



R·A·M

Property of  
Flood Control District of MC Libras  
Please Return to  
2801 W. Durango  
Phoenix, AZ 85009

**Geotechnical Engineering Report**  
**Southeast Mesa Area Drainage Master Plan**  
**FCD 95-32**  
**Four CAP Basins**  
**Mesa, Arizona**  
**R.A.M. Project No. G02263**

*[Handwritten Signature]*  
Registered Professional Engineer (Civil)  
CERTIFICATE NO.  
10971  
KENNETH L.  
RICKER  
Date Signed 5/7/98  
ARIZONA, U.S.A.

**RICKER • ATKINSON • McBEE & ASSOCIATES, INC.**  
*Geotechnical Engineering • Construction Materials Testing*

**A442.902**

**Geotechnical Engineering Report  
Southeast Mesa Area Drainage Master Plan  
FCD 95-32  
Four CAP Basins  
Mesa, Arizona  
R.A.M. Project No. G02263**

For:  
Dibble & Associates  
2633 E. Indian School Road, Suite 401  
Phoenix, Arizona 85016-6763



By:  
Ricker, Atkinson, McBee & Associates, Inc.  
2105 South Hardy Drive, Suite 13  
Tempe, Arizona 85282



R·A·M

**RICKER • ATKINSON • McBEE & ASSOCIATES, INC.**

*Geotechnical Engineering • Construction Materials Testing*

Dibble & Associates  
2633 E. Indian School Road, Suite 401  
Phoenix, Arizona 85016-6763

May 6, 1998

Attention: Brian Fry

Subject: Geotechnical Engineering Report  
Southeast Mesa Area Drainage Master Plan  
FCD 95-32  
Four CAP Basins  
Mesa, Arizona

R.A.M. Project No. G02263

Attached to this letter is the Geotechnical Engineering Report for the proposed Southeast Mesa Area Drainage Master Plan - Four CAP Basins to be located in Mesa, Arizona.

The proposed Four CAP Basins will provide flood control for the residential area south of the basins. The basins will be developed by a combination of constructing berms up to 11-feet-high and cutting into existing grades. The results of our field exploration; laboratory testing; and engineering analysis, evaluation and recommendations are presented in the report.

The following is a brief summary of selected recommendations.

A. CAP Basin Berms and Cuts:

- 2H:1V on the side slopes.

B. Berm Material:

- Sources -  
Retention area.
- Material Type -  
Silty Sand, some to with gravel and clayey gravelly sand.

The attached report was prepared based on project and site data available at this time and was prepared in a manner and to the standards of the local geotechnical engineering practice. Our services did not include evaluations for the presence of hazardous materials, for area subsidence resulting from groundwater withdrawal or other geologic hazards.

Respectfully submitted,

**RICKER, ATKINSON, MCBEE & ASSOCIATES, INC.**



By: Kenneth L. Ricker, P.E.



Reviewed by: Charles H. Atkinson, P.E.

/nk

Copies to: Addressee (5)

## TABLE OF CONTENTS

REPORT	<u>PAGE</u>
Introduction .....	1
Proposed Construction .....	1
Site Conditions .....	2
Field Explorations .....	2
Laboratory Analysis .....	2
Subsurface Conditions .....	3
Discussions of Test Results .....	3
Detention Basin Berms .....	3
Site Development Recommendations	
Excavatability .....	4
Workability .....	5
Corrosion Potential .....	5
Materials Suitability and Requirements	
Site Soils .....	5
Site Preparation and Grading Procedures .....	5
APPENDIX A - FIELD EXPLORATION	
Site Plan .....	A1
Soil Legend .....	A2
Boring Logs .....	A3
APPENDIX B - LABORATORY ANALYSIS	
Direct Shear .....	B1
Sieve Analysis, Percent Passing No. 200 Sieve, Atterberg Limits .....	B5
pH, Minimum Resistivity .....	B6
Soluble Salts, Sulfate, Chloride by Laboratory Consultants .....	B7



**REPORT**



**R·A·M**

## **INTRODUCTION**

This report presents the results of our geotechnical engineering services for the proposed Southeast Mesa Area Drainage Master Plan - FCD 95-32 - Four CAP Basins in Mesa, Arizona. The scope of our services included performing a field exploration program, laboratory analysis and geotechnical engineering evaluation, analysis and recommendations. The geotechnical recommendations presented herein consist of basin berms and cut slope design recommendations, site development recommendations, material suitability and requirements, and site preparation and grading procedures. We would be pleased to discuss with you any additional recommendations you may require. In addition, we are available to review project specifications and plans for conformance with our recommendations at no charge to you.

This firm should be notified for additional evaluation and recommendations should the facility design parameters (location, type, size), site use or conditions encountered during construction differ from those presented herein.

## **PROPOSED CONSTRUCTION**

The proposed Four CAP Basins will provide protection for residential areas downstream from the facilities. CAP Basin 1 is located south of the CAP Canal, north of Cholla Road and west of Ellsworth Road. The basin will be 10.15 acres and 4.8 feet deep. CAP Basin 2 is located south of the CAP Canal, north of University Drive and east of Ellsworth Road. The basin will be 13.8 acres and 7.0 feet deep. CAP Basin 3 is located on the south side of the CAP Canal, south of University Drive and east of Ellsworth Road. The basin will be 8.2 acres and 7.0 feet deep. CAP Basin 4 is located on the north and east of the CAP Canal and north of Apache Trail. The basin will be 11.35 acres and 4.0 feet deep. The basins will be constructed by building berms on the downstream side of the basins and cutting the basins into the ground on the upstream side. Berm fills will be up to 11 feet high and cuts for the basins will be up to 12 feet deep. Fill material for the berm construction will be obtained from basin excavation.

## **SITE CONDITIONS**

The proposed Four CAP Basins are along an existing drainage way near the CAP Canal. Except for CAP Basin 2, the site is native desert sloping downward to the south-southwest. The sites contain various desert plants. In CAP Basin 2, part of the area is native desert and part is an area of previously developed lots containing construction debris. The sites are in Mesa, Arizona.

## **FIELD EXPLORATIONS**

Subsurface conditions at the site were explored by drilling eleven test borings to depths of 12 to 15 feet at various locations in the CAP Basins as shown in Appendix A. The test borings were drilled with a CME 55 drill rig using 7-inch diameter, hollow-stem augers. The drilling equipment and crew were provided by D & S Drilling, Inc. The test boring locations were determined in the field by a technician from our firm who also directed the drill crew. During the field explorations, representative disturbed and undisturbed samples were obtained, the test borings logged and soils field classified by our technician. The relatively undisturbed samples were obtained by driving a 3-inch diameter, ring-lined, open-end sampler into the soil with a 140-pound hammer dropping 30 inches. In addition to drilling and sampling continuous penetration tests using a 2-inch diameter ring and the 140-pound hammer dropping 30-inches were performed and extended to depths of 4.5 to 10.0 feet at each of the test boring locations. The results of the field explorations are presented on the Test Boring Logs in Appendix A.

## **LABORATORY ANALYSIS**

Representative samples obtained during the field exploration were subjected to the following laboratory tests.

<u>Type of Test</u>	<u>Type of Sample</u>	<u>Number of Samples Tested</u>
Direct Shear	Undisturbed	4
Direct Shear	Remolded	1
Sieve Analysis and Atterberg Limits	Representative	11
Soluble Salts, Sulfates, Chlorides*	Representative	4
pH/Resistivity	Representative	4
Moisture Content/Dry Density**	Undisturbed	14
Moisture Content**	Split-Spoon	12

\*Performed by Laboratory Consultants

\*\*Reported on the test boring logs

The results of the laboratory tests are presented in Appendix B.

### **SUBSURFACE CONDITIONS**

The subsurface conditions encountered at the test boring locations were relatively uniform. The results of each test boring are presented in Appendix A in the Test Boring Logs. In general, the soils encountered at the test boring locations to depths of 3.5 to 6.5 feet consisted of medium dense silty sand with various amounts of gravel. These soils had low to no plasticity fines, intermittent light cementation and were underlain by medium dense to dense clayey gravelly sand which was moderately to heavily cemented. The soil moisture was described as nearly dry. No groundwater was encountered in any of our test borings.

### **DISCUSSIONS OF TEST RESULTS**

The undisturbed samples of near surface soils exhibited low to moderate strengths in direct shear at submerged conditions.

### **DETENTION BASIN BERMS**

The Four CAP Basins will be contained by cut slopes and berms. The purpose of the basins is to

prevent flash floods from damaging downstream developments. The flows in the wash are intermittent and of variable intensity. The proposed berms will consist of a compacted soil section placed on a prepared subgrade with box, metal or concrete pipe culvert discharges along the alignment of the wash or outlet channel.

The configuration, fill berms and cut slopes should be no steeper than 2H:1V.

Since retention durations are short, long-term seepage through and/or under the embankment will not occur and detailed seepage analyses were not performed.

The allowable bearing capacity of the ground surface at the bottom of the fill berm was checked and found to be within typical design parameters. The settlement of the berm fill section was also evaluated. It is our opinion that a majority of the settlement will occur during construction and will be less than 1 inch after construction.

## **SITE DEVELOPMENT RECOMMENDATIONS**

### Excavatability:

The excavatability of site materials is difficult to evaluate based only on the exploration equipment used during this design report. Therefore, we recommend that the contractor evaluate the excavatability of site materials by performing test excavations with the size and type of equipment the contractor plans on using at the site. For design purposes the following paragraph presents our best analysis as to the excavatability of site soils.

The near surface and underlying soils to depths of 2 to 9 feet can probably be removed with conventional excavating equipment. Excavations penetrating the underlying cemented soils may be slow and difficult to accomplish. OSHA requires all excavations over five feet in depth, in which personnel are to enter, be either braced or sloped in accordance with OSHA regulations.

Workability:

Wetting site soils such that moisture contents are at or above optimum could result in some soil pumping under dynamic loadings such as heavy construction equipment driving over the area. In embankment areas, some pumping is not detrimental during the initial fill placement provided the specified percent compaction is achieved. However, where severe pumping has damaged subgrade conditions, the area should be allowed to dry until soils are workable without pumping, or the wetted areas removed and replaced with drier site soils.

Corrosion Potential:

Based on pH, soluble salts, sulfates, chlorides and resistivity tests, site soils at the CAP Basins are moderately corrosive to unprotected metal. Metal culverts should be either aluminum alloy or bituminous coated. We recommend that the attached results be reviewed by an engineer specializing in corrosion.

**MATERIALS SUITABILITY AND REQUIREMENTS**

Site Soils:

The existing native soils may be used as fill in the berms. All materials should be free of organics, debris and rubble and cobbles larger than 6 inches.

**SITE PREPARATION AND GRADING PROCEDURES**

Recommendations presented in the previous sections of this report are based upon the following site preparation and grading procedures. Therefore, all earthwork should be accomplished with observation and testing by a qualified technician under the direction of a registered geotechnical/materials engineer. The following apply to the areas within and extending 5 feet beyond the footprint of the facilities.

1. Clear and grub the site by removing and disposing of all vegetation, debris, rubble and remnants of former developments.

2. Strip the area of all existing fill zones, backfill zones, unstable soils and loose wash bed deposits. During stripping observe the surface for evidence of buried debris, vegetation or disturbed materials which will require additional removal. If encountered, these materials should be removed. Areas steeper than 5H to 1V should be benched and any depressions widened to accommodate compaction equipment.
3. Prepare the ground surface in fill areas and in areas cut to grade by scarifying, moisture conditioning and compacting the exposed surface soils to a depth of 12 inches.
4. Moisture condition and place all fill and backfill materials required to achieve specified grades. Fill materials should be moisture conditioned, placed and compacted in horizontal lifts of thicknesses compatible with the compaction equipment being used.
5. Compact subgrade, fill, backfill, subbase fill or base material to the following minimum percent compaction of the ASTM D698 maximum dry density in each lift:

<u>Material</u>	<u>Minimum Percent Compaction</u>
Soil:	
Berm Fill-----	95
Backfill:*-----	90

\* Outside of berm areas.

6. The moisture content of soil materials at the time of compaction should be:

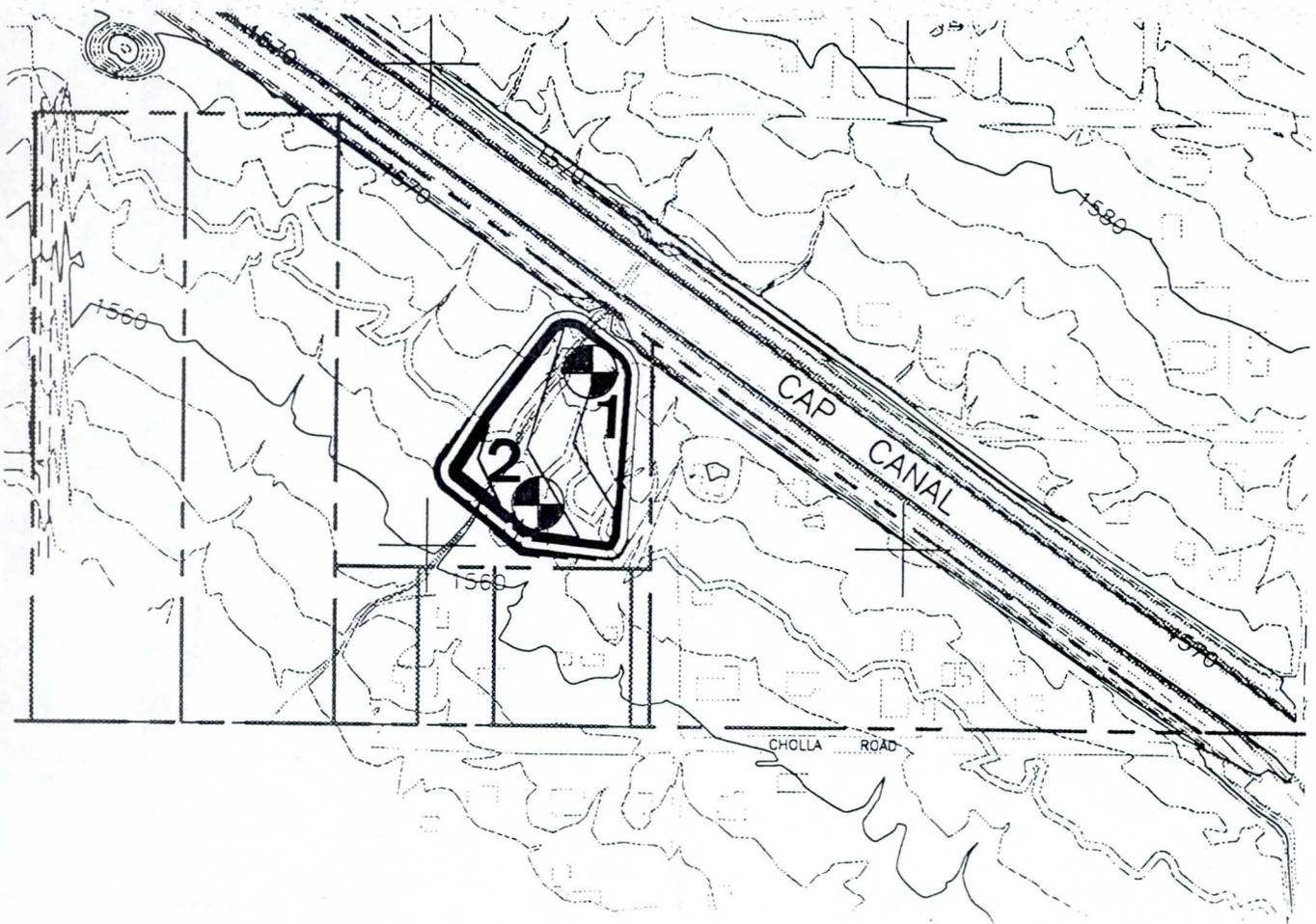
<u>Type</u>	<u>Area of Use</u>	<u>Moisture Content</u>
On-site	Berms	Optimum plus or minus 3%
Imported	Berms	Optimum plus or minus 3%

7. Any soils which are disturbed or overexcavated by the contractor, outside the limits of the plans or specifications, should be replaced with materials compacted as specified above.

**APPENDIX A**  
**FIELD EXPLORATIONS**



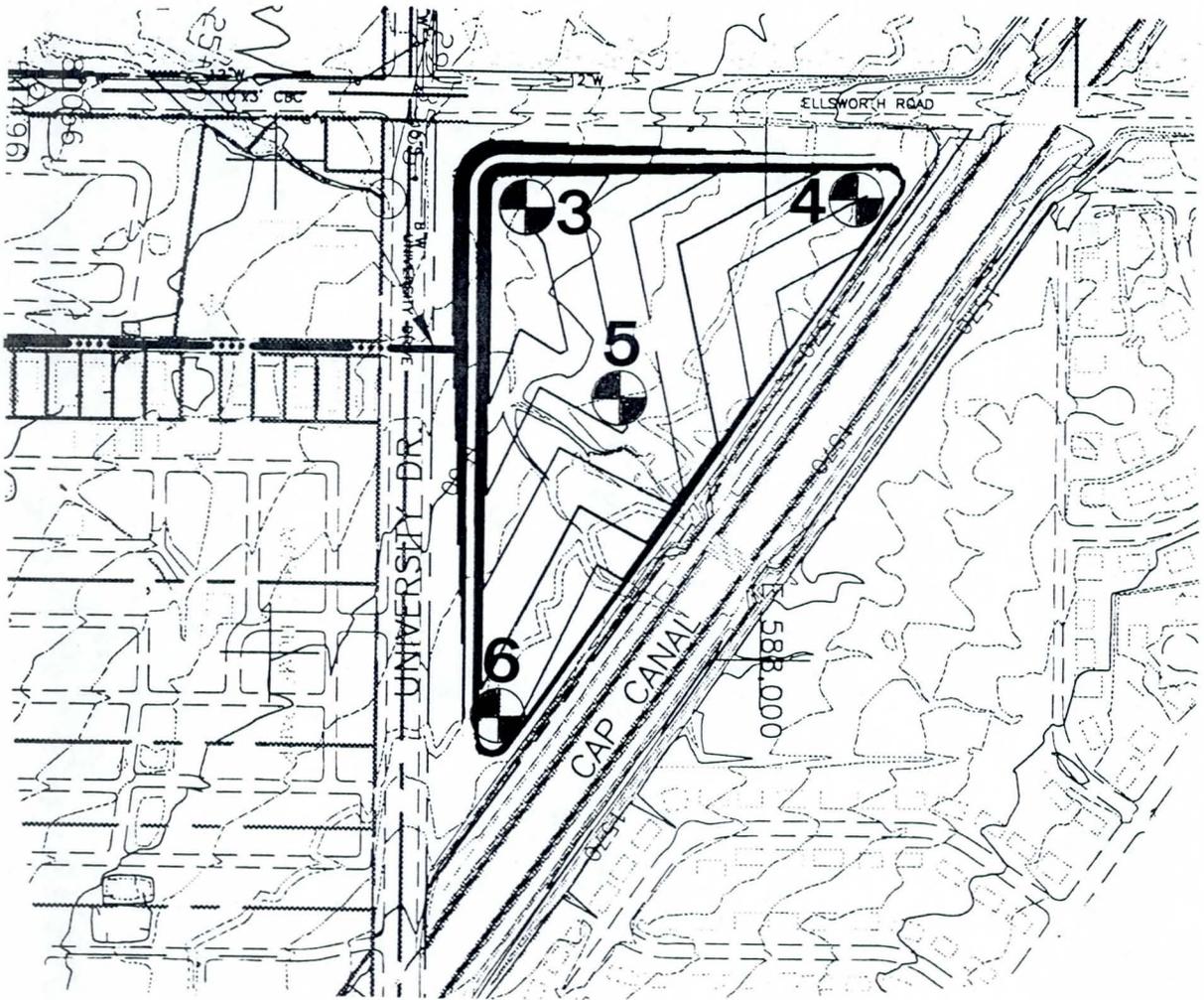
R·A·M



 Test Boring Location

CAP BASIN 1

SITE PLAN



Test Boring Location

### CAP BASIN 2 OUTLET CHANNEL

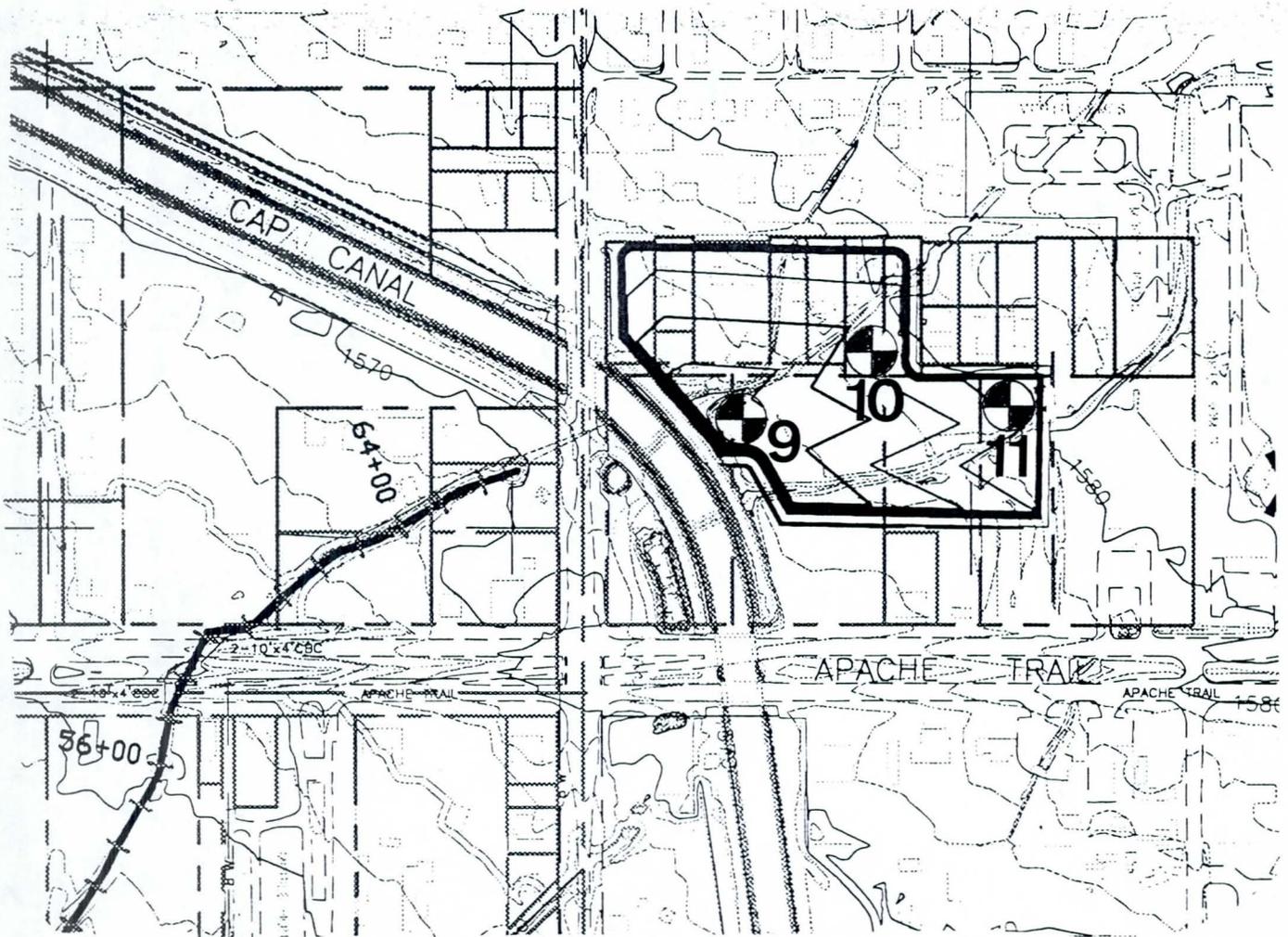
SITE PLAN



Test Boring Location

### CAP BASIN 3 OUTLET CHANNEL

SITE PLAN



Test Boring Location

### CAP BASIN 4

SITE PLAN

# LEGEND

## CLASSIFICATION OF SOILS

ASTM Designation: D2487-83  
(Based on Unified Soil Classification System)

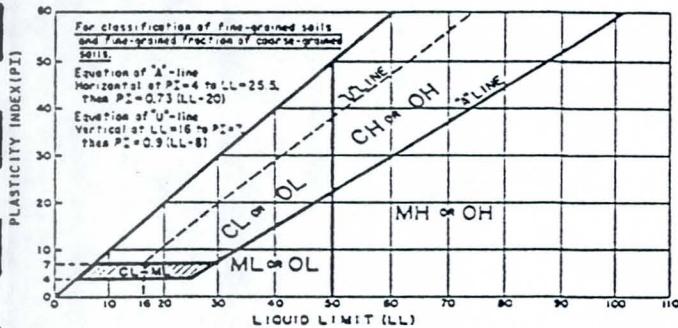
Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests			Soil Classification			
			Group Symbol	Name		
COARSE-GRAINED SOILS More than 50% retained on No. 200 Sieve	Gravels More than 50% coarse fraction retained on No. 4 Sieve	Clean Gravels Less than 5% fines	$Cu > 4$ and $1 < Cc < 3$	GW	Well graded gravel	
			$Cu < 4$ and/or $1 > Cc > 3$	GP	Poorly graded gravel	
	Sands 50% or more of coarse fraction passes No. 4 sieve	Gravels with Fines More than 12% fines	Fines classify as ML or MH	GM	Silty gravel	
			Fines classify as CL or CH	GC	Clayey gravel	
		Clean Sands Less than 5% fines	$Cu > 6$ and $1 < Cc < 3$	SW	Well-graded sand	
			$Cu < 6$ and/or $1 > Cc > 3$	SP	Poorly graded sand	
FINE-GRAINED SOILS 50% or more passes the No. 200 Sieve	Silt and Clays Liquid limit less than 50	Inorganic	$PI > 7$ and plots on or above "A" line	CL	Lean clay	
			$PI < 4$ or plots below "A" line	ML	Silt	
		Organic	$\frac{\text{Liquid Limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OL	Organic clay Organic silt	
		Silt and Clays Liquid limit 50 or more	Inorganic	$PI$ plots on or above "A" line	CH	Fat clay
				$PI$ plots below "A" line	MH	Elastic silt Organic clay
	Organic		$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OH	Organic silt	
	HIGHLY ORGANIC SOILS		Primarily organic matter, dark in color, and organic odor		PT	Peat

## TEST BORING LOG DEFINITIONS

Blows per foot using 140 pound hammer with 30 inch free-fall.

Depth, feet	Blows/Foot		Sample Type	Dry Density pcf	Water Content, %	Unified Classification	Description
	C	N/R					

C = Continuous Penetration Resistance (2 inch diameter rod)  
N = Standard Penetration Resistance (ASTM D1586)  
R = Penetration Resistance (3 inch diameter ring line sampler)



SILTS & CLAYS DISTINGUISHED ON BASIS OF PLASTICITY	U.S. STANDARD SERIES SIEVE			GRAIN SIZES		CLEAR SQUARE SIEVE OPENINGS		
	200	40	10	4	3/4"	3"	12"	
	SAND			GRAVEL		COBBLES		BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE			
MOISTURE CONDITION (INCREASING MOISTURE → )								
DRY	SLIGHTLY DAMP		DAMP	MOIST	VERY MOIST		WELL (SATURATED) (Liquid Limit)	
				(Plastic Limit)				

CONSISTENCY CORRELATION		RELATIVE DENSITY CORRELATION	
CLAYS & SILTS	BLOWS/FOOT*	SANDS & GRAVELS	BLOWS/FOOT*
VERY SOFT	0-2	VERY LOOSE	0-4
SOFT	2-4	LOOSE	4-10
FIRM	4-8	MEDIUM DENSE	10-30
STIFF	8-16	DENSE	30-50
VERY STIFF	16-32	VERY DENSE	OVER 50
HARD	OVER 32		

\*Number of blows of 140 lb. hammer falling 30" to drive a 2" O.D. (1-3/8" I.D.) split-spoon sampler (ASTM D1586).

## TEST BORING LOG

Project: Southeast Mesa Area Drainage Master Plan  
 Elevation: Not Determined Datum: ---

TEST BORING: 1  
 Date: 4-9-98

Depth, feet	Blows/Foot		Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
	C	N/R					
4 6 33 69		32	R	*	1	SM	Silty Sand, Some to With Gravel; brown, nearly dry, medium dense, low to no plasticity fines, intermittent light cementation.
5 10 15	50/5"	50/3"	N		4	SC	Clayey Gravelly Sand; brown, nearly dry, medium dense to dense, medium plasticity fines, moderate to heavy cementation.
15		50/4"	N		2		Stopped drilling at 15 feet. No Groundwater Observed. * = Sample too disturbed to determine density.
20 25							This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

## TEST BORING LOG

Project:           Southeast Mesa Area Drainage Master Plan            
 Elevation:           Not Determined           Datum:           ---          

TEST BORING:           2            
 Date:           4-9-98          

Depth, feet	Blows/Foot		Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
	C	N/R					
2 3 6 11		6	N		3	SM	Silty Sand, Some to With Gravel; brown, nearly dry, medium dense, low to no plasticity fines, intermittent light cementation.
5	-50/7"						
5 10		50/6"	N		3	SC	Clayey Gravelly Sand; brown, nearly dry, medium dense to dense, medium plasticity fines, moderate to heavy cementation.
10		50/3"	N	NR			
15 20 25							Stopped drilling at 12 feet. No Groundwater Observed. NR = No Recovery.
							This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

## TEST BORING LOG

Project: Southeast Mesa Area Drainage Master Plan  
 Elevation: Not Determined Datum: ---

TEST BORING: 3  
 Date: 4-9-98

Depth, feet	Blows/Foot		Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
	C	N/R					
5	7 5 7 12 25	9	R	109	6	SM	Silty Sand, Some to With Gravel; brown, nearly dry, medium dense, low to no plasticity fines, intermittent light cementation.
10	50/8"	50/8"	R	*	4	SC	Clayey Gravelly Sand; brown, nearly dry, medium dense to dense, medium plasticity fines, moderate to heavy cementation.
15		50/5"	N		4		Stopped drilling at 12 feet. No Groundwater Observed. * = Sample too disturbed to determine density.
20							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

## TEST BORING LOG

Project: Southeast Mesa Area Drainage Master Plan  
 Elevation: Not Determined Datum: ---

TEST BORING: 4  
 Date: 4-9-98

Depth, feet	Blows/Foot		Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
	C	N/R					
8						SM Silty Sand, Some to With Gravel; brown, nearly dry, medium dense, low to no plasticity fines, intermittent light cementation.	
6		12	R	117	3		
7							
10							
5 11						SC Clayey Gravelly Sand; brown, nearly dry, medium dense to dense, medium plasticity fines, moderate to heavy cementation.	
14	12	R	113	2			
10 31 50/6"						Stopped drilling at 12 feet. No Groundwater Observed.	
50/4"	N						
15						Stopped drilling at 12 feet. No Groundwater Observed.	
20							
25							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.



## TEST BORING LOG

Project: Southeast Mesa Area Drainage Master Plan TEST BORING: 6  
 Elevation: Not Determined Datum: --- Date: 4-9-98

Depth, feet	Blows/Foot		Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
	C	N/R					
9 6 14 32		12	R	*	4	SM	Silty Sand, Some to With Gravel; brown, nearly dry, medium dense, low to no plasticity fines, intermittent light cementation.
5 50/9"		50/5"	R	*	6	SC	Clayey Gravelly Sand; brown, nearly dry, medium dense to dense, medium plasticity fines, moderate to heavy cementation.
10 50/5"			N		4		Stopped drilling at 12 feet. No Groundwater Observed. *= Sample too disturbed to determine density.
15							
20							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

## TEST BORING LOG

Project: Southeast Mesa Area Drainage Master Plan  
 Elevation: Not Determined Datum: ---

TEST BORING: 7  
 Date: 4-9-98

Depth, feet	Blows/Foot		Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
	C	N/R					
8						SM	Silty Sand, Some to With Gravel; brown, nearly dry, medium dense, low to no plasticity fines, intermittent light cementation.
6		8	R	103	4		
4							
5							
4							
5							
12		41	R	110	2		
-50/6"						SC	Clayey Gravelly Sand; brown, nearly dry, medium dense to dense, medium plasticity fines, moderate to heavy cementation.
10		50/2"	R	NR			
15							Stopped drilling at 12 feet. No Groundwater Observed. NR = No Recovery.
20							
25							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

## TEST BORING LOG

Project: Southeast Mesa Area Drainage Master Plan  
 Elevation: Not Determined Datum: ---

TEST BORING: 8  
 Date: 4-9-98

Depth, feet	Blows/Foot		Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
	C	N/R					
6						SM Silty Sand, Some to With Gravel; brown, nearly dry, medium dense, low to no plasticity fines, intermittent light cementation.	
5		8	R	106	3		
3							
6							
10						SC Clayey Gravelly Sand; brown, nearly dry, medium dense to dense, medium plasticity fines, moderate to heavy cementation.	
29		43	R	104	4		
60						Stopped drilling at 12 feet. No Groundwater Observed. NR= No Recovery.	
50/5"							
10		50/4"	N	NR			
15							
20							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

## TEST BORING LOG

Project: Southeast Mesa Area Drainage Master Plan  
 Elevation: Not Determined Datum: ---

TEST BORING: 9  
 Date: 4-9-98

Depth, feet	Blows/Foot		Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
	C	N/R					
9						SM Silty Sand, Some to With Gravel; brown, nearly dry, medium dense, low to no plasticity fines, intermittent light cementation.	
10							
7		11	R	107	8		
12							
5	10						
18		31	R	NR		SC Clayey Gravelly Sand; brown, nearly dry, medium dense to dense, medium plasticity fines, moderate to heavy cementation.	
10							
9							
13							
10	72		N		2		
15		50/5"				Stopped drilling at 12 feet. No Groundwater Observed. NR= No Recovery.	
20							
25							
25							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

## TEST BORING LOG

Project: Southeast Mesa Area Drainage Master Plan  
 Elevation: Not Determined Datum: ---

TEST BORING: 10  
 Date: 4-9-98

Depth, feet	Blows/Foot		Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
	C	N/R					
5	5					SM	Silty Sand, Some to With Gravel; brown, nearly dry, medium dense, low to no plasticity fines, intermittent light cementation.
6		10	R	*	2		
9							
14							
18							
5	50/10"	50/10"	R	115	3	SC	Clayey Gravelly Sand; brown, nearly dry, medium dense to dense, medium plasticity fines, moderate to heavy cementation.
10		50/6"	N		3		
15							Stopped drilling at 12 feet. No Groundwater Observed. * = Sample too disturbed to determine density.
20							
25							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

## TEST BORING LOG

Project: Southeast Mesa Area Drainage Master Plan  
 Elevation: Not Determined Datum: ---

TEST BORING: 11  
 Date: 4-9-98

Depth, feet	Blows/Foot		Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
	C	N/R					
5 8 10 16 23	5	9	R	112	1	SM	Silty Sand, Some to With Gravel; brown, nearly dry, medium dense, low to no plasticity fines, intermittent light cementation.
62 50/5"	50/6"		R	NR		SC	Clayey Gravelly Sand; brown, nearly dry, medium dense to dense, medium plasticity fines, moderate to heavy cementation.
65/9"		65/9"	N		3		Stopped drilling at 12 feet. No Groundwater Observed. NR= No Recovery.
15 20 25							This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

**APPENDIX B**  
**LABORATORY ANALYSIS**



R·A·M

# LABORATORY TEST RESULTS

Date: 4-May-98

SAMPLE SOURCE: 2 @ 1.5'-3'

TESTING PERFORMED: Direct Shear (ASTM D3080) - Remolded Sample

SAMPLED BY: RAM/Miller

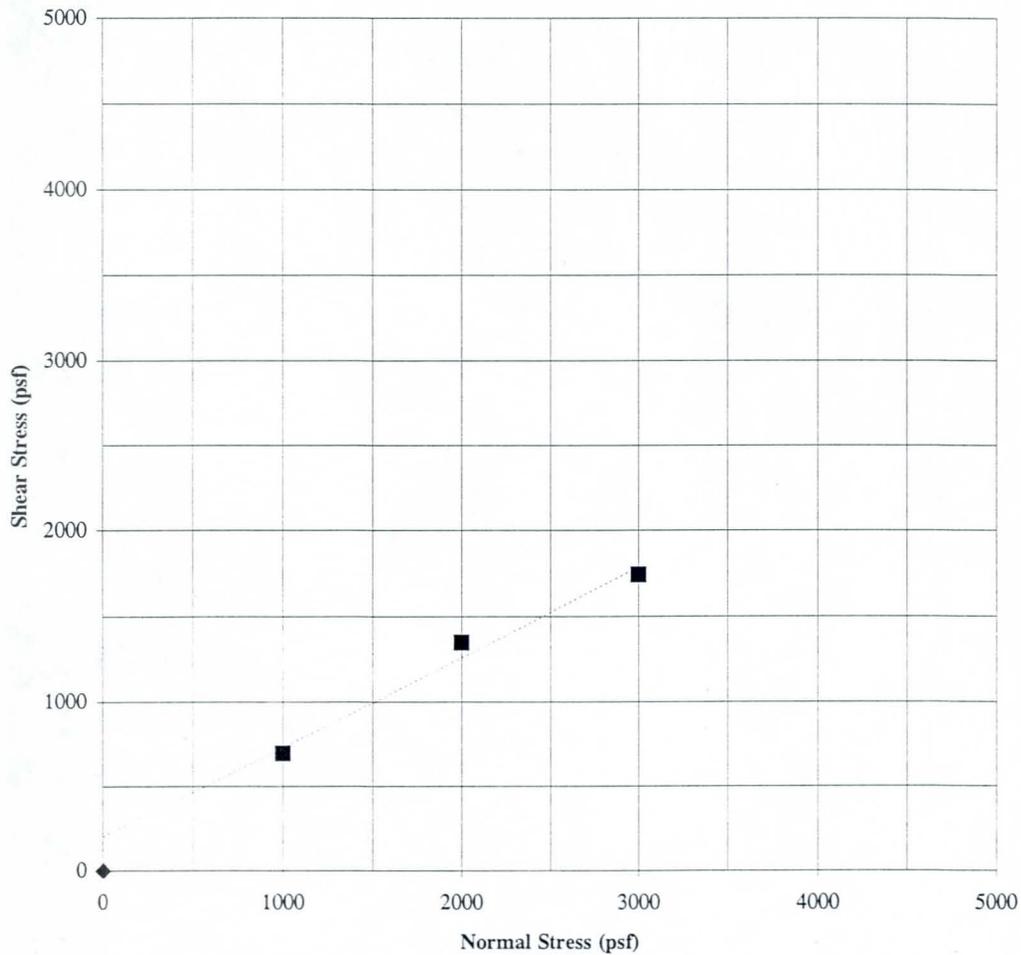
## RESULTS:

Dry Density (pcf): 121

Moisture Content (%): 4

Cohesion (psf) = 200

Friction Angle (phi) = 28



REMARKS: Samples submerged prior to testing.

# LABORATORY TEST RESULTS

Date: 4-May-98

SAMPLE SOURCE: 4 @ 5'-6'

TESTING PERFORMED: Direct Shear (ASTM D3080) - Driven Ring Sample

SAMPLED BY: RAM/Miller

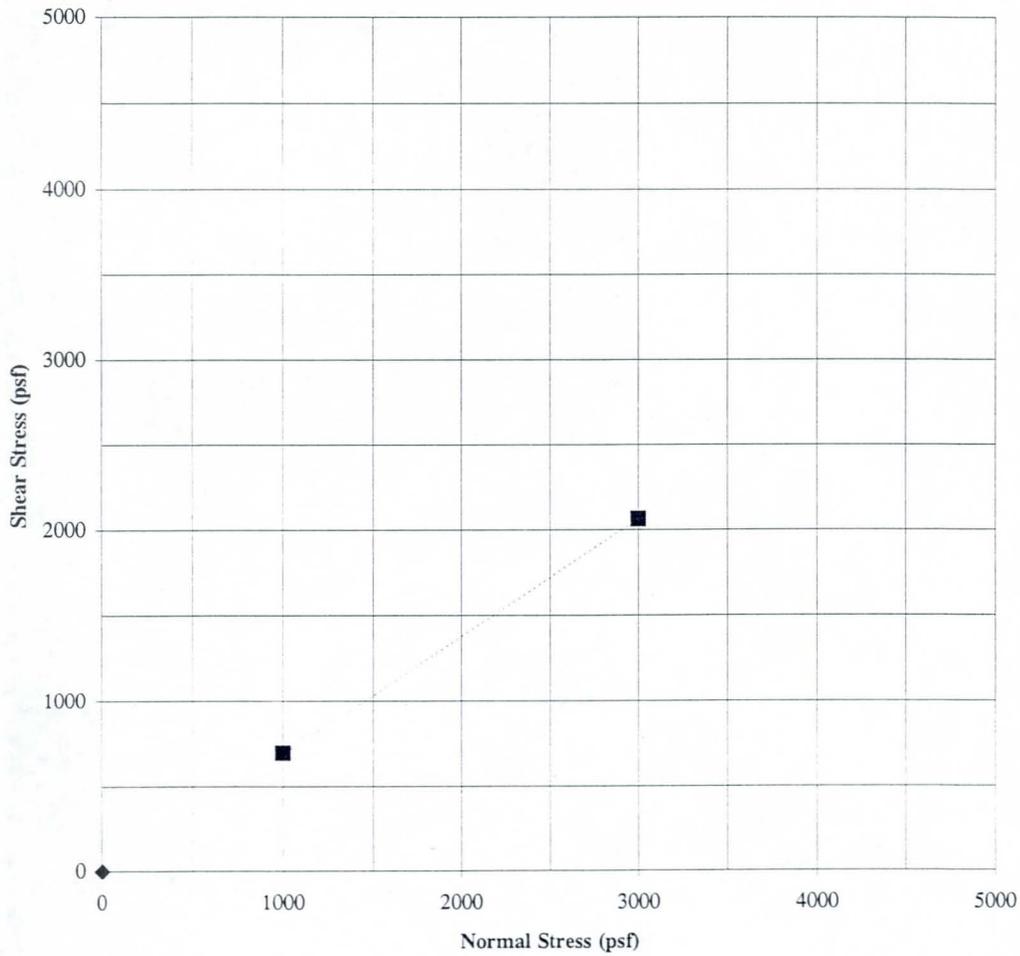
**RESULTS:**

Dry Density (pcf): 113

Moisture Content (%): 2

Cohesion (psf) = 0

Friction Angle (phi) = 35



REMARKS: Samples submerged prior to testing.

# LABORATORY TEST RESULTS

Date: 4-May-98

SAMPLE SOURCE: 7 @ 1.5'-2.5'

TESTING PERFORMED: Direct Shear (ASTM D3080) - Driven Ring Sample

SAMPLED BY: RAM/Miller

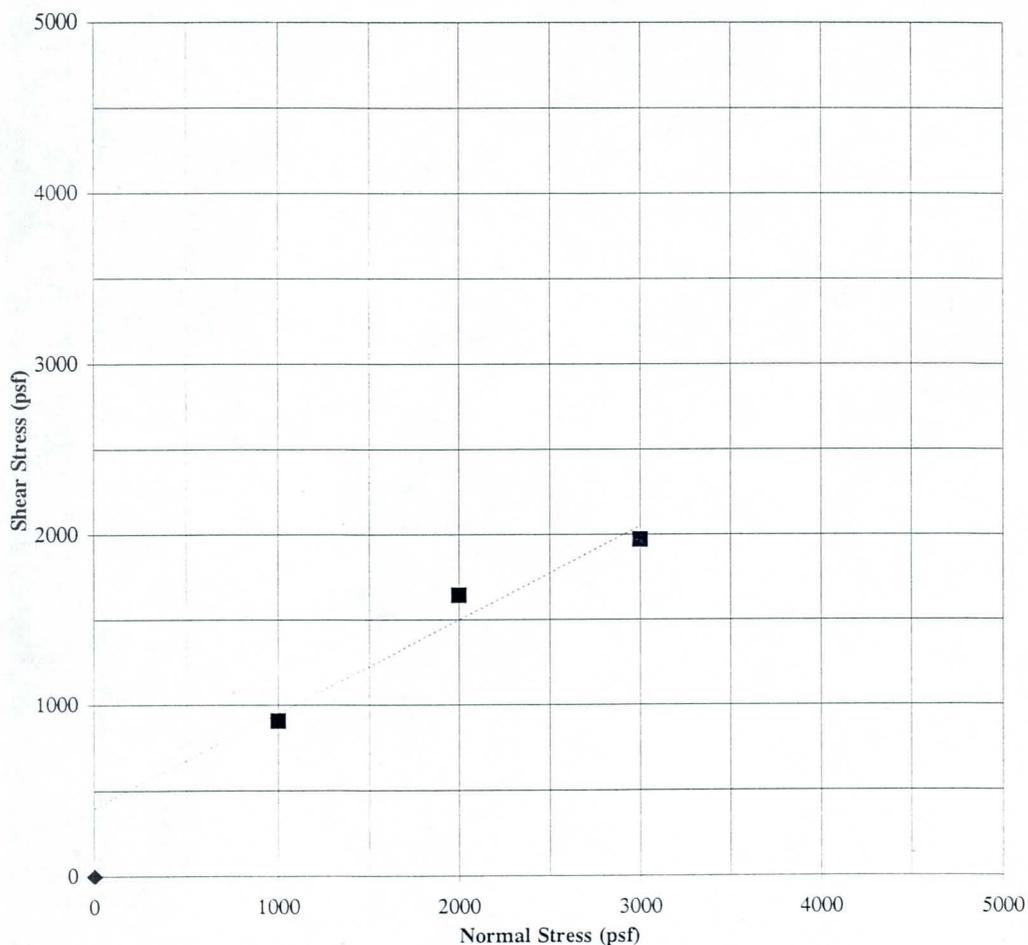
## RESULTS:

Dry Density (pcf): 103

Moisture Content (%): 4

Cohesion (psf) = 400

Friction Angle (phi) = 29



REMARKS: Samples submerged prior to testing.

# LABORATORY TEST RESULTS

Date: 4-May-98

SAMPLE SOURCE: 10 @ 5'-6'

TESTING PERFORMED: Direct Shear (ASTM D3080) - Driven Ring Sample

SAMPLED BY: RAM/Miller

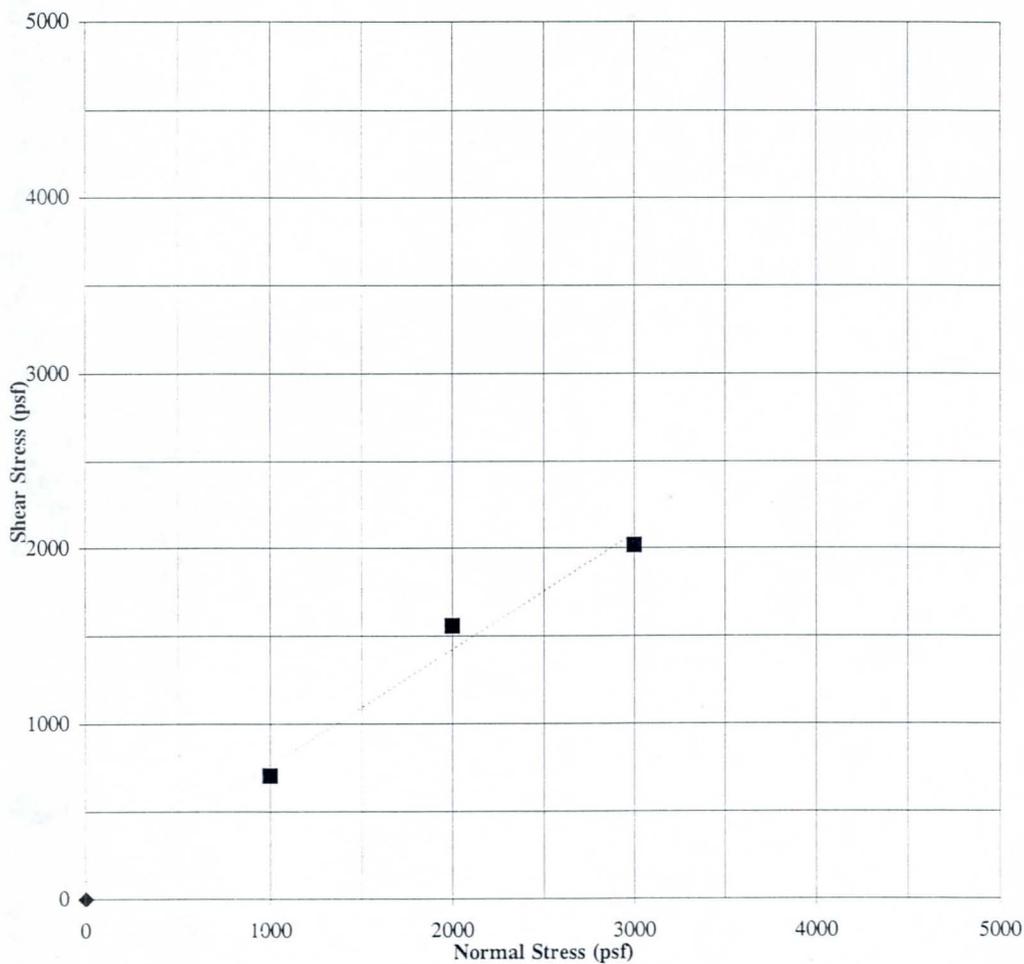
## RESULTS:

Dry Density (pcf): 115

Moisture Content (%): 3

Cohesion (psf) = 100

Friction Angle (phi) = 33



REMARKS: Samples submerged prior to testing.



# LABORATORY TEST RESULTS

Date: 4-May-98

SAMPLE SOURCE: As noted below

TESTING PERFORMED: pH, Minimum Resistivity (ADOT 236a)

SAMPLED BY: RAM/Miller

## RESULTS:

<u>Sample Source</u>	<u>pH</u>	<u>Minimum Resistivity (ohm-cm)</u>
2 @ 3'-12'	9.1	1102
4 @ 0'-3'	8.6	1189
7 @ 3'-12'	8.4	584
10 @ 0'-3'	8.5	1680



Ricker-Atkinson-McBee & Associates  
2105 South Hardy Drive, Suite #13  
Tempe, AZ 85282

Sample Number: 980698-01  
Date Reported: 4/22/98  
Date Received: 4/15/98 14:05  
Project Number: G02263

### Requested Analysis

Analysis	Method	Result	Units	Date Analyzed
SOLUBLE SALTS	ADOT237	0.021	%	4/21/98
SULFATE	ADOT733	0.0036	%	4/21/98
CHLORIDE	CAZ422M	0.0081	%	4/21/98

Approved By: \_\_\_\_\_



Ricker-Atkinson-McBee & Associates  
2105 South Hardy Drive, Suite #13  
Tempe, AZ 85282

Sample Number: 980698-02  
Date Reported: 4/22/98  
Date Received: 4/15/98 14:05  
Project Number: G02263

### Requested Analysis

Analysis	Method	Result	Units	Date Analyzed
SOLUBLE SALTS	ADOT237	0.011	%	4/21/98
SULFATE	ADOT733	0.0088	%	4/21/98
CHLORIDE	CAZ422M	0.0021	%	4/21/98

Approved By: \_\_\_\_\_



Ricker-Atkinson-McBee & Associates  
2105 South Hardy Drive, Suite #13  
Tempe, AZ 85282

Sample Number: 980698-03  
Date Reported: 4/22/98  
Date Received: 4/15/98 14:05  
Project Number: G02263

### Requested Analysis

Analysis	Method	Result	Units	Date Analyzed
SOLUBLE SALTS	ADOT237	0.011	%	4/21/98
SULFATE	ADOT733	0.0042	%	4/21/98
CHLORIDE	CAZ422M	0.0024	%	4/21/98

Approved By: Godang



Ricker-Atkinson-McBee & Associates  
2105 South Hardy Drive, Suite #13  
Tempe, AZ 85282

Sample Number: 980698-04  
Date Reported: 4/22/98  
Date Received: 4/15/98 14:05  
Project Number: G02263

### Requested Analysis

Analysis	Method	Result	Units	Date Analyzed
SOLUBLE SALTS	ADOT237	0.014	%	4/21/98
SULFATE	ADOT733	0.0049	%	4/21/98
CHLORIDE	CAZ422M	0.0057	%	4/21/98

Approved By: \_\_\_\_\_