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SERGENT, HAUSKINS & BECKWITH

DMEA LTD.
DEC 5 1986
RECEIVED

PROPOSAL FOR
Heap Leach Facility Design
Vulture Mine Project
Near Wickenburg, Arizona

Prepared for:

Budge Mining
7340 East Shoeman Lane
Scottsdale, Arizona 85251

3232 W. Virginia

SHB Proposal No. 86-12-10

Consulting Geotechnical Engineers
PHOENIX • ALBUQUERQUE • SANTA FE • SALT LAKE CITY • EL PASO • TUCSON

SERGENT, HAUSKINS & BECKWITH CONSULTING GEOTECHNICAL ENGINEERS

APPLIED SOIL MECHANICS • ENGINEERING GEOLOGY • MATERIALS ENGINEERING • HYDROLOGY

B. DWAINE SERGENT, P.E.
LAWRENCE A. HANSEN, PH.D., P.E.
RALPH E. WEEKS, P.G.
DARREL L. BUFFINGTON, P.E.
DONALD VAN BUSKIRK, P.G.
DALE V. BEDENKOP, P.E.
JOHN B. HAUSKINS, P.E.
MICHAEL L. RUCKER, P.E.
ROBERT W. CROSSLEY, P.E.
JONATHAN A. CRYSTAL, P.E.
PAUL V. SMITH, P.G.
NORMAN H. WETZ, P.E.
GEORGE H. BECKWITH, P.E.
ROBERT L. FREW
JAMES H. CLARY, C.P.G.
NICHOLAS T. KORECKI, P.E.
GERALD P. LINDSEY, P.G.
RONALD E. RAGER, P.G.
ROBERT D. BOOTH, P.E.
SUANG CHENG, P.E.
JAMES R. FAHY, P.E.
MICHAEL HULPKE, P.G.
DAVID E. PETERSON, P.G.
ALBERT C. RUCKMAN, P.E.
PAUL KAPLAN, P.E.

December 16, 1986

Budge Mining
7340 East Shoeman Lane
Scottsdale, Arizona 85251

SHB Proposal No. 86-12-10
Addendum No. 1

Attention: A. J. Fernandez
Senior Mining Engineer

DMEA LTD.
DEC 17 1986
RECEIVED

Re: Heap Leach Facility Design
Vulture Mine Project
Near Wickenburg, Arizona

Gentlemen:

Pursuant to discussions with A. J. Fernandez, Senior Mining Engineer, on December 11, 1986, we have revised our proposal for providing the geotechnical and hydrological engineering services required for the referenced project. The revisions discussed herein are specifically related to additional project details provided during the meeting.

It is our understanding that the structures presently on-site would be utilized for mill shops, offices and other facilities. No ball mills are involved and any required crushing equipment would be skid-mounted and not require detailed foundation investigation. Based on exploration data for the project area, the depth to bedrock is likely on the order of 20 to 30 feet. In addition, it is our understanding that a commercial clay source is available near Congress, thus exploration specifically for a clay source would not be required.

As presented in the original proposal, a three-phase program of studies was developed. Detailed surface water hydrology analysis was included in Phase II. Because of the importance of this element of the facility to overall project development, elements of this task specifically related to the diversion would be moved to Phase I of the study. Designs for the diversion alternative selected would be developed during Phase I in sufficient detail to allow its construction cost to be estimated. Thus, the impact of this project element on overall project costs can be assessed.

The design issue of placing a heap leach pad on top of existing tailings is recognized by both Sergent, Hauskins & Beckwith (SHB) and Budge Mining as being critical to site selection for this facility. Thus, an initial element of our Phase I studies would be to contact Arizona Department of Health Services (ADHS) to discuss this issue. It may be that a specific suite of laboratory tests could be completed to determine the leachate characteristics of the existing tailings.

We have revised our estimate of engineering fees for the proposed scope of work based on the changes discussed above. A revised Table 1 is attached which reflects the deletion of certain field and laboratory investigation elements, as well as the switching of some items of work from Phase II to Phase I.

This addendum should be attached to the original proposal and made a part thereof.

Should there be any questions, we would be pleased to discuss them with you.

Respectfully submitted,
Sergent, Hauskins & Beckwith Engineers

By _____
Lawrence A. Hansen, Ph.D., P.E.
Vice President

Copies: Addressee (2)

TABLE 1

Estimated Charges

Phase I	
Literature Review	$ 750.
Field Investigation	3,000.
Laboratory Testing	1,400.
Engineering Analysis ~~& Report~~	3,500.
	$ 8,650.
Phase II	
Field Investigation	$ 7,340.
Laboratory Testing	2,800.
Engineering Analysis & Report	3,000.
	$13,140.
Phase III	
Preparation of Plans & Technical Specifications	$ 4,000.
Permitting	$ 1,500.
Construction Services	$ 9,500.
	$ 36,790

SERGENT, HAUSKINS & BECKWITH CONSULTING GEOTECHNICAL ENGINEERS

APPLIED SOIL MECHANICS • ENGINEERING GEOLOGY • MATERIALS ENGINEERING • HYDROLOGY

B. DWAINE SERGENT, P.E.
LAWRENCE A. HANSEN, PH.D., P.E.
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DALE V. BEDENKOP, P.E.
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JONATHAN A. CRYSTAL, P.E
ROBERT D. BOOTH, P.E.
NORMAN H. WETZ, P.E.
ROBERT L. FREW
ALLON C. OWEN, JR., P.E.

December 4, 1986

Budge Mining
7340 East Shoeman Lane
Scottsdale, Arizona 85251

SHB Proposal No. 86-12-10

Attention: A. J. Fernandez
Senior Mining Engineer

Re: Heap Leach Facility Design
Vulture Mine Project
Near Wickenburg, Arizona

Gentlemen:

We appreciate the opportunity to present this proposal for providing the geotechnical and hydrological engineering services required for the referenced project. The design of the proposed heap leach pad and stream diversion is a challenging project in which Sergent, Hauskins & Beckwith (SHB) is most interested.

Included in this submittal are our technical proposal, a proposed staffing plan, a summary of estimated charges and a summary of our previous experience with similar projects.

Should there be any questions concerning this proposal, we would be pleased to discuss them with you.

Respectfully submitted,
Sergent, Hauskins & Beckwith Engineers

By _____
Lawrence A. Hansen, Ph.D., P.E.
Vice President

Copies: Addressee (2)

TABLE OF CONTENTS

SHB Proposal No. 86-12-10

Heap Leach Facility Design
Vulture Mine Project
Near Wickenburg, Arizona
SHB Proposal No. 86-12-10

1. INTRODUCTION

Our proposal for performance of the geotechnical and hydrological investigation, analysis and design for a proposed heap leach facility at the Vulture Mine near Wickenburg, Arizona is presented herein. In addition, this proposal addresses geotechnical engineering services to be provided during the construction phase of the project, and assisting Budge Mining in the permitting process.

The following sections present our proposed scope of work, estimated fees, project schedule, staffing plan and a summary of pertinent firm experience and qualifications.

2. PROJECT DESCRIPTION

Preliminary details of the project were provided by A. J. Fernandez, Senior Mining Engineer with Budge Mining. It is understood the project will consist of heap leaching ore from an open-pit mine and tailings from an existing on-site disposal area. A total of 700,000 to 750,000 tons of leach material is involved, and the anticipated project life is two to three years based on presently known reserves. Several structures that are presently on-site would be utilized for the mill shops. New processing facilities would include ball mills, crushers and assorted tankage.

TAILS + Rock

no shops

no ball mills

generator

The leach pad will have an area of approximately 375,000 square feet, with ore placed to a total height of about 36 feet. Tailings will be placed in an initial 12-foot lift, followed by two 12-foot lifts of ore. Pregnant solution will be contained in an on-site pond that is to be sized. The initial design concept is to utilize either geomembrane liners or native soils for the pad and the pond. Two potential locations for the heap leach pad have been selected, including one on relatively undisturbed ground and one on an existing mine tailings disposal area.

Additional major design elements include a diversion for an ephemeral stream which presently crosses the area planned for the open-pit and a sidehill waste rock disposal area. Preliminary locations for these elements of the facility have been selected, though alternatives may be proposed as a result of the work proposed herein.

3. SCOPE OF WORK

A three-phase program of engineering studies is proposed. The first phase would include a preliminary evaluation of the sites selected for the major project facilities, including the drainage diversion, waste rock dump and leach pad. The second phase would include detailed geotechnical investigations of the selected sites, performance of required hydrologic and geotechnical evaluations, and development of a conceptual

design for the leach pad and solution pond. The third phase would consist of preparation of final design drawings and technical specifications for construction of the leach pad and associated facilities. More detailed discussions of the scope of work proposed for each phase of the investigation are provided in the following paragraphs.

3.1 Phase I - Preliminary Site Evaluation

The first phase of the investigation would include a review of existing information regarding the planned mining and leaching operation to better understand the impact of these operations on the leach pad design. A review would also be made of available geologic and geohydrologic information, including published geologic mapping, and reports addressing groundwater, seismotectonics and seismic hazard. Literature reviewed will include that published by Federal and State agencies, universities, and private professional societies, as well as any available in-house surface and subsurface geologic and geohydrologic data developed by Budge Mining.

A geologic reconnaissance of the proposed diversion, leach pad and waste rock sites would be made to identify any potential geologic hazards that would require selection of an alternative site. Potential clay borrow areas would also be identified and further evaluated by

excavation of exploratory test pits. It is anticipated that six to ten pits, each 10 feet or less in depth, would be adequate for the preliminary investigation. An additional four to six test pits would be excavated in the existing tailings disposal area. Depending on conditions encountered during reconnaissance, six to ten test pits would also be excavated along the proposed diversion channel.

Samples obtained from the exploratory test pits in potential borrow areas would be tested for standard soil index properties to estimate their permeability when compacted. Samples obtained from test pits in the tailings disposal area would be retained for testing of leachate generation, if required, as well as soil index properties. Construction of a new leach pad and pond over tailings is a key environmental issue that will necessitate discussion with the Arizona Department of Health Services (ADHS). Samples obtained from test pits along the proposed diversion channel would be tested for standard soil index properties.

Results of the field exploration and laboratory testing would be analyzed and recommendations for siting of the leach pad, solution pond, waste rock pile and diversion channel presented. If the presently identified sites are not acceptable, alternative sites would be recommended based on the results of the preliminary site evaluation. It is anticipated that discussions with

ADHS would be initiated subsequent to the field work included in this phase specifically to address siting of the leach pad and solution pond on existing tailings. Results of these discussions, which affect site selection for these elements of the project, would be included in the report developed for this phase of the project.

3.2 Phase II - Detailed Geotechnical Investigation

Following review of the Phase I report by Budge Mining, a design level investigation would be performed to evaluate in detail the geotechnical characteristics of the sites selected for the project elements. These evaluations are necessary for design of the leach pad, and to further define the nature of available borrow materials for use in pad construction and in lining the diversion channel. The final design investigation would involve the following tasks:

A. Field Investigation

The field investigation would consist of the following subtasks:

° Drilling about ten borings to depths of 20 to 60 feet in the pad and pond areas. The exploratory drilling would be accomplished with our CME-55 drill rig using 6 5/8-inch hollow stem auger. Standard penetration testing, open-end drive sampling or other appropriate soil sampling procedures would be performed at 5-foot

intervals or less in the borings. The purpose of this drilling would be to define the properties of the shallow soil that will form the foundation of the pad and ponds.

After completion of the exploratory drilling, all holes would be backfilled with a soil-bentonite or cement grout to minimize the potential for them providing a conduit for seepage during operation of the facility.

- Drilling six to eight borings to depths of 20 to 40 feet at the site of various processing facilities, including ball mill, crusher and tankage locations. Drilling and sampling procedures would be the same as for the leach pad and pond areas. The purpose of this drilling would be to define the properties of the soil profile that will support these facilities.

- About five in-place permeability tests would be performed beneath the pad and pond areas. Test holes would be drilled by auger methods, and either falling head or constant head tests would be performed.

- Additional exploratory test pits would be excavated, if required, to further define the nature and extent of potential borrow materials, and to explore excavation conditions along the selected diversion channel. It is expected that from eight to ten test pits could be required.

B. Laboratory Analysis

It is anticipated that the final laboratory testing program would include the following:

Test Type	Number
Grain-Size Analysis & Atterberg Limits	20
Moisture Content	20

Test Type	Number
Moisture-Density Relationship	4
Direct Shear (in situ)	3
Direct Shear (remolded)	3
Consolidation (in situ)	3
Permeability	3

may be needed later since it may affect pond location? Sequence?

C. Surface Water Hydrology Analysis

Peak flow and runoff for the external drainage being diverted, and runoff from direct rainfall within the leach pad area, would be calculated for various return periods up to the probable maximum flood (PMF) using standard SCS or USGS procedures. Design floods would then be established in consultation with Budge Mining, considering the degree of risk, costs, the consequences of pond or dike overtopping or failure, and the consequences of flooding the open-pit.

Based on the design flood or floods, the following design analyses would be completed:

° Sizing of channels and dikes for diversion of the external drainage (mine waste rock might be used in construction of dikes).

° Solution channel and perimeter channel capacity to handle storm runoff within the pile.

° Water balance for the solution ponds to evaluate potential for water accumulation in the ponds during periods of high precipitation.

° Sizing the solution pond and stormwater retention pond, if used, in consultation with Budge Mining.

It is anticipated that a double-lined solution pond with a leakage detection system will be required. Though recent designs of heap leach

facilities have included a surge pond for retention of stormwater from the pad area, it may be more economical to size the solution pond for this additional storage. A single lining, typically of clay borrow, is considered suitable for a separate surge pond because the solution in the pond would be greatly diluted by the storm runoff, and the storm runoff could be pumped back into the solution circuit as makeup water within a few weeks.

D. Seepage Evaluation & Monitoring Well Design

The potential for seepage would be evaluated and an appropriate monitoring well system designed, if required. For most cases, seepage through a well constructed leach pad poses little, if any, environmental risk. Hydraulic heads over the liner are small, the "worst case" of leakage rates through liners are very low and the total period a given heap is under leach is relatively short. For an arid site, it can usually be shown that minor leakage probably will be absorbed within the unsaturated zone before it reaches the regional groundwater table.

Because of the relatively great depth to groundwater, seepage from the solution pond has only a slightly higher potential to affect the underlying groundwater quality. Accordingly, double-lined ponds with leakage detection and monitoring systems are advisable. The ADHS may nonetheless require installation of a downgradient monitoring well. During this phase of the project, the need for a monitoring well would be discussed with ADHS.

E. Final Geotechnical & Hydrological Report

A final geotechnical and hydrological report would be submitted summarizing all geotechnical, hydrological and seismological data, analysis

results and recommendations. This report would include:

we have geologic data

1. Geologic maps and cross sections illustrating the site and regional geology.

2. Logs of all borings and test pits.

3. Results of laboratory analyses of the soils and rock sampled. ? Rip-rup ?

4. Results of stability analysis of the leach pile and waste rock pile, including both static and seismic analysis.

5. Characterization of the groundwater system and evaluation of potential seepage from the pile.

6. Surface water hydrologic analyses and diversion channel hydraulic analyses.

7. Recommendations for pad design including site preparation, liner composition and thickness, overliner requirements, fluid collection and retention systems, and storm water retention pond.

The report would be completed in sufficient detail for submission as a backup document to the Notice of Disposal submittal required by the ADHS. Preliminary designs for the leach pad, solution pond and diversion channel would also be completed in sufficient detail for this purpose.

3.3 Phase III - Plan & Specification Development

Phase III of the investigation would consist of developing plans and specifications for the project for

use in final permitting and construction of the facility. It is anticipated this would primarily involve refinement, formalization and modification of work completed in the preceeding phases. It appears, therefore, that the degree of engineering analysis would be relatively minor. Detailed construction plans and specifications would be prepared for the leach pad liner system, perimeter dikes, solution pond, leachate monitoring and collection system, and storm water overflow retention basin, if used. An engineer's cost estimate would be developed for construction of these items. Work associated with this phase would not include the design of mechanical and structural items (i.e., pump systems). It is anticipated topographic base mapping of a suitable scale will be provided, from which the required plans and cross sections would be developed.

3.4 Consultation During Permitting

During the permitting process, it is anticipated an SHB representative will meet with the ADHS to discuss the design of the project with respect to groundwater protection. In addition, it is anticipated that SHB would assist Budge Mining in preparing the Notice of Disposal submittal required by the ADHS. For budgeting purposes, costs for attending three meetings have been included. Estimated charges for direct permitting aspects of the scope of work are also included.

3.5 Construction Services

It is anticipated that construction services would include quality assurance testing of the earthwork, liner installation and concrete. The cost of such services will be dependent on the final plans and specifications for the project and the construction period. Based on our previous involvement with similar sized projects, we anticipate a construction period of one month during which SHB's engineering technician services would be required on a full-time basis. We have also included estimated charges for two site visits during this period by the project manager and project engineer.

4. ESTIMATED FEES

4.1 Fees

Charges for work associated with this project would be made on the basis of our standard Unit Fee Schedule, a copy of which is presented in Appendix A. Estimated charges for the various phases are detailed in Table 1. Charges would not exceed the figures in Table 1 without prior authorization.

4.2 Terms of Payment

Terms of payment are net 30 days. Payments not received within 30 days will be charged interest at the rate of

TABLE 1

Estimated Charges

Phase I	
Literature Review	$ 1,000.
Field Investigation	3,500.
Laboratory Testing	1,400.
Engineering Analysis & Report	1,500.
	$ 7,400.
Phase II	
Field Investigation	$10,050.
Laboratory Testing	3,300.
Engineering Analysis & Report	5,500.
	$18,850.
Phase III	
Preparation of Plans & Technical Specifications	$ 4,000.
Permitting	$ 1,500.
Construction Services	$ 9,500.

1.5 percent per month for an effective annual rate of 18 percent.

4.3 Warranty

Our professional services would be performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties either express or implied.

5. STAFFING PLAN

A team of geotechnical engineers, hydrologists, and engineering geologists with extensive experience with similar projects would be assigned to the work. This multidisciplinary team has performed corresponding elements of work on about 20 projects involving gold leaching or waste disposal of tailings. Key staff members would be:

A. Lawrence A. Hansen, Ph.D., P.E. - Project Manager. Overall direction of work and review of engineering analysis.

B. David E. Peterson, P.G. - Project Geologist. Site characterization, seepage analysis and seismic hazard evaluation.

C. James R. Fahy, P.E. - Geotechnical Engineer. Perform engineering analyses, design and report.

D. Philip T. LaHue - Construction Engineer. Construction cost estimating.

Resumes of these individuals are presented in Appendix B.

6. FIRM & STAFF EXPERIENCE

For your information, a firm profile and summary of pertinent capabilities and experience are presented in Appendix C. SHB has over 20 years of experience with geotechnical investigations for processing plants and waste disposal facilities for mineral processing, power generation projects and other heavy industrial facilities.

SHB has been continuously involved during the past 15 years with the design and construction of clay and geomembrane linings for waste impoundments. Specific projects involving the design of heap leach pads are listed in Appendix C.

APPENDIX A

UNIT FEE SCHEDULE

Project Heap Leach Facility Design
Vulture Mine Project

Submitted to Budge Mining

Personnel

Charges will be made at the following unit rates for all project related time including travel to and from the project site.

Engineers, Geologists, Hydrologists & Support Staff

	Hourly Rate Regular	Hourly Rate Overtime
Principals & Firm Officers	$ 75.00	
Project Manager - Professional Engineers, Geologists & Hydrologists	60.00	
Professional Engineers, Geologists & Hydrologists	55.00	
Staff Engineers, Geologists, Hydrologists - Office Work	47.00	
Staff Engineers, Geologists, Hydrologists - Field Work	42.00	
Engineering & Geologic Aides	27.00	
Word Processor Operator including equipment charges	25.00	35.00
Clerical	17.00	22.00
Draftsman	25.00	34.00

Legal projects requiring deposition or court appearances are billed at our standard personnel billing rates for all investigative and preparation activities. The rate is increased 25 percent for deposition time and 50 percent for court appearance time.

1986

UNIT FEE SCHEDULE

Personnel - Drilling & Other Equipment Operation

	Hourly Rate Regular	Hourly Rate Overtime
Drilling Supervisor	$ 40.00	
Drillers	30.00	40.00
Swampers/Truck Drivers	20.00	27.50
Laborers & Helpers	18.00	26.00

Personnel - Testing

Supervising Technician	40.00	
Field Project Manager/Specialist	35.00	45.00
Senior Engineering Technician	29.00	40.00
Engineering Technician	26.00	36.00
Laboratory Technician	30.00	42.00

Equipment

Charges will be made for applicable mileage, hourly or daily rate. Equipment not shown will be quoted separately.

Field Equipment

		Rate
Drill Rig - Mayhew 1000	operating or travel	$ 55.00/hour
CME-55 Drill Rig	operating or travel	40.00/hour
CME-75 Drill Rig	operating or travel	45.00/hour
SHB ECO Drill Rig ATV	operating or travel	60.00/hour
Drill Rig Travel on Site		hourly operating rates
Trucks - 1/2 ton		30.00/day or 0.40/mile

UNIT FEE SCHEDULE

Field Equipment (cont'd.)

	Rate
Trucks - 3/4 ton	35.00/day or 0.40/mile
4-Wheel Drive	40.00/day or 0.50/mile
Water Truck - 400 gallon	45.00/day or 0.50/mile
Water Truck - 1,000 gallon	60.00/day or 0.75/mile
1 Ton Flatbed Truck	40.00/day or 0.50/mile
Water Tank	35.00/day
Wireline Sampling Equipment	27.50/hour
Nuclear Densometer	40.00/day
Water Quality Sampling Equipment	35.00/day
Geometrics/Nimbus Model ES-1210, 12 Channel Seismograph	100.00/day
Rented Pickups and Cars	Cost plus 15%
Rented Heavy Equipment (Backhoes, Bulldozers, etc.)	Cost plus 10%
Chartered Aircraft	Cost plus 10%
Drill Bits, Teeth, Expendable Drilling Supplies, Casing, Well Screen, Piezometers	Cost plus 15%

Miscellaneous Charges

Printing - 8 1/2" x 11"	0.18/page
Printing - Plan Size Blueline, Mylars, Photo Reduction, etc.	Cost plus 15%
Computer Usage (In-house Equipment)	10.00/hour
Computer Usage (Outside Time Sharing)	Cost plus 15%
Postage - Shipping Charges, Long Distance Telephone, Miscellaneous Supplies	Cost plus 15%
Air Fare, Taxi, Car Rental, etc.	Cost plus 15%
Travel Subsistence for Personnel (usually billed at flat rate but in some cases at actual expense plus 15%) Per Diem	50.00
Miscellaneous Subcontracts	Cost plus 15%

LABORATORY ENGINEERING DEPARTMENT

Unit Cost Laboratory Tests - Soil

CONSOLIDATION	$ 95.00
DENSITY OF UNDISTURBED RING SAMPLES	8.00
DIRECT SHEAR TEST	
In Situ	
Unit Cost (one point)	65.00
Unit Cost (two points)	85.00
Unit Cost (three points)	100.00
Saturated or Remolded	
Unit Cost (one point)	70.00
Unit Cost (two points)	90.00
Unit Cost (three points)	110.00
EXPANSION (SWELL, CONSTANT SURCHARGE)	
Unit Cost	75.00
Unit Cost	90.00
HYDROMETER ANALYSIS	100.00
HYDRO DISPERSION	165.00
MOISTURE CONTENT	5.50
MOISTURE-DENSITY RELATIONS TEST (PROCTORS)	
Standard	
Unit Cost (ASTM D698 A)	75.00
Unit Cost (ASTM D698 B, C or D)	85.00
Modified	
Unit Cost (ASTM D1557 A)	85.00
Unit Cost (ASTM D1557 B, C or D)	95.00
PERMEABILITY (CONSTANT HEAD) - GRANULAR	
Unit Cost (in situ)	135.00
Unit Cost (remolded)	160.00

LABORATORY ENGINEERING DEPARTMENT

Unit Cost Laboratory Tests - Soil

PRESSURE PERMEATER - COHESIVE	
Unit Cost (in situ)	$ 165.00
Unit Cost (remolded)	190.00
PLASTICITY INDEX (ATTERBERG LIMITS)	
Unit Cost	31.00
Wet Preparation P.I.	100.00
PINHOLE TEST	70.00
R-VALUE	155.00
RELATIVE DENSITY (ASTM D2049)	140.00
RESISTIVITY & pH (LABORATORY-AHD 707 PARTS 3 & 4)	
Unit Cost (pH)	15.00
Unit Cost (laboratory min. resistivity)	50.00
SAMPLE PREPARATION	30.00/hour
SAMPLE TUBE CUTTING (charges vary depending on type and purpose)	max. 55.00/tube
SIEVE ANALYSIS	
Fine Sieve Analysis including Elutriation	30.00
Total Sieve Analysis, Coarse & Fine	45.00
-#200 Fraction Only	17.00
SPECIFIC GRAVITY OF SOILS	40.00
SPECIMEN TRIMMING	30.00/hour
UNCONFINED COMPRESSION	
Core Sample	30.00
Molded Sample	40.00

SERGENT, HAUSKINS & BECKWITH
CONSULTING GEOTECHNICAL ENGINEERS
PHOENIX • TUCSON • ALBUQUERQUE • SANTA FE • SALT LAKE CITY • EL PASO

LABORATORY ENGINEERING DEPARTMENT

Unit Cost Laboratory Tests - Aggregate

ALKALI REACTIVITY (including sample preparation)- -	$ 250.00
CALIFORNIA BEARING RATIO (CBR) (Complete including M-D Curve)	
3 Point Method - 95 Percent Complete - - - - -	350.00
1 Point Method - 100 Percent Complete - - - - -	175.00
CRUSHING (1 hour minimum) - - - - - - - - - - - - - -	35.00/hour
CLAY LUMPS - FRIABLE PARTICLES- - - - - - - - - - - -	85.00
DURABILITY OF AGGREGATE WITH ETHYLENE GLYCOL- - - -	75.00
FLAT & ELONGATED PARTICLES, per screen- - - - - - -	17.50
FRACTURE FACE COUNT, per screen - - - - - - - - - - -	18.00
FREEZE-THAW (AASHTO T103) - - - - - - - - - - - - - -	165.00
LOS ANGELES ABRASION	
500 or 100 Revolutions- - - - - - - - - - - - - - -	85.00
500 and 100 Revolutions - - - - - - - - - - - - - -	100.00
ORGANIC IMPURITIES- - - - - - - - - - - - - - - - - -	30.00
POINT LOAD INDEX- - - - - - - - - - - - - - - - - - -	8.00
PULVERIZATION (1 hour minimum)- - - - - - - - - - - -	40.00
ROCK HAMMER (4 trials)- - - - - - - - - - - - - - - -	5.00
SAMPLE PREPARATION- - - - - - - - - - - - - - - - - -	30.00/hour
SAND EQUIVALENT (average of 3 trials) - - - - - - - -	35.00

SERGENT, HAUSKINS & BECKWITH
CONSULTING GEOTECHNICAL ENGINEERS
PHOENIX • TUCSON • ALBUQUERQUE • SANTA FE • SALT LAKE CITY • EL PASO

LABORATORY ENGINEERING DEPARTMENT

Unit Cost Laboratory Tests - Aggregate

SIEVE ANALYSIS	
Fine Sieve Analysis including Elutriation - - - -	$ 35.00
Total Sieve Analysis, Coarse & Fine - - - - - - - -	45.00
-#200 Fraction Only - - - - - - - - - - - - - - - -	17.00
SLAKE DURABILITY- - - - - - - - - - - - - - - - - - -	75.00
SODIUM SULFATE SOUNDNESS	
Unit Cost (coarse aggregate) Complete - - - - - - -	120.00
Unit Cost (fine fraction) Complete- - - - - - - - -	125.00
SPECIFIC GRAVITY & ABSORPTION	
Unit Cost (coarse aggregate)- - - - - - - - - - - -	27.50
Unit Cost (fine aggregate)- - - - - - - - - - - - -	40.00
UNIT WEIGHT OF AGGREGATES	
Unit Cost (loose) - - - - - - - - - - - - - - - - -	35.00
Unit Cost (dry rodded)- - - - - - - - - - - - - - -	40.00

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LABORATORY ENGINEERING DEPARTMENT

Unit Cost Laboratory Tests - Concrete

CYLINDER MOLDS, PLASTIC	
Per Cylinder (6"x12" Mold)	$ 1.30
Per Case (6"x12" Mold)	31.20
Per Cylinder (4"x8" Mold)	1.10
Per Case (4"x8" Mold)	44.00
COMPRESSION TESTS (CURING & CAPPING)	
Concrete Cylinder, Grout Prisms, Mortar Cubes	7.00
Hold Cylinders, Not Tested (30 Days +)	7.00
Flexural Beams	12.00
Concrete Cores	12.00
CONCRETE CORING (Min. 2 hours) Includes Equipment	
Rental & Diamond Wear	45.00/hour
CORE TRIMMING, per cut	
2 3/4" diameter	4.00/min.
4" diameter	5.00/min.
5" diameter	7.00/min.
6" diameter	10.00/min.

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LABORATORY ENGINEERING DEPARTMENT

Unit Cost Laboratory Tests - Asphaltic Concrete

BULK DENSITY (SPECIFIC GRAVITY)		
Compacted Bituminous Specimen (ASTM D2726)		
Unit Cost (remolded)- - - - - - - - - - - - - - - - -		$ 25.00
Unit Cost (core)- - - - - - - - - - - - - - - - - - -		15.00
Paraffin Coated Bituminous Specimen (ASTM D1188)		
Unit Cost (remolded)- - - - - - - - - - - - - - - - -		30.00
Unit Cost (core)- - - - - - - - - - - - - - - - - - -		17.50
COATING & STRIPPING OF BITUMINOUS-AGGREGATE MIXTURES		
Unit Cost (ASTM D1664) Strip Test - - - - - - - - -		35.00
EXTRACTION & GRADATION OF BITUMINOUS MIXTURES - - -		80.00
WITH XYLENE MOISTURE- - - - - - - - - - - - - - - -	add	25.00
Total Unit Cost - - - - - - - - - - - - - - - - - - -		105.00
SAMPLE PREPARATION- - - - - - - - - - - - - - - - - -		30.00/hour
UNIT WEIGHT, STABILITY & FLOW - - - - - - - - - - - -		40.00

LABORATORY ENGINEERING DEPARTMENT

Materials Design Reports

ASPHALTIC CONCRETE MIX DESIGN
Marshall ASTM D1559, Estimated $650.00 to $950.00 range.

Based on professional engineer and laboratory technician hourly rates and number of unit laboratory tests performed.

RETAINED STABILITY OF BITUMINOUS MIXTURE
Analysis generally performed in conjunction with AC Mix Design, wet to dry analysis at $250.00. Additional evaluation of additives, Estimated $85.00 to $250.00 range based on one to three additive evaluations.

CEMENT-LIME-EMULSION STABILIZATION DESIGNS
Based on professional engineer and laboratory technician hourly rates and overall extent of evaluation required, Estimated $450.00 to $550.00 range.

CONCRETE MIX DESIGN
Based on professional engineer and laboratory technician hourly rates and overall extent of evaluation required, Estimated $500.00 to $650.00 range.

TRIAXIAL THREE POINT ENVELOPE
Based on professional engineer and laboratory technician hourly rates and overall extent of type of test required. Estimated $375.00 per point and Estimated $1,100.00 per envelope for consolidated-undrained with pore pressure measurement.

LABORATORY ENGINEERING DEPARTMENT

Structural & NDE Inspection
Metalogic

Visual Inspector- - - - - - - - - - - - - - - - - - - -	$ 35.00/hour
Bolt Torque Inspector - - - - - - - - - - - - - - - - -	35.00/hour
Ultrasonic Inspector Level II - - - - - - - - - - - - -	38.00/hour
Fire Insulation Inspector - - - - - - - - - - - - - - -	35.00/hour
AWS Certified Welding Inspector - - - - - - - - - - - -	40.00/hour
Assistant Inspector - - - - - - - - - - - - - - - - - -	18.00/hour
Film & Supplies -	Cost plus 15 %

Work/travel/standby performed by Metalogic are all billed at the same hourly rate. Minimum callout 4 hours locally, 8 hours on overnight projects.

APPENDIX B

Lawrence A. Hansen, Ph.D., P.E.
Vice President
Sergent, Hauskins & Beckwith
Geotechnical Engineers, Inc.

Dr. Hansen received his B.S. degree in Civil Engineering in 1974 and his M.S. degree in 1975 from Oregon State University. In 1980, he received his Ph.D. from Stanford University. He is a registered Civil Engineer in the states of California and Arizona, and is a member of the American Society of Civil Engineers (ASCE), the International Society of Soil Mechanics and Foundation Engineering, and the American Society for Testing of Materials (ASTM). Dr. Hansen is a member of the ASCE Geotechnical Division Earth Retaining Structures Committee, and ASTM Subcommittees D18.11 on Deep Foundations, D18.20 on Impermeable Barriers, and D34.05 on Evaluation of Liner Materials.

Dr. Hansen joined the faculty of Arizona State University (ASU) as an Assistant Professor of Engineering in January, 1979. While at ASU, he conducted research on the attenuation of mine tailings contaminants by soils, the shear strength of overconsolidated clay soils, and the performance of excavation support systems. He also was a consultant on projects assessing potential contamination at two waste disposal sites. He left ASU in June, 1983 to assume his present position at Sergent, Hauskins & Beckwith (SHB).

Prior to joining SHB, Dr. Hansen was a consultant to the firm in the design of several major mine tailings impoundments and water retention dams. These included the Jerritt Canyon and Cortez Gold projects in Nevada; the Silver Bell, Miami No. 2, and Gold Gulch No. 2 structures in Arizona; the Golden Sunlight project in Montana; and three Soil Conservation Service (SCS) dams and the Church Rock tailings dam in New Mexico. He has performed numerous stability, settlement, and seepage analyses for these and other structures.

Since joining SHB, Dr. Hansen has directed the design effort for Schoens Dam in Arizona, the heap leach pad for the Mesquite project in California, and the McCabe-Gladstone tailings facility in Arizona. He has directed SHB's design efforts for tailings impoundments for the Colosseum project in California, the Getchell Mine project in Nevada, and the Hog Heaven project in Montana. He has continued his work on excavation support systems, including both design and design review of large tied-back walls in Salt Lake City, Phoenix, El Paso, and Albuquerque. Dr. Hansen recently completed a study of the long-term effects of subsidence on the sanitary sewer system located in a 20 square mile section of northeast Phoenix.

Lawrence A. Hansen, Ph.D., P.E. (Cont'd.)

Journal Articles and Conference Publications

"Restoration of McMicken Dam - Repairing the Effects of Ground Subsidence and Protection Against Earth Fissuring," Proceedings, The Second Arizona Symposium on Subsidence, Arizona Consulting Engineers Association, October, 1983, Phoenix, Arizona. (R. E. Weeks and L. A. Hansen)

"Discussion: Ground Movements Caused by Braced Excavations," Journal of the Geotechnical Engineering Division, ASCE, Vol. 109, No. 3, March, 1983, pp. 485-487.

"Finite Element Analyses of the Behavior of the Willow Island Cofferdam," Proceedings, Fourth International Conference on Numerical Methods in Geomechanics, Edmonton, Alberta, Canada, June, 1982, Vol. 2, pp. 899-906. (L. A. Hansen and G. W. Clough)

"Evaluation of On-Site Soil for Use as an Impoundment Liner," Symposium on Testing of Hazardous and Industrial Solid Wastes, Lake Buena Vista, Florida, January, 1982, ASTM STP No. 805. (L. A. Hansen, R. E. Weeks and R. K. Shrestha)

"The Significance of Clay Anisotropy in Finite Element Analyses of Supported Excavation," Proceedings, Symposium on Implementation of Computer Procedures and Stress-Strain Laws in Geotechnical Engineering, Chicago, Illinois, August, 1981, pp. 73-92. (L. A. Hansen and G. W. Clough)

"Clay Anisotropy and Braced Wall Behavior," Journal of the Geotechnical Engineering Division, ASCE, Vol. 107, No. GT7, July, 1981, pp. 893-913. (G. W. Clough and L. A. Hansen)

"Calcareous Soils of the Southwestern United States," Symposium on Geotechnical Properties, Behavior and Performance of Calcareous Soils, Ft. Lauderdale, Florida, January, 1982, ASTM STP No. 777, pp. 16-35. (G. H. Beckwith and L. A. Hansen)

"Characterization of the Undrained Anisotropy of Clays," Proceedings, Symposium on Limit Equilibrium, Plasticity and Generalized Stress Strain Applications in Geotechnical Engineering, ASCE, Hollywood, Florida, October, 1980, pp. 253-273. (L. A. Hansen and G. W. Clough)

"Prediction of Supported Excavation Movements Under Marginal Stability Conditions in Clay," Proceedings, State of the Art Volume, Third International Conference on Numerical Methods in Geomechanics, Aachen, Germany, April, 1979, pp. 1485-1502. (G. W. Clough, L. A. Hansen and A. I. Mana)

Lawrence A. Hansen, Ph.D., P.E. (Cont'd.)

"Penetration Resistance for Driven Piling," Journal of the Construction Division, ASCE, Vol. 103, No. C03, September, 1977, pp. 513-528. (L. A. Hansen and W. L. Schroeder)

"Performance of Thin Metal Retaining Wall with Multiple Anchorage," Transportation Research Record No. 616, Transportation Research Board, 1976, pp. 56-61. (W. L. Schroeder, J. C. Schwarzhoff and L. A. Hansen)

Lawrence A. Hansen, Ph.D., P.E. (Cont'd.)

Selected Research and Consulting Reports

"An Evaluation of Metal Contamination by a Waste Treatment Sump at Digital Equipment Corporation, Phoenix, Arizona," prepared for Henningson, Durham and Richardson, Omaha, Nebraska, March, 1983. (T. E. Higgins and L. A. Hansen)

"An Evaluation of Metal Contamination Waste Lagoon Site," prepared for Motorola, Inc., Government Electronics Division, Scottsdale, Arizona, February, 1981. (T. E. Higgins and L. A. Hansen)

"Cause of Breach of the Church Rock Tailings Dam, Church Rock, New Mexico," testimony presented to the Committee on Interior and Insular Affairs, U.S. House of Representatives, Washington, D.C., October, 1979.

"Geotechnical Investigation: Phase I: The Design of Market Street Subway Muni Track Extension and Turnaround Facilities, Easterly of Embarcadero Station, San Francisco, California," Woodward-Clyde Consultants, September, 1978. (Co-Author of "Appendix C: Finite Element Studies" with G. W. Clough)

"Finite Element Study of the Willow Island Cofferdam, Ohio River, Parkersburg, West Virginia," consulting report submitted to the Huntington District, U.S. Army Corps of Engineers, Huntington, West Virginia, April, 1977. (G. W. Clough and L. A. Hansen)

"Instrumentation of a Tied-Back Wall on Mary's Peak Road, Sinslaw National Forest," research report prepared for U.S. Department of Agriculture, Forest Service, by Oregon State University, July, 1975. (W. L. Schroeder and L. A. Hansen)

"Driving Estimates for Pile Contract Bids," research report prepared for AGC Education and Research Foundation by Oregon State University, April, 1975. (W. L. Schroeder and L. A. Hansen)

Lawrence A. Hansen, Ph.D., P.E. (Cont'd.)

Technical Presentations

"Excavation Support Systems for Desert Alluvial Soils," presentation to Engineering Department, City of Phoenix, December, 1985.

"Excavation Support Systems for Desert Alluvial Soils," presentation at the Fall Meeting, Arizona Section, ASCE, Phoenix, Arizona, October, 1985.

"Design and Analysis of Excavation Support Systems," presentation to Structural Engineers Association of Utah, Salt Lake City, Utah, January, 1985.

"Parameter Selection for Design of Foundations on Desert Soils," presentation at the Fall Geotechnical Seminar, New Mexico Section, ASCE, October, 1984, Albuquerque, New Mexico.

"Geotechnical Considerations for Foundation Selection," presentation to the Albuquerque Chapter, ASCE, July, 1984, Albuquerque, New Mexico.

"Investigation of Collapsing Soils at Montesa Park, New Mexico," presentation at the Spring Meeting, New Mexico Section, ASCE, Albuquerque, New Mexico, March, 1984.

"Analysis and Repair of McMicken Dam Cracking," paper presented at the technical session on Effects of Faulting and Subsidence on Construction, ASCE National Convention, Houston, Texas, October, 1983. (L. A. Hansen, R. E. Weeks and G. H. Beckwith)

"Design Charts for Simplified Analysis of Laterally Loaded Piers," paper presentation to the Central Chapter, Structural Engineers Association of Arizona, Phoenix, Arizona, November, 1982.

David E. Peterson, P.G.
Senior Geologist
Sergent, Hauskins & Beckwith
Geotechnical Engineers, Inc.

Mr. Peterson received his B.S. degree in geology from Arizona State University in 1978, and participated in advanced field studies sponsored by the University of Nevada. Mr. Peterson is a registered geologist in the State of Arizona.

Since joining the firm in 1979, Mr. Peterson has acquired experience in the supervision of geotechnical and hydrogeologic field investigations, compilation and research of geologic literature and data, and preparation of report input for site characterization. Field functions have included logging and sampling of soil/rock formations by multiple borehole methods, pump and infiltration testing for hydrogeologic determinations, geologic mapping, application of seismic refraction and resistivity geophysical methods, water quality sampling, aggregate and riprap source evaluations, slope stability assessment in rock slopes and foundation inspection of dams during construction.

During his association with SHB, Mr. Peterson has had the opportunity to be involved in projects in Arizona, Montana, Nevada, Idaho, New Mexico, California and Utah. These projects have included site selection and geotechnical evaluations for millsites, tailings disposal and coal ash facilities, power plants, power lines, industrial buildings and bridges, and studies in aggregate quality and rock rippability. The following list enumerates several significant projects:

Supervision of field program, mapping and
hydrologic testing for tailings disposal site.
Golden Sunlight Project
Jefferson County, Nevada

Rock aggregate suitability and
quality control evaluations.
Central Arizona Project
Yuma County, Arizona

Supervision of field program and geologic
mapping for tailings disposal dam.
Jerritt Canyon Project
Elko County, Nevada

Supervision of geotechnical field
program for coal ash disposal system.
Springerville Power Plant
Apache County, Arizona

Supervision of field program, geologic
mapping and hydrologic testing for
effluent disposal facilities.
Twin Lakes Project
Snowflake, Arizona

David E. Peterson, P.G. (Cont'd.)

Supervision of field program, geologic mapping and hydrologic testing for tailings disposal facilities.
Gold Quarry Project and Maggie Creek Project
Carlin, Nevada

Geotechnical evaluations.
Power Plant Site Selection and Evaluation Project
Arizona and California

Supervision of field program, geologic mapping for new facilities.
Emery Mine
Consolidation Coal Company
Emery County, Utah

Supervision of field program and geologic mapping for tailings disposal facilities.
Pinos Altos Project
Pinos Altos, New Mexico

Supervision of field program, geologic mapping and hydrologic testing for tailings disposal facility.
Colosseum Project
San Bernardino County, California

Geotechnical evaluations.
Santa Fe to Los Alamos Corridor Study
Santa Fe, New Mexico

Geotechnical evaluations, geologic mapping for water storage facility.
Grindstone Canyon Dam Project
Ruidoso, New Mexico

Supervision of field program, geologic mapping of dam foundation area, slope stability assessments and pressure grouting during construction of flood control dam.
Schoens Dam Project
Navajo County, Arizona

David E. Peterson, P.G. (Cont'd.)

Supervision of field program, geologic mapping and geologic hazard evaluations for hotel complex.
Phoenician Hotel Project
Phoenix, Arizona

Supervision of field program, geologic mapping, slope stability assessment and pressure grouting during construction of B & B solution retention structure.
Inspiration Consolidated Copper Co.
Gila County, Arizona

Supervision of field program, geologic mapping for tailings dam site selection.
Getchell Mine Project
Humboldt County, Nevada

Geotechnical evaluation, geologic mapping and slope stability evaluation of landslides.
Four Corners - Mohave 500KV Line
Apache County, Arizona

Supervision of field program, geologic mapping and hydrologic testing for tailings disposal facility.
Hog Heaven Project
Flathead County, Montana

James R. Fahy, P.E.
Project Engineer
Sergent, Hauskins & Beckwith
Geotechnical Engineers, Inc.

Mr. Fahy received his B.S. degree in Geological Engineering from Arizona State University in 1981, followed by graduate studies in which he received an M.S.E. degree in Civil Engineering in 1983. He is a registered Civil Engineer in the state of Arizona.

Since joining the firm in 1983, Mr. Fahy has been involved in projects covering a wide range of geotechnical investigations and design. He has been project engineer for projects involving mining developments, and residential, industrial, commercial and transportation construction. He has performed the engineering analysis and design on tailings dams, leach facilities, and millsite foundations for a number of mining developments. He performed the vertical and lateral analysis of pier group foundations for the proposed Papago Inner Loop Ramp Structures. Mr. Fahy was project engineer on a recently completed study for Salt River Project's proposed 230KV Transmission Line from the Pinnacle Peak to Papago Buttes Receiving Station.

Some of the more significant projects Mr. Fahy has been involved with are as follows:

Preliminary Design Study for Tailings Dam
Getchel Mine - FRM Minerals
Humboldt County, Nevada

Geotechnical Design
I-10 West Papago/Inner Loop
Ramp Structures
T.Y. Lin International
Phoenix, Arizona

Geotechnical Design of Dump Leach Pile
& Related Facilities
Newmont Services Limited - Gold Quarry Project
Eureka County, Nevada

Geotechnical Engineering Services
for Design & Construction of Heap Leach Facilities
Gold Fields Operating Co. - Mesquite Project
Imperial County, California

James R. Fahy, P.E.
Project Engineer
Sergent, Hauskins & Beckwith
Geotechnical Engineers, Inc.

Geotechnical Investigation
Camelback Esplanade
The Symington Company
Phoenix, Arizona

Geotechnical Investigation - Pinnacle Peak to
Papago Buttes 230KV Transmission Line
Salt River Project
Maricopa County, Arizona

Publications

Deatherage, J.D., Fahy, J.R. and Hansen, L.A., "Shear Testing of Geomembrane Soil Interfaces," Symposium on Geotechnical Aspects of Heap Leach Design, 1987 SME, Inc., Annual Meeting, Denver, Colorado (in publication).

Duffy, D.M. and Fahy, J.R., 1983, "Slope Stability Evaluation Procedures," report prepared for the Arizona Transportation Research Center, Phoenix, Arizona, August.

Fahy, J.R., 1983, "An Investigation of Rockfalls on Selected Rock Cuts in North Central and South Central Arizona," Unpublished Masters Thesis, Arizona State University, Tempe, Arizona.

Philip T. LaHue
Construction Management Consultant
Sergent, Hauskins & Beckwith
Geotechnical Engineers, Inc.

Mr. LaHue received his B.S. degree in Civil Engineering from Purdue University in 1962. Following his graduation, Mr. LaHue has maintained a steady level of professional growth with several contracting firms, including responsibility for construction management and administration of many major projects.

Work Experience

(1983-1985)
Ed Logan Contracting Company, Mesa, Arizona
Employed as estimator and construction manager. The company is a general contracting firm involved in heavy and highway construction with particular interest in structural and foundation work. Piling and drilled foundations accounted for a considerable part of the company's work. Appointed Vice President of engineering in 1984.

(1982-1983)
Self employed as construction estimating consultant. Prepared estimates (for formal bids) on projects ranging from $300,000.00 to $7,000,000.00 in New Mexico, Arizona and California.

(1978-1982)
D.C. Speer Construction Co., Phoenix, Arizona
Hired as Chief Estimator in February, 1978. The company is basically a crushing and paving contractor with equipment on hand to provide a turn key capability on highway projects to the $6 million range. Functioned as Chief Estimator until September, 1980 (annual volume $20 million range) with three man estimating crew. September, 1980, assigned to contact private industry (utilities, mines, etc.) to develop this market. In February, 1981, the company obtained its first project in New Mexico and he acted as Project Manager. This was a $4 million highway project at Las Cruces.

(1966-1978)
Fisher Contracting Co., Phoenix, Arizona
1966-1967 - Field Office Manager - Highway Project
1967-1968 - Grade Foreman - Highway Project
1968 - Crusher Foreman - Highway Project
1968-1969 - Estimator-Heavy and Highway and Industrial Construction
1969 - Manager Industrial Construction Division
1970 - Vice President - Industrial Construction Division
1975 - Appointed to Board of Directors

During the period from 1969 to 1978, it was Mr. LaHue's responsibility to bid and negotiate industrial work and to administer the accomplishment of that work.

Philip T. LaHue
Construction Management Consultant
Sergent, Hauskins & Beckwith
Geotechnical Engineers, Inc.

(1965-1966)
Philippine Rock Products, Inc., Manila, The Philippines
Project Manager for Cubi Point Naval Air Station, Subic Bay, P.I. Project included various grading and paving projects including taxiway, cargo apron and ammunition storage bunkers.

(1964-1965)
Kaizer Engineers, Oakland, California
Assistant Project Engineer for Cement Plant Expansion for Foreman Cement Co. at Foreman, Arkansas. Included addition to gas fired power plant, new 15' x 500' kiln, addition of two ball mills, added slurry facilities and finish cement silos (four barrels 40' diameter x 200' high). Project cost was $20,000,000.

(1963-1964)
Royal Engineering Co., Phoenix, Arizona
Project Engineer on 21-story apartment structure, (reinforced concrete construction) through top-out of structural work.
Project Superintendent - Four-plex housing units.
Project Superintendent - Branch Bank ($120,000).
Project Superintendent - Office Building, (Arizona Sand and Rock Co.) 10,000 square feet.

(1962-1963)
Fisher Contracting Co., Phoenix, Arizona
Industrial Design Group, assigned to U.S. Rubber Co., Five-Mile High Speed Test Track at Laredo, Texas. Worked as surveying party chief from initial layout through completion of track surface courses. Labor Foreman on off-track facilities through completion of project.

PHASE I

A. Review existing information; review/obtain geologic & hydrologic information

B. Geologic reconnaissance of the site & site visit; obtain clay samples from local commercial source — SAmple in hand

C. Contact ADHs & discuss project

D. Field investigation: test pits in diversion channel & existing tailings area

E. Laboratory testing

F. Hydrology & hydraulic analyses

G. Report preparation

PHASE II

A. Field investigation : test borings, test pits and permeability testing

B. Laboratory testing

C. Additional contact with ADHS

* D. Engineering analyses : hydrology, pad and pond design, develop recommendations for monitoring well (if required).

E. Report preparation

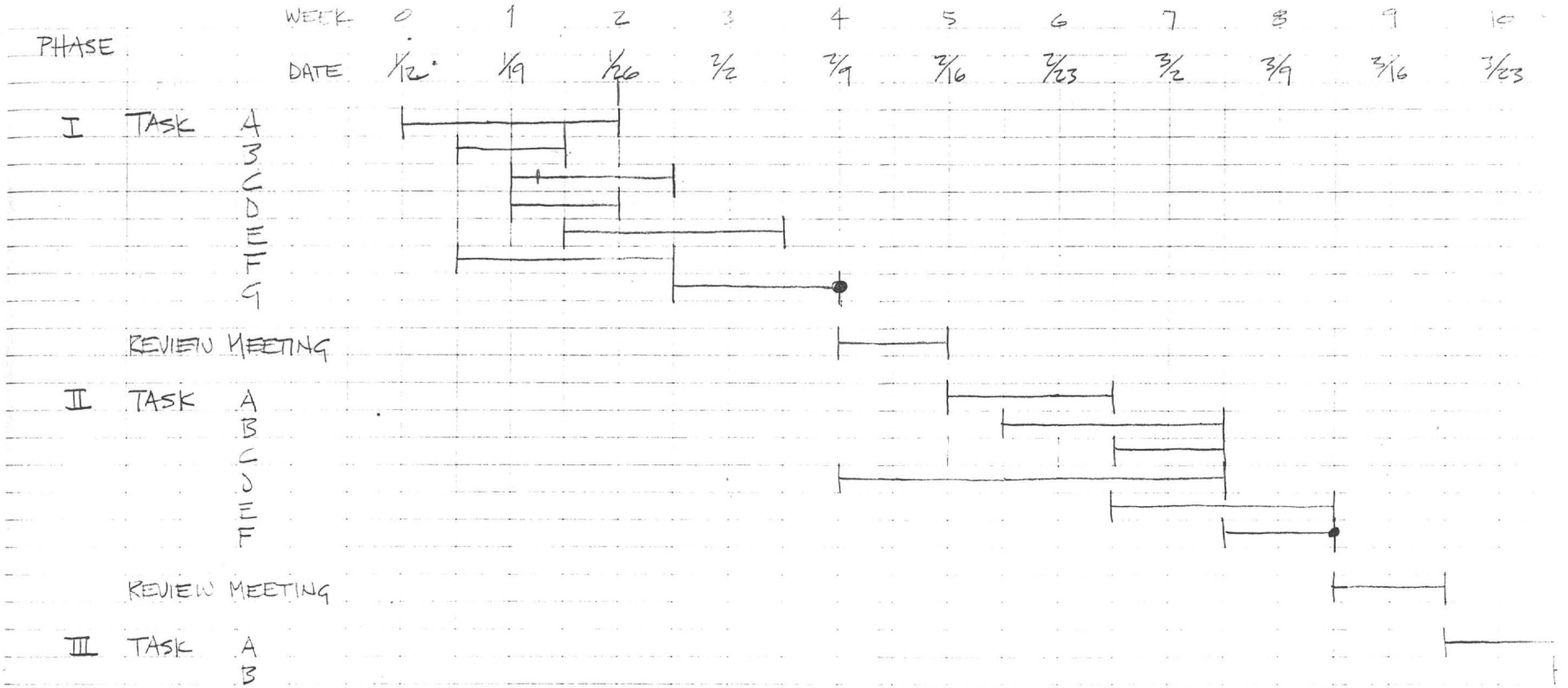
F. ADHS NOD filing

* is design of septic / leach field system required ? have not included costs in our proposal

PHASE III

A. Preparation of plans & specifications

B. Development of cost estimate



● REPORT OR OTHER DELIVERABLE

Notes and Comments on SHB Work 12-18-86

1-Need to establish start date. At completion of Met. tests. About Jan. 12-19.

2-Must establish schedule by Phase of SHB work and design.

3-Develope permitting schedule with SHB input.

4-Establish scheduled periodic (weekly?) reveiw and update with SHB with minimum paper generated. In other words, face to face meetings with memos for most important points only.

5-Periodic reveiws to address:

a) work progress and direction

b) discussion of results and design considerations

c) permitting progress

d) SHB charges relative to budget

6-Determine early if maps on hand provide adequate detail for SHB to complete work. If not new maps may be prepared from film on hand.

8-Need to have input from SHB in determining required contractor qualifications for heap and drainage construction.

9-Devise system of tracking SHB charges to enable cost control.

10-Frank Millsaps must be involved in heap design and location.

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Prefer billing by stages

A. F. Budge (Mining) Limited
7340 E. Shoeman Lane, Suite 111 "B" (E)
Scottsdale, AZ 85251-3335
(Business Office)
Telephone: (602) 945-4630
Telex: 751739

January 9, 1987

Sergent, Hauskins & Beckwith
3232 W. Virginia
Phoenix, AZ 85009

Attention: Lawrence A. Hansen, Ph.D., P.E.
Vice President

Re: SHB Proposal No. 86-12-10

Gentlemen:

This letter will serve as authorization for Sergent, Hauskins and Beckwith (SHB) to provide geotechnical and hydrological engineering services to A.F. Budge (Mining) Limited.

These services will be limited to those outlined in SHB Proposal No. 86-12-10 and Addendum No. 1 and shall incorporate such modifications as needed and directed by A.F. Budge (Mining) Limited.

It is understood that work will commence on January 12, 1987 and will be completed, barring any unforeseen circumstances, on or about April 1, 1987.

We look forward to working with SHB on this project.

Very truly yours,

A.J. Fernandez
Senior Mining Engineer

AJF:ca

DIRECTORS: A.F. Budge, O.B.E., C.Eng., F.I.C.E., F.I.H.T.; Mrs. J. Budge; 7602 Clearwater Parkway, Paradise Valley, AZ 85253

Key Project Items for SHB

Phase I

1) SHB to review existing AFB information on Vulture. (geology, metallurgy, site maps, etc.)

2) Test old cyanide tailings for FREE CN, Au content STANDARD soil indexes and permeability. Will require test trenches. + other heavy metals —

3) Test stamp-mill tailings for Hg and Au using samples on hand.

4) With test results in hand, approach ADHS with idea of using old cyanide tailings as pad underlining.

5) Surface water hydrology analysis. (limited to external drainage diversion at this point)

6) Size and select diversion channel site to protect heap, plant and pit.

7) Test diversion channel site materials and pit waste(rip-rap).

8) Estimate diversion channel construction cost.

9) Select possible leach pad sites.

10) Test pits at leach pad sites.

11) Evaluate leach pad sites.

12) Submit report and recommendations to AFB.

NOTE - a, b, c can be done simultaneously

Phase II

1) Drilling in pad and pond areas.

2) Permeability test in pad and pond areas.

3) Pad and pond hydrology analysis. Water balance. Drainage diversion in immediate area of pad, ponds and pit.

4) Lab work on soil samples.

5) Seepage evaluation.

6) Determine need for monitoring well.

7) Final geotechnical and hydrological report.

8) Permit preparation.

Phase III

1) Plans and specifications.

2) Final design and permitting.

3) Cost estimate to construct.

Outline of Permit Procedures

(Vulture)

I. Arizona Department of Health Services

1. Bureau of Water Quality

Gary Ullinsky (257-2270)

Operator must file "Notice of Disposal"; 30 days for preliminary review if application is complete.

A "Letter of Intent to Issue Permit" will be sent; permit to follow in 5-6 months.

"Notice of Disposal" must contain:

(a) 15-Minute Topo map showing site location

(b) Construction plan (detailed)

(c) Containment facilities (detailed)

(d) Cyanide neutralization plan (detailed)

(e) Leak-detection plan (detailed)

2. Department of Water Resources (255-1550)

Present well was drilled in 1942 and is registered (Reg. No. 55-800940); Department will send necessary forms to update well information.

3. State Air Quality

State permit may not be needed since Maricopa County has jurisdiction. (Should submit application in any event to have a record ruling that we don't need permit.)

4. Hazardous Waste

Allen Roslen (257-2249)

Mining activity apparently exempted by law. (Should check with Inspection & Compliance Department.)

II. Arizona Commission of Agriculture and Horticulture

Larry Richards (255-4373).

Involves native plants on mine site.

Operator must give 30 days' notice by a Letter of Intent including areas where native plants are available.

This agency will inventory plants and make information available to those interested in removing protected plants.

Persons wishing to remove protected native plants will come to us with application and tags.

III. Bureau of Land Management (U.S. Government)

Fred Potter (863-9553).

If more than 5 acres per year of land will be disturbed, operator must file a generalized "Plan of Operations" at least 30 days prior to activity on BLM land.

No permit is issued as such; mining must be allowed according to Mining Law of 1872.

BLM issues a letter approving Plan of Operation which may contain stipulations. These stipulations could pertain to land disturbance and reclamation.

If BLM fails to issue Letter of Approval in 30 days, operator may go ahead per the "Plan of Operations" by default.

IV. Maricopa County Bureau of Air Pollution Control

Larry Crisafulli (258-6381).

County only requires permitting of stationary sources.

Requirments:

(a) Accurate location description

(b) Crushing plant layout, size, type, HP, etc. (need not be very specific.)

(c) General process plan

(d) Mine equipment description (generalized)

(e) Indicate location of water source

Must control dust from mobile equipment by watering roads and muck piles.

Review of above requires 1 - 2 weeks.

Installation permit follows review of plan

Notify Bureau at start-up

Inspection

Permit issued after start-up

V. State Mine Inspector

Notify in writing at start of operations.

VI. MSHA

Notify in writing at start of operations.

APPENDIX C

1. GENERAL

Sergent, Hauskins & Beckwith (SHB) specializes exclusively in geotechnical engineering and was ranked the 284th largest design firm in the United States in 1985 by Engineering News Record. The firm maintains offices and laboratories in Phoenix, Albuquerque, El Paso, Salt Lake City, Santa Fe and Tucson.

Since the formation of SHB in 1959, the firm has performed over 8,000 geotechnical investigations of the sites of various projects, including commercial, institutional, and industrial facilities, as well as work on a large number of tailings dams and other types of solid and liquid waste disposal facilities, water storage dams and flood control dams. Extensive work has also been performed on foundation design studies for coal processing plants and other types of mineral processing, smelting and refining plants.

2. SHB FIRM RESOURCES

SHB's resources which are applicable to geotechnical investigation and quality assurance services are as follows:

1. Offices located in Phoenix and Tucson, Arizona, Albuquerque and Santa Fe, New Mexico and Salt Lake City, Utah.

2. Total professional staff of 60, including 20 registered professional engineers, geologists, hydrologists and an engineering geophysicist. Total staff of approximately 180, including field and laboratory technicians, draftsmen, drill rig operators, clerical and administrative personnel.

3. An in-house subsurface exploration group equipped with six CME-55 and 75 truck-mounted drill rigs and one Mayhew 1000 drill rig with the capability of hollow stem auger drilling, diamond core drilling of rock, standard penetration, Shelby tube, Denison and Pitcher sampling of soils, and rotary drilling to 1,000 feet for hydrological investigations. The group is fully equipped to perform in-place permeability tests by open well, single packer and double packer methods, as well as steady-state pumping tests with multiple observation wells.

4. A geophysical group capable of performing vibration monitoring, seismic refraction, reflection, downhole, uphole and crosshole surveys for the determination of compression and shear wave velocities, and resistivity and gravity surveys. SHB owns two Sprengnether 3-dimensional VS-1200 Seismographs with 4-channel, 2-speed recorders. These instruments are capable of recording ground and air vibrations simultaneously. Equipment also includes a Bison Signal Enhancement Seismograph Model 1570B and a Geometrics 12-channel Signal Enhancement Recording Seismograph Model ES-1210.

5. A mobile unit for use in hydrogeological investigations with pumps, samplers, reels and water level measurement devices, etc. for the sampling of wells

and test holes for water quality surveys in accordance with U.S. Geological Survey criteria. The unit is equipped for the performance of field conductivity, pH and temperature testing which are a part of the required sampling procedures.

6. Soil mechanics and materials laboratories at the Phoenix and Albuquerque facilities capable of performing a wide range of testing, including soil classification, consolidation, expansion, direct shear, unconfined compression, triaxial shear, aggregate quality, bearing ratio and R-value testing, asphaltic concrete, Portland Cement concrete, and cement, lime and other stabilization mix designs.

7. In-house computer capabilities for geotechnical, hydrological and related applications. Computer hardware includes remote batch terminal access to Control Data Corporation facilities. Geotechnical programs include the Spencer-Wright slope stability program, the Bureau of Mines finite element seepage program, finite element deformations and earth pressures against buried structures and corresponding deformations, and mine pillar stability.

8. Groundwater programs include the U.S. Geological Survey 2 and 3-dimensional finite difference and related programs for analysis of seepage, contaminant transport, groundwater flow, effects of injection or pumping from wells, pit and mine dewatering, and similar programs. Surface hydrology programs include the latest additions of the U.S. Army Corps of Engineers HEC-1 and HEC-6 and the U.S. Soil Conservation Service TR-2 programs for analysis of runoff, reservoir flood routing, spillway capacity, dam breaks, sediment transport, and scour and deposition in rivers and reservoirs.

9. A comprehensive technical library and information center, managed by a full-time professional librarian, which we believe is the largest private facility of its type in the Southwest. Holdings include more than 500 volumes, over 2,500 technical

reports, 66 domestic and international periodicals and journals, an extensive collection of U.S. and State Geological Survey publications, aerial photographs, satellite imagery, bibliographies, abstracts and maps. The information center conducts an ongoing search and review of governmental regulations and design criteria with particular emphasis on regulations relating to dams and solid and liquid waste disposal. Comprehensive research of a particular subject is rapidly achieved by computer searches with access to over 100 on-line bibliographic data bases, including GeoRef, ReCon and Engineering Index.

10. SHB has a sophisticated word processing system to facilitate the production of our large and complex volume of engineering reports and related correspondence. The system consists of microcomputers with modems to communicate information and reports between SHB and other offices. We find it essential to maintain the above equipment and support personnel to provide efficient and reliable services to our clients.

3. PROJECT MANAGEMENT & FIELD QUALITY CONTROL

SHB performed field quality control and/or construction management or contract administration on the projects listed below. SHB also performed geotechnical investigations and dam design for these projects.

1. Golden Sunlight Project, Placer Amex Inc., Jefferson County, Montana (1982). Construction quality assurance for starter dam. Project included soil-bentonite cutoff to 60 feet in depth and extensive underdrain system including 12,000 feet of finger drains.

2. Gold Quarry Project, Carlin Gold Mining Company, Lander County, Nevada (1983-84). Construction quality control for 250-foot high zoned embankment dam for tailings storage, 60-foot high diversion dam.

3. Jerritt Canyon Project, Freeport Gold Company, Elko County, Nevada (1980-83). Contract administration and quality control of two phases of construction for a 140-foot high zoned embankment dam for tailings storage.

4. Copper Flat Project, Quintana Minerals Corporation, Sierra County, New Mexico (1982). Construction quality assurance for 60-foot starter dam for copper tailings dam. Dam, which was 5,000 feet in length, included extensive blanket drain.

5. Springer Tungsten Project, Utah International Inc., Tungsten, Nevada (1981). Construction quality assurance of tailings dam and evaporation ponds.

6. Gold Gulch Dam No. 2, Cities Service Company (Now Pinto Valley Mining Co.), Pinto Valley Project, Gila County, Arizona (1982). Contract administration and construction quality assurance of 105-foot zoned embankment dam for containment of hazardous wastes created by runoff from copper leach dumps. Included extensive foundation grouting program.

7. La Caridad Copper Project, Mexicana de Cobre, S.A., Nacazari, Sonora, Mexico (1974-77). Construction management and quality control of starter dam for 300-foot tailings dam. Work also included control of 2 million cubic yards of structural fill for mill-site.

8. Dry Fork Impoundment, Kennecott, Utah Copper Division, Salt Lake County, Utah (1984-85). Construction quality control for a project which involves constructing embankment over the face of existing mine waste rock dump and covering the face with a specially anchored, high density polyethylene membrane liner keyed to bedrock at the sides. The membrane will interconnect with a 70-foot deep slurry wall with soil-bentonite backfill.

9. Hayden Plant, ASARCO, Inc., Hayden, Arizona (1983). Construction quality assurance for embankment dam (height = 60 feet) for containment of SO_2 sludge from pollution control system of copper smelter. Project involved rubber-asphalt lining for containment of hazardous wastes.

10. Saddleback Flood Control Structure, U.S. Soil Conservation Service, Maricopa County, Arizona (1982-83). Construction management, contract administration and quality control for 6-mile long flood control dam.

11. McMicken Dam, Flood Control District of Maricopa County, Maricopa County, Arizona (1983-85). Contract administration and quality control of repairs of 9-mile long, 30-foot high flood control dam which included extensive internal drain system.

12. Bohme Ranch, Live Oak Canyon & Barney Canyon Dams, Inspiration Consolidated Copper Co., Gila County, Arizona (1983-84). Contract administration and quality control for three zoned embankment dams for water storage.

13. B & B Retention Dam, Inspiration Consolidated Copper Co., Gila County, Arizona (1984-85). Contract administration and quality control for zoned embankment

dam for copper leachate collection and storage. Projects include 40-foot deep slurry cutoff wall and extensive foundation grouting program.

14. Church Rock Uranium Project, United Nuclear Corporation, Church Rock, New Mexico (1980-83). Contract administration and quality control of repairs and additions to a zoned embankment dam for uranium tailings storage.

15. Kayenta & Black Mesa Mines, Peabody Coal Company, Navajo County, Arizona (1982-83). Quality control of three zoned embankment dams for water and sediment storage.

16. Silver Bell Project, ASARCO, Inc., Pima County, Arizona (1981). Quality control of starter dam for copper tailings dam.

17. Comstock Gold Project, Houston International Minerals Corporation & United Mines Corporation, Virginia City, Nevada (1980-82). Quality control of construction of zoned embankment dam for tailings storage.

4. EXPERIENCE WITH TAILINGS DAMS & OTHER DISPOSAL FACILITIES FOR MINING, MILLING & SMELTING WASTES

In the course of performing the work outlined below, SHB has had extensive experience with preparation of licensing, permitting and portions of environmental submittals to various Federal and State agencies, and in dealing with these agencies during the review process. Federal agencies include the Mine Safety and Health Administration, Office of Surface Mining, Environmental Protection Agency Nuclear Regulatory Commission, Forest Service and Bureau of Land Management. SHB has dealt with State agencies in California, Colorado, Montana, Idaho, Oregon, Wyoming, Utah, Nevada, Arizona, New Mexico and Texas.

Specialized studies and analysis performed in the course of this work include:

1. Seepage and solute transport analysis by computer models.
2. Design and installation of monitoring and instrumentation systems.
3. Seismic hazard analysis, determination of earthquake design parameters and dynamic stability analysis by permanent deformation techniques. A detailed summary of experience in this area is given in Section 5.
4. Design of linings and slurry walls.
5. Design of covers and riprap to prevent or minimize erosion, leachate generation and emanation of radon gas.

6. Studies of geomorphology and river mechanics to evaluate the possibility of long-term geologic processes affecting the facilities after reclamation.

7. Laboratory studies of contaminant attenuation mechanisms and the effect of the chemistry of the fluids on the hydraulic conductivity of soils.

SHB has acquired extensive experience in site selection studies and design of waste containment dams and basins.

1. Golden Sunlight Project, Placer Amex Inc., Jefferson County, Montana (1979-82). Preliminary and final investigations, design and construction quality assurance for 240-foot high tailings dam for 5,000 TPD gold mill. Project included soil-bentonite cutoff to 60 feet in depth and extensive underdrain system.

2. Black Pine Mine, Inspiration Mines, Inc., Granite County, Montana (1981). Geotechnical and hydrological investigations and design of a 70-foot high tailings dam for a silver mill.

3. Uranium Mill Tailings Reclamation Project, U.S. Department of Energy (1982-83). SHB in collaboration with Jacobs Engineering Group Inc. and Roy F. Weston, Inc. is performing preliminary design studies for the U.S. Department of Energy under the UMTRA (Uranium Mill Tailings Remedial Action) Program. SHB is responsible for the geotechnical and hydrological elements of the work. This work involves formulating preliminary designs for reclamation of uranium mill tailings disposal sites at 22 sites located in the western United States and in Pennsylvania. Work includes seepage and contaminant transport analysis by computer modeling, development of seepage mitigation measures, analysis of covers for attenuation of radon gas emissions, development of earthquake design parameters, static and dynamic stability analysis, evaluation of site geomorphology and erosion potential and preliminary design of riprap, diversion channels and other

erosion control elements. Sites for which work is either complete or for which a substantial part of the studies have been accomplished are as follows:

Vitro Site, Salt Lake City, Utah
Clive Site, Salt Lake County, Utah
Canonsburg, Pennsylvania
Durango, Colorado
Gunnison, Colorado
Shiprock, New Mexico
Riverton, Wyoming
Lakeview, Oregon
Mexican Hat, Utah
Tuba City, Arizona
Monument Valley, Arizona

4. Round Mountain Project, Copper Range Company, Nye County, Nevada (1982). Geotechnical and hydrological investigations and preliminary design of tailings dam for 25,000 TPD gold milling operation involving cyanide processes.

5. Gold Quarry Project, Carlin Gold Mining Company, Lander County, Nevada (1981-82). Geotechnical and hydrological investigations and preliminary design of tailings dam for 5,000 TPD gold mill involving cyanide processes. Included preliminary design of a major diversion dam.

6. Jerritt Canyon Project, Freeport Gold Company, Elko County, Nevada (1978-83). Site selection study, preliminary and final design and construction quality assurance for the disposal of 17 million tons of tailings and liquid waste from a gold mill involving cyanide processes. Work included detailed evaluation of seismic hazard, coordination with environmental assessments, and design of 140-foot high zoned embankment dam.

7. Cortez Gold Project, Placer Amex Inc., Eureka County, Nevada (1981). Design of expansion of tailings dam for gold mill involving cyanide processes. Geohydrological evaluation of existing cyanide contamination of the groundwater system.

Investigation included the installation of 14 monitoring wells, water quality sampling and testing, and three-dimensional computer modeling of groundwater system to predict effects of future seepage and development of alternative remedial measures for seepage control.

8. Comstock Gold Project, Houston International Minerals Corporation, Virginia City, Nevada (1978). Geotechnical and hydrological investigations, design and construction quality assurance for tailings dam for a gold mill involving cyanide processes (height = 70 feet).

9. McCabe-Gladstone Project, Jerome Mining Corp., Yavapai County, Arizona (1982). Site selection study and preliminary design of tailings dam for a 250 TPD silver mill involving a cyanide process (height = 50 to 80 feet for sites evaluated).

10. Copper Flat Project, Quintana Minerals Corporation, Sierra County, New Mexico (1976-82). Preliminary and final design and construction quality assurance for copper tailings dam for 18 million tons of storage (height = 240 feet; length = 5,000 feet). Investigations included a hydrological study and preparation of application for a discharge permit.

11. Springer Tungsten Project, Utah International Inc., Tungsten, Nevada, (1980-81). Geotechnical and hydrological investigations and design and construction quality assurance of tailings dam and evaporation ponds for a tungsten mill.

12. Gold Gulch Dam No. 2, Cities Service Company (Now Pinto Valley Mining Co.), Pinto Valley Project, Gila County, Arizona (1980-82). Site selection study, geotechnical and hydrological investigations, design and construction quality assurance of 105-foot zoned embankment dam for containment of hazardous wastes created by runoff from copper leach dumps.

13. Schafter Plant, Gold Fields Mining Corp., Shafter, Texas (1981-82). Geotechnical investigations and

embankment design for three dams (height = 10 to 35 feet) for containment of sediments and surface run-off from a "dry" tailings disposal area for a gold mill involving a belt filtration process.

14. La Caridad Copper Project, Mexicana de Cobre, S.A., Nacazari, Sonora, Mexico (1974-77). Site selection study, geotechnical and hydrological investigations and preliminary design of a tailings dam for 90,000 TPD copper mill. Included final design of first phase of disposal system.

15. Ambrosia Lake Uranium Project, Kerr-McGee Nuclear Corporation, Ambrosia Lake, New Mexico (1974-83). Geotechnical investigations to evaluate stability of existing uranium tailings dam for 8,000 TPD mill. Hydrological studies, design of channelization to protect existing dam, design and development of operating plan to raise dam. SHB is acting as engineer of record for this project pursuant to New Mexico Environmental Improvement Agency requirements and is required to periodically review results of instrumentation system and perform stability analysis.

16. Miami Tailings Dam No. 2, Cities Service Company (Now Pinto Valley Mining Co.), Miami, Arizona (1980). Geotechnical investigation and analysis of stability of existing copper tailings dam (height = 240 feet). Included development of earthquake design parameters and analysis of liquefaction and dynamic stability.

17. Aurora Joint Venture Uranium Project, Placer Amex Inc., Humboldt County, Nevada & Malheur County, Oregon (1978-82). Site selection study involving the evaluation of 12 sites for the disposal of 23 million tons of uranium mill tailings. Work included detailed geotechnical and hydrological investigations, preliminary design, computer modeling of aquifer systems and special laboratory studies of permeability and contaminant attenuation of clay liners.

18. Silver Bell Project, ASARCO, Inc., Pima County, Arizona (1980-81). Geotechnical investigation and

analysis of stability of existing copper tailings dam (height = 220 feet). Included development of earthquake design parameters and liquefaction and dynamic stability analysis. Geotechnical investigation and construction quality assurance of new dam (height = 200 feet).

19. Church Rock Uranium Project, United Nuclear Corporation, Church Rock, New Mexico (1979-83). Investigation of failure of uranium tailings dam, detailed geotechnical and hydrological investigations and design of repairs and additions to dam and construction quality assurance (height = 60 feet; length = 6,000 feet). SHB engineers are acting as expert witnesses for United Nuclear Corporation in litigation arising from the failure. Work included detailed seismic hazard investigation and dynamic stability analysis.

20. Hayden Plant, ASARCO, Inc., Hayden, Arizona (1981-83). Site selection study, geotechnical and hydrological investigations, design, preparation of sections of application for operating permit and construction quality assurance for embankment dam (height = 60 feet) for containment of SO_2 sludge from pollution control system of copper smelter. Project involves rubber-asphalt lining for containment of hazardous wastes.

21. K-2 Brine Ponds, International Minerals and Chemical Corporation, Esterhazy, Saskatchewan (1981). Geohydrological analysis of existing brine contamination from 500-acre disposal pond. Study included characterization of site and aerial geology and geohydrology, installation of monitoring wells, development of 3-dimensional groundwater model to assess the future impact of brine migration and development of remedial measures for mitigation of seepage problem.

22. Nose Rock Project, Phillips Petroleum Company, McKinley County, New Mexico (1978-79). Geotechnical and hydrological investigations and preliminary embankment design for a uranium tailings dam.

23. Hobbs Potash Facility, Kerr-McGee Chemical Corporation, Hobbs, New Mexico (1977). Geotechnical and hydrological investigations and embankment design for expansion of dam for storage of brines and solid wastes from potash plant.

24. Utah Uranium Project, Pennsylvania Power & Light Company, San Juan County, Utah (1979). Site selection study including preliminary geotechnical and hydrological investigations and embankment design for uranium tailings dam.

25. Anderson Uranium Project, Minerals Exploration Co., Yavapai County, Arizona (1978). Preliminary geotechnical and hydrological investigations and design of uranium tailings dam.

26. Sacaton Project, ASARCO, Inc., Casa Grande, Arizona (1973-74). Geotechnical and hydrological investigations and embankment design analysis for tailings dam for 15,000 TPD copper mill (height = 200 feet).

27. South Trend Project, Mobile Oil Corp., Crown Point, New Mexico (1976). Preliminary geotechnical and hydrological investigations and embankment design for uranium tailings dam.

28. El Paso Plant, ASARCO, Inc., El Paso, Texas (1983). Geotechnical and hydrological investigations, site selection, preliminary and final design of storm water retention basins and lined ponds for storage of waste and process waters for copper smelter.

29. Midnite Mine, Dawn Mining Company, Lincoln County, Washington (1981). Preliminary geotechnical and hydrological studies and development of preliminary designs for zoned embankment dams for the containment and evaporation of seepage from waste rock dumps at an open-pit uranium mine. Three alternative sites were evaluated.

30. Pinos Altos Copper/Zinc Project, Exxon Minerals, U.S.A., Grant County, New Mexico (1977-78). Preliminary geotechnical and geohydrological investigations for site selection studies and preliminary design for tailings dam for a copper/zinc mill.

31. Kayenta & Black Mesa Mines, Peabody Coal Company, Navajo County, Arizona (1975-83). SHB has performed geotechnical and hydrological investigations, design and construction quality assurance for the following zoned embankment dams for the containment of surface runoff and sediment and for water storage for open-pit coal mines. Work included development of permitting submittals to OSM and MSHA.

Dam	Height (ft.)	Length (ft.)	Note*
N-14D	52	1,750	2
N-14E	36	600	2
N-14F	26	450	4
N-14G	24	700	4
J-16A	50	1,122	2
N-14H	29	600	3
J7 No. 1	15	960	1
J7 No. 3	77	2,000	1

*Notes:
1. Investigations of existing dams to satisfy MSHA requirements.
2. Complete design and construction quality assurance by SHB.
3. Designed, but not constructed.
4. Designed by SHB; construction quality assurance by owner.

32. Hog Heaven Project, CoCa Mines, Inc., Flathead County, Montana (1983). Site selection study, geotechnical and hydrological investigations for a 1,000 TPD silver mill and tailings dam involving cyanide process. Preliminary design of tailings dam.

33. Getchell Mine Project, FRM Minerals Inc., Humboldt County, Nevada (1984). Site selection study, geotechnical and hydrological investigations for a 3,000 TPD gold mill and tailings dam involving cyanide process. Tailings dam will be about 200 feet in height with storage capacity of ten million tons. A 60-foot high diversion dam and extensive diversion channels are also involved. Work includes

final design, plans and specifications for the dam and preparation of various submittals for permitting.

34. Colosseum Project, Amselco Exploration, Inc., San Bernardino County, California (1984). Site selection studies, geotechnical and hydrological investigations for a 3,000 TPD gold mill and tailings dam involving cyanide process. Tailings dam is about 250 feet high with a storage capacity of about 15 million tons. Work includes final design, plans and specifications for the tailings dam and preparation of various submittals for permitting.

35. Pinos Altos Project, Boliden Minerals, Inc., Grant County, New Mexico (1984). Design of a 125-foot high, 1,800-foot long zoned embankment dam with extensive diversion channels. The dam will be used for storage of slimes of copper/zinc tailings. A second small dam for storage of sands to be used for mine backfill is involved. Scope of work includes final design, plans and specifications.

36. Dry Fork Impoundment, Kennecott, Utah Copper Division, Salt Lake County, Utah (1984). Site selection study including geotechnical investigations, design, plans, specifications and construction quality control. Project involves constructing embankment over the face of existing mine waste rock dump and covering the face with a specially anchored, reinforced polyethylene membrane liner keyed to bedrock at the sides. The membrane will interconnect with a 70-foot deep slurry wall with soil-bentonite backfill. The facility will create a 135-foot high impoundment with a 1,000 acre-foot storage capacity. The purpose of the impoundment is to conserve fresh water and to prevent runoff from seeping through the dump and becoming contaminated.

5. SEISMIC HAZARD EVALUATIONS & DETERMINATION OF EARTHQUAKE DESIGN PARAMETERS

SHB has had extensive experience in seismic hazard studies of sites throughout the Rocky Mountain states. Over the past five years, SHB has collaborated on a continuing basis with Dr. David B. Slemmons of the University of Nevada in Reno in these state-of-the-art studies. Dr. Slemmons is widely recognized as an authority on fault evaluation utilizing photogeologic techniques, including low-sun-angle photography. In these procedures, maximum credible earthquakes applicable to design are determined based on fault studies, earthquake history and seismotectonics. Design accelerations, velocities, periods of ground motion and durations are estimated from attenuation relationship and other empirical methods.

A partial listing of projects in which SHB has performed detailed studies of this type for tailings, flood control or water storage dams is as follows:

Project	Location
Comstock Gold Project	Virginia City, Nevada
Aurora Joint Venture Uranium Project	Malheur County, Oregon & Humboldt County, Nevada
Springer Tungsten Project	Tungsten, Nevada
Vitro Uranium Tailings Dam	Salt Lake City, Utah
Uranium Tailings Dam	Gunnison, Colorado
Uranium Tailings Dam	Riverton, Wyoming

Project	Location
Uranium Tailings Dam	Shiprock, New Mexico
Uranium Tailings Dam	Mexican Hat, Utah
Uranium Tailings Dam	Tuba City, Arizona
Jerritt Canyon Gold Project	Elko County, Nevada
Cortez Gold Project	Eureka County, Nevada
Nevada Molybdenum Project	Nye County, Nevada
Gold Quarry Project	Lander County, Nevada
Golden Sunlight Project	Jefferson County, Montana
Black Pine Mine Project (Silver)	Granite County, Montana
Sunbeam Mine (Gold)	Custer County, Idaho
Church Rock Uranium Project	Church Rock, New Mexico
Copper Flat Project	Sierra County, New Mexico
Santa Cruz Watershed (Three Flood Control Dams)	Espanola, New Mexico
Silverbell Mine (Copper)	Pima County, Arizona
Miami Tailings Dam No. 2 (Copper)	Gila County, Arizona
McMicken Dam Restoration (Flood Control)	Maricopa County, Arizona
Hog Heaven Project (Silver)	Flathead County, Montana
Uranium Tailings Dam	Lakeview, Oregon

6. HEAP & DUMP LEACHING PROJECTS

The following work has been performed on heap or dump leaching plants for the extraction of copper or gold. These projects involve many of the same geotechnical and hydrological considerations as mine waste dams.

1. Round Mountain Project, Copper Range Company, Nye County, Nevada (1976-82). Geotechnical materials and hydrological investigations, development of design criteria and construction quality assurance for heap leaching pads and barren and pregnant solution ponds for a 12,000 TPD gold heap leaching plant. Included pavement structure design analysis for asphaltic concrete leaching pads.

2. Ortiz Project, Gold Fields Mining Corporation, Santa Fe County, New Mexico (1978-79). Geotechnical materials and hydrological investigations, development of design criteria and construction quality assurance for heap leaching pads and barren and pregnant solution ponds for gold heap leaching plant. Included pavement structure design analysis for asphaltic concrete leaching pads.

3. Maggie Creek Project, Carlin Gold Mining Co., Eureka County, Nevada (1979-80). Geotechnical materials and hydrological investigations, development of heap leaching plant. Included pavement structure design analysis for asphaltic concrete leaching pads, stability analysis of waste rock and tailings dumps and the development of measures to prevent the dumps from affecting the ground and surface water systems.

4. Gold Quarry Project, Carlin Gold Mining Company, Eureka County, Nevada (1981-82). Preliminary geotechnical materials and hydrological investigations and development of design criteria for heap leaching pads and barren and pregnant solution ponds for a 10,000 TPD gold heap leaching plant. Included pavement structure design analysis for asphaltic concrete leaching pads, stability analysis of waste rock and tailings dumps and the development of

measures to prevent the dumps from affecting the ground and surface water systems.

5. Borealis Project, Houston International Minerals Corporation, Mineral County, Nevada (1982). Design and quality control of repairs to asphaltic concrete gold leaching pads.

6. Sunbeam Mine, Sunbeam Mining Company, Custer County, Idaho (1981). Preliminary geotechnical and hydrological analysis and preliminary design for a gold dump leach pile (height = 130 feet) for a 3,000 TPD leaching facility. Work included preliminary design of a double lining and underdrain system for containment of cyanide fluids, detailed dynamic stability and seepage analysis, and preliminary design of solution containment ponds and surface water diversions.

7. Bluebird Mine, Ranchers Exploration and Development Co., Miami, Arizona (1974). Geotechnical and hydrological investigations to evaluate the fluid holding properties and potential effects on groundwater systems of a copper dump leaching area.

8. Mesquite Project, Goldfields Operating Company, Imperial County, California (1983). Site selection studies, geotechnical and hydrological investigations for 6,000 TPD gold heap or dump leaching projects. Included plant and pregnant and barren solution ponds.

9. Colosseum Project, Amselco Exploration, Inc., San Bernardino County, California (1984). Geotechnical, hydrological and capital cost estimate and design for single use gold heap leach pile. Ore loading will be 4,000 TPD. Work included preliminary design and siting of a double lined pad, seepage containment system, solution containment ponds and surface water diversions.

10. Getchell Mine Project, FRM Minerals, Inc., Humboldt County, Nevada (1984). Geotechnical and hydrological investigations for a single use 2,000 TPD gold heap leach facility, including pads, solution ponds, surface water diversions, seepage monitoring system, and collection ditches.

11. B & B Solution Dam and Impoundment, Inspiration Consolidated Copper Company, Miami, Arizona (1984). Geotechnical and hydrological investigations, site selection study and design for impoundment to collect and store pregnant solution from a copper dump leaching operation and storm runoff. The 700-foot long, 35-foot deep impoundment has a storage capacity of about 300 acre-feet. Extensive grouting, clay cutoffs and seepage collection and monitoring systems are involved.

7. MINERAL PROCESSING PLANTS

Geotechnical investigations have been completed for the following conventional mills or concentrators for the processing of "hard rock" minerals or uranium ores.

1. Golden Sunlight Project, Placer Amex, Inc., Jefferson County, Montana (1981-82). 5,000 TPD gold mill and associated facilities including primary and secondary crushers, ore storage area, conveyors and conveyor tunnels, tailings thickeners, water tank, and shop and office building.

2. Jerritt Canyon Project, Freeport Gold Company, Elko County, Nevada (1980). 4,000 TPD gold mill and associated facilities including primary and secondary crushers, ore storage areas, conveyors and conveyor tunnels, tailings thickener, water tank, and shop and office buildings.

3. Copper Flat Project, Quintana Minerals Corporation, Sierra County, New Mexico (1976-81). 15,000 TPD concentrator and associated facilities including primary and secondary crushers, ore storage areas, conveyors and conveyor tunnels, tailings thickeners, concentrates thickeners, water reservoir, and shop and office buildings.

4. Cananea Mine, Compania Minera de Cananea, S.A. Cananea, Sonora, Mexico (1982). 42,000 TPD concentrator addition and associated facilities including primary and secondary crushers, ore storage areas, conveyors and conveyor tunnels, tailings thickeners, concentrates thickeners, water reservoirs, and shop and office buildings.

5. Los Bronces Project, Compania Minera Disputada de las Condes, S.A., Near Santiago, Chile (1981). 90,000 TPD concentrator and associated facilities including primary and secondary crushers, ore storage areas, conveyors and conveyor tunnels, tailings thickeners, concentrates thickeners, water reservoirs, and shop and office buildings.

6. Nose Rock Project, Phillips Petroleum Company, McKinley County, New Mexico (1978). Uranium mill and associated facilities including crushers, ore storage areas, conveyors and conveyor tunnels, tailings thickeners, water reservoir, and shop and office buildings.

7. Pinos Altos Copper/Zinc Project, Exxon Minerals USA, Grant County, New Mexico (1977). Concentrator and associated facilities including crushers, ore storage area, conveyors and conveyor tunnels, tailings thickener, and shop and office buildings.

8. Mt. Taylor Project, Gulf Mineral Resources, Inc., Sandoval County, New Mexico (1977). Uranium mill and associated facilities including crusher, ore storage area, conveyors and conveyor tunnels, tailings thickeners, water reservoir, and shop and office buildings.

9. Springer Tungsten Project, Utah International, Inc., Tungsten, Nevada (1981). Tungsten mill and associated facilities including crusher, ore storage area, conveyors, tailings thickeners, water tank, and shop and office buildings.

10. La Caridad Project, Mexicana de Cobre, S.A., Nacozari, Sonora, Mexico (1976). 90,000 TPD copper concentrator and associated facilities including primary and secondary crushers, ore storage facilities, conveyors and conveyor tunnels, tailings thickeners, concentrates thickeners, water reservoirs, and shop and office buildings.

11. South Trend Project, Mobile Oil Company, McKinley County, New Mexico (1977). Uranium mill and associated facilities including crusher, ore storage areas, conveyors, tailings thickeners, leaching tanks, water reservoir, and shop and office buildings.

12. Pima Mine, Cyprus-Pima Mining Company, Pima County, Arizona (1977). Concentrator and associated facilities including secondary crushers, ore storage areas, conveyors and conveyor tunnels, tailings thickeners, concentrates thickeners, water reservoir, and shop and office buildings.

13. Palo Verde Project, ANAMAX Mining Company, Sahuarita, Arizona (1976). 100-foot below grade primary crusher and conveyor system.

14. Cyprus-Bagdad Copper Project, Cyprus-Bagdad Copper Company, Bagdad, Arizona (1976). Concentrator and associated facilities including primary and secondary crushers, ore storage areas, one-mile long conveyors and conveyor tunnels, tailings thickeners, concentrates thickeners, water reservoirs, and shop and office buildings.

15. Delamar Silver Project, Earth Resources Company, Owyhee County, Idaho (1974). Concentrator and associated facilities including primary and secondary crushers, ore storage areas, conveyors and conveyor tunnels, tailings thickeners, water tank, and shop and office buildings.

16. Sacaton Project, ASARCO Incorporated, Casa Grande, Arizona (1973). 15,000 TPD copper concentrator and associated facilities including primary and secondary crushers, ore storage areas, conveyors and conveyor tunnels, tailings thickeners, concentrates thickeners, water reservoirs, and shop and office buildings.

17. Lakeshore Project, Hecla Mining Company, Pinal County, Arizona (1971-72). Copper concentrator oxide leaching plant and associated facilities including primary and secondary crushers, ore storage areas, conveyors and conveyor tunnels, tailings thickeners, concentrates thickeners, water reservoir, leaching vats, and shop and office buildings.

18. San Xavier Project, ASARCO Incorporated, Pima County, Arizona (1971). Copper silicate leaching plant and associated facilities including leaching vats, primary and secondary crushers, ore storage areas, conveyors and conveyor tunnels, and shop and office buildings.

19. Pinto Valley Project, Cities Service Company, Miami, Arizona (1971). 40,000 TPD concentrator and associated facilities including primary and secondary crushers, ore storage areas, conveyors and conveyor

tunnels, tailings thickeners, concentrates thickeners, water reservoirs, and shop and office buildings.

20. Twin Buttes Project, The Anaconda Company, Pima County, Arizona (1966-72). 45,000 TPD concentrator oxide leaching plant and associated facilities including secondary and tertiary crushers, ore storage areas, conveyors and conveyor tunnels, tailings thickeners, concentrates thickeners, five 400-foot diameter leaching tanks, water reservoirs, molybdenum plant, and shop and office buildings.

Vulture Development Schedule August 28, 1987

Event	September 1 7 14 21 28	October 5 12 19 26	November 2 9 16 23 30	December 7 14 21 28	January 4 11 18 25
Permits					
Response to DEQ on NOD	▬▬				
Letter of Intent from DEQ	▬				
Public Notice	▬▬				
Permit Issued					▬
Plant Construction					
Final Design	▬▬▬				
Review Bids	▬▬				
Construct		▬▬▬▬			
Ship to Site			▬		
Install at Site			▬▬▬		
Site Work					
Final Design	▬▬▬				
Contractor Selection	▬▬▬				
Pad and Pond Construction		▬▬▬▬	▬▬▬		
Storm Diversion		▬▬			
Fencing		▬▬			
Power Station		▬▬			
Water Delivery	▬▬	▬			
Sewage		▬	▬		
Load Pad					
Agglomerate and Stack				▬▬▬	
Install Sprinklers				▬	
Fill Ponds				▬▬	
Test for Leaks					▬
Equipment					
Stacking Belts	▬▬		▬▬▬		
Agglomerator	▬▬		▬▬▬▬		
FEL	▬▬		▬		
Trucks	▬▬		▬		
Assay Lab					
Procure			▬	▬	
Sales Contract					
Contact refiners		▬			
Negotiate Contract				▬▬	

Event	September 1 7 14 21 28	October 5 12 19 26	November 2 9 16 23 30	December 7 14 21 28	January 4 11 18 25
Personnel					
Develop Requirements	▬▬▬				
Hire		▬	▬▬	▬	
Safety Training		Ongoing			
Accounting					
Develop System		▬▬			
Install			▬▬		
Miscellaneous					
Office Trailer		▬			
Phone Service		▬			
Security Procedures					
Overall Site		Part of Final Design			
Precipitate Handling		Part of Operating Procedures			
Dore Shipping		Coordinate with Refiners			

SERGENT, HAUSKINS & BECKWITH
Geotechnical Engineers, Inc.

3232 West Virginia Avenue
Phoenix, Arizona 85009
(602) 272-6848

TRANSMITTAL

DATE September 21, 1987

TO A. F. Budge (Mining) Ltd.
7340 East Shoeman Lane, Suite 111 "B"(E)
Scottsdale, Arizona 85251-3335

ATTENTION Mr. Joe Fernandez, Senior Mining Engineer

PROJECT Vulture Mine Heap Leach Facility

JOB/PROPOSAL NO. E87-220

WE ARE SENDING YOU:

- [x] Attached
- [ ] Under separate cover the following:
- [ ] Boring Logs
- [ ] Calculations
- [ ] Design Charts
- [ ] Progress Reports
- [ ] Laboratory Results
- [ ] Plans
- [ ] Specifications
- [x] See below

DELIVERY BY:

- [ ] Hand Delivery
- [x] First Class Mail
- [ ] Registered Mail
- [ ] Express Mail
- [ ] Federal Express
- [ ] Other
- [ ] Return Receipt Requested

TRANSMITTED FOR:

- [ ] Review & Comment
- [ ] Approval
- [x] Your Files/Information
- [x] As Requested

DESCRIPTION Location of survey information required for diversion channel design.

REMARKS I need cross sections of the existing drainages north and south of the diversion as well as cross sections and topo along the diversion corridor.

COPY TO File

SIGNED Nick LaFaney

A. F. Budge (Mining) Limited
7340 E. Shoeman Lane, Suite 111 "B" (E)
Scottsdale, AZ 85251-3335
(Business Office)
Telephone: (602) 945-4630
Telex: 751739

February 23, 1988

Mr. Philip T. LaHue
Sergent, Hauskins & Beckwith
3232 W. Virginia
Phoenix, AZ 85009

Re: Professional Services Agreement
Vulture Mine Project: SHB Job No. E88-41

Dear Mr. LaHue:

Per your letter of February 18, 1988, I enclose 3 executed copies of the referenced agreement.

Sincerely,

Carole A. O'Brien

Carole A. O'Brien
Mining Coordinator

encl.(3)

DIRECTORS: A.F. Budge, O.B.E., C.Eng., F.I.C.E., F.I.H.T.; Mrs. J. Budge; 7602 Clearwater Parkway, Paradise Valley, AZ 85253

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SERGENT, HAUSKINS & BECKWITH CONSULTING GEOTECHNICAL ENGINEERS

APPLIED SOIL MECHANICS • ENGINEERING GEOLOGY • MATERIALS ENGINEERING • HYDROLOGY

B. DWAINE SERGENT, P.E.
LAWRENCE A. HANSEN, PH.D., P.E.
RALPH E. WEEKS, P.G.
DARREL L. BUFFINGTON, P.E.
DONALD VAN BUSKIRK, P.G.
DALE V. BEDENKOP, P.E.
JOHN B. HAUSKINS, P.E.
MICHAEL L. RUCKER, P.E.
ROBERT W. CROSSLEY, P.E.
JONATHAN A. CRYSTAL, P.E.
PAUL V. SMITH, P.G.
NORMAN H. WETZ, P.E.
GEORGE H. BECKWITH, P.E.
ROBERT L. FREW
JAMES H. CLARY, C.P.G.
NICHOLAS T. KORECKI, P.E.
GERALD P. LINDSEY, P.G.
RONALD E. RAGER, P.G.
ROBERT D. BOOTH, P.E.
SUANG CHENG, P.E.
JAMES R. FAHY, P.E.
MICHAEL HULPKE, P.G.
DAVID E. PETERSON, P.G.
ALBERT C. RUCKMAN, P.E.
PAUL KAPLAN, P.E.

February 5, 1988

A. F. Budge (Mining) Limited
7340 East Shoeman Lane
Suite 111 "B" (E)
Scottsdale, Arizona 85251-3335

SHB Proposal No. 88-2-6

Attention: Ms. Carole O'Brien

Re: Heap Leach Facility
Vulture Mine Project
Near Wickenburg, Arizona

Ladies and Gentlemen:

The firm of Sergent, Hauskins & Beckwith Geotechnical Engineers, Inc. (SHB) is pleased to present our proposal for providing construction management for the above referenced project. SHB has had the privilege of preparing the construction plans and specifications, and appreciates this opportunity to be involved during completion of the facility.

During construction of the project, SHB is prepared to provide construction management services and construction observation and testing. As construction managers, prior to construction, SHB would prepare full bid documents, conduct the pre-bid conference and site tour, handle the bid opening and analysis, and award the contract. During construction, SHB would oversee construction to verify acceptability, prepare any change orders required, review and approve Contractor's payment request, and review any claims for additional work submitted by the Contractor. In addition,

SHB would provide the construction observation and testing services outlined in the following paragraph.

A full-time engineering technician would be provided to observe and test site grading and liner installation operations for the leach pad and ponds. He would also observe and test earthwork operations during construction of the diversion channel. This would include clearing and grubbing the pad, scarification and compaction of cut areas and areas to receive fill, and fill placement and compaction. Of critical importance in the overall performance of a geomembrane lined leach pad is the preparation of the subgrade surface on which the liner is placed. It is necessary that a firm, smooth surface is provided with no sharp or angular particles within the upper 4 to 8 inches which could puncture the liner.

During installation of geomembrane liners, careful attention would be directed toward requiring sufficient excess liner material to prevent contraction of liner and detrimental bridging or creep. Seaming operations performed by the lining contractor would be continuously observed by an engineering technician. All field seams would be tested by the liner contractor under the observation of the technician utilizing the air lance method.

Samples of material and field seams would be taken and laboratory testing performed. Destructive shear and peel tests should be performed on samples taken every 700 lineal

feet of seam to verify the seams meet the required bond strength criteria.

SHB's services are provided on a unit cost basis, in accordance with the attached standard Unit Fee Schedule. We have prepared an estimate of total costs, which is detailed below.

Project Manager - Preconstruction Activities

Prepare bid documents, prebid conference, sites tour, bid opening, analysis and award contract.

Est. 80 hrs. @ $60/hr.	$4,800.00
130 miles @ $0.42/mile	54.60

Project Manager - Construction Activities

Oversee construction, review payment requests, review any claims for additional work and prepare any change orders required.

Est. 100 hrs. @ $60/hr.	$ 6,000.00
1,500 miles @ $0.42/mile	630.00

Senior Engineering Technician - Earthwork Phase

Observe and test site grading operations - materials quality, compaction and workmanship.

Est. 240 regular hours @ $31/hr.	$ 7,440.00
18 overtime hours @ $43/hr.	774.00
27 days per diem @ $55/day	1,485.00
30 days vehicle @ $35/day	1,050.00
1,050 miles @ $0.42/mile	441.00

Senior Engineering Technician - Lining Phase

Observe and report on installation and contractor quality control tests.

Est. 200 regular hours @ $31/hr.	$ 6,200.00
15 overtime hours @ $43/hr.	645.00
22 1/2 days per diem @ $55/day	1,237.50
25 days vehicle @ $35/day	875.00
875 miles @ $0.42/mile	367.00

Laboratory Testing Services - Budget $ 2,000.00

Our total estimate for construction management and the observation and testng services, including laboratory testing, is about $34,000.00. In our opinion, this is a realistic figure, but actual costs would reflect the actual number of units consumed in response to the contractor's schedule and success rate. The $34,000.00 estimate could be established as a budget figure. That budget would not be exceeded without your review and authorization.

We appreciate this opportunity to be of service to A. F. Budge (Mining) Limited. Should any questions arise, please do not hesitate to contact us. We look forward to working with you on this project.

If the foregoing meets with your approval, please execute the authorization below and we will prepare a formal contract for your review and acceptance.

Respectfully submitted,
Sergent, Hauskins & Beckwith Engineers

By _____
Dale S. Parker
Field Services Coordinator

Copies: Addressee (3)

Accepted for A.F. Budge (Mining) Limited
(Organization Responsible for Payment)

Accepted by Carole A. O'Brien, Consultant/Coordinator
(Name and Title)

Signature Carole A. O'Brien Date February 15, 1988