CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

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SERGENT, HAUSKINS & BECKWITH
Geotechnical Engineers, Inc.

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

TRANSMITTAL

DATE November 11, 1987

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

ATTENTION Joe Fernandez, Senior Mining Engineer

PROJECT Vulture Mine Project

JOB/PROPOSAL NO. E87-220

WE ARE SENDING YOU:

- ☒ Attached
- ☐ Under separate cover the following:
- ☐ Boring Logs
- ☐ Calculations
- ☐ Design Charts
- ☐ Progress Reports
- ☐ Laboratory Results

- ☒ Plans
- ☒ Specifications
- ☐ _____

DELIVERY BY:

- ☒ Hand Delivery
- ☐ First Class Mail
- ☐ Registered Mail
- ☐ Express Mail
- ☐ Federal Express
- ☐ Other
- ☐ Return Receipt Requested

TRANSMITTED FOR:

- ☐ Review & Comment
- ☐ Approval
- ☒ Your Files/Information
- ☐ As Requested

DESCRIPTION Draft Construction Plans & Specifications for Heap Leach Facility

REMARKS _____

COPY TO File

SIGNED Nick LaFranz

Construction Plans &
Specifications
Heap Leach Facility
Vulture Mine Project
Near Wickenburg, Arizona
SHB Job No. E87-220

DRAFT

TECHNICAL SPECIFICATIONS FOR EARTHWORK CONSTRUCTION ELEMENTS OF THE HEAP LEACH FACILITY

1. General

1.1 These technical specifications establish the quality of materials and workmanship and define how quality is measured for site grading and earthwork construction elements. They apply to excavations and fills for the heap leach facility, including the leach pad, ponds, solution channel, berms and all related facilities.

2. Abbreviations

2.1 The abbreviation below shall mean:

ASTM American Society for Testing and Materials

3. Codes & Standards

3.1 Unless otherwise specified or shown, the following codes and standards shall apply to the extent indicated by references herein:

ASTM D422	Standard Method for Particle-Size Analysis of Soils (1972).
ASTM D1556	Standard Test Method for Density of Soil in Place by the Sand-Cone Method (1982).
ASTM D698	Standard Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-pound Hammer and 12-inch Drop (1978).
ASTM D2167	Standard Test Method for Density of Soil in Place by the Rubber-Balloon Method (1977).

ASTM D2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth, 1981).
ASTM D3017	Standard Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth, 1978).
ASTM D4318	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (1983).

4. Stripping

4.1 All vegetation, debris and other deleterious material shall be removed from areas of cut and fill, including the leach pad, solution channel and pond areas within the limits of construction shown on the construction plans. Materials to be removed include surface boulders, organic matter (trees, cacti, shrubs and grasses, stumps and roots), soft compressible topsoil or subgrade soils, and objectional material as determined by the Engineer. This material shall be removed from the site and wasted at a location approved by the Engineer, except for topsoil and subgrade soils, which shall be stockpiled at a location approved by the Engineer.

5. Excavation

5.1 Excavation shall be made to the lines and grades shown on the construction plans or as necessary for the leach pad, ponds, channel and other facilities.

5.2 All excavated materials shall be classified as common excavation.

5.3 Suitable excavated materials conforming to the requirements of Section 8 shall be utilized for backfill for berms and leach pad area fill or other miscellaneous

fills. Unsuitable excavated materials shall be disposed of as directed by the Engineer.

5.4 Pockets of unsuitable materials within the limits of excavation shall be removed and wasted as directed.

5.5 All excavation shall conform within the tolerances specified to the lines, grades, sections and elevations shown on the construction plans.

5.6 Storm runoff in excavations shall be controlled and removed. Discharge from pumps shall be wasted at locations as directed.

5.7 Except as otherwise shown, grading tolerances shall be plus or minus 0.1 foot for horizontal and sloped planes of excavation.

5.8 Overexcavated horizontal areas shall be restored to the designated grade with compacted fill of the class of material specified.

5.9 Areas being excavated and areas to be filled shall be maintained in a clean condition free from leaves, brush, sticks, trash and other debris.

6. Surface Treatment

6.1 Excavated Areas & At-Grade Areas

Subgrade soils in any area which will receive geomembrane liner coverage shall be observed for zones of coarse gravel, cobbles, protrusions of rock and cemented soils by the Engineer. All such zones shall be overexcavated and backfilled with selected finer grained fill to achieve a continuous relatively smooth surface. Specifications for final subgrade preparation prior to placing geomembrane are provided in the specifications for lining materials.

6.2 Fill Areas

Areas to receive fill shall be cleared and stripped, as described in Section 4.1, prior to placing fill.

The upper 6 inches of native soils beneath cut surfaces and areas to receive fill and in areas to be covered with geomembrane lining shall be scarified and compacted in accordance with the requirements provided in Paragraphs 9.2 and 9.4 of this specification. Where tailings are present as foundation materials beneath the pad, perimeter channel and berms, the upper 1 foot shall be overexcavated and recompacted in accordance with the aforementioned standards.

6.3 Benching of Sloped Surfaces

Existing ground surfaces, embankments and native soils beneath the cut surfaces steeper than 4:1 (horizontal to vertical) that are to receive structural fill shall be continuously benched to provide a firm bond between the structural fill and native materials. Benches shall be sufficiently wide to permit operations of placing and compacting equipment. The slope shall be leveled for every lift of structural fill placed.

6.4 Filling Holes, Depressions & Cavities

Stump holes, depressions and other cavities shall be filled to the natural ground surface prior to placing fill material. The class of fill material utilized shall be the same as that to be used for the subsequent layer of fill above.

7. Stockpiling

7.1 As part of the mass earthwork operations, stockpiling of excavated or borrowed materials may be required.

7.2 Different classes of material shall be stockpiled separately.

7.3 Stockpiles and waste material shall be placed in such a manner as to provide natural drainage and a stable embankment.

7.4 Stockpiles shall be constructed with a maximum height of 20 feet.

8. Fill Materials

8.1 Site Derived Fill

Fill material for structural fill shall be obtained from the required pad, pond and channel excavations and shall be free of deleterious materials such as expansive clay, rubbish and organic, perishable or uncompactible material. When fill materials are not available from required excavations, they shall be obtained from borrow pits at locations shown or as directed by the Engineer. All fill material placed in the various areas of the project shall meet the requirements of Sections 8.2 or 9.5 where applicable.

8.2 Structural Fill

Structural fill shall be placed to the lines and grades shown on the plans with a tolerance of plus or minus 0.1 foot.

It is anticipated that all required structural fill can be obtained from required excavations or borrow pits located in native materials.

8.2.1 Random Structural Fill Quality

Random structural fill shall be used in all fill areas with the exception of the heap leach pad leak detection system trenches and the leach pad toe and storm water (surge) pond overliner and shall conform to the following gradation requirements as determined by ASTM D422:

Sieve Size (Square Openings)	Percent Passing by Weight
6-inch	100
no. 200	5-35

The plasticity index, as determined by ASTM D4318, shall not exceed 30.

8.2.2 Sand & Gravel Backfill for Leach Pad Detection System Trenches & Toe Overliner

The sand and gravel backfill for the heap leach pad leak detection system trenches and leach pad toe overliner shall be free of excessive vegetation, organic matter, debris or other deleterious material.

Sand and gravel backfill shall have the following gradation as determined by ASTM D422:

Sieve Size (Square Openings)	Percent Passing by Weight
2-inch	100
no. 4	30-65
no. 200	2-12

The plasticity index shall be less than 5 when tested by ASTM D4318. Coarse aggregate shall have a percent of wear, when subjected to the Los Angeles abrasion test (ASTM C131), of no greater than 40.

8.2.3 Overliner for PVC Liner in Storm Water (Surge) Pond

A selected tailings fill cover, 2 feet thick, shall be placed over the PVC liner in the storm water (surge) pond.

The selected tailings fill cover material shall be free of excessive vegetation, organic matter, debris and other deleterious material, and shall have the following gradation as determined by ASTM D422:

Sieve Size (Square Openings)	Percent Passing by Weight
2-inch	100
no. 200	0-50

The plasticity index of the selected fill cover material shall be less than 15 when tested by ASTM D4318.

8.2.4 Finished Subgrade in Ponds

A 6-inch thick selected tailings fill layer shall be placed as the finished subgrade surface for liner placement in the three ponds. The selected tailings fill shall meet the requirements of Section 8.2.3 and shall be placed and compacted in accordance with the specifications of Sections 9.1, 9.2 and 9.4.

9. Compaction

9.1 Required Thickness of Lifts, Compaction Methods & Equipment

9.1.1 Random Structural Fill

Random structural fill shall be placed in a loose layer thickness of no more than 8 inches. Maximum loose layer thicknesses for other classes of structural fill are specified in Section 9.3.

Maximum loose layer thicknesses for the various classes of fill shall be as specified unless otherwise authorized by the Engineer. Each layer shall be kept approximately parallel to the final grade. The fill material shall be watered to achieve the moisture requirements specified in Section 9.4 prior to compaction.

Mechanical compaction equipment shall be used in all grading operations. In no case shall water settling or "jetting" be employed.

9.2 Degree of Compaction

Optimum moisture content and maximum dry density of the structural fill shall be determined by ASTM D698.

Random structural fill shall be compacted to at least 95 percent of maximum dry density. Compaction of the upper 6 inches of native soils shall be accomplished to at least 95 percent of maximum dry density.

The storm water (surge) pond overliner tailings fill cover shall be placed and compacted in accordance with the specifications of Sections 9.1, 9.3 and 9.4, with the exception that only the upper 1 foot shall be compacted to 95 percent of maximum dry density, and the lower 1 foot to 90 percent of maximum dry density.

9.3 Initial Lifts Placed on Geotextile Overliners

The initial lift of selected fill cover or sand and gravel overliner placed directly on the storm water (surge) pond liner or heap leach pad liner shall have a minimum loose layer thickness of 12 inches. The initial lift shall be carefully placed over the lining materials in a manner approved by the Engineer. At no time shall any vehicle or unnecessary foot traffic occur on the lining materials prior to placement of the initial lift.

Moisture conditioning of the initial lift of selected fill cover or sand and gravel fill to achieve the moisture requirements specified in Section 9.4 shall not be performed within the limits of any geomembrane lined areas.

9.4 Moisture Control

Moisture contents (in terms of percent of dry weight of the total volume of the fill during compaction) of all classes of structural fill shall be maintained within 2 percentage points below to 3 percentage points above optimum moisture content.

9.5 Field Density Tests & Compliance

9.5.1 Tests for specified compaction shall be made in accordance with the following:

A. Maximum density at optimum moisture content shall be determined in accordance with ASTM D698, Methods A or C, as appropriate.

B. For purposes of acceptance, the in-place density of structural fill shall be defined as that determined by the sand cone method (ASTM D1556) or by other test procedures acceptable to the Engineer.

9.5.2 Field in-place density tests shall be taken at a rate of at least six tests per shift in each different type of material used as fill. Additional tests shall be required in critical areas.

9.5.3 Tests for maximum density shall be taken for each type of material encountered or one test for each 25 sand cone tests with a minimum of one test for every five working days.

9.5.4 Where compaction of existing ground or structural fill does not meet the specified compaction, it shall be reworked until it complies with the specified in-place density.

9.6 Weather Limitations

Unless approved in the field by the Engineer, controlled fill shall not be constructed when the atmospheric temperature is at 35 degrees Fahrenheit (°F) and falling. When the temperature falls below 35°F, it shall be the responsibility of the Contractor to protect all areas of completed surface against any detrimental effects by methods approved by the Engineer. Any areas damaged by freezing shall be reconditioned, reshaped, and recompacted by the Contractor in conformance with the requirements of this specification.

DRAFT

TECHNICAL SPECIFICATIONS FOR PVC & HYPALON GEOMEMBRANE LINERS

1. General Requirements

1.1 Scope

These specifications cover the requirements for the manufacturing and installation of 20-mil and 30-mil polyvinyl chloride (PVC) and 36-mil Hypalon geomembrane liner for the leach pad, pregnant, barren and storm water (surge) ponds, and solution channel.

The work requirements include furnishing labor, construction machinery and materials, and services for construction of the heap leach facility as outlined in these specifications.

The Lining Contractor's approved construction layout drawings will specify all components and details required to meet specifications. The responsibility of the Owner and the Lining Contractor will be clearly indicated. The area of coverage of liner is shown on the construction plans.

1.2 Submittals

A. Samples: Submit for approval and review samples of both liner materials.

B. Shop Drawings: Submit for approval, as soon as practicable after award of the contract, six (6) sets of full and complete shop and installation drawings showing a minimum of:

1. Layout of the liner system.

2. Details of jointing, liner system and liner anchorages.

C. Certificates: Certificates of compliance with the requirements of standards and testing methods specified herein shall be submitted prior to delivery.

The liner material manufacturer must satisfy by affidavit to the Owner and Contractor, jointly, that the material he offers to furnish and install will meet in every aspect the requirements set forth in the specifications. The Contractor shall transmit to the Owner the affidavit given him by the manufacturer or supplier prior to approval of the furnishing and installing of any such material.

D. Schedules: The Contractor shall submit a schedule detailing the liner fabrication and installation. The Lining Contractor shall work in coordination with the Earthwork Contractor so that the placement of lining will follow, in an orderly sequence, the progression of subgrade preparation.

1.3 Factory Fabrication

The individual liner panels shall be factory fabricated into large sheets custom designed for the project so as to minimize field seaming. Also, a minimum 18-inch wide 30-mil PVC strip shall be factory fabricated to the 36-mil Hypalon solution channel liner for purposes of making the transition from the leach pad to the channel. The seam shall be a dielectric weld as described below.

Panels shall be seamed by a heat or dielectric weld with a minimum width of 1 inch. Pressure must be applied to the full width of the seam on the top and bottom while the welded area is in a melt-type condition.

All factory seams shall be 100 percent visually inspected. Production shall be stopped upon discovery of

any defective seam to repair the seam. Additionally, seaming shall not be conducted until the cause of the defect is determined and rectified.

1.4 Delivery, Storage & Handling of Materials

A. Delivery: Materials shall be delivered to the site after the required submittals have been approved.

B. Storage & Handling: Storage and handling of the materials shall conform to the manufacturer's recommendations with approval of Owner's representative, and shall be done in such a manner as to prevent damage to any part of the work.

1.5 Verification of Subgrade

Prior to installation of the liner, the Lining Contractor shall inspect and verify the subgrade conditions of the specified areas as being adequate for placement of materials. Subgrade specifications are outlined in Section 2.2 and in the specifications for earthwork construction elements. Following the verification of the subgrade, the Lining Contractor assumes full responsibility for the approved area should subgrade conditions be altered by disturbance or damage caused by operations of the Lining Contractor outside the control of the Earthwork Contractor.

1.6 Liner Testing

Destructive and nondestructive testing shall be performed by trained personnel of the Lining Contractor. Destructive testing of field seam samples shall be performed by an independent testing laboratory approved by the Owner. Quality control procedures are specified in Section 3.

1.7 Warranty

Terms and conditions of warranty are to be agreed upon between the Owner and the Lining Contractor.

1.8 Qualification of Suppliers

The Lining Contractor shall have not less than five years experience in the installation of flexible membrane lining material, and shall provide the Owner or Owner's representative with a list of not less than ten projects and not less than five million square feet of successfully installed flexible membrane lining. The project list shall include the name, address and telephone number of an appropriate party to contact in each case.

2. Installation Specifications

2.1 Inspection of Sheet Liner at Jobsite

The Lining Contractor shall be responsible for inspection of the sheet rolls at the job site. Should rolls show damage from transit, they will be so identified by the Lining Contractor and set aside.

During unrolling of the lining material, the Lining Contractor will carry out visual inspection of the sheet surface. Any faulty areas shall be marked and repaired by the Lining Contractor in a manner approved by the Owner's representative. A representative of the Owner will make periodic, independent inspections of the liner, and any additional faulty areas discovered shall be repaired.

2.2 Area Subgrade Preparation

The prepared subgrade in contact with the membrane liner shall be free of angular gravel, gravel over 2 inches in size, or hard objects within 4 inches of the surface. The surface shall provide a firm foundation with no abrupt changes in grade. A continuous, relatively smooth surface free of protrusions of rock, nested gravels or other abrupt irregularities shall be achieved. Several passes with a smooth-wheeled vibratory roller over a moist subgrade will be necessary to meet the intent of

this specification for much of the area. In areas of nested gravels or angular rock, or as directed by the Owner's representative, finer grained materials shall be used at and near the surface to achieve a continuous, relatively smooth surface. The upper 6 inches of subgrade shall be compacted to a minimum of 95 percent of maximum dry density as determined by ASTM D698 by the Earthwork Contractor.

2.3 Installation

2.3.1 General

The PVC and Hypalon liner shall be laid out and installed by the Lining Contractor's trained technicians in accordance with the construction layout and details presented in the approved shop drawings. The lining layout shall be designed to minimize the number and length of the field joints, consistent with proper methods of liner installation. Only those sheets of lining material which can be anchored and sealed together that same day shall be unpackaged and placed in position.

In areas where wind is prevalent, lining installation should be started at the upwind side of the project and proceed downwind. The leading edge of the liner shall be secured at all times with sandbags or other means sufficient to hold it down during high winds.

Sandbags or rubber tires may be used as required to hold the lining in position during installation. Materials, equipment or other items shall not be dragged across the surface of the liner, or be allowed to slide down slopes on the lining. All parties walking or working upon the lining material shall wear soft-sole shoes.

All piping, structures and other projections through the lining shall be sealed with approved sealing methods.

The liner shall be installed in a relaxed condition and shall be free of tension or stress upon completion of the installation. Stretching of the liner to fit will not be allowed.

2.3.2 Field Seaming

Adjacent sheets of Hypalon shall be overlapped a minimum of 4 inches. A minimum overlap of 6 inches shall be provided for PVC sheets. The contact surfaces shall be wiped clean to remove all dirt, dust, moisture, or other foreign materials.

The Hypalon sheets shall be sealed together by a thermal weld which is a minimum of 2 inches in width or a bodied solvent adhesive seam with a minimum width of 4 inches. A 1/8-inch bead shall be extruded from the thermal welding process to ensure proper chemical bonding of the two sheets.

Hypalon to PVC field seams shall not be permitted.

PVC sheets shall be sealed with a bodied solvent contact adhesive. A minimum glued width of 4 inches shall be obtained.

A smooth, hard surface shall be maintained beneath the liner being seamed by use of a conveyor belt or plywood board. All wrinkles shall be smoothed out prior to seaming.

Sandbags placed to hold the lining in position during installation shall remain after completion of field seaming operations.

3. Quality Control

3.1 Sheet Material Testing

Sheet material shall be tested in the laboratory prior to delivery on-site. PVC liner shall meet or exceed the National Sanitation Foundation minimum material

properties given in Table 1. Minimum material property specifications to be met or exceeded by the 36-mil Hypalon are presented in Table 2.

The certificate of compliance (see Section 1.2C) shall indicate the results of these tests.

3.2 Field Seam Testing

A. Each field seam shall be visually inspected after the seaming operations have been completed. Suspected discrepant areas shall be identified with a contrasting marker.

B. All field seams shall be tested using the Air Lance Method. A compressed air source shall deliver a minimum of 40 pounds per square inch (psi) to a 3/16-inch nozzle. The nozzle shall be directed to the lip of the field seam in a near perpendicular direction to the length of the field seam. The nozzle shall be held a maximum of 4 inches from the seam and travel at a rate not to exceed 15 feet per minute. Any loose flaps of 1/8-inch width or greater shall require repair.

C. Destructive shear and peel tests shall be conducted by an independent testing laboratory, selected by the Owner or his representative, on field seam samples taken every 700 lineal feet of seam. Hypalon seams shall withstand a minimum 160 pounds per inch dead load. PVC seams shall have a minimum of 80 percent of the parent material tensile strength. Peel tests for the Hypalon liner shall have a film tearing bond. The expense of this independent laboratory testing shall be borne by the Owner.

All joints, on completion of the work, shall be tightly bonded. Any lining surface showing

injury due to scuffing, penetration by foreign objects, or distress from rough subgrade shall, as directed by the Owner's representative, be replaced or covered, and sealed with an additional layer of lining of the proper size, in accordance with the repair procedure.

3.3 Repairs

Any repairs to the lining shall be patched with the lining material. The patch material shall have rounded corners and shall extend a minimum of 4 inches in each direction from the damaged area.

The Owner shall have the right to reject any field-made seam for cause. Cause shall be defined to include poor workmanship, defective welds or insufficient overlap. Any field seam rejected for such causes shall be repaired or replaced to the satisfaction of the Owner's representative.

Construction Plans &
Specifications
Heap Leach Facility
Vulture Mine Project
Near Wickenburg, Arizona
SHB Job No. E87-220

TABLE 1

Material Properties
Polyvinyl Chloride (PVC)

Property	Test Method	Unsupported (U) 30	Unsupported (U) 20
Gauge (Nominal)	-	30	20
Thickness, mils minimum	ASTM D1593 Para 8.1.3	28.5	19
Specific Gravity (minimum)	ASTM D792 Method A	1.20	1.20
Minimum Tensile Properties (each direction)	ASTM D882		
1. Breaking Factor (pounds/inch width)	Method A or B (1-inch wide)	69	46
2. Elongation at Break (percent)	Method A or B	300	300
3. Modulus (force) at 100% Elongation (pounds/inch width)	Method A or B	27	18
Tear Resistance (pounds, minimum)	ASTM D1004 Die C	8	6
Low Temperature, °F	ASTM D1790	-20	-15
Dimensional Stability (each direction, percent change maximum)	ASTM D1204 212°F, 15 min.	5	5
Water Extraction (percent loss maximum)	ASTM D3083*	-0.35	-0.35

*As modified in Appendix A of National Sanitation Foundation Standard 54 for Flexible Membrane Liners, November 1983.

Construction Plans &
Specifications
Heap Leach Facility
Vulture Mine Project
Near Wickenburg, Arizona
SHB Job No. E87-220

TABLE 1 (Cont'd.)

Material Properties
Polyvinyl Chloride (PVC)

Property	Test Method	Unsupported (U) 30	Unsupported (U) 20
Volatile Loss (percent loss maximum)	ASTM D1203 Method A	0.7	0.9
Resistance to Soil Burial (percent change maximum in original value)	ASTM D3083*		
1. Breaking Factor		5	5
2. Elongation at Break		20	20
3. Modulus at 100% Elongation		20	20
Hydrostatic Resistance (pounds/sq. in. minimum)	ASTM D751 Method A	82	60
Factory Seam Requirements			
Bonded Seam Strength (factory seam, breaking factor, ppi width)	ASTM D3083*	55.2	36.8
Peel Adhesion (pounds/in. minimum)	ASTM D413*	FTB[1] or 10 lb/in	FTB[1] or 10 lb/in

*As modified in Appendix A of National Sanitation Foundation Standard 54 for Flexible Membrane Liners, November 1983.

[1]FTB - Film Tearing Bond.

Construction Plans &
Specifications
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TABLE 2

Material Properties of 36-mil Hypalon

Property	Test Method	36
Gauge (Nominal)	-	36
Piles, Reinforcing	-	1
Thickness, mils minimum	ASTM D751	
1. Overall		34
2. Over Scrim	Optical Method	11
Breaking Strength-Fabric (pounds minimum)	ASTM D751 Method A	200
Tear Strength (pounds, minimum)	ASTM D751	
1. Initial		60
2. After Aging		25
Low Temperature, °F	ASTM D2136 1/8 in mandrel, 4 hrs., Pass	-40
Dimensional Stability (each direction, percent change maximum)	ASTM D1204 212°F, 1 hr.	2
Volatile Loss (percent loss maximum)	ASTM D1203 Method A 30-mil sheet	0.5

Construction Plans &
Specifications
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TABLE 2 (Cont'd.)

Material Properties of 36-mil Hypalon

Property	Test Method	36
Resistance to Soil Burial (percent change maximum in original values)	ASTM D3083* 30-mil sheet	
a. Unsupported sheet		
1. Breaking Strength		5
2. Elongation at Break		20
3. Modulus at 100% Elongation		20
b. Membrane Fabric Breaking Strength	ASTM D751 Method A	25
Hydrostatic Resistance (pounds/sq. in. minimum)	ASTM D751 Method A Procedure 1	250
Ply Adhesion (each direction pounds/in. width minimum)	ASTM D413 Machine Method Type A	7

Factory Seam Requirements

Bonded Seam Strength (factory seam, breaking factor, lb. width)	ASTM D751*	160
Peel Adhesion (pounds/in. minimum)	ASTM D413*	FTB[1] or 10 lb/in.

Construction Plans &
Specifications
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Vulture Mine Project
Near Wickenburg, Arizona
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TABLE 2 (Cont'd.)

Material Properties of 36-mil Hypalon

Property	Test Method	36
Resistance to Soil Burial (percent change maximum in original value)	ASTM D3083*	
Peel Adhesion		20
Bonded Seam Strength		-25

*As modified in Appendix A of National Sanitation Foundation Standard 54 for Flexible Membrane Liners, November 1983.

[1]FTB - Film Tearing Bond.

Construction Plans &
Specifications
Heap Leach Facility
Vulture Mine Project
Near Wickenburg, Arizona
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DRAFT

TECHNICAL SPECIFICATIONS FOR SHOTCRETE & GEOTEXTILE ELEMENTS OF THE HEAP LEACH FACILITY

1. General

1.1 These technical specifications establish the quality of materials and workmanship and define how quality is measured for shotcrete and geotextile elements. They apply to the shotcrete spillway protection for the pregnant pond and geotextile underliner for the pregnant and barren ponds.

2. Abbreviations

2.1 The abbreviations below shall mean:

ASTM	American Society for Testing and Materials
ACI	American Concrete Institute
MAG	Maricopa Association of Governments

3. Codes & Standards

3.1 Unless otherwise specified or shown, the following codes and standards shall apply to the extent indicated by references herein:

ACI 506-66	Recommended Practice for Shotcreting (revised 1983).
MAG 525	Uniform Standards for Public Works Construction, Section 525, Pneumatically Placed Mortar (1979).

4. Shotcrete Spillway Protection

4.1 Areas of Placement

Shotcrete shall be placed beneath the geomembrane in the pregnant pond spillway as shown on the design plans.

4.2 Material Quality & Placement

Shotcrete shall meet the requirements of ACI Recommended Practice 506-66 (Revised 1983) for wet-mix process pneumatically placed mortar. Additional requirements to these specifications are listed below.

A. Fine aggregate shall consist of washed sand and shall be hard, dense, durable, clean, and well graded from fine to coarse, with no particles larger than 3/8 inch in diameter. It shall be free from organic matter and shall contain no more than 5 percent by weight passing the no. 200 sieve.

B. The sand to be used shall contain not less than 3 percent nor more than 6 percent moisture.

C. Before placing mixture in the hopper of the gun, all lumps too large for proper handling by the gun shall be removed by passing the mixture through a screen of suitable size.

D. The air pressure shall be maintained at a uniform level and shall be sufficient to maintain uniform and satisfactory nozzle operation.

E. At any construction joint, shotcrete shall be sloped to a thin edge. Before shooting the adjacent section, the sloped portion shall be thoroughly cleaned and wetted. No square joints will be allowed.

F. Shotcrete shall be membrane cured as described in MAG 525.7. No shotcrete shall be placed during freezing weather, except when proper protective measures are taken as with ordinary concrete work. Shotcrete shall not be placed against frosted surfaces.

G. Succeeding layers shall be placed less than one hour apart.

5. Geotextile Underliner

5.1 Pregnant & Barren Pond Underliner

The geotextile underliner for the pregnant and barren ponds shall consist of a 16-ounce per square yard, nonwoven geotextile, such as Trevira 1155, Mirafi 1160N, Supac 16NP or an approved equivalent.

5.2 Geotextile Installation

The underliner shall be installed such that foot traffic is minimized and no vehicle traffic crosses the underliner. All holes or tears which occur during installation shall be immediately marked and repaired. Repair methods shall be approved by the Engineer.

All overlap joints shall be overlapped a minimum of 2 feet.

Geotextiles are sensitive to ultraviolet radiation and must have very limited exposure to direct sunlight. Any geotextile stored at the site shall be covered with an ultraviolet stabilized tarp for protection. The geotextile shall not be exposed to direct sunlight for more than five days. Geotextiles shall be dry and clean immediately prior to installation.

5.3 Certification of Material

Before incorporating any geotextile materials into the project, a certification of materials must be submitted by the manufacturer or supplier. The certificate shall include:

A. Name of manufacturer.

B. Name of fabricator.

C. Chemical composition of geotextile and coating, if any.

D. Product description and life expectancy.

E. Statement of specification compliance including the name of this project.

F. Signature of authorized official attesting to the information presented.

G. Manufacturer's recommendations for field sewing and repairs.

At least 30 days prior to delivery of geotextile materials to the site, the Contractor shall inform the Engineer of the manufacturer and/or supplier from which he intends to obtain the geotextile materials. The Engineer shall have free access to the site of manufacture and subsequent area of storage for the purpose of obtaining samples for testing. All materials shall be subject to the approval of the Engineer.

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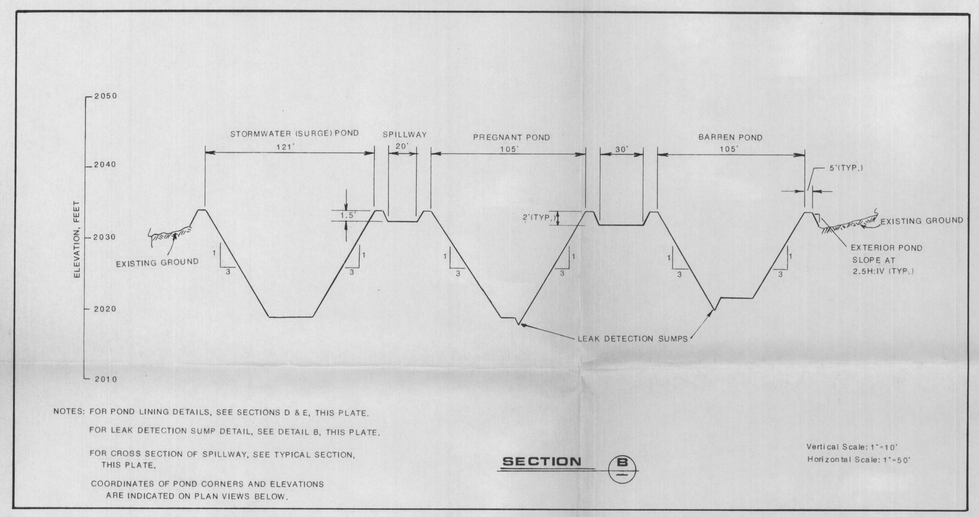


NOTES: FOR POND LINING DETAILS, SEE SECTIONS D & E, THIS PLATE.

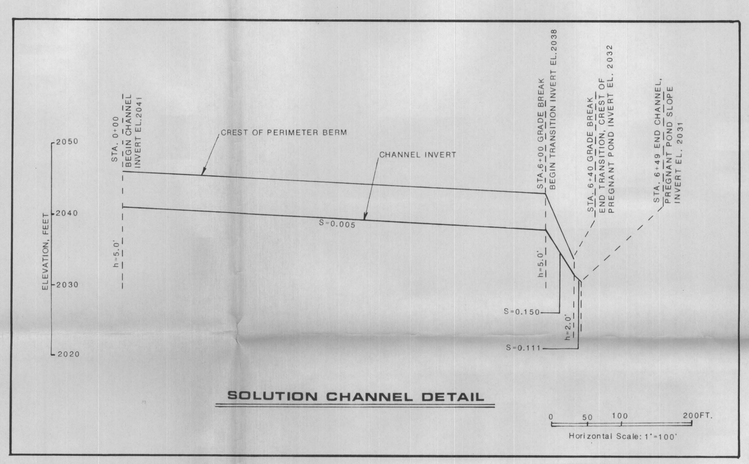
FOR LEAK DETECTION SUMP DETAIL, SEE DETAIL B, THIS PLATE.

FOR CROSS SECTION OF SPILLWAY, SEE TYPICAL SECTION, THIS PLATE.

COORDINATES OF POND CORNERS AND ELEVATIONS ARE INDICATED ON PLAN VIEWS BELOW.

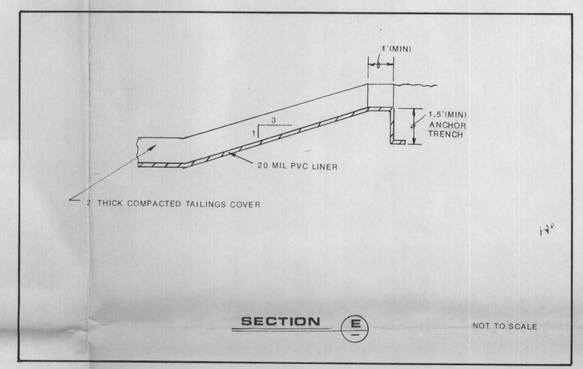
SECTION B

Vertical Scale: 1"=10'
Horizontal Scale: 1"=50'

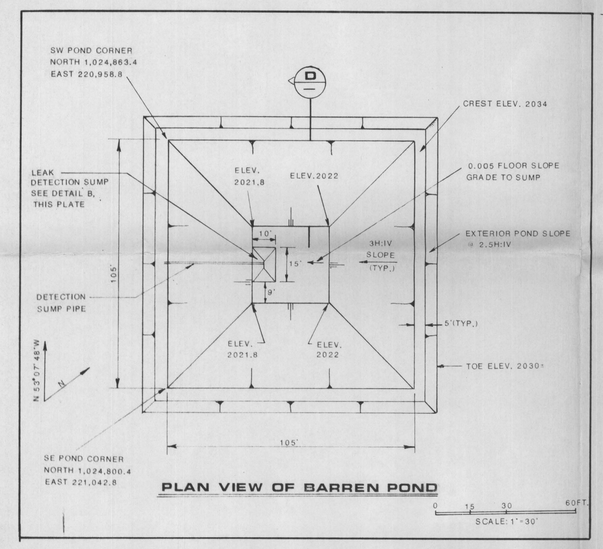


SOLUTION CHANNEL DETAIL

Horizontal Scale: 1"=100'

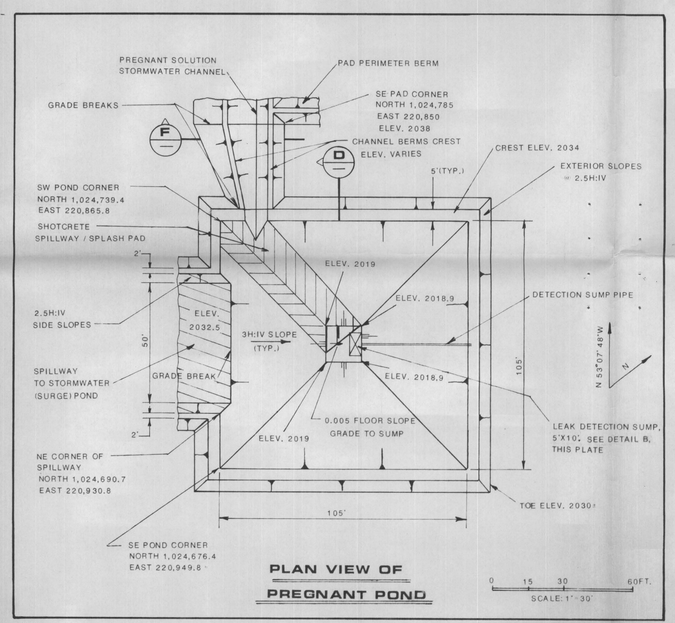


SECTION E NOT TO SCALE



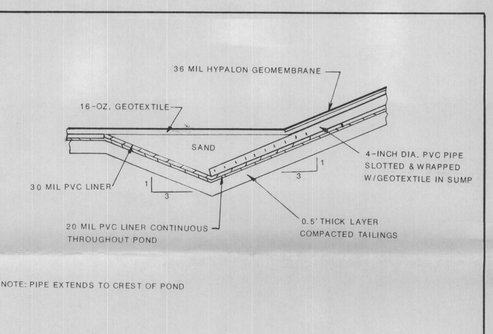
PLAN VIEW OF BARREN POND

SCALE: 1"=30'



PLAN VIEW OF PREGNANT POND

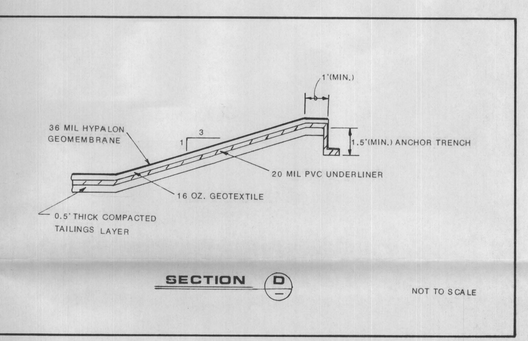
SCALE: 1"=30'



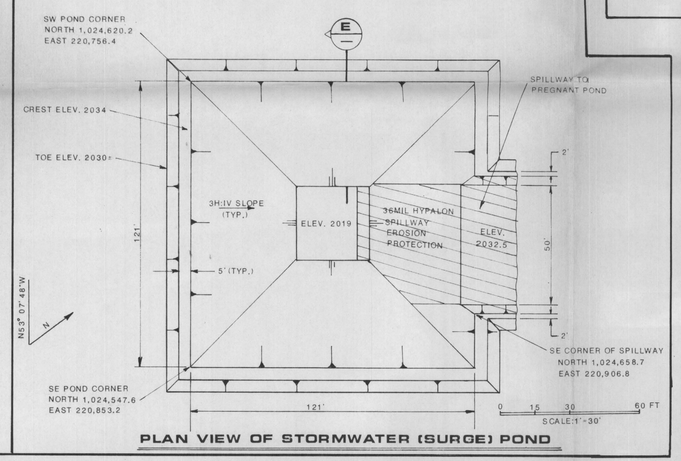
NOTE: PIPE EXTENDS TO CREST OF POND

LEAK DETECTION SUMP DETAIL B

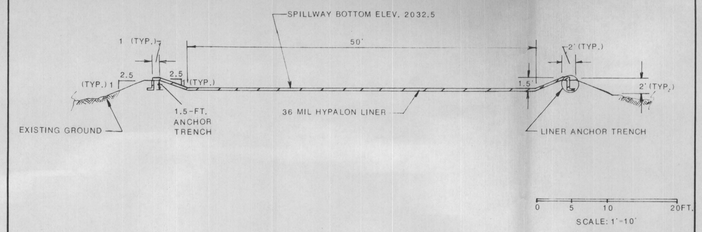
NOT TO SCALE



SECTION D NOT TO SCALE

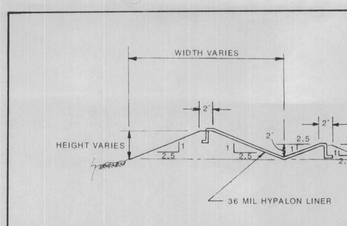


PLAN VIEW OF STORMWATER (SURGE) POND



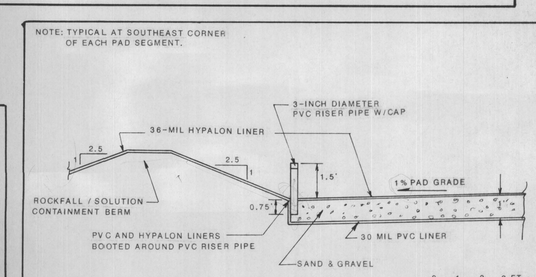
TYPICAL CROSS-SECTION THROUGH SPILLWAY

PAD LEAK DETECTION SYSTEM DETAIL



SECTION F
PREGNANT SOLUTION CHANNEL TRANSITION ZONE

SCALE: 1"=10'



PAD LEAK DETECTION SYSTEM LONGITUDINAL TYPICAL SECTION

DRAFT

NO.	DESCRIPTION	DATE
	REVISIONS	

SERGENT, HAUSKINS & BECKWITH
CONSULTING GEOTECHNICAL ENGINEERS

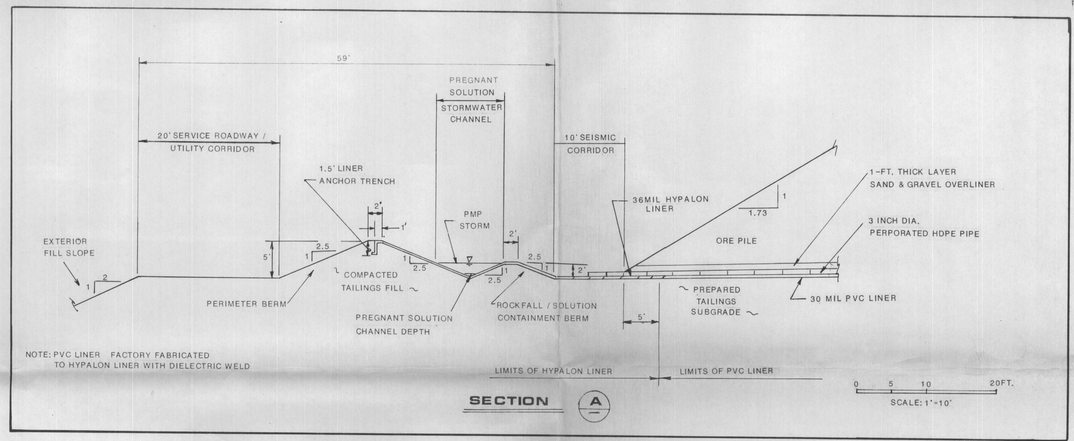
PLAN VIEWS, SECTIONS & DETAILS
VULTURE MINE PROJECT
NEAR WICKENBURG, ARIZONA

JOB NO.	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	PLATE NO
E87-220	10/87	NJL	CAW	LAH	2

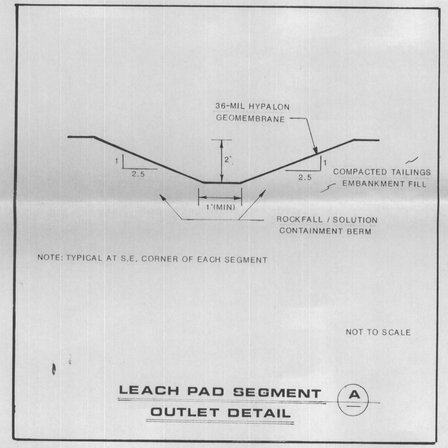
100282

REFERENCE DRAWING: "TOPOGRAPHIC MAP OF TAILING AREA, VULTURE MINE", PREPARED FOR ZORTMAN MINING CO., AERIAL MAPPING CO., INC., PHOENIX, ARIZONA, DATED 12/3/82.

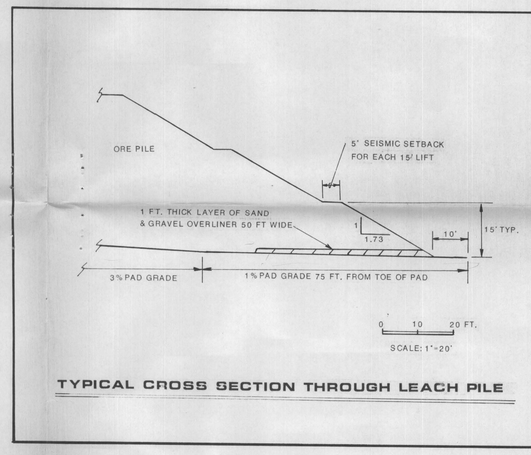
PLAN VIEW OF LEACH PAD & PONDS



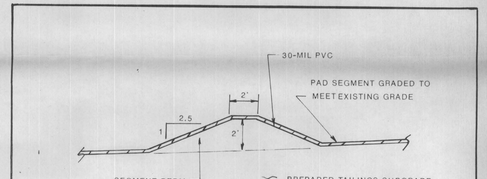
SECTION A



LEACH PAD SEGMENT OUTLET DETAIL A



TYPICAL CROSS SECTION THROUGH LEACH PILE



TYPICAL CROSS SECTION THROUGH PAD SEGMENT BERM

DRAFT

NO.	DESCRIPTION	DATE
	REVISIONS	

SERGENT, HAUSKINS & BECKWITH
CONSULTING GEOTECHNICAL ENGINEERS

LEACH PAD & POND LAYOUT DETAILS & TYPICAL SECTIONS VULTURE MINE PROJECT NEAR WICKENBURG, ARIZONA

JOB NO.	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	PLATE NO
E87-220	10/87	NJL	CAW	LAH	1