in. placer ore on 0.31 inch mesh, rejecting 70 tons, passing 150 tons. Telsmith Standard Rotary Washing Screen, or equal, 60 in. diam. by 19 ft, complete with cleaning rollers, piping, motor and drive. Weight 21,000 lb	20	12,000
421	Belt Conveyor. For 65 t per hr of minus 4 inch ore, 110 lb per cu ft. Conveyor width 24 in., length 50 ft, lift 4 ft. Complete with motor and drive. Weight 2345 lb	7.5	2,470
425	Belt Conveyor. For 245 t per hr of minus 8 inch ore, 120 lb per cu ft. Conveyor width 24 in., length 70 ft, zero lift. With motor and drive. Weight 4285 lb	15	4,370

Item Number	Description	Power hp	Cost at Factory
426	Belt Conveyor. Duty: move 245 t per hr of minus 8 inch ore, 120 lb per cu ft. Conveyor 24 in. by 100 ft, lift 32 ft. With motor and drive. Weight 4310 lb	15	$4,410
427	Surge Bin. Capacity 50 tons. Steel bin, on legs. Weight 10,600 lb	1	2,100
428	Sump Tank. Steel, open top, 9 ft diam. by 6 ft straight side, plus 3 ft eccentric bottom cone. Weight 2100 lb	--	630
429	Centrifugal Pump. Capacity 2700 gpm of slurry, spec. gravity 1.2 at 50 ft total dynamic head. Morris Model 10CK solids pump, or equal. Variable speed drive. Weight 9800 lb	75	9,000
430 AB	Settling Cones (2). Total feed: 2670 gpm of 22 percent (wt.) slurry, overflow approx. 1440 gpm. Telsmith No. 10 Sand Tanks, or equal, with rubber-lined automatic valve. Weight 10,600 lb	--	6,000
432 AB	Pulp Distributors (2). Receive total 1230 gpm underflow from items 430A B and divide evenly for 10 rougher jigs, items 445 A to J. Denver 5 ft pulp distributors, or equal, 2-bearing, 5-compartment. Weight 2500 lb	--	1,500

Item Number	Description	Power hp	Cost at Factory
435	Sump Tank. Same specifications as item 428. Weight 2100 lb	--	$ 630
440	Centrifugal Pump. Capacity 2210 gpm water at 50 ft total dynamic head. Morris 8 CK pump, or equal, with variable speed drive and motor. Weight 6600 lb	60	6,100
445 A to J	Mechanical Rougher Jigs (10). Duty: 500 to 1 concentration of 155 ton per hr minus 0.31 inches placer sands and slimes. Denver 16 by 24 in. Duplex Mineral Jigs, or equal. With motors and drives. Total weight 20,000 lb	15	22,000
450	Cleaner Jig. Duty: 20 to 1 concentration of 620 lb per hr product from item 445. Denver 8 by 12 in. Simplex Mineral Jig, or equal. Weight 520 lb	0.5	840
455	Centrifugal Pump. Capacity 685 gpm water at 40 ft total dynamic head. Morris 4 JC14, or equal. With motor and variable drive. Weight 1580 lb	15	2,200
460	Surge Tank. 26 in. diam. by 42 in. deep vertical steel tank, cone bottom, open top. Weight 80 lb	--	30

Item Number	Description	Power hp	Cost at Factory
462	Centrifugal Pump. Capacity 5 gpm of water at 25 ft total dynamic head. Weight 25 lb. Allowance:	0.1	$ 200
465	Amalgamator. Duty: amalgamation of 1000 lb of concentrates in one 8-hr shift. Denver 42 by 48 in. Amalgamation Unit, or equal. Weight 8200 lb	7.5	3,800
466	Amalgamation Equipment, Miscellaneous. Includes small water tank, pumps, blanket table, etc. Weight 1500 lb Allowance:	3	1,000
470 A, B	Dewatering Screens (2). Duty: to dewater a 45 to 55 percent slurry carrying 155 ton per hr solids. Telsmith 5 x 12 ft Horizontal Screens, or equal, slotted openings, single deck, plus ball-tray deck. Total weight 15,000 lb	30	12,000
475	Belt Conveyor. Duty: move 84 tons per hr of wet sand, 120 lb per cu ft. Conveyor 24 in. by 50 ft, lift 5 ft. With motor and drive. Weight 2000 lb	5	2,200
480	Sump Tank. Steel, open top, 7.5 ft diam. by 4 ft straight side, plus 3 ft eccentric bottom cone. Weight 1700 lb	--	400

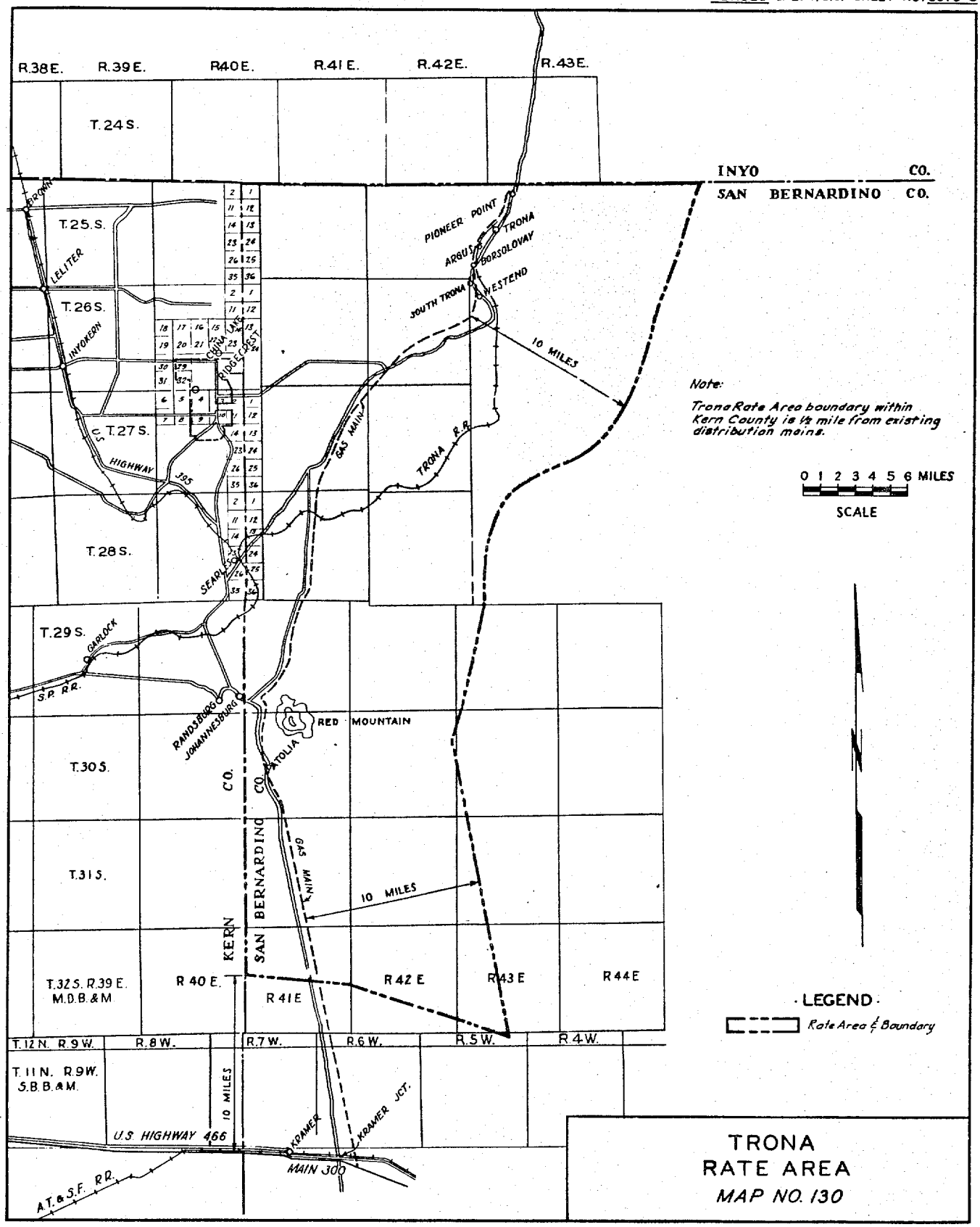
Item Number	Description	Power hp	Cost at Factory
485	Centrifugal Pump. Capacity 1400 gpm slurry, spec. gravity 1.1, at 35 ft total dynamic head. Morris 8CK Solids Pump, or equal, with variable speed drive and motor. Weight 6100 lb	40	$5,400
490 A	Thickener Mechanism. Duty: to settle 77 ton per hr placer sands, minus 30 mesh, from 1400 gpm of slurry. Mechanism for 100 ft tank. Weight 44,000 lb	7.5	25,000
490 B	Thickener Tank. 100 ft diam. by 14 ft, steel, with launder. Weight 115,000 lb	--	25,000
491	Sump Tank. Capacity 1000 gal. Steel, open top, 5 ft diam. by 5.5 ft straight side, plus 4 ft eccentric bottom cone. Weight 1380 lb	--	340
493	Air Blower. Supplies air to item 496, filter. Roots-Connorsville 4 in., or equal. Weight 1200 lb	7.5	1,470
494	Belt Conveyor. Duty: Conveys 86 t per hr filter cake, 105 lb per cu ft. Conveyor 24 in. by 30 ft, lift 5 ft. Weight 1725 lb	5	1,800

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
495 A, B	Slurry Pumps (2). Transfer underflow from thickener, item 490B, to filter, item 496. Dorrco WLP, 8 in., or equal. Total weight 12,000 lb	15	$ 17,000
496	Filter, Rotary Vacuum. Receives 77 ton per hr solids in 40 percent (wt.) slurry. Dorrco Disc Filter, 8 ft diam. by 9 disc, or equal. Weight 20,000 lb	2	17,500
497	Filtrate Receiver. Steel, 48 in. diam. by 48 in. Weight 1000 lb	--	700
498	Vacuum Pump, Wet. For use with filter, item 296. Nash CL 4001, or equal. Weight 13,000 lb	200	17,500
499	Filtrate Pump. For use on filtrate receiver, item 497. Olivite, 4 in., or equal. Weight 1600 lb	10	2,200
Totals		594.6	$227,360
	Total Weight 374,467 lb		
Freight, delivery, handling at site 374,467 x $6.00/100			22,470
Sales taxes, 3 percent of factory cost			6,820
Equipment cost, ready to install			$255,650
	Rounded		256,000
Capital cost for Section 400 (Installed) 256,000 x 2.65			$680,000
Misc. equipment not requiring installation			30,000
	Total Capital Cost		$710,000

PACIFIC GAS & ELECTRIC COMPANY
SAN FRANCISCO, CALIFORNIA

REVISED CAL. P.U.C. SHEET NO. 7069-G
CANCELING REVISED CAL. P.U.C. SHEET NO. 5678-G



TRONA
RATE AREA
MAP NO. 130

ADVICE LETTER NO. 460-G
DECISION NO. 62681

ISSUED BY
S.L. SIBLEY
VICE-PRESIDENT AND GENERAL MANAGER

DATE FILED FEBRUARY 15, 1963
EFFECTIVE MARCH 17, 1963
RESOLUTION NO.

Schedule No. G-50
INTERRUPTIBLE NATURAL GAS SERVICE

APPLICABILITY

Applicable, subject to interruptions in supply as provided in special conditions below, for natural gas service to commercial and industrial establishments for gas used for all purposes at the option of the customer, except directly for the cooking of meals, where such establishments are located along existing mains having a delivery capacity in excess of the then existing requirements of firm customers.

TERRITORY

The entire territory served natural gas by the Company as follows, except in—

Humboldt Division.

Portion of Shasta Division supplied from main 177 north of Corning Field and Shasta Rate Area.

Portions of Stockton Division supplied from the transmission mains between Lodi Gas Field and Las Vinas, from the six inch gas main extending east on Linden Road from a point 800 feet east of White Lane to Linden.

A—(1100 Btu)

Portion of Coast Valleys Division supplied from mains 103, 181, 301, and from the Salinas Mixing Station.

Portion of Colgate Division supplied from main 400.

Portion of De Sabla Division supplied from main 400.

Portion of Sacramento Division supplied from main 400.

Portion of Shasta Division supplied from main 400 south of main 177.

San Francisco Division

San Jose Division, except portion supplied from mains 105 and 107.

Portions of East Bay Division supplied from mains 105 and 153 north of Irvington, from main 114 between Livermore Junction and Antioch Terminal, from mains 131 and 107 between Irvington and Milpitas Terminal, and from main 131 between Irvington and Antioch.

Portions of Stockton Division supplied from mains 110 and 162, from the Stanpac transmission main south of Tracy Terminal, and from the Tracy distribution system.

Portions of San Joaquin Division served (1) from the Bakersfield distribution system, (2) in the Northern District south of Herndon Junction, (3) from the tap of transmission main 300 at Newberry, (4) from the tap of transmission main 300 to Huron, (5) in T 3 N, R 1 W; T 3 N, R 1 E; T 3 N, R 2 E; and westerly one-half of T 3 N, R 3 E; S.B.B.&M., (6) in T 10 N, R 8 W; T 11 N, R 8 W; and westerly one-third of T 10 N, R 7 W and T 11 N, R 7 W; S.B.B.&M., (7) in the Trona Rate Area, (8) from transmission main 164, and (9) from Stanpac transmission main.

B—(1050 Btu)

North Bay Division.

Portions of East Bay Division supplied from main 107 between Irvington and Livermore Junction, from main 105 between Irvington and Milpitas Terminal, from main 191, from Contra Costa Power Plant main, and from Stanpac transmission main north of Brentwood Terminal.

Portions of Sacramento Division supplied from transmission mains extending from Rio Vista Gas Field to Antioch gas terminal, to Rio Vista Y (junction of mains 200, 210 and 220), and westward to beyond Fairfield and including Vacaville tap.

Portion of San Joaquin Division supplied from main 118 north of Herndon Junction, from the Avenal distribution system, and from Main 134 east of Gill Ranch Field.

Portion of San Jose Division supplied from mains 105 and 107.

C—(1000 Btu)

Portion of Coast Valleys Division supplied from main 187.

Portions of Colgate Division supplied from main 167 north of Wild Goose mixing station, from main 172 and west of Buttes Junction from main 121.

Portions of De Sabla Division supplied from mains 167 and 169.

Portion of East Bay Division supplied from Stanpac transmission main south of Brentwood Terminal.

Portions of Sacramento Division supplied from main 119 between Davis Junction and the North Sacramento Holder Station, from main 220 south of Davis Junction, from main 108 between Sacramento and valve 66.8, from main 172, and from main 196.

Portion of Stockton Division supplied from main 196, and from the Stanpac transmission main north of Tracy Terminal.

(continued)

Schedule No. G-50
INTERRUPTIBLE NATURAL GAS SERVICE
(Continued)

TERRITORY (Continued)

D—(950 Btu)

Portion of Colgate Division supplied from main 121 between Buttes Junction and Yuba Terminal.

Portions of De Sabla Division supplied from main 177 west of valve 6.27, from Orland tap, from main 177 between valve 6.27 and Sterling Junction, from main 128, and from main 136 west of its junction with Durham Gas Field transmission main.

Portion of Drum Division supplied from main 119 northeast of Palm Avenue and Roseville Road Regulator Station.

Portions of Sacramento Division supplied from the Davis distribution system, from the mains between Dunnigan Hills Gas Field and Davis Junction, from main 108 between valve 62.2 and Thornton Field, from main 108 between valve 66.8 and valve 62.2, from main 116, in the area north of the American River except portion supplied from McClellan Field tap, in the Folsom area, and in the area supplied by main 119 northeast of Palm Avenue and Roseville Road Regulator Station.

Portions of San Joaquin Division supplied from main 134 west of Gill Ranch Field, and within the Taft, Fellows, and Maricopa Rate Areas.

Portion of Stockton Division supplied from the transmission main between Roberts Island Gas Field and Tracy terminal, from main 108 north of Las Vinas, from main 197, from main 108 between Las Vinas and valve 16.7, from main 108 south of valve 16.7, except the area supplied from the Waterford Mixer.

Portion of Shasta Division supplied from main 177 south of Corning Field.

E—(900 Btu)

Portions of Colgate Division supplied from main 50 south of valve 21.62, from main 167 south of Wild Goose Mixing Station, from main 123, from main 124, from main 173, and from the Oroville tap.

Portion of De Sabla Division supplied from main 50, and from the Sterling Junction-Chico distribution system.

Drum Division except portion supplied from main 119 northeast of Palm Avenue and Roseville Road Regulator Station.

Portions of Sacramento Division supplied from main 149, from main 150, from main 159, from the 6" main between Davis Meter Station and Dixon, and from McClellan Field tap.

Portion of Stockton Division supplied from the Waterford Mixer.

F—(850 Btu)

Portion of Colgate Division supplied from main 50 north of valve 21.62.

Portion of East Bay Division supplied from main 107 between Livermore Junction and Tracy Station.

G—(800 Btu)

Portions of Colgate Division supplied from Wild Goose Gas Field transmission main west of Wild Goose Mixing Station and from main 151.

Portion of De Sabla Division supplied from main 136 east of main 156 junction.

RATES

Commodity Charge:

	Per Meter Per Month							
	Base Rates	Effective Rates						
		A	B	C	D	E	F	G
	1100 Btu	1100 Btu	1050 Btu	1000 Btu	950 Btu	900 Btu	850 Btu	800 Btu
First 1,000 Mcf, per Mcf	54.688¢	54.7¢	52.2¢	49.8¢	47.3¢	44.8¢	42.4¢	39.9¢
Next 2,000 Mcf, per Mcf	50.388	50.4	48.1	45.9	43.6	41.3	39.1	36.8
Next 3,000 Mcf, per Mcf	48.688	48.7	46.5	44.3	42.1	39.9	37.7	35.5
Next 4,000 Mcf, per Mcf	47.188	47.2	45.1	42.9	40.8	38.7	36.6	34.4
Over 10,000 Mcf, per Mcf	40.738	40.7	38.9	37.1	35.2	33.4	31.6	29.7

The above effective rates are based on the average monthly heating value per cubic foot indicated and as set forth in Rule No. 2(C).

Minimum Charge:
$80 per meter per month, accumulative annually.

(continued)

Schedule No. G-56
INTERRUPTIBLE NATURAL GAS SERVICE

APPLICABILITY

Applicable, subject to interruptions as provided in contract referred to in Special Condition 1 hereof, for natural gas required for fuel purposes in the operation of kilns, dryers and boilers.

TERRITORY

A—(1100 Btu)

Portions of Kern County as follows:

1. Section 24, T11N, R14W, S.B.B.& M.
2. Section 19, T11N, R7W and Sections 22, 23 and 24, T11N, R8W, S.B.B.& M.

Portions of San Bernardino County as follows:

1. Sections 11 and 14, T3N, R1E, S.B.B.& M.
2. Section 4, T5N, R4W, S.B.B.& M.
3. Section 18, T6N, R4W, S.B.B.& M.
4. Section 6, T26S, R43E, M.D.B.&M.
5. Section 17, T25S, R43E, M.D.B.&M.

RATES

Per Meter Per Month

Commodity Charge:

	Base Rates 1100 Btu	Effective Rates A 1100 Btu
First 1,000 Mcf, per Mcf	54.688¢	54.7¢
Next 2,000 Mcf, per Mcf	50.388	50.4
Next 3,000 Mcf, per Mcf	48.688	48.7
Next 4,000 Mcf, per Mcf	47.188	47.2
Next 10,000 Mcf, per Mcf	40.738	40.7
Over 20,000 Mcf, per Mcf	33.938	33.9

The above effective rates are based on the average monthly heating value per cubic foot indicated and as set forth in Rule No. 2(C).

Minimum Charge:

$16,000 per meter per month.

SPECIAL CONDITIONS

1. Gas service supplied hereunder shall be in accordance with a contract on file with the Public Utilities Commission of the State of California as part of the Company's effective tariff schedules. This rate schedule shall expire upon the termination or expiration of the gas service contract.

2. Service under this schedule is subject to discontinuance without notice in case of an actual or threatened shortage of natural gas, whether due to insufficient supply in the fields or to inadequate transmission or delivery capacity or facilities. The Company will not be liable for damages occasioned by interruption or discontinuance of service supplied under this schedule.

3. No customer shall be entitled to service hereunder for new or additional equipment unless adequate standby equipment and fuel shall have been first provided therefor, said standby facilities to be ready at all times for immediate operation in the event that the supply of gas hereunder shall be partially or totally curtailed.

Schedule No. A-7

GENERAL SERVICE

(Continued)

SPECIAL CONDITIONS (Continued)

5. Power Factor Adjustment: When the billing demand has exceeded 200 kw for three consecutive months, a kilovar-hour meter will be installed as soon as practicable and, thereafter, until the billing demand has been less than 150 kw for 12 consecutive months, the charges will be adjusted each month for the power factor as follows:

The charges will be decreased by 20 cents per kilowatt of measured maximum demand and will be increased by 20 cents per kilovar of reactive demand. However, in no case shall the kilovars used for the adjustment be less than one-fifth the number of kilowatts.

The kilovars of reactive demand shall be calculated by multiplying the kilowatts of measured maximum demand by the ratio of the kilovar-hours to the kilowatt-hours. Demands in kilowatts and kilovars shall be determined to the nearest 1/10 (0.1) unit. A ratchet device will be installed on the kilovar-hour meter to prevent its reverse operation on leading power factors.

6. Temporary Discontinuance of Service: Where the use of energy is seasonal or intermittent, no adjustments will be made for a temporary discontinuance of service. Any customer prior to resuming service within twelve months after such service was discontinued will be required to pay all charges which would have been billed if service had not been discontinued.

7. Off-Peak Demand: Upon application by the customer, any kilowatts of measured demand in excess of 500 kw occurring between the hours of 10:30 p.m. and 6:30 a.m. Pacific Standard Time, of the following day, and on Sundays and the following holidays, New Years, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas, will not be considered in establishing the billing demand for computing the energy charge, but will be considered in establishing the billing demand for computing the demand charge, by adding one half of the amount that the off-peak demand exceeds the on-peak demand, to the on-peak demand.

8. Contracts: An initial three-year contract may be required where applicant requires new or added serving capacity exceeding 2,000 kva.

Schedule No. A-7

GENERAL SERVICE

APPLICABILITY

Applicable to three-phase general service including power and lighting.

TERRITORY

Within the entire territory served, excluding Santa Catalina Island.

RATES

Demand Charge:	Per Meter Per Month
First 75 kw or less of billing demand	$85.00
Next 125 kw of billing demand, per kw	0.95
Next 1,800 kw of billing demand, per kw	0.85
Next 8,000 kw of billing demand, per kw	0.75
Next 40,000 kw of billing demand, per kw	0.60
All excess kw of billing demand, per kw	0.55
Energy Charge (to be added to Demand Charge):	
First 150 kwhr per kw of billing demand:	
First 15,000 kwhr, per kwhr	1.8¢
Balance of kwhr, per kwhr	1.0¢
Next 150 kwhr, per kw of billing demand, per kwhr	0.8¢
All excess kwhr, per kwhr	0.6¢

Minimum Charge: The monthly minimum charge shall be the monthly demand charge.

SPECIAL CONDITIONS

1. **Voltage:** Service will be supplied at one standard voltage. Service may be supplied under this schedule at 120/208 volts four-wire wye or at 277/480 volts four-wire wye (except in network system areas) where: (a) written application is made for such service by the customer; (b) the customer's load is of such size as to require an individual transformer installation of not less than 150 kva of transformer capacity for 120/208 volt service or not less than 300 kva of transformer capacity for 277/480 volt service; and (c) the customer provides space acceptable to the utility on his premises to accommodate the installation of the utility's facilities. The foregoing conditions do not apply where the utility maintains four-wire wye-connected polyphase mains.

2. **Billing Demand:** The billing demand shall be the kilowatts of measured maximum demand but not less than 50% of the highest maximum demand established in the preceding 11 months nor less than the diversified resistance welder load computed in accordance with the section designated Welder Service in Rule No. 2. However, in no case shall the billing demand be less than 75 kw. Billing demand shall be determined to the nearest 1/10 kw.

3. **Maximum Demand Measurement:** The measured maximum demand in any month shall be the maximum average kilowatt input, indicated or recorded by instruments to be supplied by the utility, during any 15-minute metered interval in the month, provided, however, that whenever such monthly maximum demand has exceeded 400 kw for three consecutive months and thereafter until it has fallen below 300 kw for 12 consecutive months, a 30-minute interval will be used. Where the demand is intermittent or subject to violent fluctuations, a 5-minute interval may be used.

4. **Voltage Discount:** The charges before power factor adjustment will be reduced by 3% for service delivered and metered at voltages of from 2 to 10 kv; by 4% for service delivered and metered at voltages of from 11 kv to 50 kv; and by 5% for service delivered and metered at voltages over 50 kv; except that when only one transformation from a transmission voltage level is involved, a customer normally entitled to a 3% discount will be entitled to a 4% discount.

(Continued)

APPENDIX C

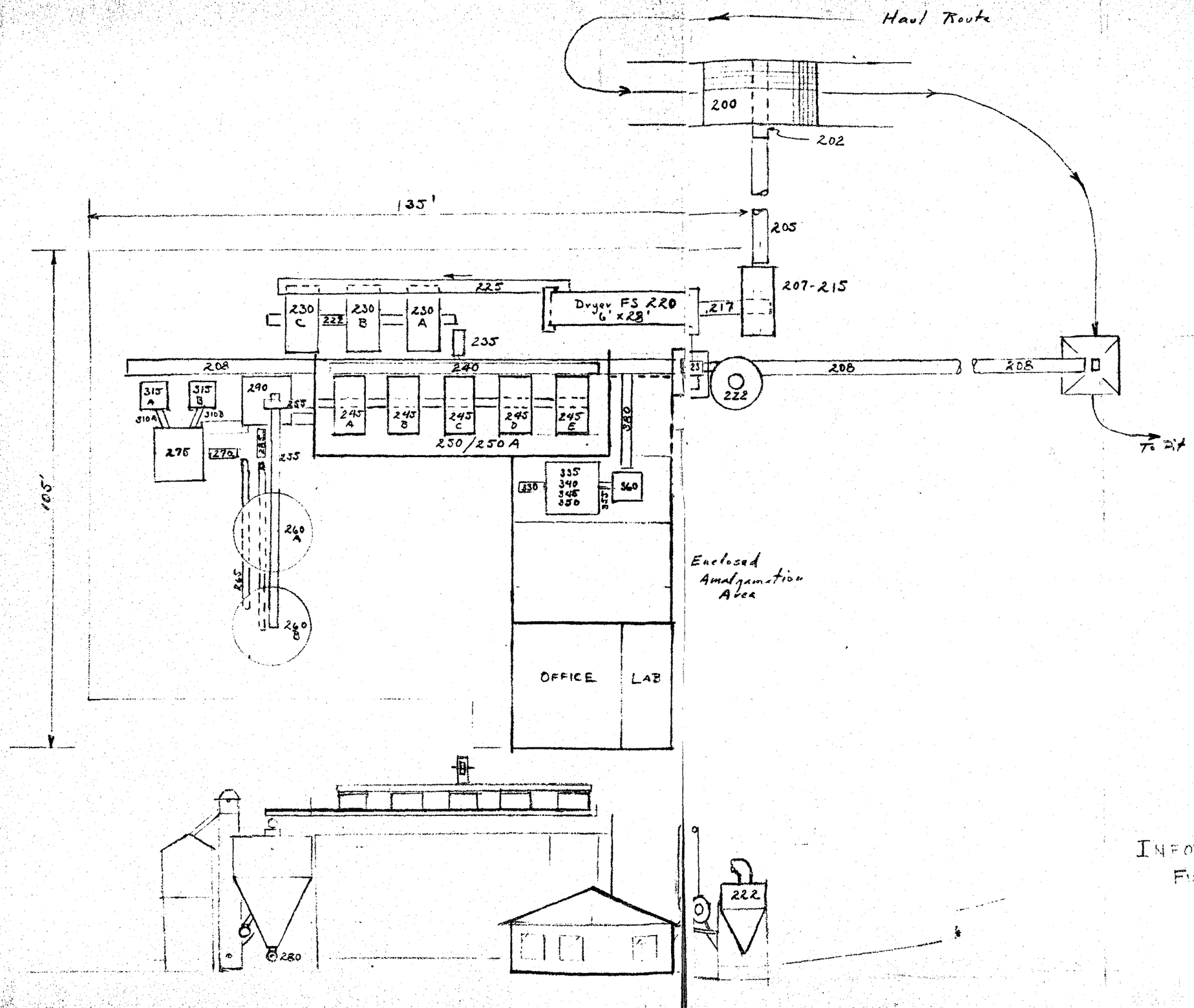
SKETCHES AND DRAWINGS

Informal Layout Sketches

909-SK-1	Fixed Dry Process Plant
909-SK-2	Wet Process Plant
909-SK-3	Portable Feed Preparation
909-SK-4	Portable Concentration
909-SK-5	Alternate Portable Dry Processing

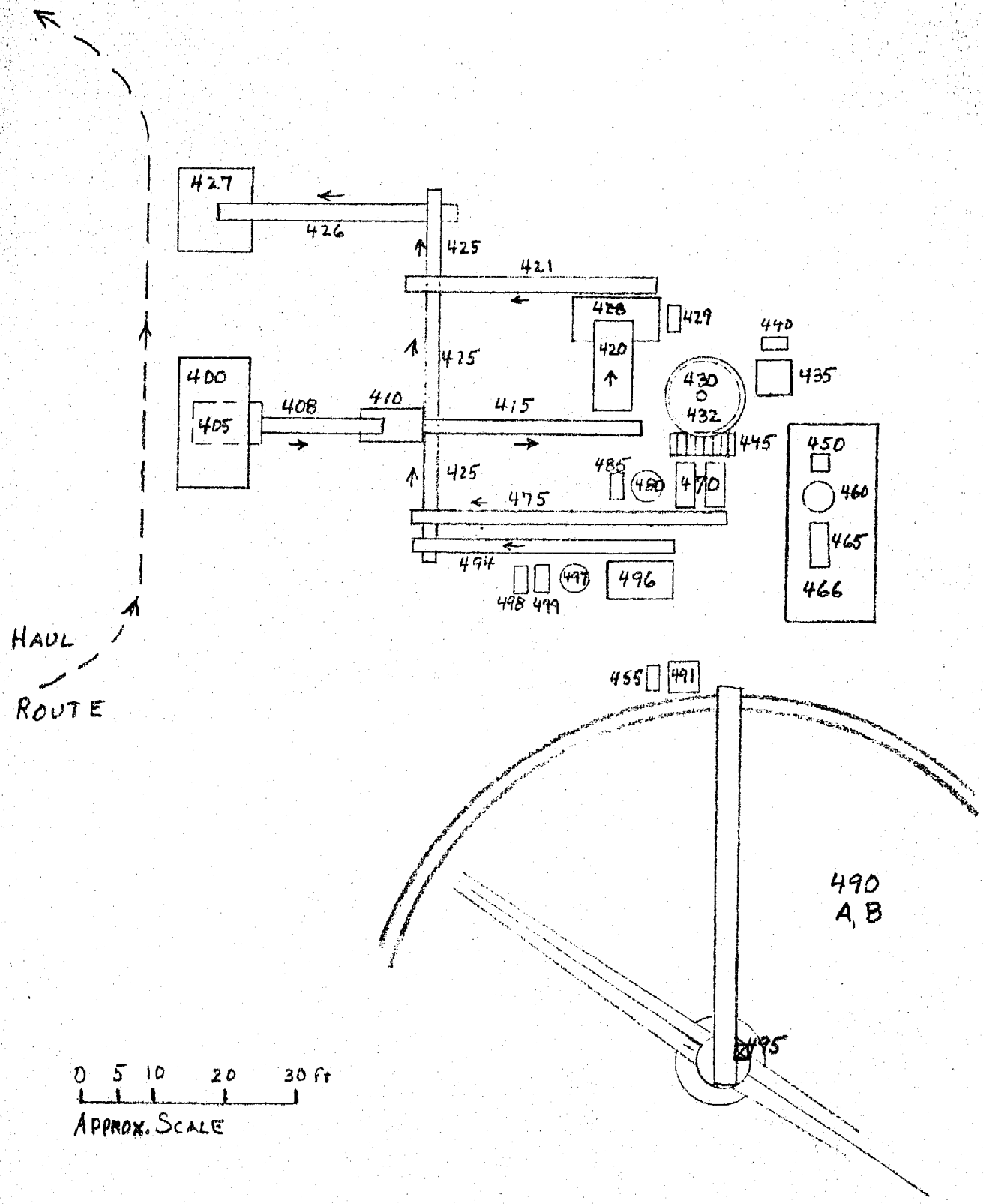
Drawings

909-G1	Flowsheet of Dry Process
909-G2	Flowsheet of Wet Process



INFORMAL LAYOUT SKETCH
FIXED DRY PROCESS PLANT
Scale ½" = 10'-0"
SEPT 1964

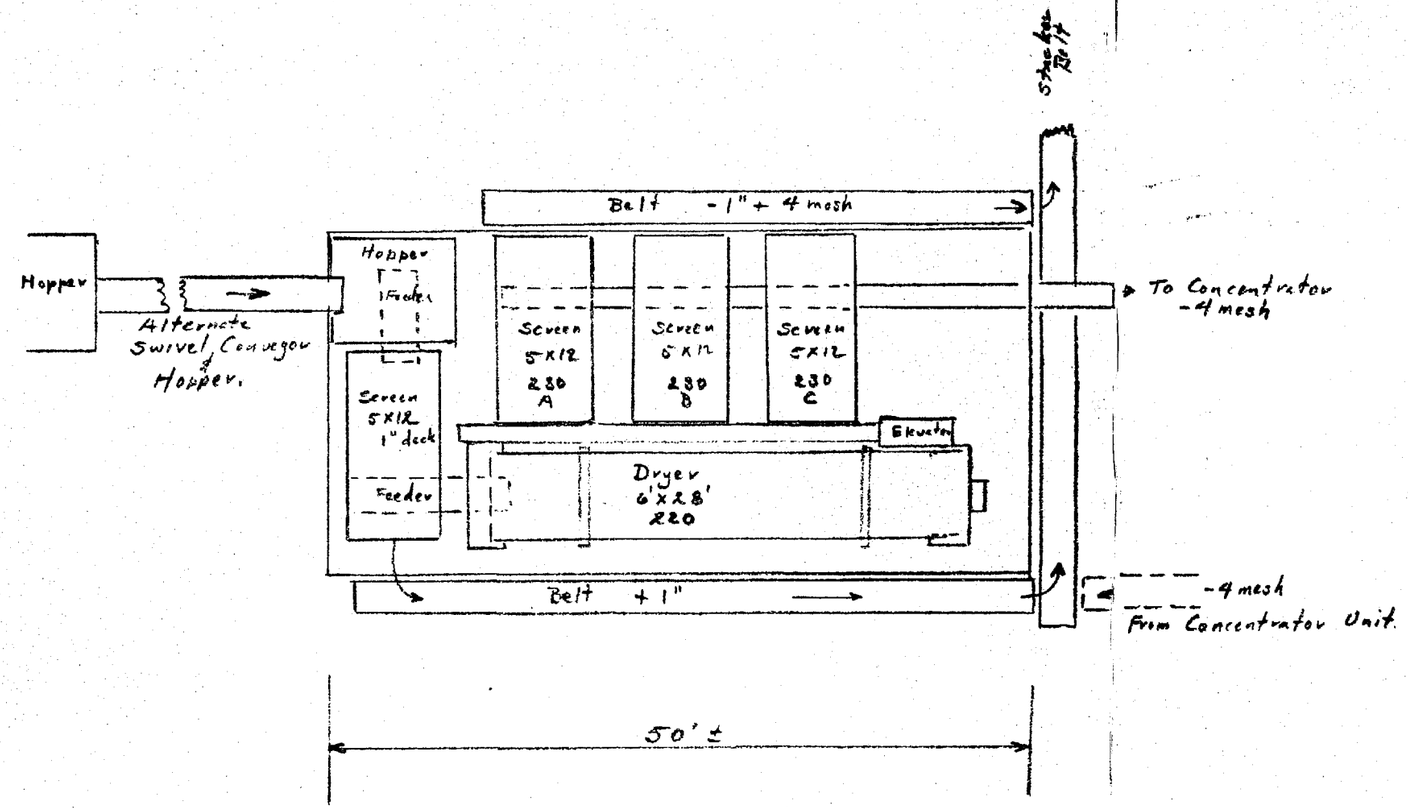
909-SK-1

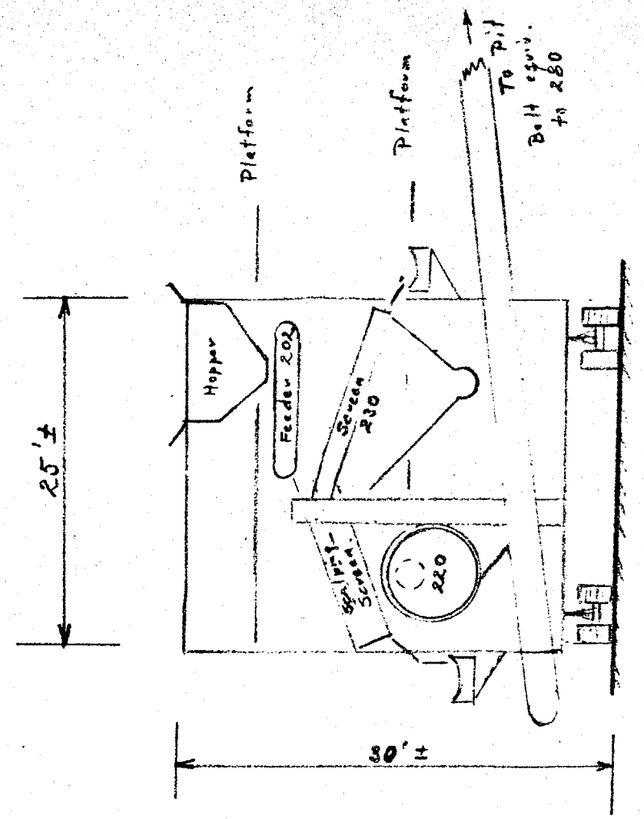


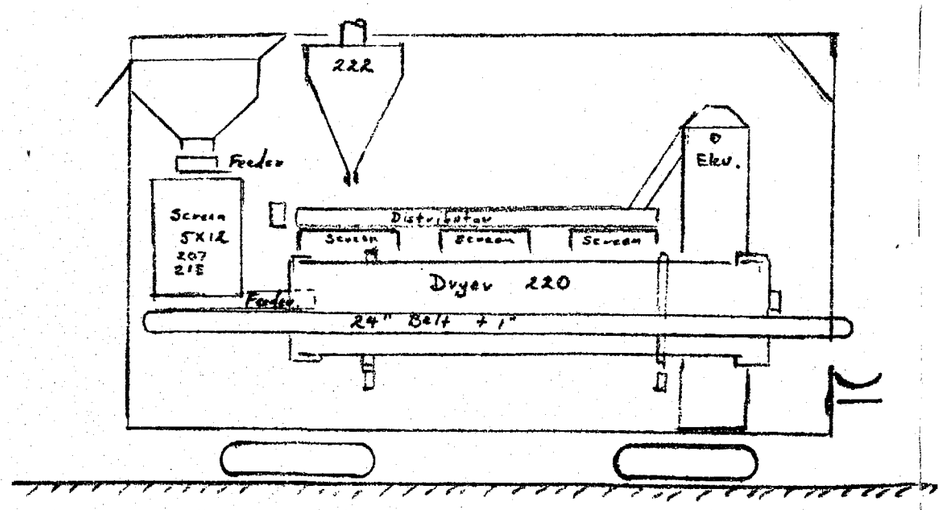
INFORMAL LAYOUT SKETCH
WET PROCESS PLANT

Sept 1964

909-SK2







INFORMAL LAYOUT SKETCH

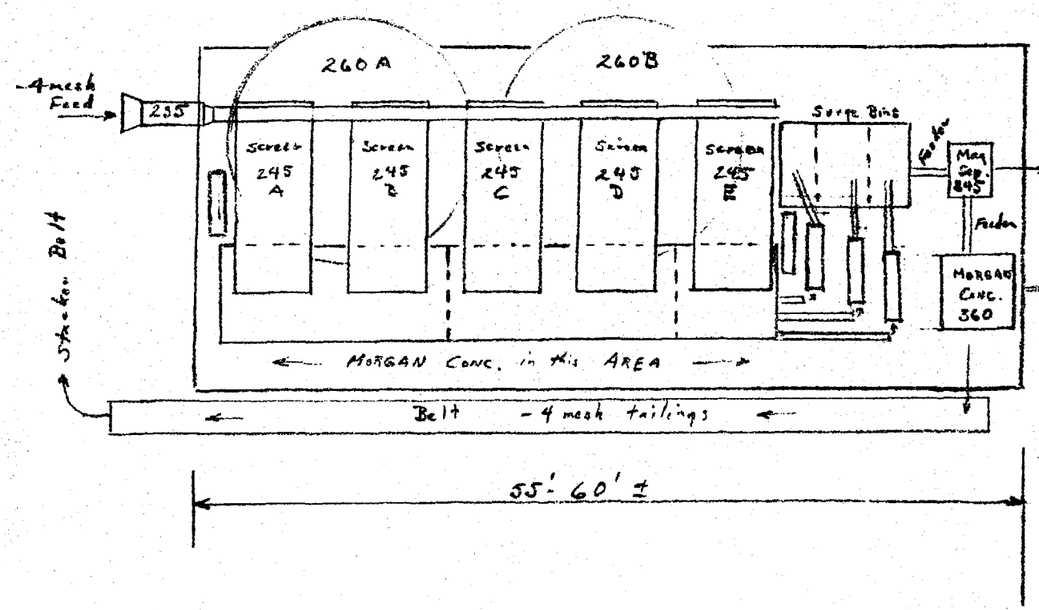
PORTABLE FEED PREPARATION

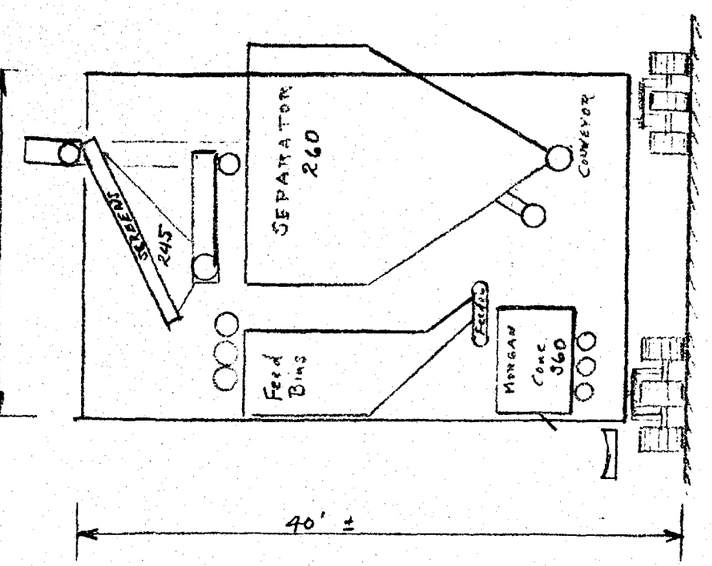
DRY PROCESS
1000,000 YD/YR.

SCALE: 1" = 10'

SEPT. 1964

909- SK 3





Note:
Concentrates & magnetics are brought to fixed Amalgamation Section located adjacent to Lab & office. Movement by tank trailer.

INFORMAL LAYOUT SKETCH
PORTABLE CONCENTRATION SECT.
DRY PROCESS
1,000,000 YD/YR.

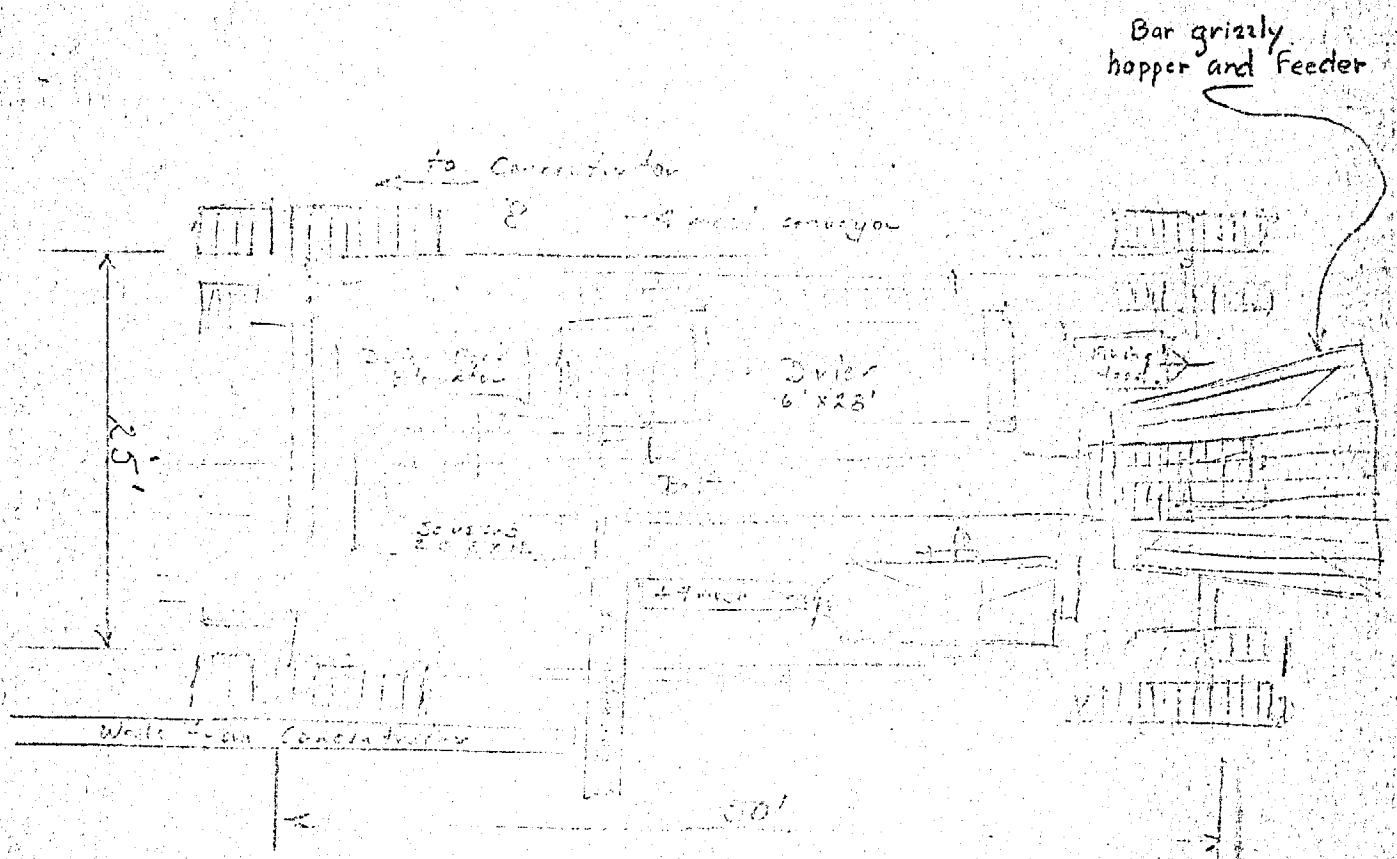
SCALE 1" = 10'

SEPT '64

909-SK-4

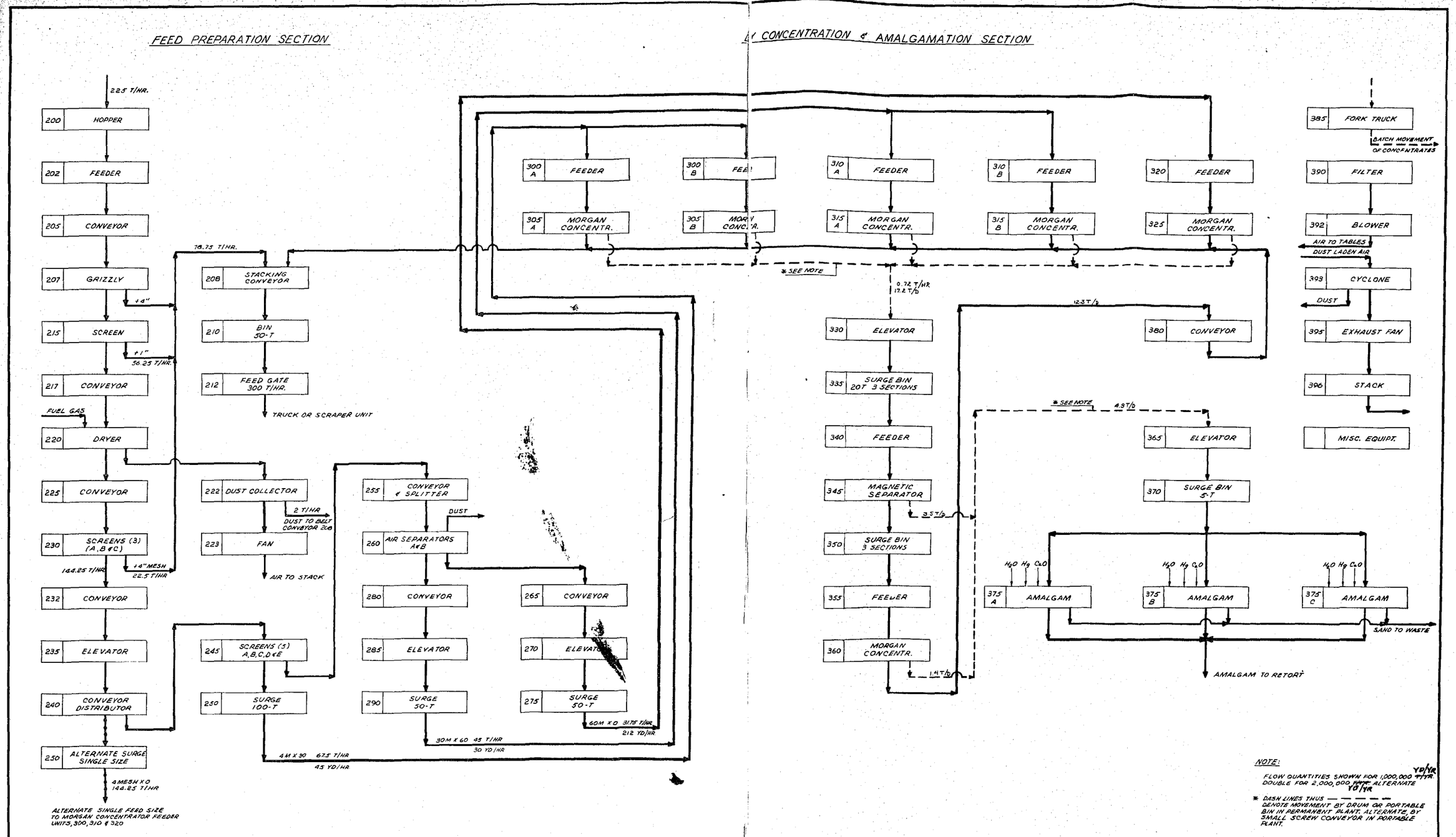
Alternate Portable Dry Processing Plant
Screening and Drying Unit

Using low-mounted, integral feed hopper



Study Sketch

909-Sk-5



NOTE:

FLOW QUANTITIES SHOWN FOR 1,000,000 T/YR. DOUBLE FOR 2,000,000 YD/YR ALTERNATE

* DASH LINES THUS — — — — — DENOTE MOVEMENT BY DRUM OR PORTABLE BIN IN PERMANENT PLANT. ALTERNATE, BY SMALL SCREW CONVEYOR IN PORTABLE PLANT.

PREPARATION, CONCENTRATION, AMALGAMATION
1,000,000 YD/YR PLANT

FLOWSHEET OF DRY PROCESS

REVISIONS	DESCRIPTION	BY	CK.	DATE

REVISIONS	DESCRIPTION	BY	CK.	DATE

REVISIONS	DESCRIPTION	BY	CK.	DATE

REFERENCES

REFERENCES

DRAWN BY	CR	DATE 6-10-64
CHECKED		
APPROVED		7/14/64

WESTERN KNAPP ENGINEERING CO.
DIVISION OF ARTHUR G. McKEE & CO.
ENGINEERS · CONSTRUCTORS
SAN FRANCISCO . . . CALIFORNIA

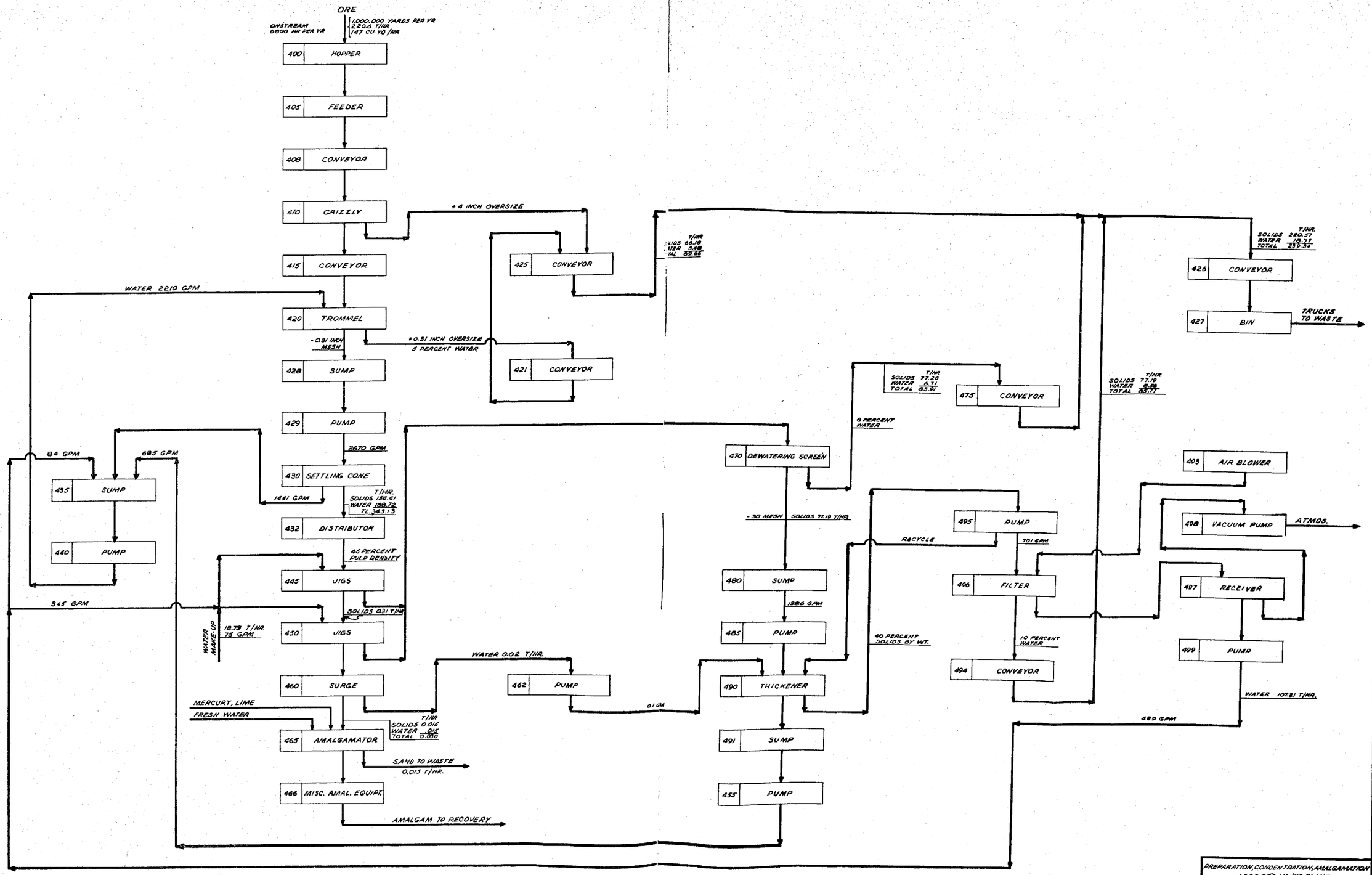
SHELL CANADIAN EXPLORATION CO.

STUDY OF PLACER GOLD RECOVERY BY DRY CONCENTRATION

SCALE

909-G1

REV. 0



REVISIONS	DESCRIPTION	BY	CK.	DATE

REFERENCES	

DRAWN BY		DATE 9-8-64
CHECKED		9-16
APPROVED		

WESTERN KNAPP ENGINEERING CO.
DIVISION OF ARTHUR G. McKEE & CO.
ENGINEERS CONSTRUCTORS
SAN FRANCISCO . . . CALIFORNIA

SHELL CANADIAN EXPLORATION CO.

STUDY OF PLACER GOLD RECOVERY BY DRY CONCENTRATION

PREPARATION, CONCENTRATION, AMALGAMATION
1,000,000 YD/YR PLANT
FLOWSHEET OF WET PROCESS

SCALE

909-G2

REV. 0

TABLE 3

SUMMARY OF CAPITAL AND PRODUCTION COSTS

1,000,000 Yards per Year of Bank-run Placer Gravels

	Dry Processing		Wet Processing	
	Capital Cost	Production Cost ** per yard	Capital Cost	Production Cost ** per yard
Royalties	--	$0.050	--	$0.050
Mining (Scraper) (Tables 15, 16)	$ 352,000	.310	$ 352,000	.310
Feed Preparation (Appendix B)	650,000	.281	710,000	.280
Concentration and Amalgamation (Appendix B)	290,000	.118		
Utilities (Water)	--	Incl.	--	Incl.
Non-Process Facilities (Tables 6, 7)	70,000	.100	70,000	.100
Total Fixed Capital	$1,362,000		$1,104,000	
Working Capital *	120,000	--	120,000	--
Total Capital and Production	$1,482,000	$0.859	$1,224,000	$0.740
Alternates				
No concentrate drier and single-size feed, deduct	433,000	.193		
Net costs with alternates	$1,049,000	$0.666		

*Does not include exploration and development
**From Production Cost Estimate Tables 17 to 29

TABLE 4

SUMMARY OF CAPITAL AND PRODUCTION COSTS

2,000,000 Yards per Year of Bank-run Placer Gravels

	Dry Processing		Wet Processing	
	Capital Cost	Production Cost ** per yard	Capital Cost	Production Cost ** per yard
Royalties	--	$0.050	--	$0.050
Mining (Scraper) (Tables 15, 16)	$ 435,000	.278	$ 435,000	.278
Feed Preparation (Appendix B)	1,070,000	.221	1,170,000	.199
Concentration and Amalgamation (Appendix B)	480,000	.082		
Utilities (Water)	--	Incl.	--	Incl.
Non-Process Facilities (Tables 6, 7)	85,000	.060	85,000	.060
Total Fixed Capital	$2,051,000		$1,690,000	
Working Capital *	200,000		200,000	
Total Capital and Production	$2,251,000	$0.691	$1,890,000	$0.587
Alternate				
No concentrate drier and single-size feed, deduct	714,000	.152		
Net Costs with alternates	$1,537,000	$0.539		

* Does not include exploration and development
**From Production Cost Estimate Tables 17 to 29

TABLE 5

SUMMARY OF CAPITAL AND PRODUCTION COSTS - PORTABLE PLANTS

	1,000,000 yd per yr		2,000,000 yd per yr	
	Capital Cost	Production Cost per yard	Capital Cost	Production Cost per yard
Royalties	--	$0.05	--	$0.05
Mining (Case III, Tables 15, 16)	$ 195,000	.21	$ 243,000	.14
Processing (Tables 32, 33)	1,335,000	.49	2,119,000	.36
Utilities (Water)	--	Incl.	--	Incl.
Non-Process Facilities (Tables 6, 7)	70,000	.10	85,000	.06
Total Fixed Capital	$1,600,000		$2,447,000	
Working Capital *	120,000		200,000	
Total Capital and Production	$1,720,000	$0.85	$2,647,000	$0.61
Alternates				
No concentrate drier and single-size feed, deduct	500,000	.19		
Net Costs with alternates	$1,220,000	$0.66		

* Does not include exploration and development

TABLE 13

UTILITIES - ELECTRIC POWER COSTS

Operation	1,000,000 yd Plant Dry Process	1,000,000 yd Plant Dry Alternate	1,000,000 yd Plant Wet Process	2,000,000 yd Plant Dry Process	2,000,000 yd Plant Dry Alternate	2,000,000 yd Plant Wet Process
Summary of Power Requirements (estimated connected horsepower)						
Mining	--	--	--	--	--	--
Feed Preparation, Concentration, Amalgamation	785	455	595	1,475	855	1,120
Maintenance Shop	25	25	25	25	25	25
Office, etc.	25	25	25	25	25	25
Total	835	505	645	1,525	905	1,170
Estimated Billing Demand, kw hp x 0.8 x 0.746	498	301	385	910	540	698
Energy used, kwhr per 567 hr month	282,200	170,670	218,170	515,670	306,180	395,540
Demand Charge per month						
First 75 kw of billing demand	$ 85	$ 85	$ 85	$ 85	$ 85	$ 85
Next 125 kw at $0.95 per kw per month	119	119	119	119	119	119
Next 1,800 kw at $0.85 per kw per month	253	86	157	604	289	423
Total demand charge per month	$ 457	$ 290	$ 361	$ 808	$ 493	$ 627
Energy Charge per month						
First 150 kwhr per kw of demand						
First 15,000 kwhr at 1.8¢/kwhr	270	270	270	270	270	270
Balance of kwhr at 1.0	597	302	428	1,215	660	897
Next 150 kwhr per kw demand at 0.8	598	361	462	1,092	648	838
All excess at 0.6¢/kwhr	797	482	616	1,456	865	1,117
Total Energy and Demand Charges per month	$2,719	$1,705	$2,137	$4,841	$2,936	$3,749
Average power rate, cents per kwhr	0.964	0.999	0.980	0.939	0.959	0.948

Table 14

PROCESS WATER SYSTEM CAPITAL COST

Facility	Cost
3 Pumping stations, 120 hp total	$ 7,800
Pipeline, 8 miles: 150 gpm capacity; 40 ft lengths of 5 in. pipe, seamless, sched. 40; Victaulic couplings; ground cleared, not ditched; pipe not painted	90,000
Powerline, 8 miles	80,000
Reservoir at plant site; 150,000 gal 29 by 30 ft covered steel tank	15,500
Subtotal	$ 193,300
Indirect costs: taxes, engineering, fee	66,700
Well: 12 in. gravel-packed, 150 gpm capacity, 300 ft deep, with pump, 50 hp, and pump house	15,000
Total Capital Cost	$ 275,000

This water system serves the wet process plant treating 1,000,000 yd per yr of placer gravel.

TABLE 15

SUMMARY OF MINE CAPITAL COST ESTIMATES

Case I - Scraper Mining

Cost Items	1,000,000 yd per yr No. of Units	1,000,000 yd per yr Capital Cost	2,000,000 yd per yr No. of Units	2,000,000 yd per yr Capital Cost
Caterpillar Wheel Tractor-Scraper units, Model 631-D	1	$ 83,437	2	$166,874
Caterpillar D8 Tractors with ripper and blade	2	124,296	2	124,296
Service, Maintenance and Fueling Equipment		60,800		60,800
Standby scraper unit*	1	83,437	1	83,437
Total Capital Cost		$351,970		$435,407
Rounded		352,000		435,000

Case II - Power Shovel and Trucks

Marion 3 yd. Diesel Shovel	1	$120,000	1	$120,000
Euclid R-20 Diesel Trucks	2	71,910	4	143,820
Caterpillar D8 Tractor with ripper and blade	1	62,148	1	62,148
Service, Maintenance and Fueling Equipment		60,800		60,800
Standby Diesel Truck*	1	35,975	1	35,975
Total Capital Cost		$350,833		$422,743
Rounded		351,000		423,000

*Needed to maintain round-the-clock schedules. Units to be alternated in service.

(This table concluded on the next page)

Table 15 - Concluded

Case III - Dragline Loading Directly to a Portable Plant

Cost Items	1,000,000 yd per yr		2,000,000 yd per yr	
	No. of Units	Capital Cost	No. of Units	Capital Cost
1.5 yd dragline	1	$ 72,384		
Three yd dragline			1	$120,000
D8 Caterpillar Tractor with ripper and blade	1	62,148	1	62,148
Service, Maintenance and Fueling Equipment		60,800		60,800
Total Capital Cost		$195,332		$242,948
Rounded		195,000		243,000

Note:

All equipment prices are estimating prices, only, for a complete delivered unit and include the cost of the unit with all accessories, guards and auxiliary equipment, freight and California sales tax. If these units are purchased on competitive bids, slightly lower costs are possible.

TABLE 16

SUMMARY OF MINE PRODUCTION COST ESTIMATES

Case I - Scraper Mining

Summary of operations:

1. Rip Ground.
2. Pick up and haul with self-propelled wheel-type scraper - return tails to mined out portion of pit.
3. Rip top of bedrock and doze material to piles or windrows for pick-up by scraper.

Cost Items	Cost in Dollars Per Bank Yard	
	1,000,000 yd per yr	2,000,000 yd per yr
a. Ripping and dozing	$ 0.066	$ 0.061
b. Load and haul	.151	.151
c. Pusher Cat for loading	.067	.053
d. Supv'n, Service, Maintenance	.026	.013
Total Cost	$ 0.310	$ 0.278
Rounded	$ 0.31	$ 0.28

Case II - Shovel and Truck Mining

Summary of operations:

1. Load with Diesel Shovel
2. Haul with two trucks, return tailings to pit
3. Rip and doze top of bedrock and doze bedrock material to piles for shovel, level tailings.

(This table concluded on the next page)

Table 16 - Concluded

Case II - Shovel and Truck Mining (contd.)

Cost Items	Cost in Dollars Per Bank Yard	
	1,000,000 yd per yr	2,000,000 yd per yr
a. Shovel loading	$ 0.109	$ 0.083
b. Truck haul	.171	.171
c. Rip and doze	.066	.061
d. Supv'n - Service, Maintenance	.026	.013
Total Cost	$ 0.372	$ 0.328
Rounded	$ 0.37	$ 0.33

Case III - Dragline Loading to Portable Plant

Summary of operations:

1. Dig and dump directly to hopper of portable plant with dragline.
2. Rip top of bedrock and doze bedrock and cleanup material to bank for dragline handling.
3. Doze and level tailings - no hauling of tailings required.

a. Dragline	$ 0.119	$ 0.064
b. Doze, rip and level	.066	.061
c. Supv'n - Service, Maintenance	.026	.013
Total Cost	$ 0.211	$ 0.138
Rounded	$ 0.21	$ 0.14

In the above Production Cost Estimates, the mining equipment has been depreciated over a set number of hours of operation for each unit. In general, the equipment life in hours is the period used as a standard in the industry, and makes no allowance for trade-in or resale value. With good operators and an adequate maintenance program, the life of the equipment units could be longer than normal.

MINING EQUIPMENT - SCRAPER LOAD AND HAUL UNIT

TABLE 17

PRODUCTION COST ESTIMATE

Product: Placer Gravel to Feed Hopper, Tailings to Pit (XX) — Symbol:
Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September 1964
At: San Francisco, California

Production Rate			
	bank yd per yr	1,000,000	
	bank yd per hr	147	
	bank yd per day	2,940	
Capital Cost	Unit	$66,437.	One Caterpillar Wheel Tractor Unit
	Tires	17,000.	Model 631-D, 21 yards struck, 30 yards
	Total	83,437.	heaped. Price delivered California, sales tax
			included.
Life of unit		12,000 hr = 1.76 yr = 1,760,000 bank yd	
Life of tires		4,500 hr	

ASSUMPTIONS

Operating time: 340 days per yr, 20 hr per day, 6800 hr per yr

The function of this unit is to pick up and haul ripped placer gravel from mine site to plant feed hopper, pick up and haul tailings from plant to disposal site, and spread tailings at disposal site. It thus handles 2,000,000 yards of material per year.

Two of these scraper units are required for a production rate of 2,000,000 bank yd per yr. The cost per bank yard is the same for either one or two million bank yd per yr.

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK

PACKING COST

Kind				
Capacity				
Cost of Container				
Cost of Liner				
Packing Labor				
Other Costs				
Total Cost per Container				
Proportion Each Type				

NOTES

RAW MATERIALS	AMOUNT gal per hr	$ PER gal	$ per hr	$ per day	$ per yr	$ per bank yard
TOTAL RAW MATERIALS						
Labor 1 man at $3.00 per hr			3.00	72.00	24,480	0.024
Supervision						
Labor Benefits 20 percent			.60	14.40	4,896	.005
Steam						
Electricity						
Air						
Water – Purch. or Process						
Water – Plant or Cooling						
Fuel – Gas - Coal - Oil US gal	17.5	0.16	2.80	56.00	19,040	.019
Lubricant US gal	0.3	1.00	.30	6.00	2,040	.002
Maintenance – Minor } 90 percent						
Maintenance – Major } of depreciation			4.98	99.60	33,864	.034
Grease and filters			.17	3.40	1,156	.001
Factory Supplies Tires $17,000 per 4500 hr			3.78	75.60	25,704	.026
Laboratory						
DIRECT CONVERSION			15.63	327.00	111,180	0.111
Depreciation $66,437 in 12,000 hr			5.54	110.80	37,672	.038
Controllable Indirect						
Non-Controllable Indirect 2 percent of $83,437 per yr			.25	5.00	1,669	.002
INDIRECT CONVERSION			5.79	115.80	39,341	0.040
TOTAL MFG. COST IN BULK			21.42	442.80	150,521	0.151
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

WESTERN KNAPP ENGINEERING CO.

MINING EQUIPMENT - SCRAPER LOAD AND HAUL UNIT

TABLE 18

PRODUCTION COST ESTIMATE

Product: Placer Gravel to Feed Hopper, Tailings to Pit — Symbol: XX
Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September 1964
At: San Francisco, California

Production Rate, bank yd per yr	1,000,000 or 2,000,000
Capital Cost (Ip)	$62,148. One Caterpillar D-8 (track) with Ripper and Dozer, delivered fully equipped, including freight and California sales tax.
Life of Unit	10,000 hr

ASSUMPTIONS

Operating time: 340 days per yr, 20 hr per day, 6800 hr per yr

The function of this unit is to pick up and haul ripped placer gravel from mine site to plant feed hopper, pick up and haul tailings from plant to disposal site, and spread tailings at disposal site. It thus handles 2,000,000 yards of material per year.

Two of these scraper units are required for a production rate of 2,000,000 bank yd per yr. The cost per bank yard is the same for either one or two million bank yd per yr.

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK

PACKING COST

Kind					
Capacity					
Cost of Container					
Cost of Liner					
Packing Labor					
Other Costs					
Total Cost per Container					
Proportion Each Type					

NOTES

RAW MATERIALS	AMOUNT	PER				
	1,000,000 yd plant			2,000,000 plant		
TOTAL RAW MATERIALS	$ per day	$ per yr	$ per bank yd	$ per day	$ per yr	$ per bank yd
Labor 1 man at $3.00 (See	48.00	16,320		72.00	24,480	
Supervision assumptions)						
Labor Benefits 20 percent	9.60	3,264		14.40	4,896	
Steam						
Electricity						
Air						
Water – Purch. or Process						
Water – Plant or Cooling						
Fuel – Gas - Coal - Oil at $0.16 per gal						
and 7.6 gal per hr	12.20	4,148		24.40	8,296	
Maintenance – Minor } 90 percent						
Maintenance – Major } of depreciation	55.90	19,006		111.80	38,012	
Lub. and grease	1.70	578		3.40	1,156	
Factory Supplies Ripper shanks,						
~~xxxxxxx~~ protectors and tips	2.00	680		4.00	1,360	
DIRECT CONVERSION	129.40	43,996	0.0440	230.00	78,200	0.0391
Depreciation 10,000 hr	62.10	21,114		124.20	42,228	
Controllable Indirect						
Non-Controllable Indirect 2 percent of Ip	3.65	1,243		3.65	1,243	
INDIRECT CONVERSION	65.75	22,357	.0224	127.85	43,471	.0217
TOTAL MFG. COST IN BULK		66,353	.0664		121,671	.0608
Rounded		66,000	.066		122,000	.061
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

WESTERN KNAPP ENGINEERING CO.

MINING EQUIPMENT - PUSHER UNIT

TABLE 19

PRODUCTION COST ESTIMATE

Product: Placer Gravel, Tailings — Symbol:
At: — Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September 1964

At: San Francisco, California

Production Rate		
bank yd per yr	1,000,000 or 2,000,000	
bank yd per hr	147 or 294	
Capital Cost per unit (Ip)	$62,148	Caterpillar D-8 (track) with ripper-dozer, fully equipped including freight and California sales tax.
Life of unit	10,000 hr	

ASSUMPTIONS

This unit is used as a pusher for the Scraper unit of Table 17, but is also equipped so that it can be used as a spare Ripper-Dozer, as described in Table 18. It is a duplicate of the Ripper-Dozer unit. It can serve either one or two Scraper units, that is, it is adequate for either a 1,000,000 or a 2,000,000 yd per year plant.

It must be on duty all the time even though it actually operates only about 30 percent of the time.

For all costs except labor, use 8 hr per day for a 1,000,000 yd plant, and 16 hr for 2,000,000 yd.

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK

PACKING COST

Kind				
Capacity				
Cost of Container				
Cost of Liner				
Packing Labor				
Other Costs				
Total Cost per Container				
Proportion Each Type				

NOTES

RAW MATERIALS	AMOUNT	PER				
	1,000,000 yd plant			2,000,000 yd plant		
TOTAL RAW MATERIALS	$ per day	$ per yr	$ per bank yd	$ per day	$ per yr	$ per bank yd
Labor	72.00	24,480	0.0245	72.00	24,480	0.0122
Supervision						
Labor Benefits 20 percent	14.40	4,896	.0049	14.40	4,896	.0024
Steam						
Electricity						
Air						
Water – Purch. or Process						
Water – Plant or Cooling						
Fuel – Gas - Coal - Oil at $0.16 per gal and 7.6 gal per hr	9.76	3,318	.0033	19.52	6,637	.0033
Maintenance – Minor } 90 percent of						
Maintenance – Major } depreciation	44.72	15,205	.0152	89.44	30,410	.0152
Lub. 0.13 gal/hr, $1 per gal	1.04	354	.0002	2.08	707	.0002
Factory Supplies grease, filters	.48	163	.0002	.96	326	.0002
Laboratory						
DIRECT CONVERSION	142.40	48,416	0.0484	198.40	67,456	0.0337
Depreciation 10,000 hr	49.68	16,891	.0169	99.36	33,782	.0169
Controllable Indirect						
Non-Controllable Indirect 2 percent of Ip	3.60	1,224	.0012	3.60	1,224	.0006
INDIRECT CONVERSION	53.28	18,115	.0181	102.96	35,006	.0175
TOTAL MFG. COST IN BULK	195.68	66,531	.0664	301.36	102,462	.0512
Rounded	196	66,000	.066	301	102,000	.051
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

WESTERN KNAPP ENGINEERING CO.

TABLE 20

MINING EQUIPMENT - SHOVEL UNIT

PRODUCTION COST ESTIMATE

Product: Placer Gravel to haul units — Symbol:
At: — Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September 1964

At San Francisco, California

Production Rate		
bank yd per yr	1,000,000 or 2,000,000	
yd per hr	147 294	
Capital Cost (Ip)	$ 120,000	Heavy duty diesel shovel, 3 cu yd capacity, complete including freight and California sales tax
Life hr	17,000	

ASSUMPTIONS

Operating schedule: 20 hr per day, 340 day per yr, 6800 hr per yr
Tough digging is assumed, and medium efficiency, 90 degree swing.
A 3 cu yd shovel is required for either 1,000,000 or 2,000,000 yd per yr to reduce truck loading time and keep the trucks on schedule. (A smaller shovel would require more trucks for the same production rate). This shovel will produce 1,000,000 yd per yr with two trucks or 2,000,000 yd with four trucks.
Labor costs are figured at 24 hr per day, all other costs assume 20 hr per day. Other costs, except for "non-controllable indirect" are in proportion to use, and will be the same per bank yard for 1,000,000 or 2,000,000 yd per yr.

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK

PACKING COST

Kind					
Capacity					
Cost of Container					
Cost of Liner					
Packing Labor					
Other Costs					
Total Cost per Container					
Proportion Each Type					

NOTES

RAW MATERIALS	AMOUNT	PER				
	1,000,000 yd plant			2,000,000 yd plant		
TOTAL RAW MATERIALS	$ per day	$ per yr	$ per bank yd	$ per day	$ per yr	$ per bank yd
Labor 1 man at $3, 1 at $2.50	132.00	44,880	0.0449	132.00	44,880	0.0224
Supervision						
Labor Benefits 20 percent	26.40	8,976	.0090	26.40	8,976	.0045
Steam						
Electricity						
Air						
Water – Purch. or Process						
Water – Plant or Cooling						
Fuel – Gas - Coal - Oil 12 gal per day at $0.16 per gal	38.40	13,056	.0131	76.80	26,112	.0131
Maintenance – Minor } 100 percent of						
Maintenance – Major } depreciation	141.20	48,008	.0480	282.40	96,016	.0480
Lub. Allowance	5.40	1,836	.0018	10.80	3,672	.0018
Factory Supplies						
Laboratory						
DIRECT CONVERSION	343.40	116,756	.1168	528.40	179,656	.0898
Depreciation 17,000 hr	141.20	48,008	.0480	282.40	96,016	.0480
Controllable Indirect						
Non-Controllable Indirect 2 percent of Ip	7.06	2,400	.0024	7.06	2,400	.0012
INDIRECT CONVERSION	148.26	50,408	.0504	289.46	98,416	.0492
TOTAL MFG. COST IN BULK	491.66	167,164	.1672	817.86	278,072	.1390
Rounded	492	167,000	.167	818	278,000	.139
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

WESTERN KNAPP ENGINEERING CO.

MINING EQUIPMENT - TRUCK HAUL UNITS

(Appendix A)
TABLE 21

PRODUCTION COST ESTIMATE

Product: Placer Gravel to plant — Symbol:
At: — Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September 1964
At: San Francisco, California

Production Rate			
bank yd per yr	1,000,000 or	2,000,000	
bank yd per hr	147	294	
Capital Cost (Ip) Total	71,910 or	143,820	These are Euclid Mod. 20
Number of truck units	2	4	Off-highway, H.D. diesel trucks
(Tire cost, $3800 per truck, included in these prices)			13 cu yd capacity complete. Includes freight, Calif. sales tax
Truck life, hr	10,000	10,000	
Tire life, hr	4,500	4,500	

ASSUMPTIONS

Operating schedule: 20 hr per day, 340 day per yr, 6800 hr per yr.

These truck units are loaded with a 3 cu yd Power Shovel (Table 20). Two trucks are needed for the 1,000,000 yd per yr plant and four for 2,000,000 yd.

For a one mile round trip haul, the cycle is 10 minutes. Plant tailings are loaded into the trucks from a bin for backhaul to the pit for disposal.

Labor costs are calculated at 24 hr per day, 340 day per yr, all other costs at 20 hr per day, 340 day per yr.

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK

PACKING COST

Kind				
Capacity				
Cost of Container				
Cost of Liner				
Packing Labor				
Other Costs				
Total Cost per Container				
Proportion Each Type				

NOTES

RAW MATERIALS	AMOUNT	PER				
	The costs below are for production of 1,000,000 bank yd per yr. The costs per bank yd are the same for 2,000,000 yd.					

TOTAL RAW MATERIALS		$ per hr	$ per day	$ per yr	$ per bank yd	$ per bank yd
Labor 1 man per truck at $3		6.00	144.00	48,960	0.0490	
Supervision						
Labor Benefits 20 percent		1.20	28.80	9,792	.0098	
Steam						
Electricity						
Air						
Water – Purch. or Process						
Water – Plant or Cooling						
Fuel – Gas - Coal - Oil 7 gal per hr per truck at $0.16 per gal		2.24	44.80	15,232	.0152	
Maintenance – Minor } 90 percent of		5.79	115.80	39,372	.0394	
Maintenance – Major } depreciation						
Lub. 0.12 gal per hr per truck at $1		.24	4.80	1,632	.0016	
Factory Supplies Tires $7600 for 4500 hr		1.69	33.80	11,492	.0115	
Laboratory						
DIRECT CONVERSION		17.16	372.00	126,480		0.1265
Depreciation $64,310 for 10,000 hr		6.43	128.60	43,724	.0437	
Controllable Indirect						
Non-Controllable Indirect 2 percent of Ip		.21	4.23	1,438	.0014	
INDIRECT CONVERSION		6.64	132.83	45,162		.0451
TOTAL MFG. COST IN BULK		23.80	504.83	171,642		.1716
Rounded			505.	172,000		.172
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

WESTERN KNAPP ENGINEERING CO.

MINING EQUIPMENT - DRAGLINE

TABLE 22

PRODUCTION COST ESTIMATE

Product: Placer Gravel to Portable Plant Symbol:
At: Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering Date: September 1964

At: San Francisco, California

Production Rate, yd per yr	1,000,000	2,000,000
yd per hr	150	300
Capital Cost		
H. D. diesel dragline	$57,000	$95,000
Long crawlers	3,500	5,200
Counterweight	1,300	2,100
Bucket	4,500	7,000
Freight, sales tax	6,084	9,506
Total Cost (Ip)	$72,384	$118,806
Life hr	16,000	25,000 (as dragline)
hr		17,000 (as power shovel)

ASSUMPTIONS

Operating schedule: 20 hr per day, 340 day per yr, 6800 hr per yr.

The production of 150 yd per hr (1,000,000 yd plant) requires a 1.5 yd dragline with 60 ft boom. The production of 300 yd per hr (2,000,000 yd plant) takes a 3 yd dragline with 80 ft boom.

Tough digging is assumed and low dragline efficiency.

Labor costs are calculated at 24 hr per day, all other costs at 20 hr per day and 6800 hr per yr.

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK

PACKING COST

Kind					
Capacity					
Cost of Container					
Cost of Liner					
Packing Labor					
Other Costs					
Total Cost per Container					
Proportion Each Type					

NOTES

RAW MATERIALS	AMOUNT	PER				
	1,000,000 yd plant			2,000,000 yd plant		
TOTAL RAW MATERIALS	$ per day	$ per yr	$ per bank yd	$ per day	$ per yr	$ per bank yd
Labor 1 man at $3, 1 at $2.50	132.00	44,880	0.0449	132.00	44,880	0.0224
Supervision						
Labor Benefits 20 percent	26.40	8,976	.0090	26.40	8,976	.0045
Steam						
Electricity						
Air						
Water – Purch. or Process						
Water – Plant or Cooling						
Fuel – Gas - Coal - Oil 7 and 12 gal per hr, $0.16 per gal	22.40	7,616	.0076	38.40	13,056	.0065
Maintenance – Minor } 80 percent of						
Maintenance – Major } depreciation	72.40	24,616	.0246	76.00	25,840	.0129
Lub. Allowance	3.20	1,088	.0011	5.40	1,836	.0009
Factory Supplies						
Laboratory						
DIRECT CONVERSION	256.40	87,176	.0872	278.20	94,588	.0473
Depreciation 16,000 and 25,000 hr	90.40	30,736	.0307	95.00	32,300	.0161
Controllable Indirect						
Non-Controllable Indirect 2 percent of Ip	4.26	1,450	.0015	7.00	2,380	.0012
INDIRECT CONVERSION	94.66	32,186	.0322	102.00	34,680	.0173
TOTAL MFG. COST IN BULK	351.06	119,362	.1194	380.20	129,268	.0646
Rounded	350	119,000	.119	380	129,000	.065
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

WESTERN KNAPP ENGINEERING CO.

MINING - COST OF SUPERVISION, SERVICE AND MAINTENANCE

TABLE 23

PRODUCTION COST ESTIMATE

Product: Placer Gravel to Process Plant — Symbol:
At: — Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September 1964
At: San Francisco, California

Mobil Equipment	Grease and Service Truck, with Hydralift	$ 9,000
	Pickup Truck	2,500
(Life: 3 years)	Portable Welder	1,500
	Total Mobile Equipment	$13,000
Shop and Fueling Equipment	Shop Building	$16,800
	Manual Shop Crane	12,000
(Life: 10 years)	Shop Equipment	15,000
	Fuel Oil Storage and Handling	4,000
	Total Shop and Fueling	47,800
Total Service and Maintenance Equipment		$60,800

ASSUMPTIONS

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK

PACKING COST

Kind				
Capacity				
Cost of Container				
Cost of Liner				
Packing Labor				
Other Costs				
Total Cost per Container				
Proportion Each Type				

NOTES

RAW MATERIALS	AMOUNT	PER				
			1,000,000 yd plant		2,000,000 yd plant	
TOTAL RAW MATERIALS				$ per bank yd		$ per bank yd
Labor						
Supervision Pit Foreman	12,000	year		0.0120		0.0060
Labor Benefits 20 percent	2,400	year		.0024		.0012
Steam						
Electricity						
Air						
Water – Purch. or Process						
Water – Plant or Cooling						
Fuel – Gas - Coal - Oil						
Maintenance – Minor	2,500	year		.0025		.0012
Maintenance – Major						
Factory Supplies						
Laboratory						
DIRECT CONVERSION	16,900	year		.0169		.0084
Depreciation - Mobile	4,334	year		.0043		.0022
Depreciation Shop and Fueling	4,780	year		.0048		.0024
Controllable Indirect						
Non-Controllable Indirect 2 percent of $60,800	1,216	year		.0012		.0006
INDIRECT CONVERSION	10,330			.0103		.0052
TOTAL MFG. COST IN BULK	27,230			.0272		.0136
Rounded	27,000			.027		.014
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

WESTERN KNAPP ENGINEERING CO.

SECTION 200 - DRY PROCESS FEED PREPARATION
1,000,000 YARD PLANT

PRODUCTION COST ESTIMATE

TABLE 24

Product: Beneficiated Placer Sands — Symbol:
At: — Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September, 1964
At: San Francisco, California

Placer Gravel			
Feed Rate	yd per yr	1,000,000	
	ton per yr	1,500,000	(1.5 tons per cu yd)
	yd per hr	150	
	ton per hr	220	
Capital Cost (Ip)		$ 650,000	(See Table 7 for non-process costs)

ASSUMPTIONS

See Design Criteria, Table 2, for basic design assumptions.
Operating time: 340 days per year, 20 hours per day or a total of 6800 hours per year
Labor and Supervision
- 2 operators per shift, 4 shifts: 8 x $3.25 x 2080 hr = $54,080
- 1 laborer, days only: $2.50 x 2080 = 5,200
- 1/2 foreman $3.50 x 1040 = 3,640

Power
- 650 hp motive, 10 hp lighting (660)(0.8)(0.746)(6800) = 2,670,000 kwh per yr

Fuel: 26,250,000 Btu per hr for dryer

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK
None					

PACKING COST

Kind				
Capacity				
Cost of Container				
Cost of Liner				
Packing Labor				
Other Costs				
Total Cost per Container				
Proportion Each Type				

NOTES

Weights are given in short tons.

RAW MATERIALS		AMOUNT per year	$ PER unit	$ per yr	$ per yr	$ per yd of feed	$ per yd of feed
Placer Gravels	yd	1,000,000	(See Mining Table 16)				
TOTAL RAW MATERIALS							
Labor				59,280		0.0593	
Supervision				3,640		.0036	
Labor Benefits	15 percent of L + S			9,440		.0094	
Steam				---			
Electricity	kwhr	2,670,000	0.00984	26,270		.0263	
Air	Allowance			300		.0003	
Water – Purch. or Process	Allowance			100		.0001	
Water – Plant or Cooling							
Fuel – Gas - Coal - Oil	thousand cu ft	162,276	0.469	76,100		.0761	
Maintenance – Minor / Maintenance – Major	3 percent of Ip	Materials		19,500		.0195	
Factory Supplies	Lubricants, misc.	Allowance		3,250		.0032	
Laboratory	Supplies, tests, etc.			1,500		.0015	
DIRECT CONVERSION					199,380		0.1994
Depreciation	10 percent of Ip			65,000		.0650	
Controllable Indirect	See Table 6						
Non-Controllable Indirect	2.5 percent of Ip			16,250		.0162	
INDIRECT CONVERSION					81,250		.0812
TOTAL MFG. COST IN BULK					280,630		.2806
	Rounded				281,000		.281
Packing Cost							
Shipping Cost							
TOTAL COST F.O.B.							

SECTION 200A - DRY PROCESS FEED PREPARATION
2,000,000 YARD PLANT

(Appendix A)

TABLE 25

PRODUCTION COST ESTIMATE

Product: Beneficiated Placer Sands — Symbol:
At: — Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September, 1964
At: San Francisco, California

Placer Gravel Feed Rate	
yd per yr	2,000,000
ton per hr	440
Capital Cost (Ip)	$1,070,000 (Cost of 1,000,000 yd plant times $2^{0.72}$)

ASSUMPTIONS

Operating time: same as 1,000,000 yard plant (See Table 24)

Labor and Supervision: same as 1,000,000 yard plant

Power: 1.88 times the power for the 1,000,000 yard plant

Fuel: twice as much as 1,000,000 yard plant

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK
None					

PACKING COST

Kind					
Capacity					
Cost of Container					
Cost of Liner					
Packing Labor					
Other Costs					
Total Cost per Container					
Proportion Each Type					

NOTES

Weights are given in short tons.

RAW MATERIALS	AMOUNT per year	$ PER unit	$ per yr	$ per yr	$ per yd of feed	$ per yd of feed
Placer Gravels yd	2,000,000	(See Mining Table 16 for cost)				
TOTAL RAW MATERIALS						
Labor			59,280		0.0296	
Supervision			3,640		.0018	
Labor Benefits 15 percent of L + S			9,440		.0047	
Steam						
Electricity kwhr	5,000,000	0.00867	43,350		.0217	
Air Allowance			500		.0002	
Water – Purch. or Process			200		.0001	
Water – Plant or Cooling						
Fuel – Gas - Coal - Oil thousand cu ft			152,200		.0761	
Maintenance – Minor } 3 percent of Ip	Materials		32,100		.0161	
Maintenance – Major }						
Factory Supplies 0.5 percent of Ip			5,350		.0027	
Laboratory			1,500		.0008	
DIRECT CONVERSION				307,560		0.1538
Depreciation 10 percent of Ip			107,000		.0535	
Controllable Indirect See Table 6						
Non-Controllable Indirect 2.5 percent of Ip			26,750		.0134	
INDIRECT CONVERSION				133,750		.0669
TOTAL MFG. COST IN BULK				441,310		.2207
Rounded				441,000		.221
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

WESTERN KNAPP ENGINEERING CO.

SECTION 300 - DRY CONCENTRATION AND AMALGAMATION
1, 000, 000 YARD PLANT

PRODUCTION COST ESTIMATE

TABLE 26

Product: Amalgam and Gold — Symbol:
At: — Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September, 1964
At: San Francisco, California

Plant Feed Rate, yd per yr	1, 000, 000 (placer gravel)
Section 300 Feed Rate	(from Section 200)
yd per yr	650, 000
ton per yr	975, 000
ton per hr	144
Capital Cost (Ip)	$ 290, 000 (See Table 7 for non-process costs)

ASSUMPTIONS

See Design Criteria, Table 2, for basic design assumptions.
Operating time: 340 days per yr, 20 hr per day, 6800 hr per yr
Feed in three grades of particle sizes: (Flowsheet WKE Dwg 909-G2)
4 x 30 mesh, 30 x 60 mesh, and -60 mesh
Labor and Supervision
1 operator per shift, 4 shifts: 4 x $3.25 x 2080 hr = $27, 040
1 operator, days only: $3.25 x 2080 6, 760
1 laborer, days only: $2.50 x 2080 5, 200
1/2 foreman: $3.50 x 1040 3, 640
Power: 135 hp motive, 10 lighting (145)(0.8)(0.746)6800 = 588, 000 kwhr per yr

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING and storage	IN STOCK
Mercury	Flask 76 lb	$280.00	$3.50	$1.50	$285.00
Quicklime (sacks)	ton	25.00	5.00	---	30.00

PACKING COST

Kind				
Capacity				
Cost of Container				
Cost of Liner				
Packing Labor				
Other Costs				
Total Cost per Container				
Proportion Each Type				

NOTES

Final concentrates are 4.9 ton per day or 1, 660 ton per yr
Weights are given in short tons or pounds.

RAW MATERIALS	AMOUNT per year	$ PER unit	$ per yr	$ per yr	$ per yd plant feed	$ per yd plant feed
Section 200 product, yd	650, 000	(See Dry Feed Preparation			Table 24	for cost)
Mercury lb	1, 660	3.75	6, 230		0.0062	
one pound per ton of final concentrate						
Quicklime lb	16, 600	.015	250		.0002	
10 lb per ton of final concentrate						
TOTAL RAW MATERIALS				6, 480		0.0065
Labor			39, 000		.0390	
Supervision			3, 640		.0036	
Labor Benefits 15 percent of L + S			6, 400		.0064	
Steam						
Electricity kwhr	588, 000	0.00984	5, 790		.0058	
Air Allowance			100		.0001	
Water – Purch.			200		.0002	
Water – Plant or Cooling						
Fuel – Gas - Allowance			200		.0002	
Maintenance – Minor / Maintenance – Major } 6 percent of Ip	Materials		17, 400		.0174	
Factory Supplies 0.5 percent of Ip			1, 500		.0015	
Laboratory Supplies, assays.	Allowance		1, 500		.0015	
DIRECT CONVERSION				75, 730		.0757
Depreciation 10 percent of Ip			29, 000		.0290	
Controllable Indirect See Table 6						
Non-Controllable Indirect 2.5 percent of Ip			7, 250		.0073	
INDIRECT CONVERSION				36, 250		.0363
TOTAL MFG. COST IN BULK				118, 460		.1185
Rounded				118, 000		.118
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

WESTERN KNAPP ENGINEERING CO.

SECTION 300A - DRY CONCENTRATION AND AMALGAMATION
2,000,000 YARD PLANT

(Appendix A)

TABLE 27

PRODUCTION COST ESTIMATE

Product: Amalgam and Gold — Symbol:
At: — Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September, 1964
At: San Francisco, California

Plant Feed Rate, yd per yr	2,000,000	
Section 300A Feed Rate		(from Section 200A)
yd per yr	1,300,000	
ton per yr	1,950,000	
ton per hr	288	
Capital Cost (Ip)	$ 480,000	(Cost of 1,000,000 yd plant times $2^{0.72}$)

ASSUMPTIONS

See Design Criteria, Table 2, for basic design assumptions.
Operating time: same as 1,000,000 yard plant (See Table 26)
Feed: same as 1,000,000 yard plant
Labor and Supervision: same as 1,000,000 yard plant

Power: 1.88 times the power for the 1,000,000 yard plant

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK
Mercury	Flask 76 lb	$280.00	$3.50	$1.50	$285.00
Quicklime (sacks)	ton	25.00	5.00	--	30.00

PACKING COST

Kind				
Capacity				
Cost of Container				
Cost of Liner				
Packing Labor				
Other Costs				
Total Cost per Container				
Proportion Each Type				

NOTES

Final concentrates are 9.8 ton per day or 3,320 ton per yr.
Weights are given in short tons or pounds.

RAW MATERIALS	AMOUNT per year	$ PER unit	$ per yr	$ per yr	$ per yd plant feed	$ per yd plant feed
Section 200 A product, yd	1,300,000	(See Dry Feed Preparation Table 25 for cost)				
Mercury lb	3,320	3.75	12,460		0.0062	
one pound per ton of final concentrate						
Quicklime lb	33,200	.015	500		.0003	
10 lb per ton of final concentrate						
TOTAL RAW MATERIALS				12,960		0.0065
Labor			39,000		.0195	
Supervision			3,640		.0018	
Labor Benefits 15 percent of L + S			6,400		.0032	
Steam						
Electricity kwhr	1,105,000	0.00867	9,580		.0048	
Air Allowance			150		.0001	
Water – Purch. or Process			400		.0002	
Water – Plant or Cooling						
Fuel – Gas - ~~Coal~~ ~~Oil~~			200		.0001	
Maintenance – Minor } 6 percent of Ip		Materials	28,800		.0144	
Maintenance – Major }						
Factory Supplies 0.5 percent of Ip			2,400		.0012	
Laboratory Supplies, assays		Allowance	1,500		.0008	
DIRECT CONVERSION				92,070		.0460
Depreciation 10 percent of Ip			48,000		.0240	
Controllable Indirect See Table 6						
Non-Controllable Indirect 2.5 percent of Ip			12,000		.0060	
INDIRECT CONVERSION				60,000		.0300
TOTAL MFG. COST IN BULK				165,030		.0825
Rounded				165,000		.082
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

WESTERN KNAPP ENGINEERING CO.

TABLE 28

SECTION 400 - WET FEED PREPARATION, CONCENTRATION AND AMALGAMATION - 1,000,000 YARD PLANT

PRODUCTION COST ESTIMATE

Product: Amalgam and Gold — Symbol:
At: — Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September, 1964
At: San Francisco, California

Placer Gravel Feed Rate	
yd per yr	1,000,000
yd per yr	1,500,000
ton per hr	221
Capital Cost	$ 710,000 (See Table 7 for non-process costs)

ASSUMPTIONS

See Design Criteria, Table 2, for basic design assumptions
Operating Time: 340 days per yr, 20 hr per day, 6800 hr per yr
Labor and Supervision:

2 operators per shift, 4 shifts:	8 x $ 3.25 x 2080 hr =	$ 54,080
1 operator, days only	3.25 x 2080 =	6,760
1 laborer, days only	2.50 x 2080 =	5,200
1 foreman	3.50 x 2080 =	7,280

Power: 595 hp motive, 20 hp lighting (615)(0.8)(0.746)6800=2,500,000 kwhr per yr
Power cost based on average load of water system and Section 400 or 0.667 (170 hp) + 615 hp = 728 hp or 434 kw average.

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK
Mercury	Flask 76 lb	$280.00	$3.50	$1.50	$285.00
Quicklime (sacks)	ton	25.00	5.00	---	30.00

PACKING COST

Kind				
Capacity				
Cost of Container				
Cost of Liner				
Packing Labor				
Other Costs				
Total Cost per Container				
Proportion Each Type				

NOTES

Final concentrates are 30 lb per hr or 102 ton per yr.
Weights are given in short tons or pounds.

RAW MATERIALS		AMOUNT per year	$ PER unit	$ per yr	$ per yr	$ per yd plant feed	$ per yd plant feed
Placer Gravels	yd	1,000,000	(See Mining Table 16 for cost)				
Mercury	lb	102	3.75	380		0.0004	
One pound per ton of final concentrate							
Quicklime	lb	1,020	0.015	15		.0000	
10 lb per ton of final concentrate							
TOTAL RAW MATERIALS					395		0.0004
Labor				66,040		.0660	
Supervision				7,280		.0073	
Labor Benefits 15 percent of L + S				11,000		.0110	
Steam							
Electricity	kwhr	2,500,000	0.01023	25,580		.0256	
Air Allowance				100		.0001	
Water – Purch. or Process							
Water – Plant or Cooling	thousand gallons	40,800	1.11	45,250		.0452	
Fuel – Gas - ~~Coal~~ Allowance				200		.0002	
Maintenance – Minor } 4 percent of Ip		Materials		28,400		.0284	
Maintenance – Major }							
Factory Supplies 0.5 percent of Ip				3,550		.0036	
Laboratory Supplies, assays		Allowance		3,000		.0030	
DIRECT CONVERSION					190,400		.1904
Depreciation 10 percent of Ip				71,000		.0710	
Controllable Indirect See Table 6							
Non-Controllable Indirect 2.5 percent of Ip				17,750		.0177	
INDIRECT CONVERSION					88,750		0.0887
TOTAL MFG. COST IN BULK					279,545		.2795
Rounded					280,000		.280
Packing Cost							
Shipping Cost							
TOTAL COST F.O.B.							

WESTERN KNAPP ENGINEERING CO.

TABLE 29

SECTION 400A - WET FEED PREPARATION, CONCENTRATION AND AMALGAMATION - 2,000,000 YARD PLANT

PRODUCTION COST ESTIMATE

Product: Amalgam and Gold — Symbol:
At: — Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September, 1964

At: San Francisco, California

Placer Gravel Feed Rate	
yd per yr	2,000,000
ton per yr	3,000,000
ton per hr	442
Capital Cost	$1,170,000 (Cost of 1,000,000 yd plant times $2^{0.72}$)

ASSUMPTIONS

See Design Criteria, Table 2, for basic design assumptions.
Operating time: same as 1,000,000 yard plant (See Table 28)
Labor and Supervision: same as 1,000,000 yard plant
Power: 1.88 times the power for the 1,000,000 yard plant or 1156 hp
(Water supply system adds another 320 hp connected load.)
Power cost based on average load of water system and this section or
0.667 (320 hp) + 1156 hp = 1369 hp or 817 kw total demand
Water: twice the water for the 1,000,000 yard plant.

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK
Mercury	Flask 76 lb	$280.00	$3.50	$1.50	$285.00
Quicklime (sacks)	ton	25.00	5.00	---	30.00

PACKING COST

Kind					
Capacity					
Cost of Container					
Cost of Liner					
Packing Labor					
Other Costs					
Total Cost per Container					
Proportion Each Type					

NOTES

Final concentrates are 60 lb per hr or 204 ton per yr.
Weights are given in short tons or pounds.

RAW MATERIALS		AMOUNT per year	$ PER unit	$ per yr	$ per yr	$ per yd plant feed	$ per yd plant feed
Placer Gravels	yd	2,000,000	(See Mining Table 16 for cost)				
Mercury one pound per ton of final concentrate	lb	204	3.75	760		0.0004	
Quicklime 10 lb per ton of final concentrates	lb	2,040	0.015	30		.0000	
TOTAL RAW MATERIALS					790		.0004
Labor				66,040		.0330	
Supervision				7,280		.0036	
Labor Benefits 15 percent of L + S				11,000		.0055	
Steam							
Electricity	kwhr	4,700,000	0.00893	41,970		.0210	
Air Allowance				150		.0002	
Water – Purch. or Process							
Water – Plant or Cooling	thousand gallons	81,600	0.83	67,730		.0339	
Fuel – Gas - ~~Coal x Oil~~ Allowance				200		.0001	
Maintenance – Minor / Maintenance – Major: 4 percent of Ip		Materials		46,800		.0234	
Factory Supplies 0.5 percent of Ip				5,850		.0029	
Laboratory Supplies, assays		Allowance		3,000		.0015	
DIRECT CONVERSION					250,020		.1250
Depreciation 10 percent of Ip				117,000		.0585	
Controllable Indirect See Table 6							
Non-Controllable Indirect 2.5 percent of Ip				29,250		.0146	
INDIRECT CONVERSION					146,250		.0731
TOTAL MFG. COST IN BULK					397,060		.1985
Rounded					397,000		.199
Packing Cost							
Shipping Cost							
TOTAL COST F.O.B.							

PROCESS WATER FOR 1,000,000 YARD PLANT

TABLE 30

PRODUCTION COST ESTIMATE

Product: Process Water
Symbol:
At:
Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering
Date: September, 1964
At: San Francisco, California

Water Use Rate	gpm	100
	gal per day	144,000
	gal per hr	6,000
	gal per yr	40,800,000
Pumping Rate	gpm	150
	gal per hr	9,000
Capital Cost	(Ip)	$ 275,000 (See Table 14)

ASSUMPTIONS

Water used at 100 gal per min for 6800 hr per yr, but pumped to reservoir at 150 gpm for 4533 hr.

Power: (170 hp)(0.8)(0.746) 4533 hr = 460,000 kwhr per yr
Power cost based on average load of water system and Section 400, or 0.667 (170 hp) + 615 hp = 728 hp or 434 kw average.

Labor and Supervision
1/4 operator, days only, $3.25 x 520 hr = $1690

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK

PACKING COST

Kind				
Capacity				
Cost of Container				
Cost of Liner				
Packing Labor				
Other Costs				
Total Cost per Container				
Proportion Each Type				

NOTES

RAW MATERIALS	AMOUNT per year	$ PER unit	$ per yr	$ per yr	$ per 1,000 gal
TOTAL RAW MATERIALS					
Labor			1,690		
Supervision					
Labor Benefits 15 percent of Labor			250		
Steam					
Electricity kwhr	460,000	0.001023	4,700		
Air					
Water – Purch. or Process					
Water – Plant or Cooling					
Fuel – Gas - Coal - Oil					
Maintenance – Minor / Maintenance – Major } 1.0 percent of Ip	Materials		2,750		
Factory Supplies 0.5 percent of Ip			1,380		
Laboratory Allowance			100		
DIRECT CONVERSION				10,870	0.266
Depreciation 10 percent of Ip			27,500		
Controllable Indirect See Table 6					
Non-Controllable Indirect 2.5 percent of Ip			6,880		
INDIRECT CONVERSION				34,380	.843
TOTAL MFG. COST IN BULK				45,250	1.109
Rounded				45,000	1.11
Packing Cost					
Shipping Cost					
TOTAL COST F.O.B.					

WESTERN KNAPP ENGINEERING CO.

PROCESS WATER FOR 2,000,000 YARD PLANT

(Appendix A)
TABLE 31

PRODUCTION COST ESTIMATE

Product: Process Water
Symbol:
At:
Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering
Date: September, 1964
At: San Francisco, California

Water Use Rate,	gpm	200
	gal per day	288,000
	gal per hr	12,000
	gal per yr	81,600,000
Pumping Rate	gpm	300
	gal per hr	18,000
Capital Cost	(Ip)	$ 415,000 (Cost of 1,000,000 yd plant times $2^{0.6}$)

ASSUMPTIONS

Water used at 200 gal per min for 6800 hr per yr, but pumped to reservoir at 300 gpm for 4533 hr.
Power: 1.88 times the power for the water system for 1,000,000 yd plant
Power cost based on average load of water system and Section 400 A. See Table 30

Labor and Supervision: same as for water for 1,000,000 yd plant

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK

PACKING COST

Kind				
Capacity				
Cost of Container				
Cost of Liner				
Packing Labor				
Other Costs				
Total Cost per Container				
Proportion Each Type				

NOTES

RAW MATERIALS	AMOUNT per year	$ PER unit	$ per yr	$ per yr	$ per 1,000 gal
TOTAL RAW MATERIALS					
Labor			1,690		
Supervision					
Labor Benefits 15 percent of Labor			250		
Steam					
Electricity kwhr	865,000	0.00893	7,725		
Air					
Water – Purch. or Process					
Water – Plant or Cooling					
Fuel – Gas - Coal - Oil					
Maintenance – Minor } 1.0 percent of Ip Materials			4,150		
Maintenance – Major }					
Factory Supplies 0.5 percent of Ip			2,075		
Laboratory Allowance			100		
DIRECT CONVERSION				15,990	0.1960
Depreciation 10 percent of Ip			41,500		
Controllable Indirect See Table 6					
Non-Controllable Indirect 2.5 percent of Ip			10,375		
INDIRECT CONVERSION				51,875	.6357
TOTAL MFG. COST IN BULK				67,865	.8317
Rounded				68,000	.83
Packing Cost					
Shipping Cost					
TOTAL COST F.O.B.					

WESTERN KNAPP ENGINEERING CO.

PORTABLE PLANT - DRY PROCESS
1,000,000 YD PER YR

PRODUCTION COST ESTIMATE

(Appendix A)

TABLE 32

Product: Amalgam and Gold — Symbol:
At: — Company: Shell Canadiam Exploration
Estimated By: Western Knapp Engineering — Date: September 1964

At: San Francisco, California

Placer Gravel	
Feed Rate, yd per yr	1,000,000
ton per yr	1,500,000
yd per hr	147
ton per hr	220
Capital Cost (Ip)	1,206,000
Dozers and Automotive Eqpt.	129,000
Total Cost (I)	1,335,000

ASSUMPTIONS

See Design Criteria, Table 2, for basic design assumptions
Operating time: 340 days per year, 20 hours per day or a total of 6800 hours per year
Labor and Supervision
Same as fixed plant Sections 200 plus 300 except add one dozer operator: $3.00 x 2270 hr = $6840
Power:
800 hp motive, 20 hp lighting: (820)(0.8)(0.746)6800 = 3,330,000 kwhr per yr
Dryer fuel: 26,250,000 Btu per hr, same as for Section 200 (Table 24)
See note below.

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK

PACKING COST

Kind					
Capacity					
Cost of Container					
Cost of Liner					
Packing Labor					
Other Costs					
Total Cost per Container					
Proportion Each Type					

NOTES

* Diesel tractor fuel: Allow 7.6 gal per hr, 8 hr per day, 340 day per yr or 20,600 gal per yr.

** Dryer fuel: Use fuel cost same as in Table 24 for fixed plant, but add $200 for miscellaneous heating.

WESTERN KNAPP ENGINEERING CO.

RAW MATERIALS	AMOUNT per year	$ PER unit	$ per yr	$ per yr	$ per yd plant feed	$ per yd plant feed
Mercury lb	1,660	3.75	6,230		0.0062	
one pound per ton of final concentrate						
Quicklime (sacks) lb	16,600	0.015	250		.0003	
ten lb per ton of final concentrate						
TOTAL RAW MATERIALS				6,480		0.0065
Labor See assumptions			105,120		.1051	
Supervision			7,280		.0073	
Labor Benefits 15 percent of L + S			16,860		.0169	
Steam						
Electricity kwhr	3,330,000	0.00965	32,130		.0321	
Air Allowance			400		.0004	
Water – Purch. or Process Allowance			300		.0003	
Water – Plant or Cooling						
Fuel – Gas - Coal - Oil thousand cu ft	162,276+	.469	**76,300		.0763	
Diesel Tractor Fuel gal	20,600	.16	* 3,300		.0033	
Maintenance – Tractor and auto			4,500		.0045	
Maintenance – Major 4 percent of Ip			48,240		.0482	
Lubricant - Diesel tractor			200		.0002	
Factory Supplies 0.5 percent of Ip			6,030		.0060	
Laboratory			3,000		.0030	
DIRECT CONVERSION				303,660		.3037
Depreciation, Dozers and Auto., 20 percent lineal			25,800		.0258	
Depreciation 10 percent of Ip			120,600		.1206	
Controllable Indirect See Table 6						
Non-Controllable Indirect 2.5 percent of Ip			30,150		.0302	
INDIRECT CONVERSION				176,550		.1766
TOTAL MFG. COST IN BULK				486,690		.4867
		Rounded		487,000		.49
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

PORTABLE PLANT - DRY PROCESS
2,000,000 YD PER YR

(Appendix A)

TABLE 33

PRODUCTION COST ESTIMATE

Product: Amalgam and Gold — Symbol:
At: — Company: Shell Canadian Exploration
Estimated By: Western Knapp Engineering — Date: September, 1964

At: San Francisco, California

ASSUMPTIONS

Operating time: same as 1,000,000 yd plant (See Table 32)

Labor: same as 1,000,000 yd plant

Power: 1.88 times the power for the 1,000,000 yd portable plant

Dryer fuel: twice as many cu ft as for the 1,000,000 yd plant dryer plus $200 for miscellaneous heating

Diesel tractor fuel: 1.88 times the diesel fuel rate for the 1,000,000 yd plant

RAW MATERIAL COST

MATERIAL	UNIT	AT SOURCE	FREIGHT	UNLOADING	IN STOCK

PACKING COST

Kind					
Capacity					
Cost of Container					
Cost of Liner					
Packing Labor					
Other Costs					
Total Cost per Container					
Proportion Each Type					

NOTES

WESTERN KNAPP ENGINEERING CO.

Placer Gravel						
Feed Rate, yd per yr	2,000,000					
ton per yr	3,000,000					
yd per hr	294					
ton per hr	440					
Capital Cost (Ip)	$1,990,000 (Cost of 1,000,000 yd plant times $2^{0.72}$)					
Dozers and Auto. Eqpt.	129,000					
Total Cost (I)	$2,119,000					
RAW MATERIALS	**AMOUNT per year**	**$ PER unit**	**$ per yr**	**$ per yr**	**$ per yd plant feed**	**$ per yd plant feed**
Mercury lb	3,320	3.75	12,460		0.0062	
one pound per ton of final concentrate						
Quicklime (sacks) lb	33,200	0.015	500		.0003	
ten lb per ton of final concentrate						
TOTAL RAW MATERIALS				12,960		0.0065
Labor See assumptions			105,120		.0526	
Supervision			7,280		.0036	
Labor Benefits 15 percent of L+S			16,860		.0084	
Steam						
Electricity kwhr	6,260,000	0.00938	58,720		.0294	
Air Allowance			650		.0003	
Water – Purch. or Process Allowance			600		.0003	
Water – Plant or Cooling						
Fuel – Gas - Coal - Oil thousand cu ft	324,552+	.438	142,354		.0712	
Diesel tractor fuel			6,200		.0031	
Maintenance – Tractor and auto.			6,000		.0030	
Maintenance – Major 4 percent of Ip			79,200		.0398	
Lubricant - Diesel tractor			400		.0002	
Factory Supplies 0.5 percent of Ip			9,950		.0050	
Laboratory			4,000		.0020	
DIRECT CONVERSION				437,734		.2189
Depreciation, Dozers and Auto., 20 percent			25,800		.0129	
Depreciation 10 percent of Ip			199,000		.0995	
Controllable Indirect See Table 6						
Non-Controllable Indirect 2.5 percent of Ip			49,750		.0249	
INDIRECT CONVERSION				274,550		.1373
TOTAL MFG. COST IN BULK				725,244		.3626
		Rounded		725,000		.36
Packing Cost						
Shipping Cost						
TOTAL COST F.O.B.						

APPENDIX B

EQUIPMENT LISTS AND UTILITY COMPANY RATE SCHEDULES

		Page
1.	Process Equipment List - Section 200	1
2.	Process Equipment List - Section 300	6
3.	Process Equipment List - Section 400	10
4.	Pacific Gas & Electric Co. Gas Rate Schedules	
5.	Southern California Edison Co. Electric Power Rate Schedules	
6.	Reference Item: "Dry Dredge Taps Desert Gold"	

(Appendix B)

PROCESS EQUIPMENT LIST

SECTION 200

Feed Preparation Section, Dry Process Plant. Capacity 1,000,000 yards per year.

Item Number	Description	Power hp	Cost at Factory
200	Hopper, capacity 43 yards, suitable for dumping 25 yd scraper units, 8 in. grizzly deck. Hopper unit of steel, set on concrete foundation which forms mount for feeder. Weight of steel, approx. 11,000 lb.	1	$2,200
202	Feeder, Ore, Denver Apron Type J, or equal, 36 in. by 10 ft unit capacity 25 to 375 t per hr at 20 ft per min. Includes motor and drive. Weight 8600 lb Duty: Feed 225 t per hr. of 111 lb per cu ft placer gravel.	2	5,800
205	Conveyor, Belt. 24 in. conveyor 80 ft long, 20 ft. lift, complete with bolt, idlers, pulleys, bearings, take-ups, motor and drives. Duty: 225 t per hr of 111 lb per cu. ft. placer gravel. Weight 4000 lb.	20	3,500
207	Grizzly, 4 in. bar Telsmith scalper or equal, with 1 in. screen bottom. (See Item 215). Duty: Scalp plus 4 in. rock and screen out plus 1 in. material. Feed 225 t per hr, plus 1 in. material is 56.3 t per hr. Gravel at 111 lb. per cu. ft. Unit: 5 by 10 double deck, with drive. Weight 8500 lb.	15	7,500

APPENDIX C

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
208	Conveyor, Belt. 24 in. conveyor 180 ft long with 35 ft. rise, complete with belt, idlers, pulleys, bearings, take-ups, motor and drives. Duty: 220 t/hr of minus 8 in. material to surge bin, item 210. Weight 6000 lb.	25	$6,300
210	Bin, surge, 50 t capacity, steel, on legs. Weight approx. 10,600 lb.	1	2,100
212	Feed gate, double rack and pinion 30 x 36 in. with cylinder.	1	500
215	See Item 207.		
217	Conveyor, Belt. 24 in. by 15 ft. with raise of 3 ft to discharge end. Complete with belt, idlers, pulleys, bearings, take-ups, motor and drives. Duty: 170 t per hr at 3000 lb per cu. ft. 1 in. minus gravel. Weight 2500 lb.	10	2,000
220) 222) 223)	Dryer, dust collector and fan. Duty: Dry 170 t per hr of minus 1 in. placer gravel from 3 percent to 0.5 percent water. Unit proposed is Standard Steel 6 x 28 ft unit complete with appurtenances and stack, drives, motors and firing equipment. Saw tooth lifters for maximum attrition. Heat required is 24 x 10^6 Btu per hr plus 7-1/2 percent radiation loss or 26,250,000 Btu. Fuel is 1100 Btu natural gas. Area 18 x 40 x 40 ft high. Weight dryer 40,000 lb. Weight dust concentrator 21,500 lb. Fob Los Angeles.	130	42,000
225	Drag Conveyor, Stephens Adamson, 18 x 8 in. flight, 60 ft long, 10 ft. lift. Duty 166 t per hr gravel at 111 lb/cu. ft. Temperature 180 F, weight 2500 lb.	15	2,000

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
230	Screens A, B and C (3) Telesmith or Denver-Dillon 5 x 12 ft single deck, complete with drive and dust cones. Duty: Separate 144.25 t per hr of minus 4 mesh from 166.75 t of minus 1 in. feed. Weight each 9800 lbs for total of 29,400 lb. 3 units	25	$19,500
232	Conveyor, 24 in. by 35 ft length, complete with belt idlers, drive, take-ups, etc. Duty: 145 t per hr minus 4 mesh to Elevator, Item 235. Weight 3000 lb.	10	2,500
235	Elevator, height 35 ft, complete with drive, all steel casing. Buckets 16 x 8 x 8-1/2 with 22-3/4 x 54 in. casing. Duty: 144 t per hr minus 4 mesh material. Weight 5600 lb.	15	3,500
240	Conveyor-Distributor, 18 in. x 60 ft heavy duty trough and screws. Complete with motor and drive. Duty: 144.25 t/hr of minus 4 mesh delivered to surge or screens. Weight 8200 lb.	30	6,200
245	Screens, single deck 5 x 12 ft Telesmith, Denver-Dillon or equal. Five units required (ABCDE). Dust cover required. Complete with motor and drive. Duty: Feed 144 t/hr minus 4 mesh. Product 67.5 t/hr minus 4 mesh plus 30 mesh. Weight 27,500 lb (5 units) 5 units	50	27,500
250	Surge Bin - used with either alternate. 120 ton design, 100 t nominal capacity steel bin with roof and spouts. Weight 16,000 lb.	-	3,200

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
250A	Alternate Bin, same as Item 250		
255	Conveyor-Splitter. Two units in series each 50 ft long. Stephens-Adamson Class II 16 in. diam. totally enclosed, TEFC gear motor. Duty: 76.25 t per hr of minus 30 mesh material. Weight 12,000 lb.	30	$7,700
260 A & B	Air Separator, Raymond mechanical single whizzer 16 ft unit, 2 required. Heavy duty with abrasion-resistant liner. Including 600 rpm motor direct-connected. Duty 76.25 tons per hr feed: minus 30 plus 60 mesh, 45 t per hr; minus 60 mesh, 31.75 t per hr; bulk density 110 lb per cu ft. Approx. 90 percent of -30+60 will be in that size range. Weight 60,000 lb. 2 units	250	60,000
265	Conveyor, 12 in. x 50 ft, screw type, complete with gear motor and coupling. Duty: 45 tons per hr of -30+60 sand with a bulk density of 111 lb per cu.ft. Weight 3500 lb.	5	2,300
270	Elevator, 10 in. x 6 in. x 35 ft, Ersham BB4 or equal, belt type. Duty: 45 t per hr of -30+60 mesh sand at 111 lb per cu ft. Weight 3540 lb.	5	2,500
275	Surge Bin 50 tons capacity, made of 3/16 in. steel plate, supported on steel legs, 10 x 10 x 28 ft high. (Can be cylindrical). Weight 10,600 lb.	-	2,100
280	Conveyor - same specifications as Item 265, for purpose of minimizing spares. Weight 3500 lb.	5	2,300

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
285	Elevator - same specifications as Item 270 for purposes of minimizing spares. Weight 3540 lb	5	$2,500
290	Surge Bin. 50 tons capacity, same specifications as Item 275. Weight 10,600 lb	-	2,100
Totals		650	$217,800

Total Weight 320,680 lb

Freight, delivery, handling at site 320,680 x $6.00/100	19,240
Sales taxes, 3 percent of factory cost	6,530
Equipment cost, ready to install	$243,570
Rounded	244,000
Capital cost for Section 200 (Installed) 244,000 x 2.65	650,000

PROCESS EQUIPMENT LIST
SECTION 300

Dry Concentration and Amalgamation Section, Dry Process Plant. Capacity 1,000,000 yards per year.

Item Number	Description	Power hp	Cost at Factory
300 A,B	Feeders, Variable Rate (2). Duty: feed 34 t per hr, each, of 4 by 30 mesh sand, bulk density 110 lb per cu ft. Hardinge Size C Constant Weight Unit, or equal, ratio 3:1. Total weight 800 lb.	1	$3,450
305 A,B	Concentrators, Morgan Dry (2). Duty: concentrate 25 yds per hr of sand each in ratio of 200:1. Sand feed is 4 by 30 mesh. Complete with motor, drive and dust covers. Air supply by others. Total weight 5000 lb.	1.5	13,200
310 A,B	Feeders, Variable Rate (2). Duty: feed 22 t per hr of 30 by 60 mesh sand, Same specifications as 300A, B, except total weight 700 lb.	1	3,450
315 A,B	Concentrators, Morgan Dry (2). Duty: concentrate 22 t per hr each of 30 by 60 mesh sand feed. Same specifications as Item 305A except total weight 2500 lb.	1.5	13,200
320	Feeder, Variable Rate (1). Duty: 32 t per hr of minus 60 mesh material. Same specifications as 300A except weight 700 lb.	0.5	1,725

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
325	Concentrator, Morgan Dry (1). Duty: 32 t per hr of minus 60 mesh sand. Same specifications as Item 305A except weight 2500 lb.	1	$6,600
330	Elevator. Duty: lift 2 t per hr of concentrates, bulk density 135 lb per cu ft. Evsham Size B1, or equal, 4 t per hr capacity, 35 ft centers. Complete with drive and guards. Weight 3000 lb.	1	1,800
335	Surge Bin, 3-compartment, 20 ton capacity (1 day), for rougher concentrates. Complete with roof, ladder, etc. Weight of steel 7000 lb.	-	1,400
340	Feeder, Variable Rate. Duty: feed concentrates to magnetic separator at rates up to 2 tons per hr, concentrate density 135 lb per cu ft. Hardinge Size B constant weight unit, or equal, ratio 3:1. Weight 500 lb.	0.25	1,300
345	Magnetic Separator. Duty: remove magnetite and other magnetic sands from gold concentrates at feed rate of 4000 lb per hr. Carpco Rotating Field, Model RF 118, or Dings Model FA Drum, or equal, designed especially for separation of highly magnetic materials. Dust tight. Complete with hopper and drive. Weight 500 lb.	1	1,300
350	Surge Bin. Duty: contain 1 ton of non-magnetic concentrate, bulk density 111 lb per cu ft. Approx. 4 x 4 x 4 ft, steel. Weight 1000 lb.	-	200

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
355	Feeder, Variable Rate. Same specifications as Item 340. Weight 500 lb.	0.25	$1,300
360	Concentrator, Morgan Dry. Cleaning ratio 10:1. Same specifications as Item 305A except that unit runs intermittently, serving as a cleaner for non-magnetic sands. Weight 2500 lb.	0.75	6,600
365	Elevator. Same specifications as Item 330. Weight 3000 lb.	1	1,800
370	Surge Bin. Capacity 5 tons of sand with bulk density 135 lbs per cu ft. Weight 2250 lb.	-	450
375 A,B,C	Amalgamation Units (3). Duty: amalgamate 4.9 tons of gold concentrates in one 8 hour shift. Denver 42 x 48 in., or equal, with motor and drive. Weight 25,300 lb (3 units)	22.5	16,500
380	Belt Conveyor. Duty: move tailings and waste sands to conveyor Item 208. Size 24 in. x 15 ft, complete with belt, idlers, motor, drive. Weight 2500 lb.	2	2,000
385	Fork lift truck, barrel type, capacity 2000 lb. Gasoline motor drive. Weight 4000 lb.	-	3,500
386	Amalgamation Equipment, Miscellaneous. Includes small water tank, pumps, blanket table, etc. Weight 1500 lb. Allowance:	3	1,000
390	Air Filter. Four (4) Air Maze P116, or equal, 20 x 25 inch, including holding frames. Weight 150 lb.	-	450

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
392	Centrifugal Blower. Duty: 3500 cfm of air at 2 psi, inlet temp. 110 F, maximum. Elevation 3500 ft above sea level. AC type "C", single stage, direct coupled. Complete with motor, baseplate, check valves, inlet butterfly. Weight 5000 lb.	50	$12,000
393	Cyclone, Dust Collection. Duty: 10,000 cfm at 3.5 in. pressure drop. American Blower Series 311, design 13, size 22, or equal. Steel shell 3/16 in., complete with 30 cf hopper and type F seal flapper valve. Weight 3040 lb.	-	2,240
395	Fan, Dust Collection Service. Duty: 10,000 cfm at 6.5 in. American type 21AH, Series 106, with TEFC motor and drive. Weight 1500 lb.	20	1,100
Totals		108.25	$96,565

Total Weight 75,440 lb

Freight, delivery, handling at site 75,440 x $6.00/100	4,530
Sales taxes, 3 percent of factory cost	2,900
Equipment cost, ready to install	$103,995
Rounded	104,000
Capital cost for Section 300 (Installed) 104,000 x 2.65	$275,000
Miscellaneous Equipment not requiring installation	15,000
Total Capital Cost	$290,000

PROCESS EQUIPMENT LIST

Section 400

Feed Preparation, Concentration, and Amalgamation Section of Wet Process Plant. Capacity 1,000,000 yards per year.

Item Number	Description	Power hp	Cost at Factory
400	Hopper, capacity 43 yards, with 8 in. grizzly deck. Suitable for dumping 25 yd scraper units. Steel construction, on concrete foundation that also supports feeder. Weight of steel 11,000 lb	1	$2,200
405	Ore Feeder. Duty: Feeds 220 t per hr of 111 lb per cu ft placer gravel. Denver Apron Feeder, Type J, or equal, 36 by 111 in. Includes motor and drive. Weight 8600 lb	2	5,800
408	Belt Conveyor. For 220 t per hr of mine-run ore, 110 lb per cu ft, largest lump 8 in. Conveyor width 24 in., length 30 ft, lift 8 ft. Complete with motor and drive. Weight 3205 lb	15	3,090

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
410	Grizzly. Capacity 220 t per hr of placer ore, rejects plus 4 in. material. (Telsmith heavy duty scalper, or equal, 5 by 10 ft single plate or bar deck.) With motor and drive. Weight 7000 lb	10	$5,500
415	Belt Conveyor. For 220 t per hr of placer ore, 110 lb per cu ft, all minus 4 inch. Conveyor width 24 in., length 42 ft, lift 12 ft. Complete with motor and drive. Weight 3092 lb	10	2,980
420	Trommel Screen. Washes and screens 220 ton per hr of minus 4 in. placer ore on 0.31 inch mesh, rejecting 70 tons, passing 150 tons. Telsmith Standard Rotary Washing Screen, or equal, 60 in. diam. by 19 ft, complete with cleaning rollers, piping, motor and drive. Weight 21,000 lb	20	12,000
421	Belt Conveyor. For 65 t per hr of minus 4 inch ore, 110 lb per cu ft. Conveyor width 24 in., length 50 ft, lift 4 ft. Complete with motor and drive. Weight 2345 lb	7.5	2,470
425	Belt Conveyor. For 245 t per hr of minus 8 inch ore, 120 lb per cu ft. Conveyor width 24 in., length 70 ft, zero lift. With motor and drive. Weight 4285 lb	15	4,370

Item Number	Description	Power hp	Cost at Factory
426	Belt Conveyor. Duty: move 245 t per hr of minus 8 inch ore, 120 lb per cu ft. Conveyor 24 in. by 100 ft, lift 32 ft. With motor and drive. Weight 4310 lb	15	$4,410
427	Surge Bin. Capacity 50 tons. Steel bin, on legs. Weight 10,600 lb	1	2,100
428	Sump Tank. Steel, open top, 9 ft diam. by 6 ft straight side, plus 3 ft eccentric bottom cone. Weight 2100 lb	--	630
429	Centrifugal Pump. Capacity 2700 gpm of slurry, spec. gravity 1.2 at 50 ft total dynamic head. Morris Model 10CK solids pump, or equal. Variable speed drive. Weight 9800 lb	75	9,000
430 AB	Settling Cones (2). Total feed: 2670 gpm of 22 percent (wt.) slurry, overflow approx. 1440 gpm. Telsmith No. 10 Sand Tanks, or equal, with rubber-lined automatic valve. Weight 10,600 lb	--	6,000
432 AB	Pulp Distributors (2). Receive total 1230 gpm underflow from items 430A, B and divide evenly for 10 rougher jigs, items 445 A to J. Denver 5 ft pulp distributors, or equal, 2-bearing, 5-compartment. Weight 2500 lb	--	1,500

Item Number	Description	Power hp	Cost at Factory
435	Sump Tank. Same specifications as item 428. Weight 2100 lb	--	$ 630
440	Centrifugal Pump. Capacity 2210 gpm water at 50 ft total dynamic head. Morris 8 CK pump, or equal, with variable speed drive and motor. Weight 6600 lb	60	6,100
445 A to J	Mechanical Rougher Jigs (10). Duty: 500 to 1 concentration of 155 ton per hr minus 0.31 inches placer sands and slimes. Denver 16 by 24 in. Duplex Mineral Jigs, or equal. With motors and drives. Total weight 20,000 lb	15	22,000
450	Cleaner Jig. Duty: 20 to 1 concentration of 620 lb per hr product from item 445. Denver 8 by 12 in. Simplex Mineral Jig, or equal. Weight 520 lb	0.5	840
455	Centrifugal Pump. Capacity 685 gpm water at 40 ft total dynamic head. Morris 4 JC14, or equal. With motor and variable drive. Weight 1580 lb	15	2,200
460	Surge Tank. 26 in. diam. by 42 in. deep vertical steel tank, cone bottom, open top. Weight 80 lb	--	30

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
462	Centrifugal Pump. Capacity 5 gpm of water at 25 ft total dynamic head. Weight 25 lb. Allowance:	0.1	$ 200
465	Amalgamator. Duty: amalgamation of 1000 lb of concentrates in one 8-hr shift. Denver 42 by 48 in. Amalgamation Unit, or equal. Weight 8200 lb	7.5	3,800
466	Amalgamation Equipment, Miscellaneous. Includes small water tank, pumps, blanket table, etc. Weight 1500 lb Allowance:	3	1,000
470 A, B	Dewatering Screens (2). Duty: to dewater a 45 to 55 percent slurry carrying 155 ton per hr solids. Telsmith 5 x 12 ft Horizontal Screens, or equal, slotted openings, single deck, plus ball-tray deck. Total weight 15,000 lb	30	12,000
475	Belt Conveyor. Duty: move 84 tons per hr of wet sand, 120 lb per cu ft. Conveyor 24 in. by 50 ft, lift 5 ft. With motor and drive. Weight 2000 lb	5	2,200
480	Sump Tank. Steel, open top, 7.5 ft diam. by 4 ft straight side, plus 3 ft eccentric bottom cone. Weight 1700 lb	--	400

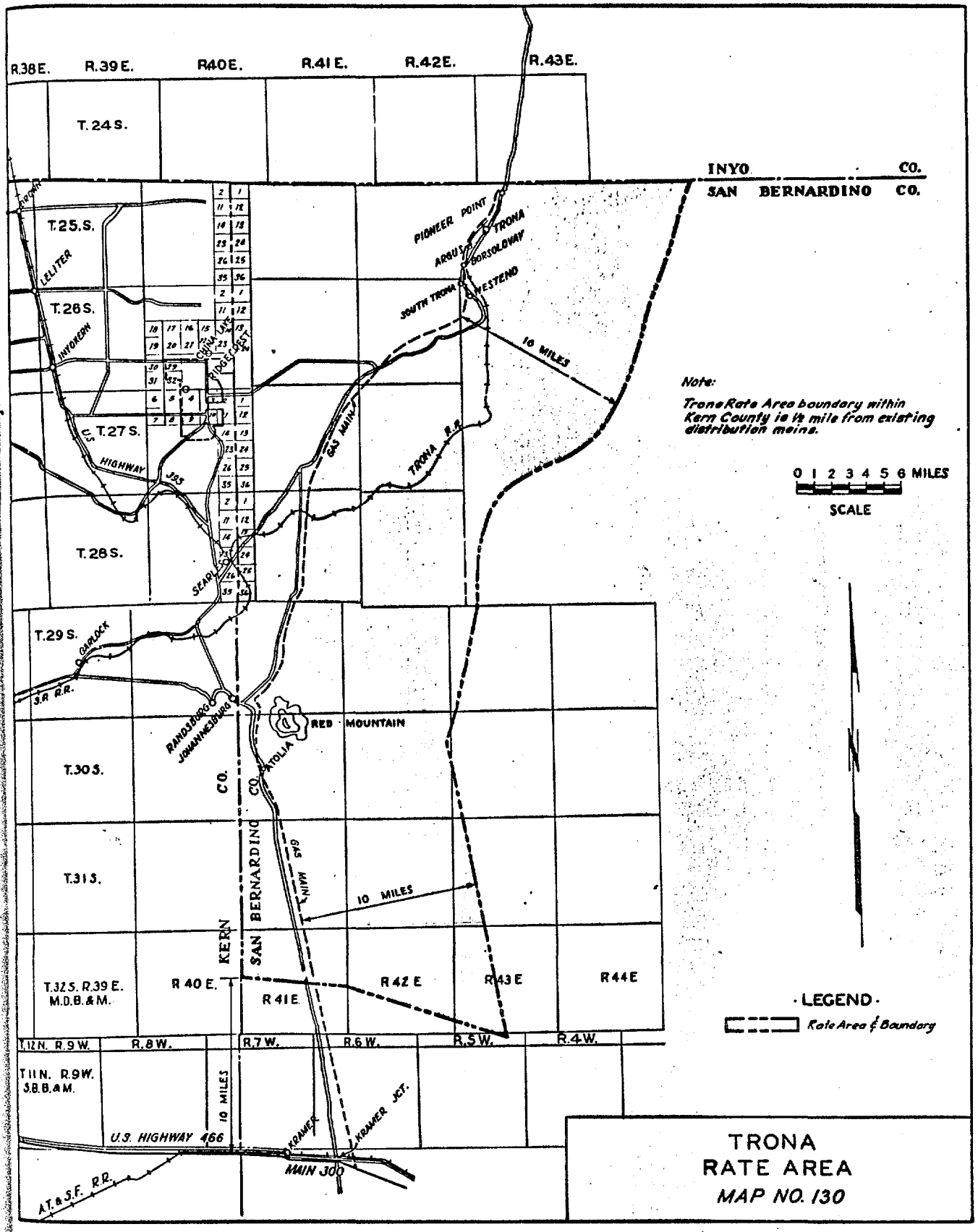
Item Number	Description	Power hp	Cost at Factory
485	Centrifugal Pump. Capacity 1400 gpm slurry, spec. gravity 1.1, at 35 ft total dynamic head. Morris 8 CK Solids Pump, or equal, with variable speed drive and motor. Weight 6100 lb	40	$5,400
490 A	Thickener Mechanism. Duty: to settle 77 ton per hr placer sands, minus 30 mesh, from 1400 gpm of slurry. Mechanism for 100 ft tank. Weight 44,000 lb	7.5	25,000
490 B	Thickener Tank. 100 ft diam. by 14 ft, steel, with launder. Weight 115,000 lb	--	25,000
491	Sump Tank. Capacity 1000 gal. Steel, open top, 5 ft diam. by 5.5 ft straight side, plus 4 ft eccentric bottom cone. Weight 1380 lb	--	340
493	Air Blower. Supplies air to item 496, filter. Roots-Connorsville 4 in., or equal. Weight 1200 lb	7.5	1,470
494	Belt Conveyor. Duty: Conveys 86 t per hr filter cake, 105 lb per cu ft. Conveyor 24 in. by 30 ft, lift 5 ft. Weight 1725 lb	5	1,800

(Appendix B)

Item Number	Description	Power hp	Cost at Factory
495 A, B	Slurry Pumps (2). Transfer underflow from thickener, item 490B, to filter, item 496. Dorrco WLP, 8 in., or equal. Total weight 12,000 lb	15	$ 17,000
496	Filter, Rotary Vacuum. Receives 77 ton per hr solids in 40 percent (wt.) slurry. Dorrco Disc Filter, 8 ft diam. by 9 disc, or equal. Weight 20,000 lb	2	17,500
497	Filtrate Receiver. Steel, 48 in. diam. by 48 in. Weight 1000 lb	--	700
498	Vacuum Pump, Wet. For use with filter, item 296. Nash CL 4001, or equal. Weight 13,000 lb	200	17,500
499	Filtrate Pump. For use on filtrate receiver, item 497. Olivite, 4 in., or equal. Weight 1600 lb	10	2,200
Totals		594.6	$227,360
	Total Weight 374,467 lb		
Freight, delivery, handling at site 374,467 x $6.00/100			22,470
Sales taxes, 3 percent of factory cost			6,820
Equipment cost, ready to install			$255,650
	Rounded		256,000
Capital cost for Section 400 (Installed) 256,000 x 2.65			$680,000
Misc. equipment not requiring installation			30,000
	Total Capital Cost		$710,000

PACIFIC GAS & ELECTRIC COMPANY
SAN FRANCISCO, CALIFORNIA

REVISED CAL. P.U.C. SHEET NO. 7069-G
CANCELING REVISED CAL. P.U.C. SHEET NO. 5678-G



TRONA
RATE AREA
MAP NO. 130

ADVICE LETTER NO. 460-G
DECISION NO. 62681

ISSUED BY
S.L. SIBLEY
VICE-PRESIDENT AND GENERAL MANAGER

DATE FILED FEBRUARY 15, 1963
EFFECTIVE MARCH 17, 1963
RESOLUTION NO.

Schedule No. G-50
INTERRUPTIBLE NATURAL GAS SERVICE

APPLICABILITY

Applicable, subject to interruptions in supply as provided in special conditions below, for natural gas service to commercial and industrial establishments for gas used for all purposes at the option of the customer, except directly for the cooking of meals, where such establishments are located along existing mains having a delivery capacity in excess of the then existing requirements of firm customers.

TERRITORY

The entire territory served natural gas by the Company as follows, except in—

Humboldt Division,

Portion of Shasta Division supplied from main 177 north of Corning Field and Shasta Rate Area,

Portions of Stockton Division supplied from the transmission mains between Lodi Gas Field and Las Vinas, from the six inch gas main extending east on Linden Road from a point 800 feet east of White Lane to Linden.

A—(1100 Btu)

Portion of Coast Valleys Division supplied from mains 103, 181, 301, and from the Salinas Mixing Station.

Portion of Colgate Division supplied from main 400.

Portion of De Sabla Division supplied from main 400.

Portion of Sacramento Division supplied from main 400.

Portion of Shasta Division supplied from main 400 south of main 177.

San Francisco Division

San Jose Division, except portion supplied from mains 105 and 107.

Portions of East Bay Division supplied from mains 105 and 153 north of Irvington, from main 114 between Livermore Junction and Antioch Terminal, from mains 131 and 107 between Irvington and Milpitas Terminal, and from main 131 between Irvington and Antioch.

Portions of Stockton Division supplied from mains 110 and 162, from the Stanpac transmission main south of Tracy Terminal, and from the Tracy distribution system.

Portions of San Joaquin Division served (1) from the Bakersfield distribution system, (2) in the Northern District south of Herndon Junction, (3) from the tap of transmission main 300 at Newberry, (4) from the tap of transmission main 300 to Huron, (5) in T 3 N, R 1 W; T 3 N, R 1 E; T 3 N, R 2 E; and westerly one-half of T 3 N, R 3 E; S.B.B.&M., (6) in T 10 N, R 8 W; T 11 N, R 8 W; and westerly one-third of T 10 N, R 7 W and T 11 N, R 7 W; S.B.B.&M., (7) in the Trona Rate Area, (8) from transmission main 164, and (9) from Stanpac transmission main.

B—(1050 Btu)

North Bay Division.

Portions of East Bay Division supplied from main 107 between Irvington and Livermore Junction, from main 105 between Irvington and Milpitas Terminal, from main 191, from Contra Costa Power Plant main, and from Stanpac transmission main north of Brentwood Terminal.

Portions of Sacramento Division supplied from transmission mains extending from Rio Vista Gas Field to Antioch gas terminal, to Rio Vista Y (junction of mains 200, 210 and 220), and westward to beyond Fairfield and including Vacaville tap.

Portion of San Joaquin Division supplied from main 118 north of Herndon Junction, from the Avenal distribution system, and from Main 134 east of Gill Ranch Field.

Portion of San Jose Division supplied from mains 105 and 107.

C—(1000 Btu)

Portion of Coast Valleys Division supplied from main 187.

Portions of Colgate Division supplied from main 167 north of Wild Goose mixing station, from main 172 and west of Buttes Junction from main 121.

Portions of De Sabla Division supplied from mains 167 and 169.

Portion of East Bay Division supplied from Stanpac transmission main south of Brentwood Terminal.

Portions of Sacramento Division supplied from main 119 between Davis Junction and the North Sacramento Holder Station, from main 220 south of Davis Junction, from main 108 between Sacramento and valve 66.8, from main 172, and from main 196.

Portion of Stockton Division supplied from main 196, and from the Stanpac transmission main north of Tracy Terminal.

(continued)

Schedule No. G-50
INTERRUPTIBLE NATURAL GAS SERVICE
(Continued)

TERRITORY (Continued)

D—(950 Btu)

Portion of Colgate Division supplied from main 121 between Buttes Junction and Yuba Terminal.

Portions of De Sabla Division supplied from main 177 west of valve 6.27, from Orland tap, from main 177 between valve 6.27 and Sterling Junction, from main 128, and from main 136 west of its junction with Durham Gas Field transmission main.

Portion of Drum Division supplied from main 119 northeast of Palm Avenue and Roseville Road Regulator Station.

Portions of Sacramento Division supplied from the Davis distribution system, from the mains between Dunnigan Hills Gas Field and Davis Junction, from main 108 between valve 62.2 and Thornton Field, from main 108 between valve 66.8 and valve 62.2, from main 116, in the area north of the American River except portion supplied from McClellan Field tap, in the Folsom area, and in the area supplied by main 119 northeast of Palm Avenue and Roseville Road Regulator Station.

Portions of San Joaquin Division supplied from main 134 west of Gill Ranch Field, and within the Taft, Fellows, and Maricopa Rate Areas.

Portion of Stockton Division supplied from the transmission main between Roberts Island Gas Field and Tracy terminal, from main 108 north of Las Vinas, from main 197, from main 108 between Las Vinas and valve 16.7, from main 108 south of valve 16.7, except the area supplied from the Waterford Mixer.

Portion of Shasta Division supplied from main 177 south of Corning Field.

E—(900 Btu)

Portions of Colgate Division supplied from main 50 south of valve 21.62, from main 167 south of Wild Goose Mixing Station, from main 123, from main 124, from main 173, and from the Oroville tap.

Portion of De Sabla Division supplied from main 50, and from the Sterling Junction-Chico distribution system.

Drum Division except portion supplied from main 119 northeast of Palm Avenue and Roseville Road Regulator Station.

Portions of Sacramento Division supplied from main 149, from main 150, from main 159, from the 6" main between Davis Meter Station and Dixon, and from McClellan Field tap.

Portion of Stockton Division supplied from the Waterford Mixer.

F—(850 Btu)

Portion of Colgate Division supplied from main 50 north of valve 21.62.

Portion of East Bay Division supplied from main 107 between Livermore Junction and Tracy Station.

G—(800 Btu)

Portions of Colgate Division supplied from Wild Goose Gas Field transmission main west of Wild Goose Mixing Station and from main 151.

Portion of De Sabla Division supplied from main 136 east of main 156 junction.

RATES

Commodity Charge:

	Per Meter Per Month							
	Base Rates	Effective Rates						
		A	B	C	D	E	F	G
	1100 Btu	1100 Btu	1050 Btu	1000 Btu	950 Btu	900 Btu	850 Btu	800 Btu
First 1,000 Mcf, per Mcf	54.688¢	54.7¢	52.2¢	49.8¢	47.3¢	44.8¢	42.4¢	39.9¢
Next 2,000 Mcf, per Mcf	50.388	50.4	48.1	45.9	43.6	41.3	39.1	36.8
Next 3,000 Mcf, per Mcf	48.688	48.7	46.5	44.3	42.1	39.9	37.7	35.5
Next 4,000 Mcf, per Mcf	47.188	47.2	45.1	42.9	40.8	38.7	36.6	34.4
Over 10,000 Mcf, per Mcf	40.738	40.7	38.9	37.1	35.2	33.4	31.6	29.7

The above effective rates are based on the average monthly heating value per cubic foot indicated and as set forth in Rule No. 2(C).

Minimum Charge:
$80 per meter per month, accumulative annually.

(continued)

Schedule No. G-56
INTERRUPTIBLE NATURAL GAS SERVICE

APPLICABILITY

Applicable, subject to interruptions as provided in contract referred to in Special Condition 1 hereof, for natural gas required for fuel purposes in the operation of kilns, dryers and boilers.

TERRITORY

A—(1100 Btu)

Portions of Kern County as follows:

1. Section 24, T11N, R14W, S.B.B.& M.
2. Section 19, T11N, R7W and Sections 22, 23 and 24, T11N, R8W, S.B.B.& M.

Portions of San Bernardino County as follows:

1. Sections 11 and 14, T3N, R1E, S.B.B.& M.
2. Section 4, T5N, R4W, S.B.B.& M.
3. Section 18, T6N, R4W, S.B.B.& M.
4. Section 6, T26S, R43E, M.D.B.&M.
5. Section 17, T25S, R43E, M.D.B.&M.

RATES

Per Meter Per Month

Commodity Charge:

	Base Rates 1100 Btu	Effective Rates A 1100 Btu
First 1,000 Mcf, per Mcf	54.688¢	54.7¢
Next 2,000 Mcf, per Mcf	50.388	50.4
Next 3,000 Mcf, per Mcf	48.688	48.7
Next 4,000 Mcf, per Mcf	47.188	47.2
Next 10,000 Mcf, per Mcf	40.738	40.7
Over 20,000 Mcf, per Mcf	33.938	33.9

The above effective rates are based on the average monthly heating value per cubic foot indicated and as set forth in Rule No. 2(C).

Minimum Charge:

$16,000 per meter per month.

SPECIAL CONDITIONS

1. Gas service supplied hereunder shall be in accordance with a contract on file with the Public Utilities Commission of the State of California as part of the Company's effective tariff schedules. This rate schedule shall expire upon the termination or expiration of the gas service contract.

2. Service under this schedule is subject to discontinuance without notice in case of an actual or threatened shortage of natural gas, whether due to insufficient supply in the fields or to inadequate transmission or delivery capacity or facilities. The Company will not be liable for damages occasioned by interruption or discontinuance of service supplied under this schedule.

3. No customer shall be entitled to service hereunder for new or additional equipment unless adequate standby equipment and fuel shall have been first provided therefor, said standby facilities to be ready at all times for immediate operation in the event that the supply of gas hereunder shall be partially or totally curtailed.

Schedule No. A-7

GENERAL SERVICE

APPLICABILITY

Applicable to three-phase general service including power and lighting.

TERRITORY

Within the entire territory served, excluding Santa Catalina Island.

RATES

Demand Charge:	Per Meter Per Month
First 75 kw or less of billing demand	$85.00
Next 125 kw of billing demand, per kw	0.95
Next 1,800 kw of billing demand, per kw	0.85
Next 8,000 kw of billing demand, per kw	0.75
Next 40,000 kw of billing demand, per kw	0.60
All excess kw of billing demand, per kw	0.55
Energy Charge (to be added to Demand Charge):	
First 150 kwhr per kw of billing demand:	
First 15,000 kwhr, per kwhr	1.8¢
Balance of kwhr, per kwhr	1.0¢
Next 150 kwhr, per kw of billing demand, per kwhr	0.8¢
All excess kwhr, per kwhr	0.6¢

Minimum Charge: The monthly minimum charge shall be the monthly demand charge.

SPECIAL CONDITIONS

1. **Voltage:** Service will be supplied at one standard voltage. Service may be supplied under this schedule at 120/208 volts four-wire wye or at 277/480 volts four-wire wye (except in network system areas) where: (a) written application is made for such service by the customer; (b) the customer's load is of such size as to require an individual transformer installation of not less than 150 kva of transformer capacity for 120/208 volt service or not less than 300 kva of transformer capacity for 277/480 volt service; and (c) the customer provides space acceptable to the utility on his premises to accommodate the installation of the utility's facilities. The foregoing conditions do not apply where the utility maintains four-wire wye-connected polyphase mains.

2. **Billing Demand:** The billing demand shall be the kilowatts of measured maximum demand but not less than 50% of the highest maximum demand established in the preceding 11 months nor less than the diversified resistance welder load computed in accordance with the section designated Welder Service in Rule No. 2. However, in no case shall the billing demand be less than 75 kw. Billing demand shall be determined to the nearest 1/10 kw.

3. **Maximum Demand Measurement:** The measured maximum demand in any month shall be the maximum average kilowatt input, indicated or recorded by instruments to be supplied by the utility, during any 15-minute metered interval in the month, provided, however, that whenever such monthly maximum demand has exceeded 400 kw for three consecutive months and thereafter until it has fallen below 300 kw for 12 consecutive months, a 30-minute interval will be used. Where the demand is intermittent or subject to violent fluctuations, a 5-minute interval may be used.

4. **Voltage Discount:** The charges before power factor adjustment will be reduced by 3% for service delivered and metered at voltages of from 2 to 10 kv; by 4% for service delivered and metered at voltages of from 11 kv to 50 kv; and by 5% for service delivered and metered at voltages over 50 kv; except that when only one transformation from a transmission voltage level is involved, a customer normally entitled to a 3% discount will be entitled to a 4% discount.

(Continued)

Schedule No. A-7

GENERAL SERVICE

(Continued)

SPECIAL CONDITIONS (Continued)

5. Power Factor Adjustment: When the billing demand has exceeded 200 kw for three consecutive months, a kilovar-hour meter will be installed as soon as practicable and, thereafter, until the billing demand has been less than 150 kw for 12 consecutive months, the charges will be adjusted each month for the power factor as follows:

The charges will be decreased by 20 cents per kilowatt of measured maximum demand and will be increased by 20 cents per kilovar of reactive demand. However, in no case shall the kilovars used for the adjustment be less than one-fifth the number of kilowatts.

The kilovars of reactive demand shall be calculated by multiplying the kilowatts of measured maximum demand by the ratio of the kilovar-hours to the kilowatt-hours. Demands in kilowatts and kilovars shall be determined to the nearest 1/10 (0.1) unit. A ratchet device will be installed on the kilovar-hour meter to prevent its reverse operation on leading power factors.

6. Temporary Discontinuance of Service: Where the use of energy is seasonal or intermittent, no adjustments will be made for a temporary discontinuance of service. Any customer prior to resuming service within twelve months after such service was discontinued will be required to pay all charges which would have been billed if service had not been discontinued.

7. Off-Peak Demand: Upon application by the customer, any kilowatts of measured demand in excess of 500 kw occurring between the hours of 10:30 p.m. and 6:30 a.m. Pacific Standard Time, of the following day, and on Sundays and the following holidays, New Years, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas, will not be considered in establishing the billing demand for computing the energy charge, but will be considered in establishing the billing demand for computing the demand charge, by adding one half of the amount that the off-peak demand exceeds the on-peak demand, to the on-peak demand.

8. Contracts: An initial three-year contract may be required where applicant requires new or added serving capacity exceeding 2,000 kva.

APPENDIX C

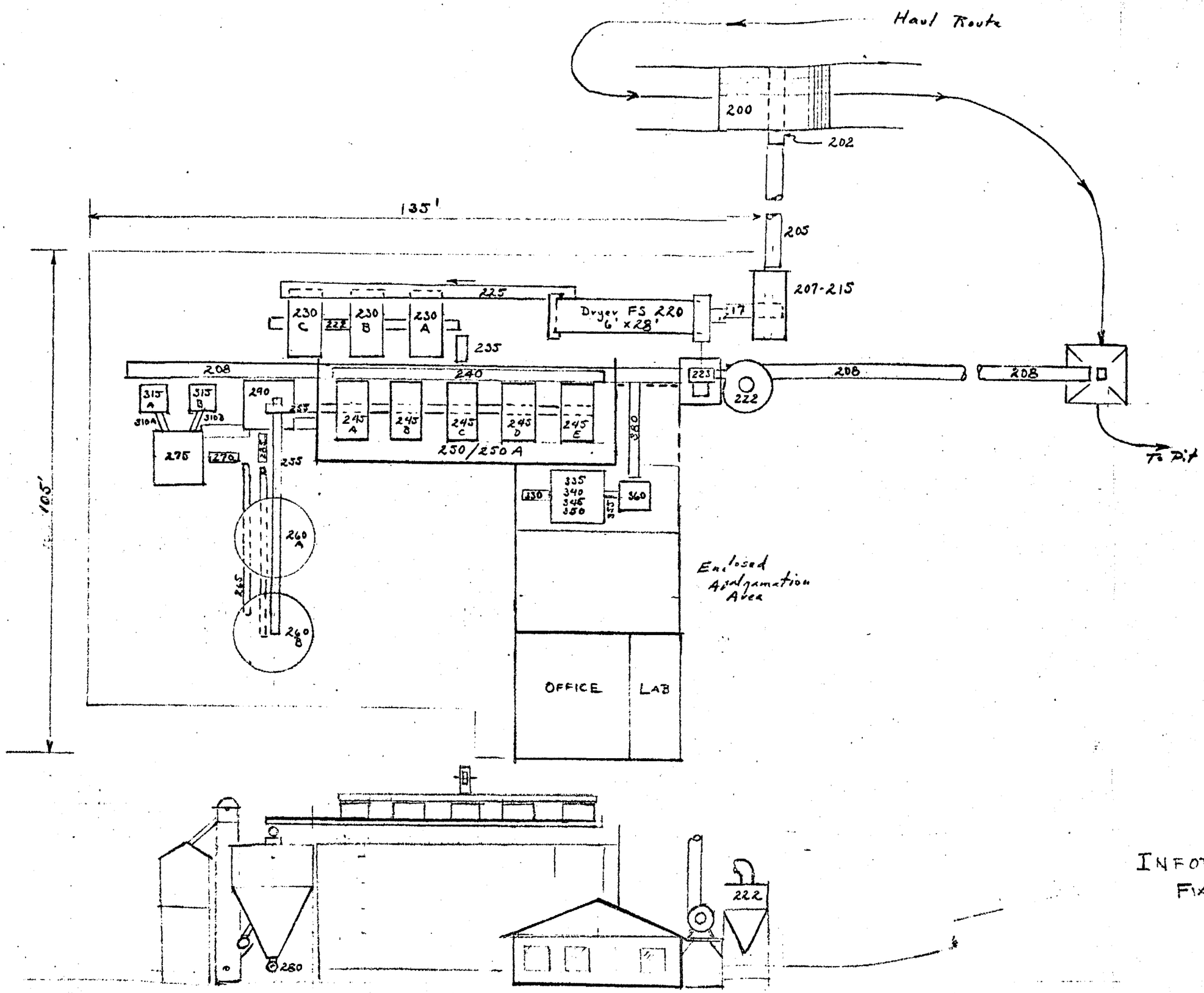
SKETCHES AND DRAWINGS

Informal Layout Sketches

909-SK-1 Fixed Dry Process Plant
909-SK-2 Wet Process Plant
909-SK-3 Portable Feed Preparation
909-SK-4 Portable Concentration
909-SK-5 Alternate Portable Dry Processing

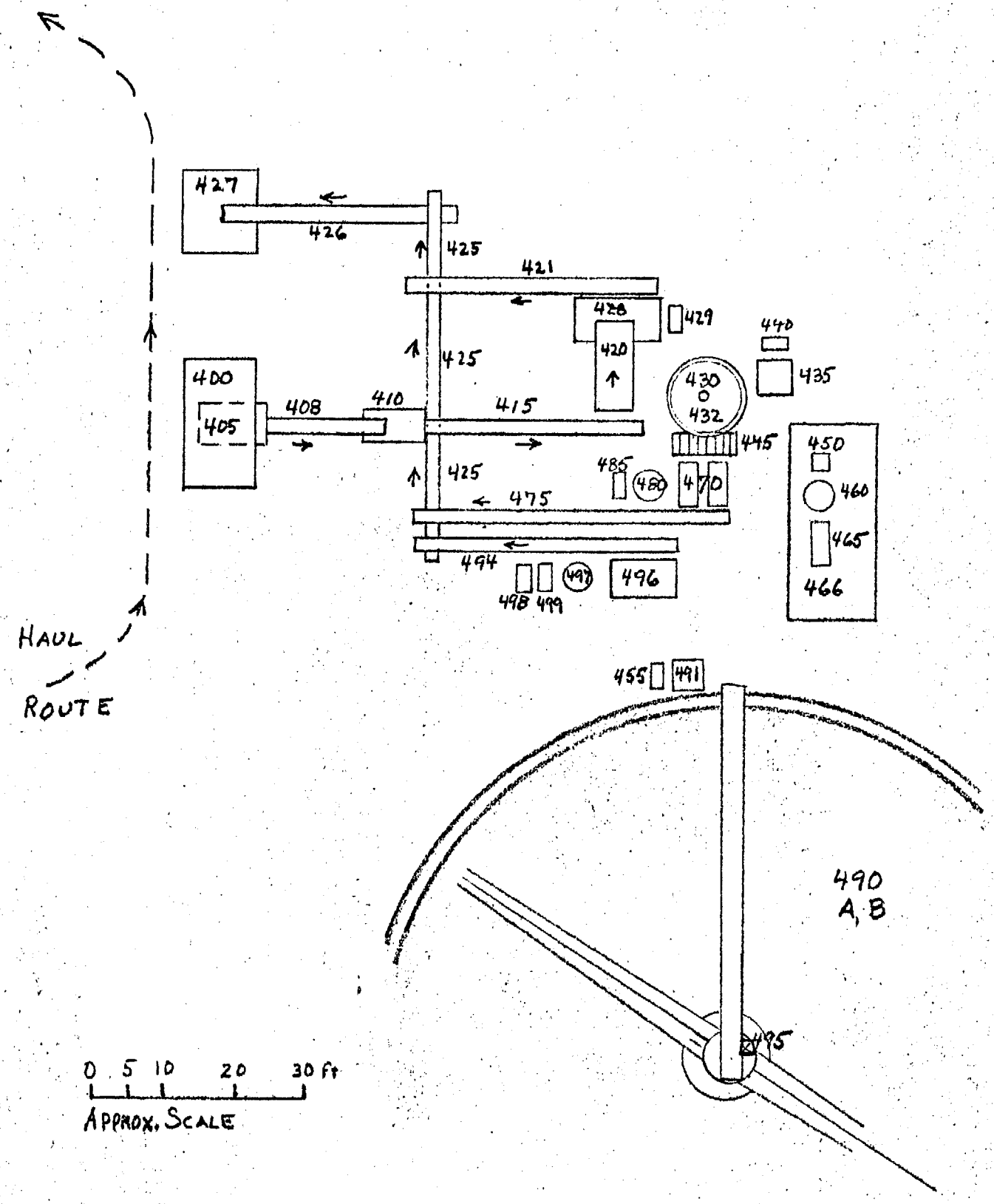
Drawings

909-G1 Flowsheet of Dry Process
909-G2 Flowsheet of Wet Process



INFORMAL LAYOUT SKE
FIXED DRY PROCESS PLA
Scale ½" = 10'-0"
SEPT 1964

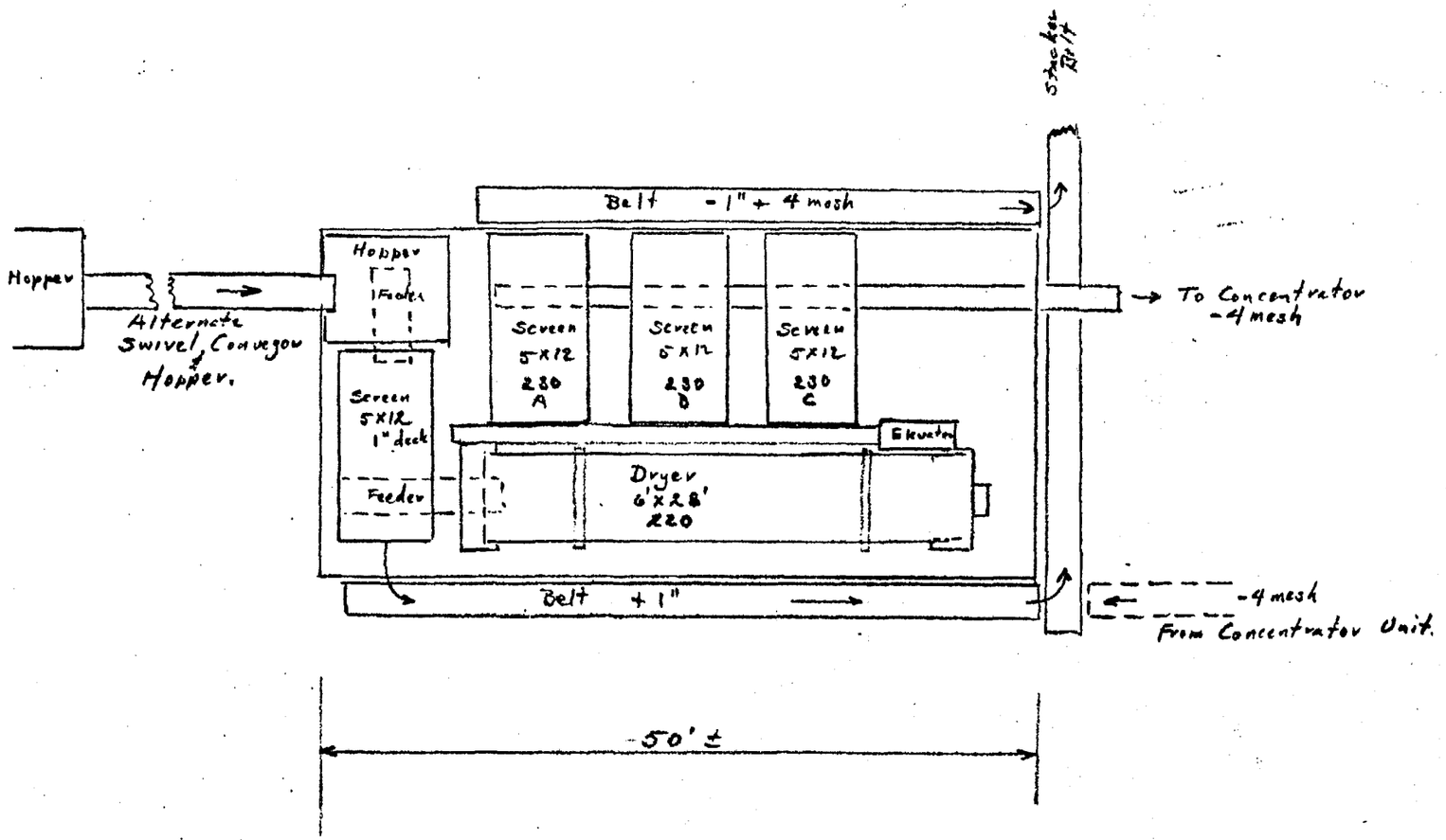
909-SK-1

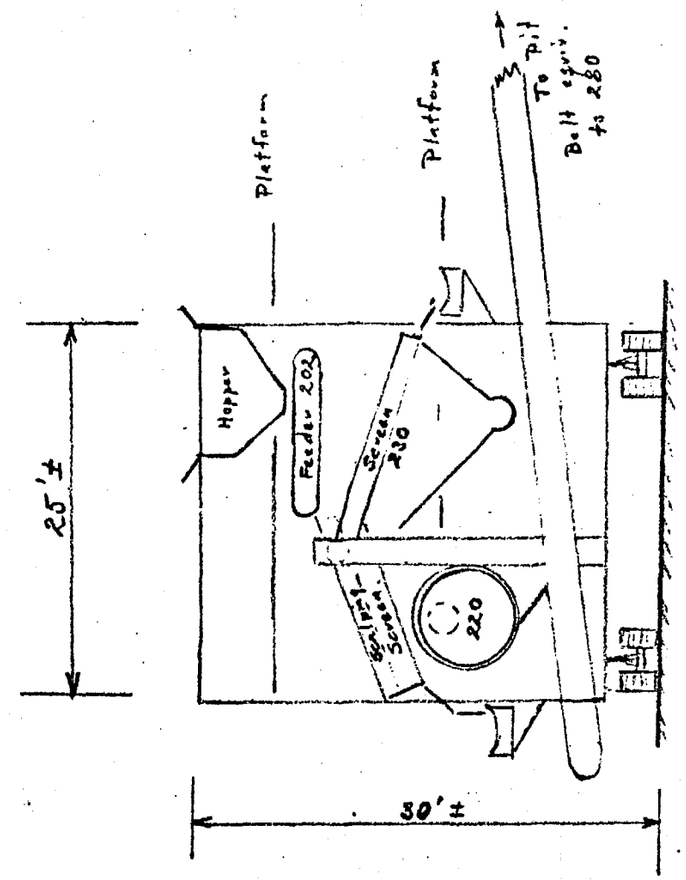


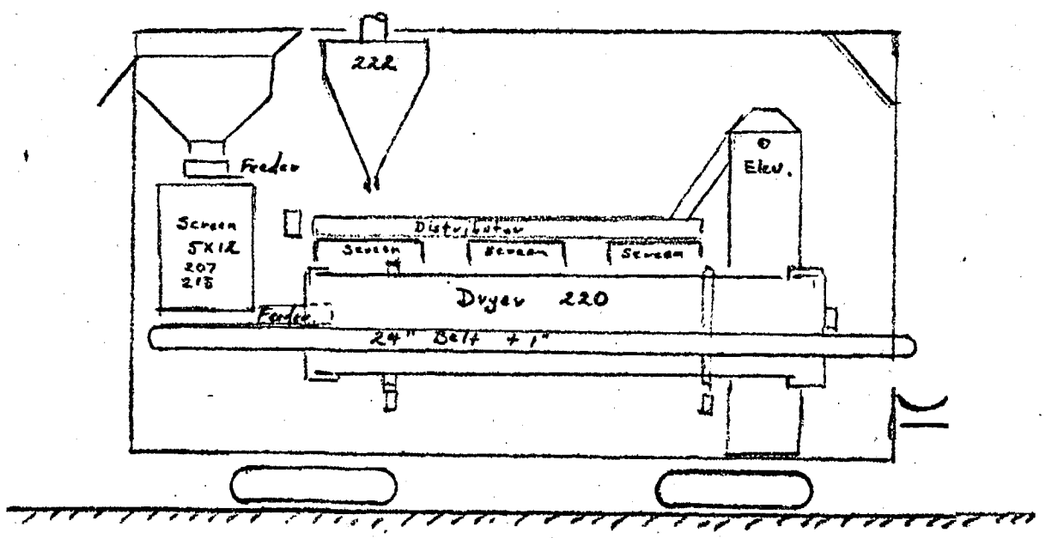
INFORMAL LAYOUT SKETCH
WET PROCESS PLANT

Sept 1964

909-SK2







INFORMAL LAYOUT SKETCH

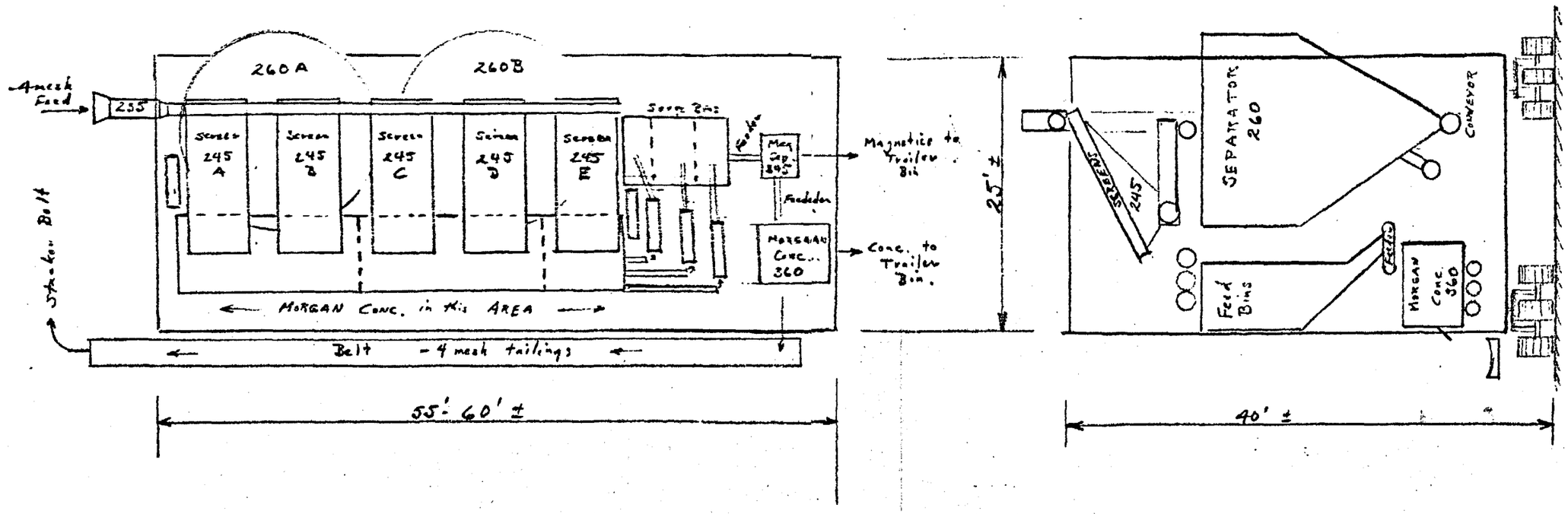
PORTABLE FEED PREPARATION

DRY PROCESS
1,000,000 YD/YR.

SCALE: 1" = 10'

SEPT. 1964

909- SK



Note:
Concentrates & magnetics are brought to fixed Amalgamation Section located adjacent to Lab. & office. Movement by tank trailer.

INFORMAL LAYOUT SKETCH
PORTABLE CONCENTRATION SECT.
DRY PROCESS
1,000,000 YD/YR.

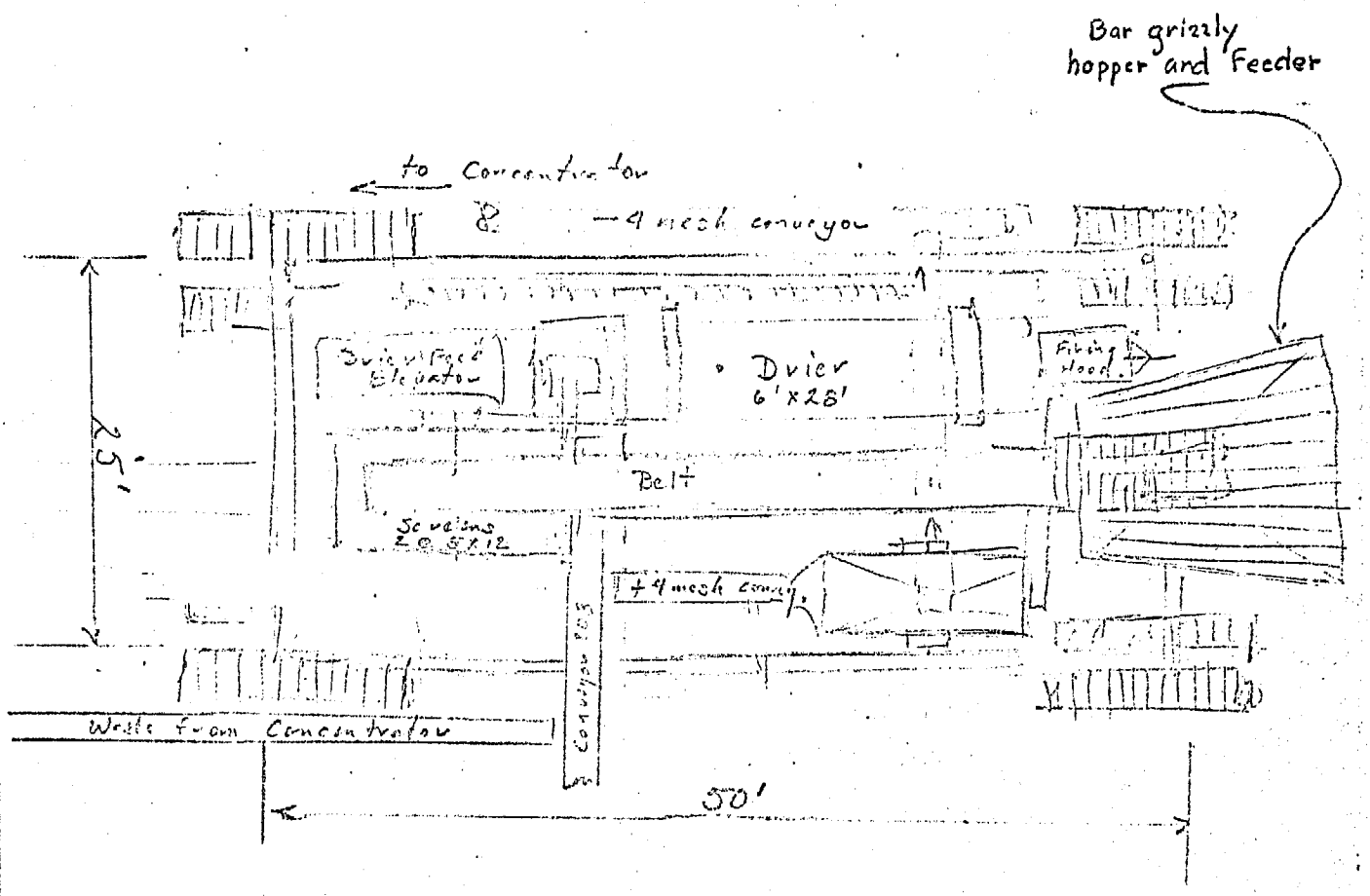
SCALE 1" = 10'

SEPT '64

9D9-SK-4

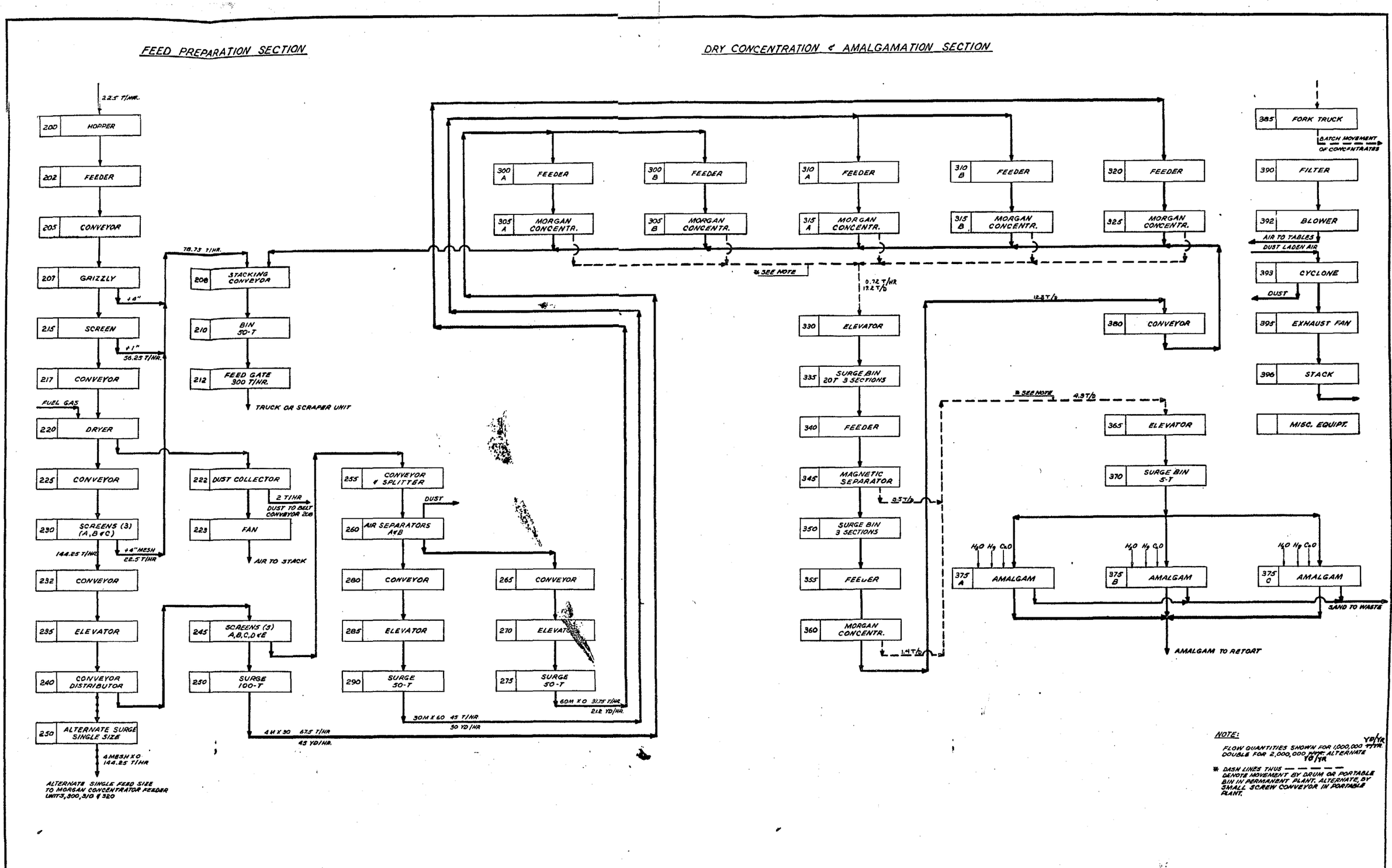
Alternate Portable Dry Processing Plant
Screening and Drying Unit

Using low-mounted, integral feed hopper



Study Sketch

909-Sk-5



NOTE:

FLOW QUANTITIES SHOWN FOR 1,000,000 YD/YR. DOUBLE FOR 2,000,000 YD/YR. ALTERNATE TO/YR

* DASH LINES THUS — — — — — DENOTE MOVEMENT BY DRUM OR PORTABLE BIN IN PERMANENT PLANT. ALTERNATE, BY SMALL SCREW CONVEYOR IN PORTABLE PLANT.

PREPARATION, CONCENTRATION, AMALGAMATION 1,000,000 YD/YR PLANT

FLOWSHEET OF DRY PROCESS

REVISIONS	DESCRIPTION	BY	CK.	DATE

REFERENCES

DRAWN BY JR DATE 9/10/64
CHECKED 9/15/64
APPROVED

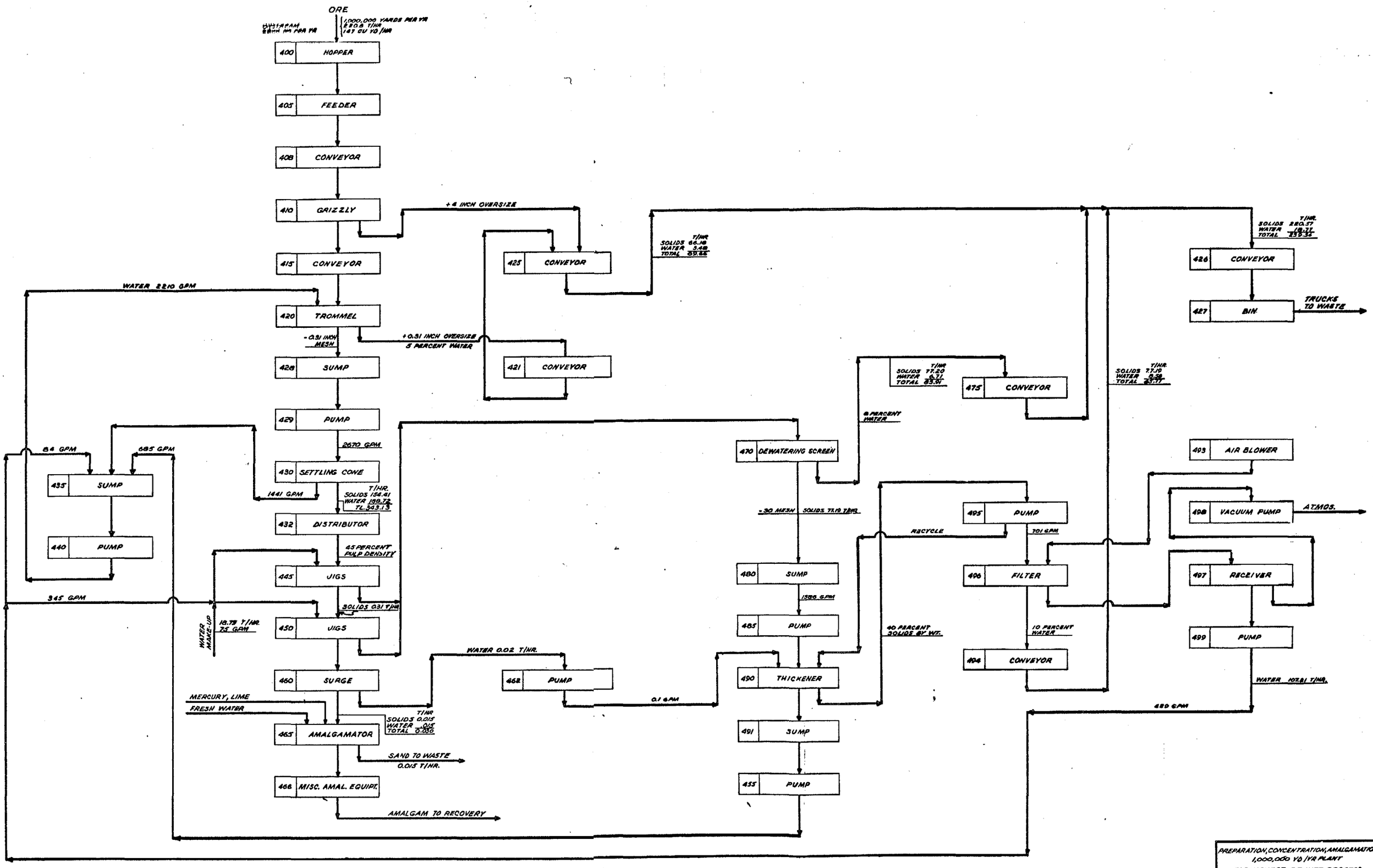
WESTERN KNAPP ENGINEERING CO.
DIVISION OF ARTHUR G. McKEE & CO.
ENGINEERS . CONSTRUCTORS
SAN FRANCISCO . . . CALIFORNIA

SHELL CANADIAN EXPLORATION CO.
STUDY OF PLACER GOLD RECOVERY BY DRY CONCENTRATION

SCALE

909-G1

REV. 0



PREPARATION, CONCENTRATION, AMALGAMATION
1,000,000 YD/YR PLANT
FLOWSHEET OF WET PROCESS

DESCRIPTION	BY	CK.	DATE

REVISIONS

DESCRIPTION	BY	CK.	DATE

REVISIONS

DESCRIPTION	BY	CK.	DATE

REFERENCES

REFERENCES

DRAWN BY
CHECKED
APPROVED

DATE 9-8-64
7-16

WESTERN KNAPP ENGINEERING CO.
DIVISION OF ARTHUR G. McKEE & CO.
ENGINEERS CONSTRUCTORS
SAN FRANCISCO . . . CALIFORNIA

SHELL CANADIAN EXPLORATION CO.

STUDY OF PLACER GOLD RECOVERY BY DRY CONCENTRATION

SCALE

909-G2

REV. 0

KEEP THIS ON TOP

Subject: GOLD
Arizona

Empire Trust Letter

March 4, 1949—Number 44

PUBLISHED BY EMPIRE TRUST COMPANY • NEW YORK, N. Y.

A FREE MARKET IN GOLD

THE ISSUE

Identical bills have been introduced in both houses of Congress giving the gold miner the right to sell his gold to the government at $35 an ounce, to take it to a better market if he can find one, to keep the gold in its natural or refined form, to do anything else with it that his mood or interest might suggest. It is a right which he always enjoyed in this country until 1933. It never crossed the mind of any citizen outside an institution that the exercise of this right was or could be incompatible with the public interest.

Under the Emergency Banking Act of March 9, 1933, introduced, debated and passed by Congress within a single day, the Secretary of the Treasury was given the power to call in all gold; the penalty—the forfeit of the gold involved plus an additional amount twice the value of the gold.

By Executive Order of April 20, 1933, all traffic in gold was forbidden under severe penalties —$10,000 fine, ten years in prison, or both.

The Gold Standard Act of 1934 reaffirms the main provisions of the Banking Act and Executive Order. It further includes extravagant precautions lest any gold miner or ordinary citizen should defy the wishes of Washington—provisions strongly reminiscent of the constitutional attempt to keep all our citizens sober by law.

The proposed return to monetary sanity and honesty is opposed by the Federal Reserve Board, the Treasury, and the Monetary Fund. The latter has taken the extreme step of barring the facilities of the Fund to a member power, France, which has seen fit to restore an open market in gold.

In bed with the foregoing official bodies on this issue is the spokesman of the Economists' National Committee on Monetary Policy. They all agree (1) that the country is now on the gold standard and (2) that the restoration of the right to own, trade and hoard gold—a right now enjoyed by the Mexican peon, the French peasant and the Chinese coolie—would "undermine exchange stability and cause gold to flow into private hoards."[1] "We would be joining, and sharing the chaos and miseries of all those countries afflicted with irredeemable paper money."[2]

It is charged that this is "a case of the gold mine interests versus the people of the United States."[3]

The issue transcends the stakes of the gold mining bloc, the vested interests of planners, or the prepossessions of pundits. That the gold miner is the only producer forced to sell his product at a fixed price, regardless of costs, to a single buyer; that, unlike utilities and transportation, no administrative body is obliged to assure compensatory rates; that he was forced to shut down his plant during the war while sorely-needed facilities were used to produce the best gold mining equipment for Russia—gratis; all this is irrelevant.

The question: Is the resumption of a free market in gold compatible with the public interest?

The issue: Is the right to own gold—the correlative right to pass judgment on our own currency and the credit conduct of our government—an essential part of that freedom for which we profess to be fighting or is freedom a selective concept containing merely that residue of individual rights which government has not yet seen fit to seize?

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[1] Federal Reserve Bank of New York, *International Traffic in Gold*, Circular No. 3238, July 21, 1947.

[2] Walter E. Spahr, The Question of a Free Gold Market, *The Commercial and Financial Chronicle*, January 20, 1949.

[3] *Idem.*

This struggle for freedom again dominates the day as it did 175 years ago. History has described a complete cycle. On the offensive are the "liberals" who believe that every social and economic ailment will respond to a simple formula: "Give the government more power." In this struggle the "liberals" have already achieved strategic victories which contain the seeds of ultimate, complete tyranny. The most important of these is the control of the purse and the complete mastery of a subtle technique of inflation which gives government—apparently—the power of infinite expenditure. The key to this power is the absence of a free market for gold and the ability, so far unchallenged, to place government securities not absorbed by the open market in the portfolios of our banks.

The obliging cooperation of our banks in confirming the ability of the Treasury to issue an infinite amount of I O U's may ultimately prove fatal. Under the pressure of wartime patriotism and the lure of Treasury deposits, banks accumulated federal obligations until at their peak in December 1945 they accounted for 73 per cent of their total assets.

This action, justified by the circumstance of war, was in distinct violation of one of the elementary canons of sound banking, namely, that no bank should commit more than a small percentage of its assets to a single borrower. State and federal law in most instances limits this to 10 per cent of capital funds, with permission under carefully prescribed special circumstances to increase this to 25 per cent.

Although there has been a decline of $27 billion or 26.9 per cent of aggregate assets held in the form of federal securities since the peak holdings of $101.3 billion, the fact is that most banking institutions still hold the I O U's of a single borrower amounting to several times their total capital funds.

STATES AS BORROWERS

Sovereigns have always been notoriously bad debtors and the modern state is no exception to the rule. The standards of integrity which apply to the individual or institutional debtor rarely limit the conduct of the state. The sanction of ordinary morals invariably yields to some real or alleged transcendent public interest. The sovereign debtor knows that he can change the rules at will; that he can block, freeze, refund, or arbitrarily reduce (as the Soviet did at the end of 1947) the principal of the debt. If it is impolitic to resort to such forms of welching or if the sophistry by which it is rationalized is too flagrant, the sovereign can always issue more currency and technically at least meet his obligations.

It is not the purpose of this story to explore the precise hazards which confront the banking system or suggest the methods by which the sovereign can use it in assuring his ability to expand the public debt indefinitely. One eminent savant believes that the present debt can be increased to $4,000 billion without difficulty. The banks might well ponder their position and particularly their freedom should it ever suit the purpose of the state to create such a "net addition to purchasing power."

POWER OF THE PURSE

Beyond the rape of the banks which such an expansion of the public debt would entail are more immediate and more sinister threats to freedom. *It is an axiom of sound political theory that the power of the monarch must be limited else the liberty of his subjects will disappear.* The notion that a government may regulate prices, control production, limit and redistribute income, provide full employment, shelter the individual against every conceivable emergency without leaving him a helpless helot in the face of an omnipotent leviathan is a notion that only idiots should propound. Yet these objectives in the aggregate comprise the program of the modern liberal who believes that they may be attained without impairing individual freedom.

The chief instrument by which this glittering Utopia is to be attained is the sovereign's power of the purse, a phrase which embraces the ability to create debt and issue currency. For laudable objectives, i. e., to erect road blocks against communism, to promote world-wide recovery, to raise the living standards of laggard races, to maintain democratic governments in power, to compensate a decline in domestic purchasing power, to shelter vast groups of voters against the impact of depression, sums in billions are appropriated. Their dispersal inflates the importance of bureaucracy, fortifies the position of the chief executive, and facilitates that corruption of the masses which induces them to relinquish their liberties.

ALIEN IDEOLOGY

The restraints which will check an abuse of the currency function are twofold. The first is a

clear-cut public disapproval of infinite currency emissions and the second the restoration of the gold standard. This is in no sense a miracle formula. Adequate public education labors against the inroads upon intellectual integrity already achieved by alien ideology. Our schools and colleges are filled with instructors whose basic thinking is an imported product bearing the stamp *Made in England, Made in Nazi Germany,* or *Made in the Kremlin.*

It is suspected that the top technical advisors in the World Fund, the Treasury, and the Federal Reserve Board are Keynesian alumni. Their convictions are further sustained by the knowledge that the theories of money management made plausible by the English are a necessary prop for present power and importance. Thus, principle and self-interest are happily identical.

A NEW ALLY

The case for a free market in gold represents a chink in the armor of these Utopians. For that reason the Fund, the Treasury, and the Federal Reserve Board are fighting the proposal without compromise. Their position to date has been so strong that they have not even deigned to state the reasons, real or otherwise, for their opposition. They have recently gained a new ally in the spokesman of the Economists' National Committee on Monetary Policy. He has rationalized the position of the anti-gold block in strong language and has aligned himself with the advocates of managed currency in the Fund, the Treasury, and the Federal Reserve Board.

This involves an element of irony because the Economists' National Committee on Monetary Policy has waged a consistent and courageous fight to restore the gold standard. This organization, supported by the donations of businessmen interested in honest currency, now gives aid and comfort to the enemy which it has fought for years by confirming the contention that the country is actually on the gold standard ("a restricted gold bullion standard"), and that a free market for gold would cause the "prices of other goods" and "foreign exchange rates" to "become highly chaotic."[4]

It often happens that men who devote themselves with intense concentration to a single objective develop an obsession which undermines their perspective and makes it difficult for them to view their particular task in the broader context within which that task plays an essential but nevertheless partial role. The return to a gold standard is desirable because it will act as a deterrent to the mighty schemes of universal welfare which actuate the planners.

It is in no sense an absolute brake. It must be regarded rather as an aid to the victim of a bad habit who under proper circumstances might overcome his weakness. The weakness is a propensity for reckless spending. A great psychologist, William James, has advised such a victim to surround himself with circumstances which will enable him to resist temptation. The gold standard is precisely such a circumstance.

WHAT IS A GOLD STANDARD?

Before testing the restraining influence of the gold standard let's define it. A country is on the gold standard when the unit of value is defined as a prescribed quantity of gold of specific fineness. In fact most currencies had their origin in a definite weight of some metal. The pound sterling at the time of the Norman invasion was actually a pound of silver 92.5 per cent fine. The American dollar up to the time of the Roosevelt Administration was defined by statute as 25.8 grains of gold nine-tenths fine.

It is necessary to emphasize the fact that the monetary standard, in order to be gold, must be a specific weight of gold, and that it is this quantity of gold and not some pale, remote claim upon the metal which constitutes the gold standard.

"The first rule of the gold standard," said the late Benjamin M. Anderson, "is to pay out gold on demand."[5] This is precisely what the Gold Standard Act of 1934 forbids. Under Section 6 the Act states categorically: "no currency of the United States shall be redeemed in gold."

This applies without exception to any citizen of the United States. Should he be so misguided as to contrive in some fashion to convert a part of his folding money into gold he could be punished under one prescribed penalty by the loss of all the gold involved plus an added amount equal to twice this value. Under another penalty he might suffer a fine of $10,000 and ten years' imprisonment.

Professor Kemmerer, probably the foremost authority on the gold standard and until the time of his death active in the affairs of the Economists' National Committee on Monetary Policy, had this to say about the gold standard: "Although there are many types of the gold standard,

[4] Spahr *op. cit.*

[5] Benjamin M. Anderson, *The Chase Economic Bulletin,* November 20, 1931, p. 14.

the gold standard may be said to exist in any country in which prices of goods and the obligations of debtors are usually expressed in terms of the value of a monetary unit consisting *of a fixed quantity of gold in a free market.* The gold standard exists whenever the value of gold *in a free market* is the actual standard, regardless of the machinery by which the standard is maintained and regardless of whether this machinery operates automatically or is managed."[6]

In other words, the test of the gold standard is the ability of the individual unconditionally and without penalty to convert his currency into gold and then do anything with that gold he chooses, i. e., take it out of the country, hoard it, convert it into ornaments, or chuck it into the sea.

LITERARY ABDUCTION

To be sure, under the liberties which have been taken in recent years with the English language it has become possible to apply the epithet "reactionary" to those who seek an honest currency and the preservation of freedom. It has become possible to apply "fascist," "war mongering," and "imperialist" to the United States and "peace loving," "democratic," and "progressive" to the Kremlin. With this precedent in literary abduction it is a simple feat to call our present currency arrangement the gold standard.

Such semantic acrobatics are to be expected from left-wingers. It is a bit shocking to find a spokesman for the conservative wing of American economists saying that "the fixity of our restricted international gold bullion provides us with enough of the basic elements of a thorough-going gold standard to make our monetary system much superior to most of those found in Europe and elsewhere. . . . Our fixed gold unit at $35 per fine ounce of gold contributes much to the stability and value of our money."[7]

The gold standard which is thus extolled is as phony as a Russiain election. If the American dollar today ranks near the top of the world's currencies it is due to reasons which have nothing to do with those exceptional circumstances, i. e., "To settle international balances or to maintain the equal purchasing power of every kind of currency of the United States"[8] under which gold may be exported by the Federal Reserve Banks. This right, it should be noted, applies only to the Federal Reserve Banks and is not shared by any other institutions. It can be exercised by the individual with his own gold only under severe penalties of the law.

REASON FOR DOLLAR ESTEEM

The greater esteem in which the American dollar is held today is due primarily to the fact that this country, with 6 per cent of the world's population, is nevertheless able to produce more than a third of its total output. It is strongly suspected that in both France and England, under managed currencies and contraceptive tax structures, savings have ceased. The socialist governments of these countries are dependent upon American aid to bridge the gap between their own output and the total required to maintain politically-tolerable living standards and that minimum of capital additions which gives their economies the semblance of vitality.

The productive impotence of ECA recipients which seems to vary directly with their socialist "progress" is relieved by resort to the fertile American market, sustained for the time being by vast grants at the expense of the American taxpayer. It is the greater availability of American goods and their lower cost which accounts for dollar demand and the preferred position of our unit in the world's exchanges. The putative merit of a fictitious gold standard has nothing to do with it. For the time being any foreign government with dollar credits would rather have steel and machine tools than gold bars.

IMPORTANCE OF A FREE MARKET

Twice during Kemmerer's definition of a gold standard he made the validity of his definition rest upon the presence of a free gold market. Without such a free market the definition is meaningless. The author had the privilege of studying under Kemmerer both as an undergraduate and a graduate student. For a period of years, in direct association as an active colleague, he taught courses in money and banking. In his oral exposition no less than in his writing this great scholar emphasized the need for maintaining the currency holder's free choice.

The citizen with paper money must have the constant, unconditional right to convert this into gold. As the holder of the yellow metal he has the option of exchanging it for food, shelter and pleasure, converting it into ornaments or using it as a medium for his savings. A valid gold standard must safeguard this constant com-

[6] E. W. Kemmerer, *Currency Stabilization in Latin America.* Fourth Pan American Commercial Conference, p. 2, October 6, 1931.

[7] Walter E. Spahr, *op. cit.*

[8] Provisional Regulations, *Gold Reserve Act of 1934,* Sec. 28.

petition between monetary and non-monetary uses of the yellow metal, its present use by expenditure, and deferred use by saving. *A gold standard without a free market is no more possible than a game of football without a gridiron.* A free market is the field within which it demonstrates its value and its alternative functions.

This vital role of the free market is thoroughly understood by the technical echelons of the F. R. B., the Fund, and the Treasury. They recognize in such a free market the necessary prior step by which an honest currency, again fulfilling its definition as a stipulated quantity of gold, may be restored. They oppose such a free market not because they fear the fancied chaos which might result but because they know that it will jeopardize their power as the managers of our currency. They hold themselves the repositories of that wisdom and integrity which alone can assure the country a stable currency serving the progressive needs of an enlightened society. They fear that a free gold market will expose their pretensions, undermine their prestige, and ultimately end their special power.

Is it not wiser to defer a free market for gold until the government is ready to resume specie payments on the basis of $35 an ounce? It is a question asked by many sincere students who believe that a free gold market today might be premature, who apprehend an exhausting drain on the government's gold stocks, vast as they are, if specie payments are resumed.

Before considering this question it is well to note the size of our gold stocks and the presence or absence of conditions which might induce an exhaustion of American gold. For this purpose the following table is helpful. It shows total gold stocks at ten year intervals for the last half century, the relation of those gold stocks to total immediate liabilities payable in gold, and the portion of world gold stocks held in the United States. It is obvious from this table that our gold supplies in relation to potential claims are greater than they have been at any time in the past excepting only the years immediately following the higher valuation of gold in 1934. Our share of the world's gold is at a record level.

MONETARY GOLD STOCKS TO LIABILITIES AND TOTAL WORLD STOCKS

(In Millions of Dollars)

Year	Total (1) Currency	Total Bank Deposits (2)	Monetary Gold Stock	Ratio Gold Stock To Total Money Supply (3)	World Monetary Gold	Ratio American to World Gold
1898	1,180	5,688	862	12.6%	4,485	19.2%
1908	2,466	12,785	1,618	10.6	6,552	24.7
1918	4,195	27,716	3,163	9.9	9,280	34.1
1928	4,510	53,245	4,109	7.1	11,100	37.0
1938	6,461	51,961	12,963	22.2	24,240	53.5
1948	28,329	146,860	24,166	13.8	34,400	70.3

(1) Does not include gold coin.

(2) All banks—U. S. excluding inter-bank deposits.

(3) Currency Plus Deposits.

Yet it may seem to some students that a gold position that amounts to only 13.8 per cent of total deposit and currency liabilities hardly affords a safe margin for a return to gold. In fact, a President of the United States, justifying the abrogation of the gold clause in a radio speech on May 7, 1933, pointed out that the government had thirty billions of debts and currency payable in gold, private corporations another sixty or seventy billions in securities and mortgages likewise payable in gold, and "that all of the gold in all of the world amounted to only about eleven billions."[9]

[9] Franklin D. Roosevelt, *On Our Way*, p. 78.

The answer, of course, is that the world has never had enough gold to meet all obligations payable in gold at the same time. The same point could be made about the $146.9 billion in deposits in our banks which are claims payable in currency on demand or short notice. The simultaneous demand for total payment on the part of all depositors would precipitate a crisis, the FDIC and the supply of Federal Reserve currency notwithstanding. No one suggests the abandonment of banks of deposit for this reason.

The same point might be made for life insurance companies which are in no position to meet

more than a fraction of the cash values of outstanding policies without liquidation. No one has suggested that life insurance be prohibited because the companies can never have enough cash on hand to meet a theoretical maximum of claims.

In addition to the size of total potential claims against a country's gold, two other factors have a bearing on the adequacy of such stocks. The first is the trade balance of a country. A persistent net import balance means a continuous strain on hard currency resources or gold if the country is on a gold standard. On the other hand a persistent net export balance correspondingly reduces the hazard to gold stocks. Our net export balance is currently running at the rate of $5.5 billion a year. For the last ten years our aggregate export balance has amounted to $54.0 billion.

The second factor is the political condition of the country. Violence and disorders, a government hostile to wealth, an unbalanced budget, and continued inflation are all conditions which cause men to search for safer havens. This country, in terms of these criteria of security, has deteriorated during the last generation. The rest of the world, with few exceptions, has fallen still further. In the universal fool's progress toward moral and fiscal abasement this country has lagged behind the other members of the world family. The dollar, therefore, is still preeminent.

REAL FEAR

In spite of these observations the fear for our gold stocks in the event of specie resumption is real. Since the hazards to which they would be exposed are partly psychological, it would be rash to say that they could withstand the unconditional access which a gold standard would entail.

There is also no blinking the fact that a great deal of economic water has gone over the dam since gold was fixed at $35 an ounce in January 1934. At that time hogs were worth $5 a hundred, corn 40 cents a bushel, cotton 12 cents a pound, and timber $25 a thousand. A good mechanic could be hired for 75 cents an hour. Since then, with the exception of aluminum and electric power, almost everything has gone up in price—even the President's expense allowance. In the interval a great war has added $230 billion to the public debt. Our bank deposits have gained $110 billion, a rise of 300 per cent, and our currency in the hands of the public $23 billion, a gain of 410 per cent. If similar upheavals in the past are any guide it is most unlikely that money will recover the general purchasing power which it had fifteen years ago.

Under the circumstances no one can know what a proper basis for a return to the gold standard should be. There is a sound practical way to find out. Repeal the silly penalties on the possession of gold. Permit all gold currently produced or imported to be traded in an open market. Let buyers and sellers, casting their free votes in the form of bids and offers in an authentic economic town meeting, determine the value of the yellow metal.

If after a probationary period of some years the price of gold revolves about a $35 axis, then it will obviously be safe for the government to open the doors of its mints and redeem at the statutory rate whatever paper currency is offered.

If, on the other hand, the price of gold in such an open market tends to fluctuate above and below a $50 line, it would obviously be foolhardy to try specie resumption on a $35 basis. Pending such an experiment, the government can retain its gold stocks.

PRECEDENT

There is persuasive precedent for this action. England abandoned the gold standard in August 1914. It returned to gold on April 28, 1925 and was again forced off the standard on September 21, 1931. The experience was unhappy. It was unhappy because in the interval between the end of the First World War and the return to gold England had the benefit of a free gold market whose verdict for reasons of national pride it chose to ignore.

The pound at that time had a statutory gold content of 123.27447 grains of gold eleven-twelfths fine. This was 4.86656 times the gold content of the American dollar, a ratio which was therefore the par of exchange between the two currencies. When sterling was unpegged in the fall of 1919 gold immediately rose to a premium, reaching a peak of almost fifty per cent for the month of February 1920. The average premium for gold that year was 33.2 per cent. In 1924, the year prior to resumption, gold traded at an average premium of 10.1 per cent, indicating strongly that a return to the old par would overvalue the pound and undervalue gold.

This advice of the free market England's leaders chose to ignore. As a result her export industries were placed at an immediate disadvantage. With her domestic prices unchanged it meant the foreign buyer of English goods had to pay approximately ten per cent more in his own currency than he did in the preceding year. The only possible way to compensate for this was through an increase in English productive efficency or a decline in English wages, neither of which proved possible.

ENGLAND'S PLIGHT

Had England heeded the clear verdict of her free market in gold she would have returned to some lower parity with the dollar possibly $4.25 instead of the prewar level. Her failure to do so left the Bank of England struggling to protect her gold reserves and induced chronic unemployment in her export industries. An eminent English authority, Professor T. E. Gregory, describes England's plight.

"The first effect of the rise in the value of sterling naturally was to cause staple exports to fall off in value and volume, thereby creating unemployment in those industries, and as time went on, to cause the level of wages in these trades to fall substantially below the general level. . . . Great Britain's exporting capacity was prejudiced, partly by the fact that her predominant pre-War export industries were being subjected to special difficulties and partly by the rise in the external value of sterling, which not only accentuated the pressure on these particular industries but hampered the possibilities of expansion of the other exporting industries."[10]

The end of this stubborn refusal to accept the instruction of a free market was a dramatic confession of insolvency on September 21, 1931.

Would "a higher price for gold . . . impair our monetary standard"? The precise reverse occurred in Great Britain. It was a lower price for gold than the free market indicated which was the cause of England's financial humiliation.

It is asserted that any break in the fixed link between gold and paper money, assuming that such a link is currently real in the United States, would cause gold to rise and paper money to decline in value. "This is simply because paper is paper and gold is gold. . . . It matters not what the size of the unit may be; if a paper money, linked directly or indirectly with gold, at a fixed rate, is cut loose from gold at that rate the price of gold will rise."

An apparition of continuous progressive inflation is conjured up should we permit a free gold market to guide us to the proper basis for specie resumption. Nothing of the kind happened in England. Actually gold was worth less in 1924, the year before resumption, than in 1920, the first full year after the pegs had been removed. The average annual premium on gold in 1920 was 33.2 per cent and in 1924 10.1 per cent. England did not suffer because she had a free gold market but rather because having such a market she ignored its judgment.

THE GREENBACK EXPERIENCE

Another lesson with a similar meaning but a happier result is provided by the Greenback period of 1862-78. Like many other governments before and since, Congress, confronted by the mounting costs of war, was unable to collect the revenue or borrow the money with which to pay the urgent bills of a nation fighting for its life. It authorized the issue of an irredeemable paper currency and promptly abandoned the gold standard.

There immediately developed in New York an open market in gold. The discount of the greenbacks and the rising premium on gold proved disconcerting to our legislators and particularly to the Secretary of the Treasury, Salmon P. Chase. The premium, it was believed, was due to speculation and speculation in turn to treason.

The story of this experience is told in one of the classics of economic literature, *A History of the Greenbacks,* by Wesley C. Mitchell, with which every student of money is familiar. Speaking of the various attempts to cure the premium on gold and their failure, Mitchell says the reason is clear. "They were based on the assumption that speculators had increased the value of gold—while the fact was rather that the government's notes had fallen in common esteem."[11]

When Congress reluctantly considered a bill to close the gold market, Senator Colamer remarked: "Gold does not fluctuate in price . . . because they gamble in it; but they gamble in it because it fluctuates. . . . But the fluctuation is not in the gold; the fluctuation is in the currency, and it is a fluctuation utterly beyond the control of individuals."[12]

[10] T. E. Gregory, *The Gold Standard and Its Future,* E. P. Dutton & Co., New York, 1935, pp. 42-43.

[11] Wesley C. Mitchell, *A History of the Greenbacks,* University of Chicago Press, Chicago, 1903, p. 228.

[12] *Ibid* pp. 229-30.

These are observations which should be noted in appraising the prediction of monetary catastrophe if a free gold market should now be authorized, i. e., "Chaos in prices, production, and foreign exchange rates would be the natural results."

With much misgiving Congress passed a bill to close the Gold Exchange to take effect on June 21, 1864. Mitchell refers to the passage of this bill as "the gold bill blunder."[13] The closing of the gold room paralyzed trade and created an immediate demand for the repeal of the bill. Rather than admit the consequences of his folly Chase resigned. The bill for repeal was passed on July 1st without debate and the gold room was reopened for business on the 5th of July.

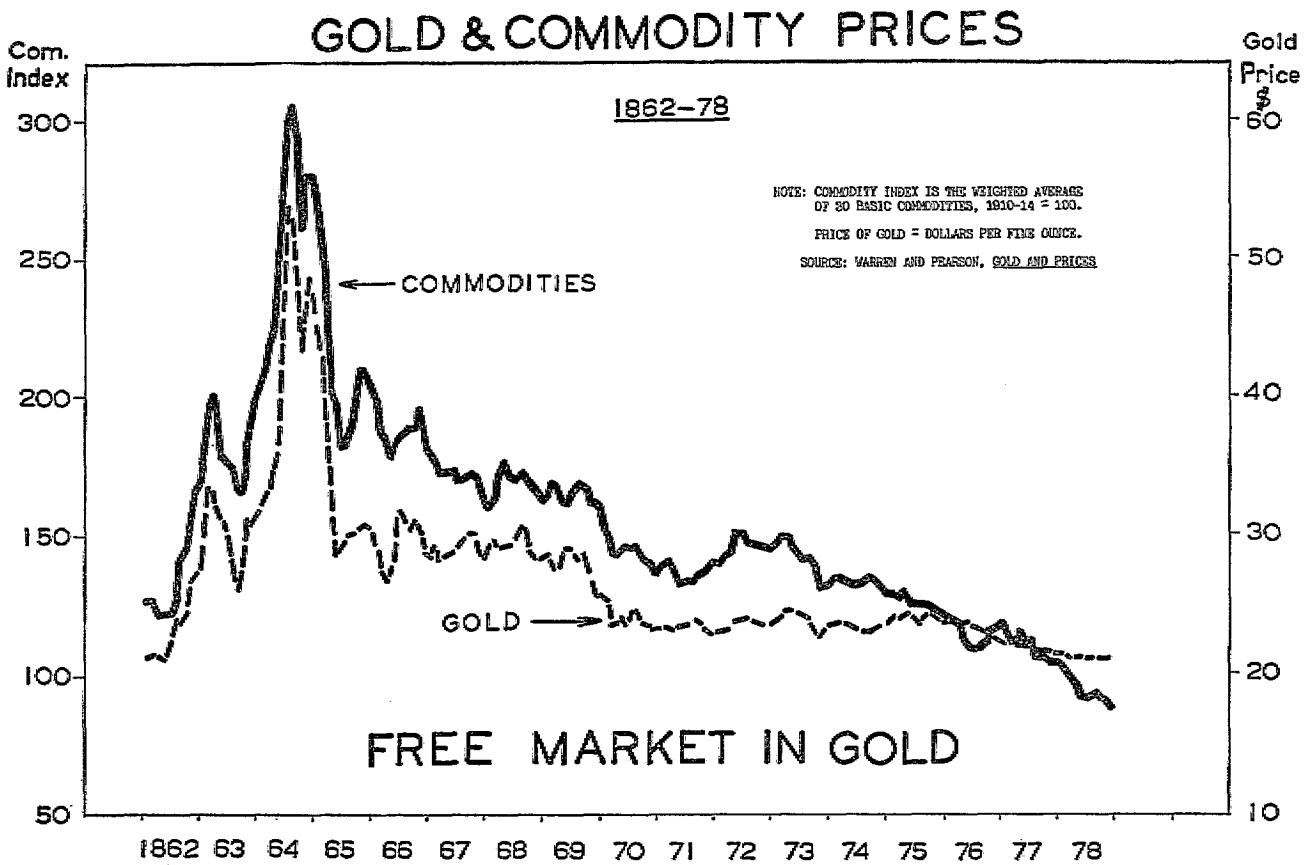
Gold trading had been suspended for approximately two weeks. In commenting on the repeal Senator Johnson said: "the gold bill is doing nothing but mischief; . . . it has had its trial and has failed to produce anything but mischief."[14]

Quite a different impression of this episode is left in the argument against a free gold market appearing in the *Commercial and Financial Chronicle* (January 20, 1949). "Should Congress authorize the free gold market recommended by the gold block, it is reasonable to suppose that in a relatively short time Congress would be frantically attempting to curb the gyrations in prices for gold and other things after the manner of the worried Congress of 1863 and 1864 when it attempted (1863) to control the premiums on gold and when it repealed (1864) the law authorizing a free gold market."

This account fails to note that Congress quickly corrected its mistake, that a free gold market continued until December 1878, that it provided a sure guide for John Sherman in resuming specie payments on January 1, 1879. Congress had authorized such resumption in January 1875. As the day for redemption approached, the premium on gold declined until on December 17, 1878 it disappeared entirely and the Gold Exchange closed its doors. "On the 1st of January, 1879, the Treasury offered to redeem its legal tender notes, but none were presented for that purpose."[15] This country remained on the gold standard until March 9, 1933.

[13] *Ibid* p. 232.
[14] *Idem.*

[15] Horace White, *Money and Banking,* 5th Edition, Ginn and Company, Boston, 1914, p. 157.



How serious were the gyrations of gold during this greenback period? The accompanying chart shows the premium on gold and an index of 30 basic commodities. It will be seen that the price of gold merely reflected, as so many members of the Civil War Congress suspected, the changing purchasing power of the paper dollar. The price of gold faithfully mirrors all the major and most of the minor fluctuations in prices with identical timing.

A free market for gold is a form of free speech. It gives the voter, the trader, the speculator a chance to pass judgment on the fiscal conduct of his government. If Henry Wallace were our Secretary of the Treasury instead of John Snyder and, with adequate political support, proposed an "abundance budget" of $54 billion, such a market would immediately render an unmistakable opinion in the form of a higher premium for gold. It would in effect be a vote of "no confidence" in the government. While this might annoy Congress and the Administration, it is hardly a valid indictment of a free gold market.

In view of all that has happened since 1934 a free gold market is the necessary prelude to an honest gold standard. It is the only practical way to restore such a standard without running the risk of a grave miscalculation such as England committed in 1925. *Those who through a blind economic fundamentalism resist this procedure are effectually barring the return of gold.*

CAUSES OF DEVALUATION

The experience of England in the period 1919-25 and this country during 1862-79 proves conclusively that the presence of a free gold market does not lead to the progressive deterioration of the monetary unit. The fear that such a market will set the stage for a succession of devaluations is without foundation.

This country has had one experience in devaluation. It occurred immediately after the advent of the Roosevelt administration and was conscious in purpose and deliberate in procedure. The gold content of the dollar was reduced from 25.8 grains of gold nine-tenths fine to 15 5/21 grains of similar fineness. *This devaluation had no relation whatsoever to a free gold market. In fact throughout this period an open market in gold was prohibited under severe penalties, a situation which has prevailed ever since.*

Devaluation on this occasion, as has been pointed out in other *Letters,* was the result of a theory that prices could be controlled by varying the gold content of the dollar. The country in 1933 was still struggling with an intractable depression and the new administration felt that drastic, even unorthodox remedies must be given a trial. *It was the absence of a free market in gold which facilitated the consummation of monetary heresy.*

Devaluations are not caused by free markets in anything, let alone gold. They are in almost every instance the belated recognition of an irrevocable currency depreciation which is due to obvious, logical causes. Currency declines in value because there is too much of it. It is a law of value which applies to everything. The same forces which cause wheat to decline operate on currency. Monetary students have long recognized this fact. Only when diverted by special obsessions or partisan contention do they think of some extraneous factor such as a free market for gold.

FEVER CHART?

Will a free market for gold constitute a "fever chart" calling public attention to the course of inflation and thus aggravate it? It is reasonably certain that a free market will show a substantial premium for gold. On the Toronto Exchange gold coins are freely traded. An American double eagle, a trifle less than an ounce of pure gold, has a bid and asked range of $45-52.

Incidentally, the Canadian government has tolerated such a market without going into a financial tailspin.

In New York under Section 19 of the Treasury's *Provisional Regulations* under the *Gold Reserve Act of 1934,* trading is permitted in natural gold. This is unsmelted, unrefined gold in the form of nuggets, flakes and dust. The firm of Bache & Co. provides a market which deals in contracts of 100 ounces on an 85 per cent fine basis. Such gold is trading at $39-$40 an ounce. On a 100 per cent fine basis this represents a price of approximately $45 an ounce.

At the end of the year gold in Zurich was selling for $43 an ounce, in Lisbon and Stockholm at $45; in Mexico City at $53; in Paris at $57; in Berlin at $62; in Buenos Aires at $68.50; in Cairo at $72; in Bombay at $92; and in Chunking at $100.

Certainly a free market for gold will be a fluctuating market as are the markets for everything else that is not nailed down by government ukase. Even when the government applies the full force of its authority as it did under the OPA, any marked difference between official and natural values leads to so-called black markets. The

term "black" is applied by frustrated officials who confuse the defiance of their edicts by otherwise free citizens with a reprehensible evasion of duty.

Actualy black markets are honest forums of value operating under artificial handicaps. When Russia openly confessed the failure of its managed currency policy in December 1947 by seizing 90 per cent of all cash, 50 per cent of all deposits, and 66 2/3 per cent of all outstanding bonds, prices showed an inflation of 12 to 15 times pre-war levels. *This deterioration in the currency was achieved without the benefit of a free market in gold.*

Price fluctuation in a free market is the delicate and automatic mechanism by which supply and demand are equated to permit the actual transfer of the units offered for sale. There is no question but that a free market for gold will mean a fluctuating market. In the beginning this may have some effect on public psychology. That it will cause any change in the general purchasing power of the dollar is open to question.

During the past decade that dollar has undergone great changes in purchasing power measured on scores of "fever charts." Many of these charts are maintained by the government itself as a valuable service for the information of business and the general public. The monthly *Federal Reserve Bulletin,* the *Survey of Current Business,* to mention only two, are virtually solid compendiums of fever charts, almost all of which have a direct or indirect bearing on the value of the dollar.

The indices of consumers' prices compiled by the National Industrial Conference Board and the U. S. Department of Labor vividly and periodically portray the changes in the value of the dollar. The Wall Street Journal maintains an index of futures, a highly sensitive fever line of conditions which are being anticipated by traders and speculators.

AN ORDERLY WORLD MARKET IN GOLD

Actually all these yardsticks of changing value promote that effective art of living which is defined as an adjustment to the probable. In fact it is in the areas in which no markets or only poor markets prevail that price changes are most violent and least predictable.

An open market in gold in this country, operating with legal sanction, would be the focus for the trading of vast quantities of gold. It would tend to reduce the great disparities which now prevail between Bombay and Paris, Buenos Aires and Karachi, natural gold, gold coins and pure gold.

It would do more. It would provide a forum in which the conglomerate currencies of the world would find a valid common denominator of value. It would explode effectively the fantastic fiction that currency relationships can be maintained at the approximate levels prevailing on July 1, 1944.

It would relieve this country of the cost and risk involved in maintaining the International Monetary Fund. *This Bretton Woods offspring was conceived in error and dedicated to fallacy.* The error lay in the premise that this country by financial *force majeure* could maintain the relative values of currencies as pegged in the midst of a great war, irrespective of the budgetary practices, the fiscal policies and the trade balances of the countries which are members of the Fund.

The fallacy inheres in the faith, typical of planners, that a group of men could be found sufficiently infallible and incorruptible to maintain in approximate fixed ratios to each other some forty to fifty distinct variables, each responding to forces beyond the control of the Fund's top command. The effort of Canute on the shore of the sea was modest by comparison.

A RECORD

Let those who fear that a free gold market might be inflationary consider the record of the past ten years. *There was no free gold market during that period.* The price of food between January 1939 and the end of June 1948 rose 116.9 per cent; clothing 56.2 per cent; housefurnishings 56.1 per cent; construction costs 107 per cent; wages 104 per cent.

The purchasing power of the dollar in terms of living costs fell 42 per cent in this period; in terms of wholesale prices 54 per cent; in terms of wages 53 per cent. It must be apparent even to those who are not professional economists that inflation is the result of forces that have little to do with a free gold market.

Actually a free gold market in addition to its moral value in restoring a vital portion of its stolen freedom to the American public and its economic value in permitting the honest evaluation of currencies in a competent open forum will *tend* to check the forces of inflation, *promote* stability and *facilitate* the management of the public debt. This is a qualified statement. A free gold market will not eliminate inflation, will not guarantee stability, will not remove the problem presented by a huge public debt. Its influence cannot be absolute.

TREASURY PURCHASE OF GOLD INFLATIONARY

Consider the effect of the present procedures in the acquisition of gold by the Treasury. During the calendar year 1948 the gold stocks of the United States increased by $1,490 million, of which approximately 5 per cent or $75 million was accounted for by domestic production. The gold which found its way into our Treasury exceeded the total world production for the period by 102 per cent.

As this gold enters the Treasury the Federal Reserve Bank is credited with the proceeds in special accounts established under Section 16 of the *Federal Reserve Act*. "Balances in such accounts shall be payable in gold certificates." These gold certificates constitute thereafter a part of the nation's basic reserve.

Under the law the Federal Reserve Banks may expand their liabilities in the form of notes and deposits up to four times this basic reserve. In other words, the sale of the gold to the Treasury permits a *potential* expansion of the central bank's credit equal to 400 per cent of gold involved. The credit of the central bank in turn when used by the member banks has a *potential* expansion ratio of approximately six times.

This means that the sale of a million dollars of gold to the Treasury creates a *potential* expansion 24 times as great in the commercial banking system. It is beside the point to argue that the Treasury and the Federal Reserve Banks will not utilize this highly combustible inflation base in the manner outlined. *The truth is that they can if they wish to.*

COMPENSATORY MEASURES

In fact the Federal Reserve Banks are forced at once to take measures to offset the inflationary impact of this gold purchase. The American producer who has sold a million dollars worth of gold to the Treasury is paid with a Treasury draft which he deposits in his own bank. The bank in turn sends it into the nearest Federal Reserve Bank where its reserve account is credited with the million dollars.

That bank has received a net addition to its reserve account against which it may make loans and increase its own deposits. The present rule of thumb expansion ratio is sixfold. In order to offset this possible credit expansion, the Reserve Bank dips into its portfolio of government securities and sells an equivalent amount.

The checks which the buyers offer for these securities are drawn against commercial banks and when cleared through the Federal Reserve Bank are charged against the reserve balances of the commercial banks, thus reducing them back to the point where they were before the gold producer sold his million of gold to the Treasury.

UNDERMINING BOND MARKET SUPPORTS

The trouble with this procedure is that it undermines the ability of the Federal Reserve Banks to support the government bond market. During the period of rising commodity prices, which seems to have come to an end for the time being, the Federal Reserve Banks tried to make money scarce by raising the interest rate.

Long term bond prices traded on a yield basis immediately reflect in their price any changes in the money rate. As the result of a firmer money policy, the prices of long term government bonds weakened.

Banks and insurance companies sold substantial quantities of these bonds for two reasons: To avoid a decline in the market value of their assets and to employ their funds more profitably elsewhere. The government did not wish to see the market for its own I O Us decline—too far. It might some day be necessary to resort to that market again to float substantial issues. In order to preserve that market it had to be supported.

At least so the government reasoned. With either a depression or war as distinct possibilities during the current administration, the Treasury could not afford an open market for bonds in which they might repeat the experience of 1920 when government securities for a brief period sold at a discount of almost 20 per cent.

The administration was confronted with this dilemma—to raise money rates in order to discourage the growth of credit and at the same time maintain the market value of long term government bonds in order to enable the Treasury to tap that market again when necessary.

MANAGING THE PUBLIC DEBT

The government succeeded in having its cake and eating it by this expedient. The Federal Reserve Banks were instructed to buy all government bonds necessary to make the pegged prices effective. During the calendar year 1948 the Reserve Banks bought more than $8 billion of long term government bonds to support the market.

Here again the purchase of these bonds by the central bank released credit to the commercial banks of an equal amount which might prove

inflationary at the very moment that the government was trying to apply the brakes on rising prices. In order to compensate for this release of central bank credit the Federal Reserve Banks sold short term government paper in equal amount.

This may seem complicated to the layman but it means that the degree to which this support of the government long term bond market is possible depends upon the Federal Reserve Bank supply of short term paper. To the extent that this short term paper is used in compensating for the inflationary potential of purchased gold, to that extent precisely does the ability of the Federal Reserve Banks to support the government long term market suffer.

In other words the present method of exclusive gold purchase by a Treasury, which does not need it, undermines its ability to manage the public debt. It would be good Treasury policy to permit private buyers in an open market to absorb the gold which is being offered. Assuming the support of the government bond market to be desirable—a moot question—this responsibility can be carried with a greater margin of safety if the Treasury is not required to purchase gold. During the past year such purchases amounted to approximately $1.5 billion.

HOARDED PAPER MONEY

A free gold market would serve public policy, particularly central bank and Treasury policy, in another way. During the ten year period ending in December 1948 the total of coins and paper money in circulation increased approximately four-fold. In that same period large denomination currency, i.e., $50 and over, increased five-fold. Large denomination currency outstanding at the end of the year amounted to $8,697 million. This is more than twice the total amount of all currency outstanding at the end of 1920. Large denominations account for almost a third of our total currency.

It is obvious that much of this is hoarding on the part of individuals who may confuse liquidity with security or simply hold cash for want of a better haven. When more than $700 million of thousand dollar notes and more than $5,000 million of hundred dollar notes are in the hands of the public, we may be sure that they are not being used in the settlement of business transactions. It is a striking index of fear.

If a free market in gold were restored with annual supplies running in the billions it is probable that much of this hoarded currency would be exchanged for the yellow metal. This currency would then find its way back to the central bank where it could be retired and thereby reduce a part of the total money supply. Furthermore, to the extent that other money of smaller denominations is used for the purchase of gold and retired, the total circulating media would shrink. If the quantity theory of money has any validity this decline in the amount of currency would tend to increase the purchasing power of the remaining money and tend to check a rise in prices.

Much of the gold coming into such a free market would unquestionably come from abroad. During the past year 95 per cent of the Treasury purchases consisted of foreign gold sold by governments desperately in need of dollars. If a free market is organized this gold will be sold to private buyers. To the extent that the price paid exceeds $35 an ounce the sellers will have that much more in dollar credits. The excess will come out of private purses voluntarily and constitute a contribution to world recovery not financed by the general funds of the Treasury and underwritten by the taxpayers of this country. Is this not a sounder provision of aid than appropriations by Congress?

Thus, a free market for gold, in addition to being a horse sense first step to the return of an honest gold standard, carries definite advantages in the form of a common denominator for world currencies, as an aid to the Treasury in the management of the public debt, as an inflation deterrent, and as a stimulant to foreign economies not underwritten by Uncle Sam. It will correct a gross injustice to the gold producer. It will restore to the American an essential right, a right that should never have been taken from him.

Free markets are anathema to dictators and planners. In a free market the individual records his choice. Whether a buyer or seller, he expresses a valuation made in the light of circumstances that affect his own interest.

It is an independence which neither the dictator nor the planner can tolerate. It imposes a limit on the power of the dictator and cramps the designs of the planner.

Particularly is this true of gold. The man who buys gold and hoards it is saying in effect: "I trust the value of gold more than the promises of my government." It protects the workers' savings against the chicanery of Finance Ministers, the designs of planners, the infirmity of governments.

Joseph Stagg Lawrence
Vice President, Empire Trust Company

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AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

March 21, 1975

Memorandum for: W.L. Kurtz

From: G.J. Stathis

Notes of a Geologic Tour of the Carlin, Cortez and Gold Acres Gold Mines

INTRODUCTION

On March 6, 1975, I toured the 3 gold mines listed above in company with Messrs. Bryan Bailey, Luis Montoya, and Eddie Vallesteros. The Carlin mine tour was given in the morning by Newmont's resident geologist, Roger D. Ellis and the Cortez Gold Acres mines tour in the afternoon by Placer Amex's resident geologist, Jerry E. Doherty. We were fortunate in getting a tour of Placer Amex's properties, because sometime this April Placer Amex is shutting down their operations and will dismantle their mill.

There is a fair amount of published information on these mines, especially on the Carlin mine, also the ASARCO file memorandums by Kurtz and by Watson summarizing a tour made to the same mines, in October of 1967. Therefore, this memorandum is written with the objective to update current developments and thoughts pertaining to these mines and to avoid duplication of earlier descriptions of these mines as much as possible.

CARLIN MINE

Mining first started on the 6600 foot level. Currently mining is down to the 6220 foot level. Open pit mining will continue to final 6000 foot level. Projected life is 7 to 10 years more. Current ore production is 2500 tpd. of which 500 tpd consists of carbonaceous ore which first undergoes a chlorine treatment. Mill heads average 0.15 oz/ton gold. Recover one flask of mercury per week at Carlin. Gold to silver ratio is 20 to 1 at Carlin. There is no copper mineralization at Carlin, however the small Blue Star gold deposit, that is located 3 miles northwest of Carlin, has copper including turquoise.

The enclosed 500 scale generalized geologic map (See USGS Miscellaneous Field Studies Map MF-537 for more detail) shows that the Carlin mineralization has a strike length of over a mile. The gold mineralization at Carlin is entirely in lower plate rocks of the Roberts Mountain thrust while at Newmont's other two, small gold properties i.e. Bootstrap and Blue Star, gold mineralization occurs in upper plate rocks of the Roberts Mountain thrust. The upper 200 feet of the Roberts Mountain formation, at Carlin, contains the main ore horizon. The top of the Roberts Mountain formation has a 20 to 30 foot marker horizon consisting of red, cherty rock.

An unconformity between the Roberts Mountain and the overlying Popovich formation is exposed at the northeast corner of the East Pit. The dense nature of the Popovich formation controlled the ore mineralization by acting as a cap rock -- a very important control according to Ellis. Gold bearing solutions moved up along the fractures and dikes and spread out after encountering the Roberts Mountain formation - Popovich formation contact zone of gouge and mudstones. Gold values fall off suddenly above the Red Mountain formation contact, but taper off gradually downward, within the Roberts Mountain formation, from the main ore horizon.

Three ages of faults according to Ellis.

1. The oldest faults have an easterly trend, i.e. Hardie fault, South Boundary fault.

2. Middle Age faults have a northeast trend, i.e., Mill fault.

3. Youngest faults have a pronounced northwest trend. They are quite abundant in the Main Pit Area (See USGS Map MF-537). The Leeville fault would also be an example. These northwest faults are strong faults which served as the principal ore channels. However, the faults die out rapidly in the overlying Popovich formation.

The Hardie and Mill faults have dropped the lower plate rocks to great depths north of the mine. Drilling, to date, has failed to penetrate the lower plate rocks. If the rocks were penetrated, there is a good chance that an extension of the Carlin mineralization would be found.

Due to the removal of carbon, calcium etc. during mineralization at the Roberts Mountain formation, the mineralized rock is markedly lighter or less dense than the unmineralized rock. At Carlin there is no close correlation of silica with gold. That is, no wide spread flooding of gold bearing silica. A detailed geochem study was made by Newmont at the Bootstrap Mine prior to mining, and it was found that arsenic and mercury were good indicators of gold mineralization. No comparable study was made by Newmont prior to commencement of mining operations at Carlin. In the Carlin ore zone, barium averages 2000 ppm and arsenic 1000 ppm. However, barium tends to be concentrated in fissure zones containing more silica.

A magnetic anomaly associated with diorite occurs 2 to 3 miles north of the Carlin mine. According to Ellis, this diorite may have been the mineralizer for Carlin. No major igneous mass is exposed at, or has been detected at depth at Carlin.

Tertiary lake beds overlie ore south of the main and East Pit areas. Thus mineralization is, at least, pre Tertiary lake beds. The coarse placer gold in the Lynn district was derived from the Big Six mine are near Carlin (West?).

No carbon at the Blue Star and Bootstrap mines. At Carlin, carbon occurs in both ore and waste rock and thus Ellis does not think much of Radtke's (USGS) carbon theory that gold mineralization follows carbon. Remobilization and upward redeposition of carbon derived from alteration of carbonaceous silstones of the Roberts Mountain formation is exposed in a rather spectacular fashion in the upper level portion of the northwall at the Main pit.

The tailings dam west of the mill has a sand core. Chlorine is pumped to check cyanide loss in water. The T Lazy Z Ranch owns 50 percent of the gold mined by Newmont from the East pit! (The ranch owns the mineral rights to Section 13, T.35N, R.50E.). The T Lazy Z is a large ranch holding which owns large sections of land with mineral rights in railroad-like checkerboard fashion. Were these originally R.R. grants?

CORTEZ MINE

Full scale mining at Cortez ceased in the fall of 1974. The mine operated for 5-1/2 years (1969-1974). Four million tons of gold ore, averaging 0.25 oz/ton, was mined. During the last year or so of operations, up to 2800 tpd of ore was milled from Cortez and the nearby Gold Acres mine. This is nearly double the original mill capacity. Milling cost was given at $1.15 to $1.50 per ton.

The orebody at Cortez was less than 100 feet thick. Mineralization occurred in the lower plate Roberts Mountain and Wenban formations. The Wenban formation accounted for less than 10 percent of the Cortez ore. The Silurian-Devonian Wenban overlies the Silurian Roberts Mountain formation. True thickness of the Wenban at Cortez is unknown. The Wenban and Roberts Mountain formations are lithologicaly identical and are differentiated on the basis of fossils. Doherty believes that the Popovich formation at Carlin is actually the upper 100 feet of the Roberts Mountain formation. The Roberts Mountain fault would project 1500 feet above the Cortez pit.

Young, weak thrust faults are present at Cortez which dip about 45 degrees west. There are sympathetic faults parallel to, but later than the prominent, Basin and Range, Crescent Valley fault, just north of the mine. These faults appear to control the distribution of some (?) of the quartz porphry dikes which are common at Cortez. The porphry dikes have been dated at 32 my. Doherty doesn't feel that the gold mineralization is related to these dikes as they are "dead" geochemically. He believes that the mineralization may be late Cretaceous (approximately 60 my), because weakly mineralized intrusive rocks in the region have been dated as such, i.e. a seyenite and the Mill Canyon stock.

Gold mineralization is controlled by the strongly fractured zone adjacent to the post ore dikes. Disseminated gold mineralization may extend laterally up to 50 feet away from the dike filled channel. In turn, the gold halo is surrounded by a silica envelope. Doherty recognizes a barren and a later stage of silicification. Ascending, silica bearing solution, presumably barren stage, spread laterally and eventually seal off, from later access by gold-bearing solutions, the fractures away from the main

channelways by healing them. Because of this, there must have been a fair amount of internal waste in the Cortez pit. Unlike Carlin, the ore zone cutoff is sharp in third dimension. The later stage silicification entraps some of the gold particles. Silver, antimony, and mercury are the best guides to gold mineralization. Barium and tungsten do not work well. Barium follows the porphyry dikes.

In the pit, have oxidation of minor sulfide and alteration consisting primarily as decalcification of the rocks presumably with consequent density decrease as at Carlin. Away from the pit, have carbonaceous limestones, that is carbon peripheral to, but not carrying or following gold as Radtke proposed.

Decalcification and silicification occur along the front of the Cortez Mountains for at least a mile, however, sampling in zones of silicification showed gold values only at Cortez.

GOLD ACRES MINE

Mining operations which Placer Amex started in February 1973 are slated to shut down around the first of April. Gold mineralization averaged about 0.1 oz/ton. The mineralization was confined entirely within the 150 to 200 foot thick Roberts Mountain fault zone. The fault zone is barren, except at Gold Acres.

The material mined is mostly oxidized and consisted of fault gouge, clay, greenstones, argillized intrusive rocks, Valmy cherts, and argillites. Carbonaceous material came only from the old London Extension pit.

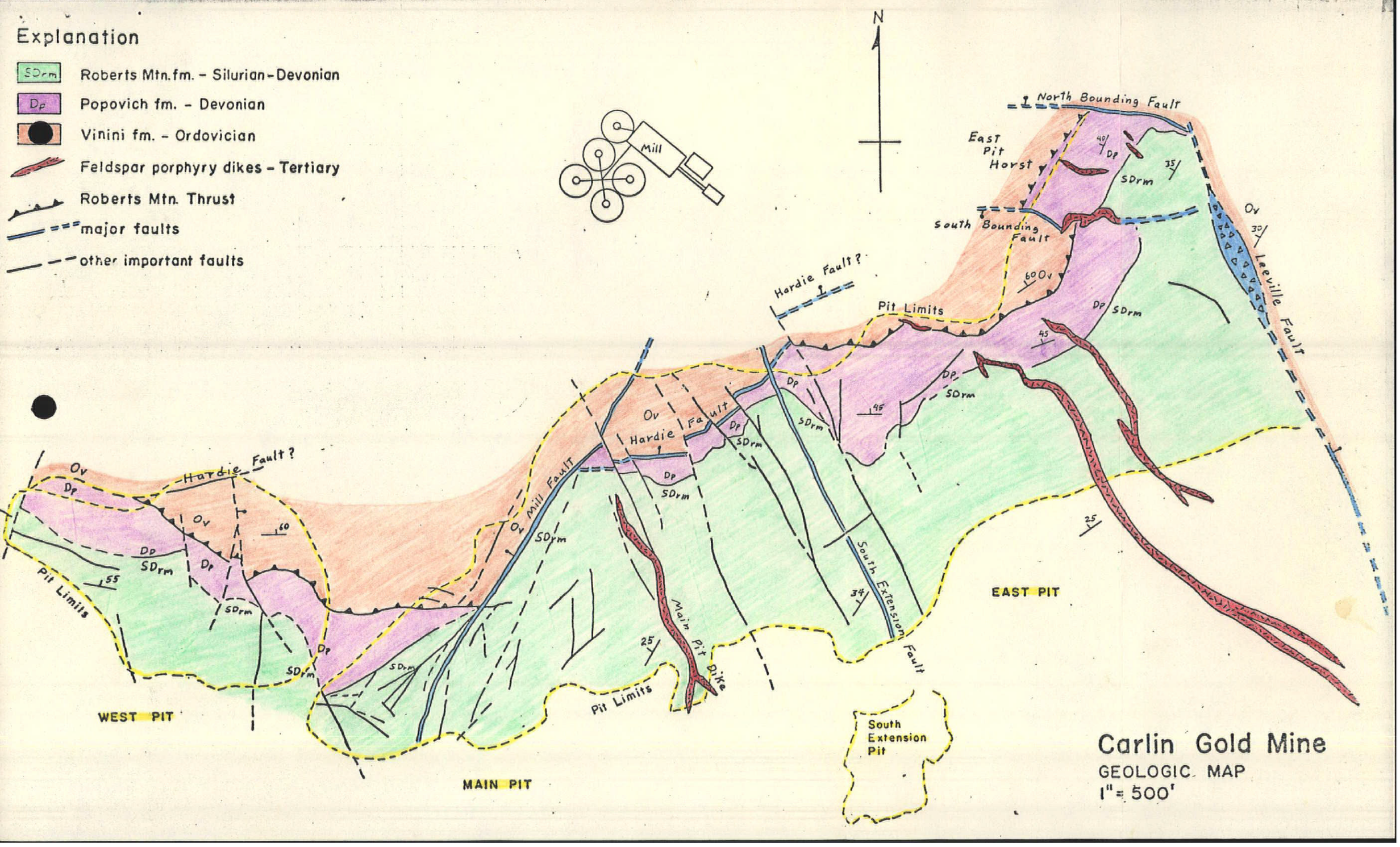
Drilling (5 holes) has shown that an intrusive mass (monzonite?) underlies the pit about 800 feet down. The intrusive is said to be only slightly altered on the rim.

George

G.J. Stathis

GJS:vmh

cc: J.H. Courtright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Dp Popovich fm. - Devonian
Vinini fm. - Ordovician
Feldspar porphyry dikes - Tertiary
Roberts Mtn. Thrust
major faults
other important faults
N
Mill
North Bounding Fault
East Pit Horst
South Bounding Fault
Hardie Fault?
Pit Limits
Leeville Fault
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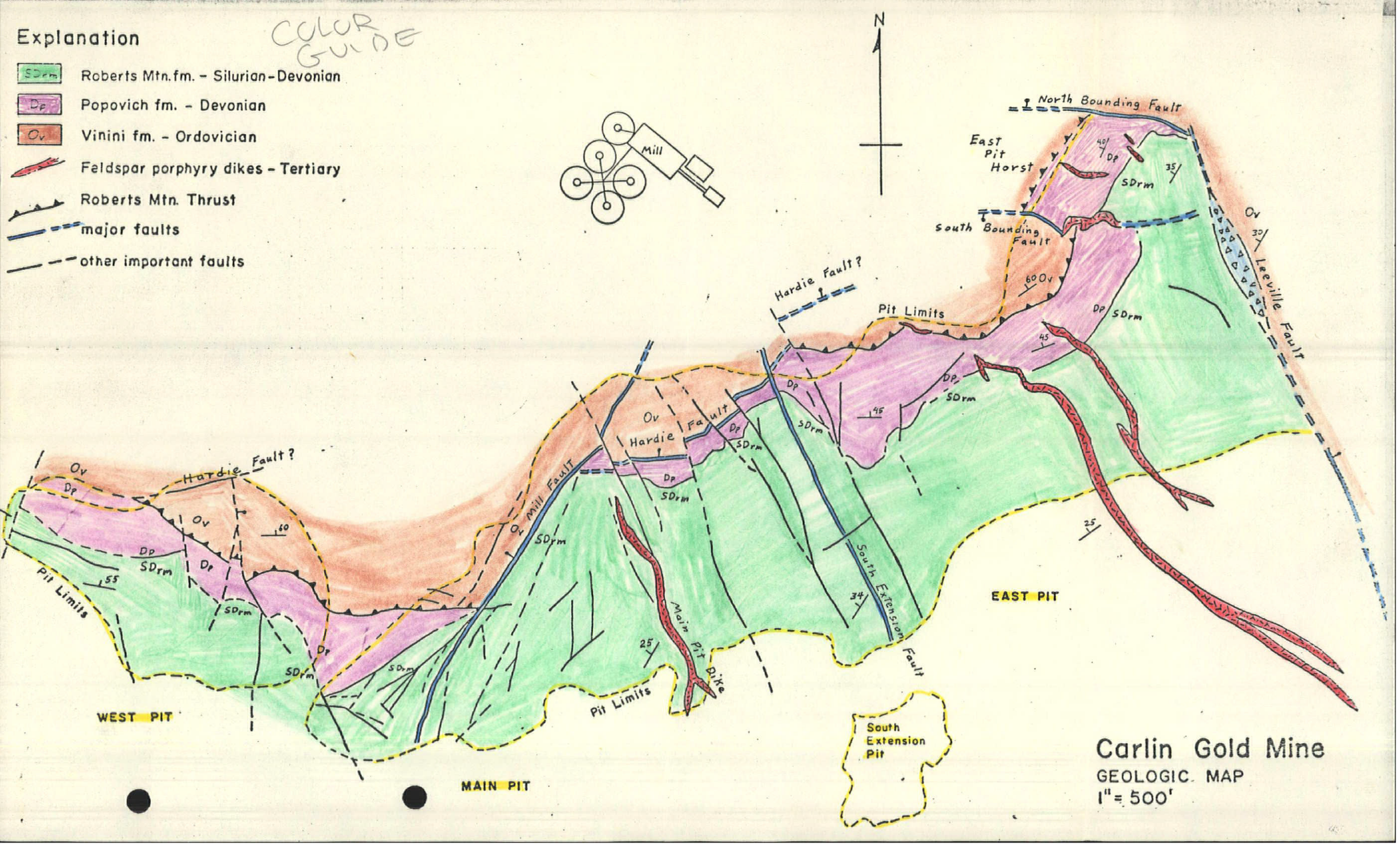
Dp
SDrm
Hardie Fault
Mill Fault
Main Pit Dike
South Extension Fault
EAST PIT
WEST PIT
MAIN PIT
South Extension Pit
Carlin Gold Mine
GEOLOGIC MAP
1" = 500'


Explanation
COLOR GUIDE
SDrm Roberts Mtn. fm. - Silurian-Devonian
Dp Popovich fm. - Devonian
Ov Vinini fm. - Ordovician
Feldspar porphyry dikes - Tertiary
Roberts Mtn. Thrust
major faults
other important faults
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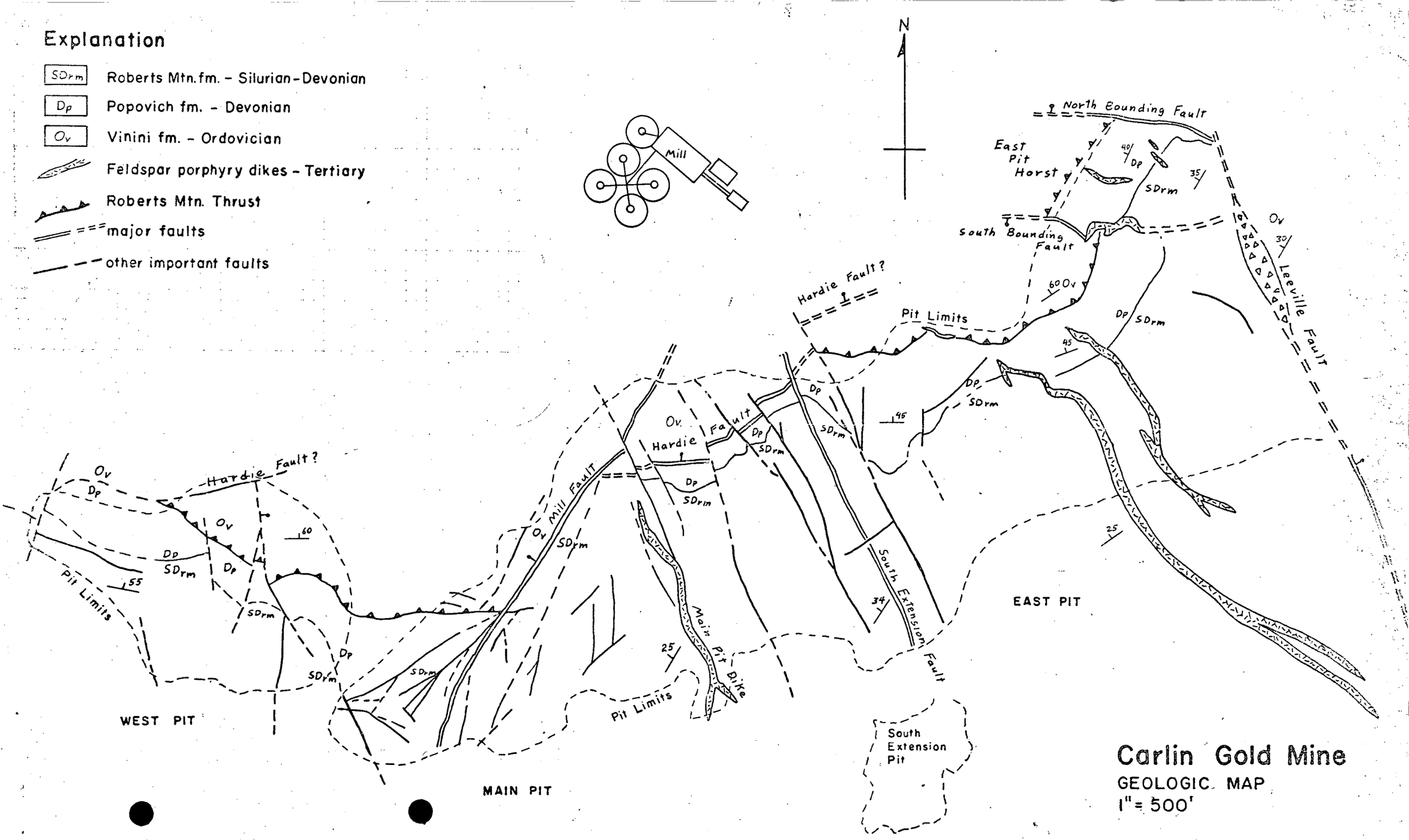
East Pit Horst
South Bounding Fault
Leeville Fault
Hardie Fault?
Pit Limits
Hardie Fault
Mill Fault
Main Pit Dike
South Extension Fault
EAST PIT
WEST PIT
MAIN PIT
South Extension Pit
Carlin Gold Mine
GEOLOGIC MAP
1" = 500'


Explanation
SDrm Roberts Mtn. fm. - Silurian-Devonian
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Main Pit Dike
South Extension Fault
South Extension Pit
WEST PIT
MAIN PIT
EAST PIT
Carlin Gold Mine
GEOLOGIC MAP
1" = 500'

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

October 25, 1973

Memorandum to: W. L. Kurtz

From: F. T. Graybeal

Syngenetic gold deposits

In my resume of the Quebec-Ontario field trip of May 1973, I mentioned the stratabound occurrences of gold in the Larder Lake-Kirkland Lake region. Recent work in this area, done mostly by R. H. Ridler (1970), indicated that the gold was deposited syngenetically in a carbonate-facies of an Algoman-type iron formation. Although subsequent metamorphism had resulted in some mobilization of gold into crosscutting quartz veins, the majority of the lower grade ore in the Kerr-Addison and other mines is rather uniformly distributed within the so-called quartz-ankerite schists and has assay boundaries. Ridler noted during the field trip that, because the gold is syngenetic, persistence of the host rocks over 20 miles of strike length and repetition of them by folding may provide additional near-surface targets for exploration.

A more recent paper by Fleischer and Routhier (1973) discusses mineralization at the Passagem mine in Brazil. Here, gold is associated with a tourmalinite in the Batatal fm. which consists of graphitic phyllite, ferruginous dolomite, and chert. They note the stratigraphic confinement of the gold mineralization over 10 miles of strike length and suggest a syngenetic origin in a boron-rich sediment. They also note the similarity of this area to the Morro Velho deposit which occurs in similar rocks about 40 miles to the northwest.

The host rock stratigraphy and the nature of gold distribution in the Larder Lake and Passagem areas appear similar to descriptions of gold deposits in the Homestake area in South Dakota and the Mother Lode belt in California. I have not reviewed the literature on this subject and there may be other similar occurrences in North America.

Should gold come into favor in ASARCO's exploration program, it might be worthwhile to review previous work in the aforementioned areas with respect to additional exploration for large, low-grade, stratabound gold deposits.

F. T. Graybeal

FTG:lb F. T. Graybeal

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AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

September 28, 1966

TO: J. H. COURTRIGHT

FROM: J. E. KINNISON

General Exploration
Sampling Gold and Silver

Our past experience with disseminated copper deposits has shown that high values--in a drill core run, for example--most often are the result of intercepting a veinlet of chalcocite, or a locally high copper concentration as disseminated grains. These occur in sufficient frequency that they constitute part of the ore, as it will be milled. The same has been true when splitting core for a sample, or in the crushing and splitting which then follows. Only ordinary precautions have proved to be necessary.

Gold or silver ores, which commonly have the tendency to be "spotty", might well require extra caution. E. M. Hamilton, in his "Manuel of Cyanidation" (1919) gives an example, (copy attached) and an explanation of why the values may not compensate over a long period. His explanation is that a very high value (gold and silver) may be contained in a single fragment of a crushed sample. If this fragment is taken by chance into the parts divided out for assay, the result will be "high", but if excluded the assay will be "normal". Thus, in sampling these "spotty" ores the comparison is one of "high" values versus the mean, rather then one of plus or minus values which produce the mean. The critical point is the size of fragments produced by crushing (or grinding), in comparison to the size of the sample cut out for assay.

Although this is self evident, I do not recall reading a similar explanation. I pass this to you so that it may be circulated through the geologic staff.

JOHN E. KINNISON

JEK/mcg
Attachment
cc: RKKirkpatrick w/attachment
JRWojcik w/attachment

tion. The ore in question was a gold-silver ore in which the gold, more especially, occurred in a notoriously "spotted" manner. The assays given are combined gold and silver results. The sample for the twenty-four hours was taken by hand from the battery feeder, a portion being caught every hour in a specially shaped scoop as it fell off the edge of the disc. The total weight was about 200 lb. and maximum size of particles from one to one and a half inches. In the course of an investigation into a continued and serious shortage of bullion as compared with the amount expected from a consideration of head and tail assays, a special series of tests was made on the method of quartering down the daily ore head sample.

Each day's sample for a number of days in succession was either mixed and quartered direct or the whole was crushed to pass ¼-in. mesh before mixing and quartering. Duplicate samples were made at the first coning-up and quartered down and assayed separately, forming checks on the method of quartering. The results are summarized below.

TABLE 10

	"A" Quartered direct		"B" Crushed to ¼ in. before quartering	
	First half assay, total High	Second half assay, total Low	First half assay, total High	Second half assay, total Low
Nov. 12	$43.95	$37.77		
Nov. 14	$52.14	$31.04		
Nov. 16	.....	.....	$37.51	$35.53
Nov. 17	$50.91	$32.62		
Nov. 18	$30.14	$20.74		
Nov. 20	.....	.....	$25.05	$24.11
Nov. 21	.....	.....	$31.78	$30.16
Nov. 22	.....	.....	$24.79	$23.17
Nov. 23	.....	.....	$45.91	$40.48
Nov. 24	.....	.....	$37.23	$35.82
Nov. 25	.....	.....	$52.72	$51.77
Averages	$44.28	$30.54	$36.42	$34.43

The above indicates a possible error of about $14 a ton when the original sample is not crushed fine before quartering, while in the other case the difference shown is only $2.00.

It may be asked, in regard to "A," why the error shown should be supposed to account for a uniformly high result in the long run, instead of neutralizing itself over a long period of time, and it should be noted in reply that the source of the error is not likely to operate on the side of defect, or only to a slight extent, for this reason: since it is known that the ore is spotted in value and that a small stone may assay several hundreds of dollars right alongside of quite low-grade rock, let us suppose that a certain battery sample is fairly uniform but contains one stone of "high-grade" value; if, in coning and quartering the sample, that stone happens to be in the rejected quarter, the sample taken for assay will be representative, whereas if it happens to fall in the quarter saved the assay sample will be thrown up to the high limit of error shown. Thus, it is not so much a question between excess and defect (neutralizing one another) as it is between excess and mean, yielding an average in excess, over a period.

It is obvious that the greater the number of pieces into which that stone of "high-grade" is broken before the sample is quartered, the better the chance of its being distributed equally between the portion rejected and the portion saved, but on the other hand assuming the sample to have been broken sufficiently fine for safety at this stage, in continuing to quarter down this same sample the original danger appears again and increases in proportion as the sample gets smaller so that it will soon become necessary to subdivide the particles still further in order to obtain an even distribution of the high-grade ore throughout the mass.

A. Harvey (Mining and Scientific Press, Jan. 30, 1904) gives the following table as a guide to the margin of safety in size of ore pieces.

TABLE 11

Diameter of largest pieces in sample, in.	Minimum weight of sample, lb.	Diameter of largest pieces in sample, in.	Minimum weight of sample, lb.
5½	79,300	⅔	256
4	69,109	⅓	32
3½	44,958	⅙	4
2½	16,384	1/12	½
1¼	2,048	1/25	1/16

All Geologists

Aa. 0.0.7D

L. P. F.

JUL 26 1966

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

S. I. B.

JUL 25 1966

J. E. K.

JUL 26 1966

S. V. F.

AUG 2 1966

RCK

July 22, 1966

FILE MEMORANDUM

Gold Subsidy

I have just been advised by one of the brokers at E. F. Hutton & Company that the following news release was carried on todays ticker-tape.

The U. S. House Interior Committee today cleared for floor action a gold subsidy bill which would authorize a $50 million annual subsidy. The bill included provisions for subsidies to new producers from gold properties that are presently inactive as well as subsidies to current producers.

INACTIVE PROPERTIES

Gold produced through reactivation of idle properties would be subsidized at the rate of $44 per ounce in addition to the current $35 per ounce treasury price. This amounts to a subsidy of 125% above the existing price. To be eligible the owner would be required to prove that operating costs had increased a minimum of 125% since 1939.

EXISTING PRODUCERS

The bill provides for a lesser subsidy for producing gold mines at a rate of 6%, computed on prior years average annual output.

W. E. Saegart

W. E. SAEGART

WES:bam

RBA ACH, WES SIB JEK RAK
L.P.E. APR 5 1965
MAY 3 1965 J.H.C.
MAR 10 1965
A.C.H.
MAR 11 1965

THE GOLD PICTURE TODAY

BY
DR. M. A. KRIZ, SENIOR ECONOMIST
FIRST NATIONAL CITY BANK OF NEW YORK
NEW YORK CITY

AT THE NATIONAL WESTERN MINING CONFERENCE
OF THE COLORADO MINING ASSOCIATION
DENVER, COLORADO, FEBRUARY 6, 1965

I am pleased and honored to be with you today. Gold is an explosive topic. It stirs up passionate debate. Such a variety of highly contradictory opinions have been held and propagated on the subject of gold that one can say that "gold has made even more people mad than love." We can, I am sure, look forward to a most stimulating afternoon.

Over the past three months, we have witnessed dramatic developments in the world gold picture: the sterling crisis, pressures of private demand for gold in jittery markets outside the United States, Frances's stepped-up purchases of gold from the U. S. Treasury, renewed weakening in the U. S. balance of payments, the decision of the Administration to propose to Congress an easing of the 25 per cent Federal Reserve gold requirement, and, on February 4, President De Gaulle's appeal to other leading nations to restore the gold standard. France's move raises a hornets' nest of intricate and delicate questions, technical as well as political. People want to know where we stand and where we are heading.

I

At the threshold of 1965, gold output in the world this side of the Iron and Bamboo Curtains is at an all-time high. You know much better than a New York bank economist the problems the gold mining industry in the United States has had to face since World War II. U. S. mines have been unable to contribute to the rise in world output. In fact, the increase in world gold output in the past decade is attributable entirely to South Africa. At some 29.3 million ounces, worth slightly more than $1 billion, output in South Africa last year was almost 150 per cent higher than in 1953 when the expansion had begun.

South Africa accounts for approximately 70 per cent of world gold output, which last year totaled about 40 million ounces, equal to $1.4 billion. In addition to the $1.4 billion from current output, the Western world last year received about $350 million worth of gold from Russia. The supplies of new gold thus totaled something like $1.8 billion -- slightly less than in 1963 when Russia sold as much as $550 million worth of gold to purchase wheat in Canada, the United States and other countries.

What happened to the $1.8 billion of gold made available in 1964 from current output and Russian sales? About $1 billion was absorbed in private uses and holdings and some $700 million was added to gold stocks of governments and central banks.

Uses of gold in the arts and industry cannot be separated statistically from other private uses. In the United States, gold consumption, on a net basis, has in recent years amounted on the average to about $100 million a year. With U. S. production only half that amount, industrial and artistic needs are met, in a degree, by drawings on U. S. Treasury stocks.

As you know, there is no gold coinage in the United States and residents are not allowed to hold gold in monetary form except for coins of recognized numismatic value. The United Kingdom, South Africa and a few other countries also forbid their citizens to hold or trade in gold. It is in the world outside these countries that additions to private holdings of gold have absorbed something like $3/4 billion worth of gold year after year over the past five years.

During the first eight months of last year, private demand for gold, although persistent, had been relatively moderate. Over the last four months of 1964 and well into 1965, however, private demand has probably absorbed all available new supplies. The rise in demand has been influenced by such events

(OVER)

as China's atomic explosion and the political changes in Russia; but the uncertainties about sterling, which culminated in a crisis in late November, and the renewed expectation that the established price of gold might be changed, are even more important. In addition, in many countries domestic political and inflationary problems have boomeranged against the national currency.

Early last month, the leakage in Washington of the Administration's intent to request Congress to revise the 25 per cent gold reserve requirement pushed the price of gold on the London market to as high as $35.20 per ounce, with the heaviest turnover since the Cuban crisis in October 1962. Later the same day, the U. S. Treasury issued a statement warning that the official gold price is "immutable" and that the London gold market is "under firm control;" subsequently, the price declined rapidly.

For the past few years, supply-demand conditions in the gold market have made it possible to hold the price practically stable through the interventions of the so-called London gold pool. This pool operates through the Bank of England acting as agent, with the United States having a 50 per cent share in net losses or gains. In 1963 and during the first three quarters of 1964, the pool tended to purchase gold on balance; the United States acquired in this way sizable amounts of gold, which helped offset sales to France and other countries. In the past few months, enlarged private demands for gold have necessitated renewed official intervention--at some cost to U. S. and other countries' reserves.

To round off the picture, let me tell you what happened to the newly mined gold that found its way into the monetary stocks of governments and central banks -- some $700 million last year. The bulk of this gold was added to the reserves of the leading nations of Western Europe, Germany and France in particular.

These countries also purchased gold from the U. S. Treasury. Four weeks ago, France announced that it would step up its purchases. Technically speaking, the French gold buying is not unusual. The stated objective is to maintain at 70-75 per cent the proportion of gold in France's total gold and foreign exchange reserves. Comparatively, France holds less gold in its reserves than any other leading European country except Germany and Italy. In total amount, France's stock is smaller than Germany's.

From a broader point of view, France is believed to be increasingly reluctant to see a continuing rise in supplies of dollars in world markets on the ground that the growing liquidity interferes with its efforts to hold down domestic inflationary pressures. There is also the view that the continued build-up of short-term dollar holdings by European central banks helps the United States to finance private investments in Europe; this creates, in some cases, concern about the prospects of increasing American ownership of key national industries.

Continuing purchases of gold by foreign governments and central banks attest to the desire of those responsible for administering national monetary reserves to protect them against the hazards of depreciation. By building up gold stocks, governments also seek to enhance confidence in the nation's currency by people who, having lived through the inflations of the past half century, keep a weather eye on the state of the nation's monetary reserves as a vital indicator of the health of its domestic finances.

For the longer run, in the view of the finance ministers of the leading nations, gold will remain "the ultimate international reserve asset." They do not want to demonetize gold by international agreement, giving up their official gold reserves and making gold merdly a commodity traded in free markets, with the price ultimately determined by the marginal cost of mining gold and the marginal revenue derived from sales of it to industry and the arts.

II

Neither the United States nor Western Europe (and, for that matter, Russia too) have thus any thought of removing gold from its place as the

ultimate monetary reserve. This is reassuring for the future of gold. What does it mean?

It fundamentally means that, year after year, gold is expected to make a substantial contribution to international liquidity. By this esoteric and fashionable phrase, people must understand not the means of financing the flow of exports and imports throughout the world but rather actual gold and foreign exchange reserves of governments and central banks, and access to reserves through borrowings from other central banks and governments and from international financial institutions. Such reserves are needed to finance balance-of-payments deficits and thus provide time for needed readjustments.

It is to international liquidity in the latter sense that gold makes a decisive contribution. The $700 million of new gold added to world monetary gold stocks in 1964 represented an increase of about 1.7 per cent -- compared with 2.2 per cent in 1963. With firm confidence in currencies -- I am aware that this is wishful thinking at this juncture -- official gold stocks could increase each year by perhaps as much as 2½ per cent. Before 1914, during the heyday of the gold standard, the annual additions to monetary gold stocks out of new output were of the order of 3 per cent.

The preference of governments and central banks for gold reflects the hard fact that gold cannot be "created" as paper money can and, for this reason, is superior to paper money as a store of enduring value. There are times and circumstances when no other money is acceptable.

While gold makes an essential contribution, it cannot alone meet all the needs for world monetary reserves. Under the gold exchange standard as it has developed over the past two decades, U. S. dollars -- and also pounds sterling, especially in the sterling-area countries -- help economize on gold. Today, gold accounts for about three fifths of the total gold and and foreign exchange reserves of governments and central banks.

Man-made reserves are easy to supply. At times, they are supplied in excessive amounts. This is the hard core of our international monetary ills. For the dollar cannot serve as international currency by divine right. It can only serve so long as it is sought and retained voluntarily by other nations. The more easily available, the less will it be in demand. Only a strong and reliable dollar, freely usable throughout the world and commanding universal respect, can be an international currency.

The problem cannot be solved by creating an Esperanto currency by some international body. The world needs, of course, international reserves for emergencies; but it already has a going institution -- the International Monetary Fund -- that, although lacking power to create money, has proved a responsible custodian of international reserves.

The search for new ways and means of ensuring international liquidity has occasioned differences of views between the United States and the United Kingdom, on the one hand, and France and several other Continental countries on the other. The idea of an open or concealed shortage of international liquidity, understandably, has particular appeal in countries experiencing balance-of-payments deficits. The United States, without committing itself, prefers that any further additions to the world's arrangements for creating monetary reserves be established within the International Monetary Fund and focused on the provision of international credit. On the other hand, France advances the thought that it will eventually be necessary to provide a new kind of reserves along with gold and such dollars and other currencies as each country would wish to hold in its reserves. The French seek less dependence upon dollars and more upon gold, with the new kind of reserve currency directly linked to gold.

Two days ago, President De Gaulle called for a restoration of the gold standard. There is, however, little sentiment to turn the clock back and restore the gold standard. In the world as it is today, with its pervasive political and social problems and, perhaps, unreasonably high expectations of economic growth, it is hard to visualize any gold standard at work without being "managed." And, if, "managed," it would not, I think, differ very much from the international monetary arrangements we have today, except that a return to

(OVER)

the gold standard -- involving as it does the discontinuance of the use of the dollar and sterling as currencies in which other nations keep part of their reserves -- would, most likely, revive the ghost of a shortage of international liquidity. As I have already mentioned, new gold added to world monetary gold stocks in 1964 represents an increase of about 1.7 per cent -- surely not enough to take care of the needs for steady year-to-year additions to monetary reserves. President De Gaulle failed to mention whether or not France would advocate a higher price of gold; this would, of course, increase the liquidity of those nations which are well stocked with gold. There is neither need for, nor a constructive purpose to be served by, raising the U. S. gold price.

There is no secret why France and other nations with balance-of-payments surpluses seek to enhance the place of gold in the international monetary system and are reluctant to grant to deficit countries automatic credits of indeterminate amounts for indeterminate duration. In the final analysis, credit facilities represent a potential draft on real resources: if used, they involve costs in the guise of goods and services supplied to deficit countries. The surplus countries also stress that, as far ahead as one can see, moves to increase international liquidity may accentuate upward pressures on demand, cost and prices.

There must, of course, be enough reserves to provide time for needed readjustment in balances of payments among nations, but not so much as to breed worldwide inflation. What is disquieting about proposals for increasing supplies of man-made reserves is the implicit danger of making domestic inflations comfortable internationally. It would be all too easy to sink balance-of-payments deficits of nations into a sea of international liquidity.

At times, the shoe may pinch, particularly if nations indulge in inflation. But, in that event, something ought to pinch to communicate a sense of harsh reality to the need for a nation to keep its economic and financial house in order. Surely, international liquidity must be "adequate;" but it must also be allowed to run out, for it is this ultimate sanction that makes it necessary for any country to frame its domestic plans and policies with continuing regard for the external repercussions of its own acts. In this sense, gold helps reinforce domestic discipline -- something we must have if we want an orderly society.

These fundamental truths have once again been demonstrated by bitter experience over the recent past. The weakening in Britian's balance of payments in the latter part of last year, stemming in part from a greatly enlarged trade deficit but, basically, from a lack of confidence, in late November brought sterling within a hair's breadth of devaluation. To help support sterling, the finance ministers and central bankers of other leading nations extended credits of unprecedented magnitude to the United Kingdom. They had no choice but to underwrite the pound massively: the compelling fact was that they feared the consequences of a sterling devaluation for their own currencies. By helping save the pound, they acted in the self-enlightened interest of their nations. This is conclusive proof of international cooperation and mutual trust, an essential underpinning of world prosperity. It is also conclusive evidence that the international monetary system is capable of providing liquidity. The rub is that liquidity merely buys time. For the longer run, the <u>curing</u> of balance-of-payments deficits is even more essential than their financing.

III

Behind this general facade of international liquidity, what is the real position of the U. S. dollar?

People who speak in terms of a threating gold deficiency for the United States often cite the fact that the Treasury gold stock, at 15.2 billion, is now less than the $30 billion of U. S. liabilities to foreign countries and international financial bodies. Statements of this sort -- hard-boiled as they seem to be -- are not quite realistic. Of the total, international institutions hold about $6 billion; since their purpose is to help overcome monetary crises and speed up economic development, they would not cash their claims into gold. Foreign governments and central banks, holding almost $14 billion, have a stake in the maintenance of the present monetary system and would be expected to avoid unreasonable demands for gold so long as we work to limit our balance-of-payments deficit. The balance of some $11 billion represents short-term

liabilities to foreign banks, traders and investors; these consist, to a large though not ascertainable extent, of working balances and are not eligible for conversion into gold unless previously sold to central banks.

There are certain other factors in the underlying position of the dollar that must, I feel, be also mentioned to form good judgment. The United States has had over the past seven years a large and seemingly intractable deficit in its international payments; but it has not lived beyond its means in the sense that it has been consuming or investing domestically more than it has been producing.

The large and growing surplus generated by the U. S. private economy on commercial goods and services (excluding those financed by government aid) covers by a comfortable margin new private investments abroad, long as well as short-term. In the accounts that are affected primarily by market forces -- merchandise trade and services, and private investment-the United States thus has a surplus. This surplus is, however, not large enough to match the U. S. Government's defense outlays abroad and the foreign exchange costs of U. S. economic aid.

Bankers, businessmen, investors and government officials abroad are aware of the underlying strength of the dollar. U. S. industrial efficiency is still the byword of the world. The domestic purchasing power of the dollar has registered a much smaller shrinkage than that of any other major currency. The best evidence that American industrial products are, for the most part, competitive in world markets is the tough bargaining we are witnessing in the current international trade negotiations. Bankers and investors abroad have greater faith in the lasting value of the dollar than in most of the leading currencies; this is evidenced by the fact that far more international lending is done in dollars than in any other currency and also by the continuing restrictions in countries with ample gold and dollar reserves to prevent their citizens from investing in the United States when they wish and in ways they prefer.

All this sounds reassuring. But what is it really? The U. S. balance-of-payments deficit, as conventionally defined, amounted last year to about $3 billion -- a disappointingly small improvement from the 3.3 billion in 1963. The large and stubborn deficit is a very serious matter. Because of the deficit, governments and central banks abroad, and also private bankers, traders and investors, are continuously coming into possession of large amounts of dollars. We cannot depend on the willingness of foreign nations to be patient creditors and build up without limit holdings of dollars and special U. S. Treasury obligations denominated in buyers' currencies. Sooner or later, and, I think, it may well be quite soon, the rest of the world will be reluctant to add more dollars to its holdings. It may come to exchange them for gold from our stock which, though still amounting to about two fifths of the world total, is not inexhaustible.

It is against this background that we must look at the Administration's proposal that Congress free up about $5 billion of gold by excluding Federal Reserve deposit liabilities from the present 25 per cent gold reserve requirement. There is a practical need for this action: to provide reassurance to foreign governments and central banks that the United States will continue to supply gold to them at the established price of $35 an ounce and thus protect the position of the dollar, firmly linked to gold, as the anchor of the international monetary system.

The Administration bill has been given a friendly reception in Congressional committees. Administration spokesmen indicated that the Federal Reserve needs a leeway to accommodate the money and credit needs of a growing economy. Furthermore, aside from the United States, there are only three countries where the statutory reserves must be held exclusively in gold -- Belgium, South Africa and Switzerland. In many countries, these requirements were repealed or suspended at the outbreak of World War II. A number of central banks established since the war, including the German Bundesbank, have no such requirements.

Arguments like these sound convincing. At the same time, however, it is also true that over the past few years the gold reserve requirment has

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been like a "red light" -- a warning to watch our gold stock, hold inflation in check and keep spending abroad to what we can afford. What is in question, therefore, is how to devise an effective "braking system" to replace the gold reserve requirement. Perhaps we can get it if people become sensitive to erosion of the purchasing power of the dollar and insist on fiscal and wage discipline. Long-range confidence of the world in the dollar will depend more on the wisdom and courage of our monetary and fiscal authorities than on a statistical ratio.

Even if the gold ratio is eased, the United States will require a gold reserve large enough to give full assurance that the dollar will remain at all times a strong currency and command universal respect. The protection of our gold stock must remain a prime objective of U. S. Government actions and policies.

IV

To conclude, it is -- I venture to say -- indisputable that the U. S. dollar is still the best currency the world can offer. Why should it be devalued?

It can be stated categorically that the dollar will not be devalued in the absence of necessity and, so far as one can see, there is no necessity for it.

Most of the advocates of a higher gold price seek a simultaneous, perhaps uniform, worldwide gold upvaluation as part of a plan for improving the international monetary system. To my mind, it is difficult to visualize any improvement that would be preceded by a gigantic devaluation of currencies. By spreading turmoil and creating distrust, repudiation by governments of the established price of gold would do irremediable damage to the incentive to hold currencies as reserves, which is an essential part of the system as it operates today.

Furthermore, the benefits from gold appreciation would be distributed haphazardly. Gold-producing countries, nations holding the largest gold reserves and maintaining the highest proportion of gold in the total gold and foreign exchange reserves, and nations where private gold holdings are largest, would benefit most. Russia, probably the world's second largest gold producer and holder, would reap a huge windfall profit.

Most importantly: I can see only one rock of any solidity that stands as a barrier against a fairly serious degree of inflation -- the fact that the U. S. Government is aware of, and shares, the aversion of a large body of public opinion to the depreciation of the dollar in terms of gold. Devaluation must be avoided in the interest of whatever chance there is for maintaining reasonable monetary stability.

Devaluation, nevertheless, could conceivably be forced upon the United States by external developments, just as it was in the 1930's when the price of gold was raised from $20.67 an ounce to $35, an increase of nearly 70 per cent.

One hypothetical conjecture that can be visualized is a devaluation of sterling. Britain is not really very far out of line in terms of costs, prices and capabilities to sell in world markets. Tinkering with sterling is not the answer to Britian's problems. The British, as the Governor of the Bank of England, Lord Cromer, pointed out last week have just seen "into the abyss." "It is an uninviting prospect," he continued. "It is well that the people of this country should recognize the depth of the fall and the lack of friends at the bottom. But now, thanks to the lifeline held out to us by our friends, we have crept back from the edge and the future is what we make of it."

Nevertheless, it would be a rash person to say flatly that, by some bad luck or misguided policies, a situation could not develop in which a sterling devaluation might become an essential part of any future rehabilitation. This was, you may recall, the state of affairs in 1949 when a devaluation of sterling proved to be necessary to recognize the changed price-cost situation in which Britain had found itself as a result of inflation during the war and in the immediate postwar period.

Even in this conjecture of a sterling devaluation in response to changed price-cost relationships -- and, I repeat, this is a hypothetical conjecture -- there would be no built-in necessity for the dollar and other leading currencies to go down along with sterling. Much of the world could withstand the shock of a British devaluation.

As things are shaping up -- full of uncertainties, as they always are -- all of us are sure to have interesting times. This reminds me of a Chinese curse: "May you have most interesting times!" I hope the years to come will not become "too" interesting.

Let us keep uppermost in our minds the lessons of experience. The dollar rests on the large real resources and high productivity and efficiency of the American economy. However, even with all its productive power to give real value to the dollar, the United States requires a strong gold reserve -- a reserve large enough to give full assurance that the dollar will remain at all times a reliable currency, voluntarily sought and retained, and freely usable, everywhere. This, in turn, requires vigilance, skill and courage in the management of our monetary and fiscal affairs.

****

RBM ACH WES SIB ICC LPL JHK RKK
L.P.F.
MAY 3 1965 J.H.C.
MAR 10 1965 APR 5 1965
A.C.H.
MAR 11 1965

REMARKS BY KENNETH C. KELLAR, ESQUIRE
VICE PRESIDENT & GENERAL COUNSEL
HOMESTAKE MINING COMPANY, LEAD, S. D.
at the
NATIONAL WESTERN MINING CONFERENCE
DENVER, COLORADO
FEBRUARY 6, 1965

* * * *

Ladies and Gentlemen, Honored Guests, perennial optimists of the mining fraternity.

Gold Mine in the Sky is a beautiful song with which we in the West are familiar and apparently this refrain is not unknown to Treasury officialdom, since by their adamant attitude opposing any type of remedial gold legislation they would consign future domestic gold mines to celestial rather than terrestial sites. I believe Treasury has been viewing the gold problem which confronts the domestic operator from the lofty altitude of economic cloud 9 rather than from a close look at the realities with respect to increasing our gold reserves.

My good friend, Dr. Leland Howard, and I have discussed the plight of the gold miner on many occasions over a long period of years involving several Administrations. I will say that Treasury statements have been consistent on this subject since several successive Secretaries, and Dr. Howard, have stated that they are sympathetic with the ailing domestic gold operators, but they have with equal consistency opposed numerous legislative relief proposals running the gamut from bills to provide tax relief, to allow sales at a higher fixed price per ounce to the industrial trade while still requiring Treasury to purchase gold at $35 per ounce, to direct subsidies to domestic gold producers on the basis quite obviously that any measure which mentions the word gold is suspect and will demoralize the confidence of European Central bankers in the stability of the dollar.

Just how domestic payments to domestic producers to stimulate domestic gold production in recognition of a domestic economic imbalance between a fixed gold price and production costs of a segment of our overall domestic industry, should be particularly demoralizing to the financial equanimity of a Swiss banker has always been most difficult for us to understand. Rather it would appear that in the light of Treasury opposition to such relief measures, foreign circles might have cause for concern that the dollar is indeed weak by the very nature of Treasury's illogical and determined resistance to such innocuous domestic legislation.

One year ago, when I appeared before you on this platform, the gold miners had managed to break through Treasury's unsound barrier for the first time on the Legislative front when the Senate Committee of Interior and Insular Affairs unanimously approved the gold subsidy bill, S. 2125, introduced by Senator Gruening, Democrat of Alaska. Despite bipartisan committee support, S. 2125 expired peacefully on the Senate consent calendar, its demise hastened and assured because of adverse reports filed by Interior, Treasury and the Executive Office of the President, Bureau of the Budget. The coup de grace, the language "not in the national interest" being set forth in the last mentioned report. The reasons assigned raised the same shibboleth that foreign holders of dollar credits might hit the panic button and cause a dollar crisis if such legislation were to be enacted, despite the fact no mention whatsoever is made in S. 2125 of the price per ounce for gold and the formula for payment to domestic producers was strictly within the confines of domestic economic equitable adjustments which should certainly not cause apprehension on the part of foreign interests over the integrity of the dollar.

In my humble opinion, foreign Central bankers are much too astute and financially sophisticated to be alarmed over legislation in this country involving temporary relief to U. S. gold producers in recognition of the impact of inflation on costs of production, but these foreign monetary experts are undoubtedly gravely concerned over the tremendous implications to the free world arising from possible devaluation of the faltering pound sterling and in its wake, the dollar.

Is it not reasonable to assume that foreign bankers would be favorably impressed by any action of the United States operating within our own internal sphere which would result in increased gold production to add to this nation's gold reserves even though the increase be not of great magnitude.

(over)

I believe the views of gold miners and the divergent views of the Treasury converge at one common point, however, in that there is mutual recognition that gold is necessary to the monetary system, that an adequate and strong gold reserve is essential to the national welfare, that strain on the gold reserve endangers the nation's economic wellbeing, and increasing our gold reserves is a desirable objective. However, encompassed in this rather broad statement of common thinking, there is a very wide divergence, I fear, because a respectable number of monetary experts, economists, bankers, and gold operators would not agree with Treasury's opinion as to what constitutes an adequate gold reserve for this country, and while Treasury recognizes the necessity of gold in international monetary transactions, as do we, Treasury still hews to the line of reasoning that gold is more or less non-essential in support of the dollar internally, and, further, that while Treasury might profess to wish to see our gold supply augmented they are unduly apprehensive over any federal legislation which will result in an immediate revival of gold mining in this country with greater production.

In the interim of the past year significant and ominous events have occurred. While the outflow of gold was momentarily checked, the close of 1964 witnessed with dramatic suddenness action by DeGaulle to gild the fleur-de-lis by withdrawing 150 million in gold from the United States to strengthen the franc at the expense of the dollar, and no doubt the thought occurred to Treasury officials that while 50 million Frenchmen couldn't be wrong, one could be. Certainly there is no assurance merely because France still owes 700 million dollars to this country that President DeGaulle will not continue to make further severe drains on our dwindling gold reserves in view of the dollar credits still available to him.

Following this ominous event, the Administration has called for the passage of legislation to withdraw the 25% gold reserve backing for Federal Reserve deposits to provide 5 billion dollars of free gold.

Advocates of removing the 25% gold backing of Federal Reserve deposits argue that removal of the restriction would dissipate uncertainty with respect to the availability of U. S. gold to satisfy foreign claims thus relieving a great source of the gold drain and thereby would extend the period for long-range solutions of our balance of payments problem. Likewise, such advocates argue that the normal growth of the country's monetary needs in the years ahead will require an increase in Federal Reserve note and deposit liabilities which will require additional gold backing. Therefore, arguendo, maintenance of the 25% reserve could hinder such expansion with detrimental effect to domestic economic expansion.

Proponents of maintaining the gold reserve requirement take the position, and I think properly so, that this nation should not exhaust its entire free gold stock before taking action to correct domestic monetary policy and that the discipline of gold will hasten and impel the government to solve the problem of international deficits and they point to the fact that the almost complete exhaustion of free gold is the very factor which may accelerate the government to correct the balance of payments deficit. By removing the 25% reserve restriction the pressure will be off, and we believe a grave danger will then exist of already overdue remedial action will be further postponed.

Now, I don't profess to be a monetary expert and other than these few brief comments, I will leave a dissertation on these very complex problems to the monetary experts who are on this program this afternoon.

However, I would remind them that while they discuss the highly complex problems of international monetary policies and problems, that they do not overlook the fact that gold is essential to the national security, that virtually all the gold mines of the United States have been shut down, that there is no inducement to search for new gold ore reserves, that the few remaining gold producers (including Homestake) are losing the battle between constant inflation and the fixed price of the metal, and that gold relief legislation is urgently needed else the gold miner will become, in the near future, as extinct as the buffalo or the passenger pigeon. You can still see buffalo in state parks but I would hate to contemplate the day when you might have to view gold only in the Smithsonian.

When the security of the nation demanded the production of uranium, the government made it possible to mine at a profit, and the greatest mining boom in decades hit the western states with consequent investment of millions in capital and employment for thousands of miners. I submit, Gentlemen, that special legislation requested by the special gold interests coincides with the national interest since this government needs more gold, therefore, it is essential immediate steps should be taken to revitalize the gold mining industry to the end that existing properties shall be kept in operation, that dormant mines be reopened and that an aggressive search be made for new gold ore reserves; all to the end that by a positive forward looking program a new mining boom will be created which will produce badly needed increased gold production for the United States Treasury, will result in increased employment in stagnant mining camps, and will give hope and courage to the people of the western mining states by assuring them that the federal government is not unmindful of the fact that a mine cannot be whistled up over night like a pickle factory and a recognition of the fact that a domestic industry should not be permitted to disappear because of ghosts which haunt the Potomac rather than the dead and dying mining camps of our western mountains.

* * * * * * * * *

January 7, 1963

Mr. Andy Gritz
R 1, Box 19-D
Jacksonville, Oregon

Ockey Channel
near Rush, Ore.

Dear Sir:

This will acknowledge your letter of December 30 which has been forwarded to me.

We cannot find the earlier letter which you say you wrote. However, we can tell you that this Company is not interested in examining your gold property at the present time. We thank you, however, for bringing this to our attention.

Yours very truly,

KENYON RICHARD

KR/kw

J.F.F.
JAN 2 1963

Jacksonville Oreg
Dec 30 — 62.

American Smelting & Rifing Co.
600 Arnstal Bld
Salt Lake City
Utah.

K. R.
Deny
JAN 7 1963

I am still waiting for some one to come around or to hear from you. what's the matter with you people anyway aint you got any time of some thing that you can't even to answer a letter. you know what I have told you in my last letter, there is a chanel on my place which is called the Ockey chanel and it has plenty of gold if you know how to git it I myself haven't got the means to do the work with, so let me know

if you, I intend to do some-
thing if not will try someone
else. if your man is near by
he wont have a hard time
to find me cause I am
home most of the time

Yours Truly
Cindy Fritz
R. 1 Box 190
Jacksonville
I live near Rush. Oreg

J. H. C.
JAN 7 1963

January 4, 1963

K. R.
JAN 7 1963

Mr. Andy Gritz
R 1, Box 19-D
Jacksonville,
Oregon

Dear Sir:

This will acknowledge receipt of your letter of December 30th regarding the Ockey channel on your property near Rush, Oregon.

Exploration matters which were formerly handled by this office have been placed in the hands of:

Mr. K.E. Richard
813 Valley National Building
Tucson, Arizona

I am sending your letter to Mr. Richard for his consideration.

Yours very truly,
Original signed by
J. F. FROST
J. F. FROST

cc: K.E. Richard, w/orig,

JFF/mem

J. H. C.

OCT 29 1962

MR. H.H.C.
READ AND RETURN
PREPARE AN ANSWER
HANDLE
FILE

K. R.

OCT 29 1962

AIRMAIL

October 26, 1962

Mr. L. C. Miller
Cascade Minerals Co.
P. O. Box 75931
Los Angeles 5, Calif.

Dear Sir:

I have your letter of October 24th and note you are not disposed to provide any description of the property or deposit before reaching an agreement on the gold prospect mentioned in previous correspondence. Under these circumstances, we would not care to pursue the matter further.

Yours very truly,

C. P. POLLOCK

cc: KERichard A/M w/att.

CONTOMO 10-26-62: KERichard A/M

CASCADE MINERALS COMPANY

P.O. BOX 75031
LOS ANGELES 5, CALIFORNIA

OCTOBER 24, 1962

MR. C.P. POLLOCK
EXPLORATION MANAGER
AMERICAN SMELTING AND REFINING COMPANY
MINING DEPARTMENT
120 BROADWAY
NEW YORK 5, NEW YORK

DEAR SIR:

THANK YOU FOR YOUR PROMPT REPLY OF OCTOBER 23RD TO MY LETTER CONCERNING A GOLD PROSPECT.

WHEN I WROTE YOU, THE POSSIBLE ARRANGEMENT I HAD IN MIND WAS AN EXPLORATION AGREEMENT IN THE FORM OF JOINT VENTURE IN WHICH I WOULD WISH TO RETAIN A 50% INTEREST AND ADVANCE 50% OF THE FUNDS REQUIRED.

IN VIEW OF THE NUMBER OF PROSPECTS WHICH YOU MUST EXAMINE IN ORDER TO FIND ONE WORTH DEVELOPMENT I CAN VERY WELL UNDERSTAND WHY YOU ASK FOR TECHNICAL INFORMATION, ETC., IN ADVANCE.

ON THE OTHER HAND, IF YOU WILL TAKE INTO ACCOUNT THE FACT THAT I HAVE SPENT MY TIME ON THIS FOR FOUR YEARS AND HAVE SPENT MORE THAN $25,000 IN MONEY YOU WILL REALIZE THAT I WOULD NOT BE DISPOSED TO PROVIDE YOU WITH ANY DESCRIPTION OF THE PROPERTY BEFORE AN AGREEMENT IS REACHED.

I AM AWARE THAT YOUR ORGANIZATION MAY NOT CONSIDER THIS A PROMISING APPROACH BUT IT IS THE ONLY ONE POSSIBLE FROM MY STANDPOINT.

IF YOU STILL THINK THE MATTER WORTH DISCUSSING I WILL PHONE YOU WHEN I AM IN NEW YORK.

YOURS VERY TRULY,

L.C. MILLER

LCM:VS

MR. [illegible]
READ AND RETURN ✓
PREPARE ANSWERS ____ HANDLE ____
FILE ____ INITIALS ____

K. R.
OCT 29 1962

J. H. C.
OCT 29 1962

AIRMAIL

October 23, 1962

Mr. L. C. Miller
Cascade Minerals Company
P. O. Box 75931
Los Angeles 5, Calif.

Gold Prospect

Dear Sir:

Mr. MacKenzie has referred to me for attention your letter of October 20th regarding a gold property which you have been exploring over the past several years.

Since you apparently do not control the property, I presume you require a commission or finder's fee as compensation for your services in the event a deal is successfully negotiated with the property owner. An arrangement of this kind should not be difficult to work out. I would be glad to discuss this matter with you during your visit here next month and suggest you telephone me for an appointment on your arrival in New York. In order to determine what if any interest we might have in the property, I would need for review complete information covering the deposit, including technical data, location, prices and terms of the proposed deal and any other material that might be available.

Thanking you for your interest, I am

Yours very truly,

C. P. POLLOCK

cc: JDMacKenzie

blcc: KERichard A/M w/att.

ccNYOMD 10-23-62: KERichard.

CASCADE MINERALS COMPANY

P.O. BOX 75931
LOS ANGELES 5, CALIFORNIA

RECEIVED
OCT 23 1962
J. D. MacKenzie

OCTOBER 20, 1962

G. P. Pollock
R.

MR. J.D. MACKENZIE, PRESIDENT
AMERICAN SMELTING & REFINING CO.
120 BROADWAY
NEW YORK 5, NEW YORK

DEAR SIR:

FOR SEVERAL YEARS I HAVE BEEN EXPLORING A GOLD BEARING DEPOSIT AND I AM CONVINCED THAT IT CARRIES CONSISTENT VALUES IN EXCESS OF $35.00 PER TON IN PRECIOUS METALS OVER A VERY LARGE OUTCROP.

I DO NOT WANT TO MAKE THE EFFORT TO ACQUIRE THIS DEPOSIT MYSELF IF THERE IS ANY ALTERNATIVE.

IS THERE, IN YOUR EXPERIENCE, ANY FORM OF AGREEMENT UNDER WHICH WE COULD DO BUSINESS AT THIS STAGE?

I WILL BE IN NEW YORK NOVEMBER 5TH TO 19TH.

YOURS TRULY,

L.C. MILLER

LCM:VS

ideas inc
World-wide Markets for New Products
214 Ivinson Ave. Laramie, Wyoming (307) 742-6668

Aa. O.O.TD

~~G.H.P~~

Here is an opportunity!

July 24, 1962

Ken Richard:
Sure you aren't overlooking something?
George.

American Smelting & Refining Co.
P. O. Box 52
Selby, California

Gentlemen:

Is your company looking for exceptional dry placer gold mining property with lode possibilities as described in the enclosed?

We have 2,400 acres for sale in Arizona in one of the principal gold districts of the Western United States. Discovery was made only recently.

If you are interested in receiving detailed information and examining the property, please let me know.

Cordially yours,

IDEAS, INC.

Warren M. Mallory

Warren M. Mallory,
President

WMM:cr

Enc: Gold Property Bulletin

K. R.
JUL 27 1962

This could be near either Quartzite or Wickenburg, both of which are of no interest

Gold Basin, Mohave Co.

JUL 26 1962

GOLD PROPERTY FOR SALE

PROPERTY: Consists of 2,400 acres of gold dry placer claims in Arizona. Altitude is approximately 3,500 feet above sea level. The western part of the area is a low northward trending ridge. To the east of this ridge the plain is pediment-floored consisting of low, rounded ridges and thousands of shallow draws or gulches (from 2 to 20 feet deep) in a slightly sloping area covering many miles. The coarse gold has been found in an area about 3 miles wide by 10 miles long. (Finer flour gold is found outside this area). Its vegetation consists principally of small desert shrubs and abundant Joshua trees. All claims are properly posted with notice of location, are recorded in county records, and all assessment work is up-to-date.

HISTORY: The first discovery of gold on this land was made 10 years before World War II. With subsequent rapid decline of national interest in gold mining, the property has essentially lain dormant except for occasional "pick and shovel" prospectors. According to a report by members of the United States Geological Survey, this location is in one of the principal gold districts of the Western United States.

The significance is that it is one of the most recent important rich gold discoveries in the United States. Added to this is the fact that the gold recovery is one of the highest in the United States per dollar of operating cost.

EXPLORATION: Tests by the Arizona Bureau of Mines produced an average gold value of $1.21 per cubic yard. Tests in 1961 by Mr. Ted L. Johnston, Consulting Professional Mining Engineer, over a three-month period produced gold value from $.50 to $8.00 per cubic yard. Two old-time prospectors, in operating a small-scale hand-operated dry shaker, estimate the average gold value at $2.00 per cubic yard, and have found value as high as $40.00 per cubic yard. A quick calculation using a six foot depth of top soil on 2,400 acres shows the potential gold value to be many millions of dollars.

CHARACTER OF GOLD: The gold occurs as nuggets (not flour gold) ranging in size from a pin head to 3/4 inch pieces. The nuggets have sharp, ragged surfaces and are not rounded and smoothed with wear, all of which indicates the material has not traveled far. A few of the nuggets carry attached quartz, further indicating a local derivation.

BLACK SANDS: A spectrographic analysis of the "black sands" shows aluminum, arsenic, boron, bismuth, calcium, copper, iron, magnesium, molybdenum, lead, phosphorus, silicon, tin, thorium, titanium, yttrium, zinc, zirconium and, of course, gold.

AERIAL PHOTOS IN THREE DIMENSIONS: Complete aerial photographs have been taken of the property and a three-dimensional study has been made with a stereoscope. Black sand is found in abundance with the gold nuggets and these photographs show the many points of concentration of the black sands, impossible to see from the ground. These concentrations, when correlated with arroyo topography, should show where the most rich gold deposits are located. No exploration has been done at these many points of concentration since the photographs were obtained after Mr. Johnston's exploration.

LODE POSSIBILITIES: Because of the unusual raggedness and size of the nuggets, the geology, and the association of quartz, the chances are extremely likely that very rich lode deposits are nearby. No lode exploration has been conducted on the property to our knowledge.

CHARACTER OF GROUND: The placer material is not rounded gravel and sand usually encountered in gold placer. It is detretal material which is made up of angular rock fragments mixed with some sand and clay. The pebbles have sharp, ragged surfaces (like the gold nuggets) indicating local derivation. These gold-bearing gravels consist of a top soil blanket from two to ten feet deep and rest upon a hard-pan, locally known as caliche. The blanket of gold-bearing gravels is soft and can be handled by pick and shovel or earth-moving equipment. There are few boulders more than 10 inches in diameter. It is believed that the gold-bearing gravels are a result of surface weathering of the caliche, which is considered bedrock for the values shown. It is our opinion that very rich gold deposits will be found whenever the caliche is explored. No core drilling has been done. However, some of the gold nuggets found carry attached caliche material, thus indicating that it is gold bearing.

PROCESSING REQUIRED: Mr. Johnston's work consisted of trenching with a front-end tractor-loader and dry concentrating the material with a revolving trommel screen (3/4" mesh) to scalp off the larger rocks and to break up lumps of clay and sand. Vibrating air tables with riffles for recovering the gold and black sands were used. A crusher was not needed. Because of the looseness of the soil, no overburden to remove, and only a few boulders more than 10" in diameter, no drilling or blasting was required to work this blanket. This type of soil is considered to be the least costly to process. Of course, should the hard-pan caliche under the top blanket be worked, drilling and blasting probably would be required. The exploration equipment used by Mr. Johnston was capable of handling only about 30 cubic yards per day. For satisfactory operation, equipment to handle processing of from 500 to 1,000 cubic yards per day would be necessary. Because of Mr. Johnston's experience with his small scale operation, he could be of great assistance in recommending the proper type of dry processing equipment needed for maximum recovery at minimum cost for this particular type of ground. It is estimated that a minimum of $100,000 of processing and earth-moving equipment would be needed to start on a minimum basis. Of course, duplicate units could be added at a later date.

OBTAINING ADDITIONAL SURROUNDING LAND: Some adjoining sections are owned by a railroad company. Correspondence with officials of this railroad indicates they would be willing to lease these sections to a financially responsible mining company with the necessary large-capacity dry processing equipment and who will explore and work the land.

WATER: There is insufficient water on the property for complete wet washing without digging a well or obtaining pipe line water rights. Of course, the gold bearing gravels can be dry processed to obtain gold and black sands concentration, and this concentrate could then be wet washed. A water line has been built from a natural spring a few miles from our property, and runs across and stops on our claims. However, the water line is owned by a rancher who has Taylor grazing rights in the area. Also, it has been reported that water in the area has been found by drilling to depths from a minimum of 60 feet to a maximum of 660 feet.

TRANSPORTATION: The property is reached by an improved gravel road and is approximately 70 miles from a town of any size with a railroad.

RANCHO HOMESITES: This property is an ideal location for rancho homesites. In fact, land near our claims is being sold by a real estate development company for $316.00 per acre in small parcels. Another real estate development company is selling homesites about 25 miles away for $495.00 per acre, yet it is not anywhere as desirable or beautiful as our area.

CLIMATE: Unlike many mining areas of the United States where winter weather stops operations, this area can be worked year-round. The average annual maximum temperature is 76.7 degrees, the average annual minimum temperature is 46.1 degrees, and total yearly rainfall averages only 10.09 inches, resulting in low humidity. Summer temperatures are 8 degrees cooler than that of Phoenix, Arizona.

OFFICERS: Our group is offering the gold placer claims for sale. Its officers are:

President - Mr. Ted L. Johnston, Professional Consulting Mining Engineer, with experience in mining in North and South America and the Orient. Is currently employed as Chief Engineering Consultant with the Mineral Concentrates Company (Mincon), Industrial Park, Loveland, Colorado.

Vice President and Treasurer - Mr. Warren M. Mallory, Professional Registered Engineer and former Professor of Engineering at the University of Wyoming. Is currently President of Ideas, Inc., a nationwide sales organization with headquarters at 214 Ivinson Ave., Laramie, Wyoming.

Secretary - Mr. Elwood G. Childers, formerly Vice President of the Bank of Commerce, New York City. Is currently President of Ideas - Eastern, Inc., 4545 Connecticut Ave., N. W., Washington, D. C.

SOURCES OF DATA: The specific sources of information given in this report will be shown parties who examine the property.

WHY WE ARE SELLING: We do not have the necessary finances to purchase and operate the large capacity dry processing and earth moving equipment required to process this large volume of earth, and we do not have the personal time required to devote to the operation due to other pursuits.

SELLING PRICE: Our price is $135.00 per acre for all or part of the 2,400 acres. However, the minimum we will sell at one time is 800 acres with a downpayment of $32,000.

Gold AA-0.0.7D
Gold Placers

New York, January 24, 1961

MEMORANDUM FOR -

T.A.S. FEB 8 1961

K.R. JAN 25 1961

Mr. C. P. Pollock

Dry Placers of the Southwest

Please refer to Mr. Kenyon Richard's letter to you dated January 11, 1961 on the above identified subject.

As implied by Mr. Richard, neither the report nor the article contributes much new information relative to such deposits and their exploitation.

The idea of using a mechanism such as appears to have been developed does have some merit for use on the so-called dry placers in which the moisture content is usually too high (greater than 2 to 3%) to enable economic recovery of values to be accomplished without prior drying.

The cost, as Mr. Richard has stated, would appear to me to be somewhat more than has been indicated in either the article or by Mr. Lee. The mechanical problems involved should not be difficult, but as with the costs, very few definite details are given so as to make a realistic evaluation.

If the companies involved have conducted as much experimental work as the report and article indicate, I would think that Mr. Lee would be in a position to furnish more data so that the process could be better evaluated. Should such additional information be available, I would like to give the matter further consideration. Therefore, if it is convenient, I would suggest that Mr. Richard obtain any additional data that Mr. Lee could furnish.

J. F. LORD

cc: KERichard A/M

AMERICAN SMELTING AND REFINING COMPANY
MINING DEPARTMENT
120 BROADWAY, NEW YORK 5, N.Y.

C. P. POLLOCK
EXPLORATION MANAGER

K. R.

JAN 16 1961

AIRMAIL

January 13, 1961

Mr. K. E. Richard, Chief Geologist
Southwestern Mining Dept.
813 Valley National Bldg.
Tucson, Arizona

Dry Placers of the Southwest

Dear Mr. Richard:

Mr. John Lord will be returning from Honduras this weekend and I will ask him to kindly review the report by Mr. Charles A. Lee forwarded with your letter of January 11th on a supposedly new dry recovery method for gold placers. He will give you his views as to the feasibility of such a process as soon as he has had a chance to study the information.

Yours very truly,

C. P. Pollock

C. P. POLLOCK

cc: JFLord w/att., NYC

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 11, 1961

T A.S.
JAN 12 1961

C. P. Pollock, Exploration Manager
American Smelting and Refining Company
120 Broadway
New York 5, New York

DRY PLACERS OF THE SOUTHWEST

Dear Sir:

A Mr. Charles A. Lee, geologist at the Trench Unit many years ago, has presented to Mr. Snedden a report on a supposedly new method for dry recovery of gold from placer deposits. A thermofax copy of the report is attached. Also attached is a copy of an article from a local trade journal which gives a little more data about the process.

My thoughts are that the process is too expensive, and that it is not really new. However, before indicating to Mr. Lee that we are not interested, we would like to have Mr. John Lord's advice as to whether or not we should investigate further.

Yours very truly,

Original Signed By
K. Richard

KENYON RICHARD

Att: Report and article
KR/ds
cc: John Lord, w/att - To be Forwarded

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 11, 1961

C. P. Pollock, Exploration Manager
American Smelting and Refining Company
120 Broadway
New York 5, New York

DRY PLACERS OF THE SOUTHWEST

Dear Sir:

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Yours very truly,

Original Signed By
K. Richard

KENYON RICHARD

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