

**GEOTECHNICAL STUDY REPORT
WICKENBURG DOWNTOWN FLOODING
HAZARD MITIGATION PROJECT
WICKENBURG, ARIZONA
FCDMC PROJECT CONTROL NO. 343.01.31**



KLEINFELDER

An employee owned company

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WICKENBURG, ARIZONA
FCDMC PROJECT CONTROL NO. 343.01.31**

Project Number: 63683 (1)

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May 2006



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May 15, 2006
File No. 63683 (1)

Mr. Warren Rosebraugh, PE
Flood Control District of Maricopa County
2801 West Durango
Phoenix, Arizona 85009

**SUBJECT: Geotechnical Study Report
Wickenburg Downtown Flooding Hazard Mitigation Project
Wickenburg, Arizona
Contract FCD 2004C069, Assignment No. 1
FCDMC Project Control No. 343.01.31**

Dear Mr. Rosebraugh:

Kleinfelder, Inc. (Kleinfelder) is pleased to present this report summarizing our geotechnical study performed for the proposed Wickenburg Downtown Flooding Hazard Mitigation Project in Wickenburg, Arizona. The results of our geotechnical study and our conclusions and recommendations for the geotechnical design of the project are presented in the attached report. The conclusions and recommendations presented in this report are subject to the limitations presented in Section 6.1.

The recommendations presented in this report are based on the assumed type of construction, and bank protection concepts as presented in Section 1.2 of this report. If any of these items change significantly, we should be contacted to determine if revisions to our recommendations are necessary.

We appreciate the opportunity to be of service on this project. If you have questions, comments or require additional information, please do not hesitate to contact our office at (480) 763-1200.

Respectfully submitted,

KLEINFELDER, INC.

Steven A. Haire, P.E.
Senior Geotechnical Engineer



Heriberto (Eddie) Coria
Staff Professional II

SAH:HC:wcc

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1A to 1E Site Plan

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- A Field Study
- B Laboratory Testing



1 INTRODUCTION AND SCOPE OF STUDY

1.1. General

In this report we present the results of our geotechnical study for the proposed Wickenburg Downtown Flooding Hazard Mitigation Project to be located in Wickenburg, Arizona (see Figure 1A to 1E). The location of the site relative to existing streets and surrounding drainages is shown on Figure 1A to 1E. The purpose of the study was to explore and provide information regarding the subsurface conditions at various locations on the site. This information will be used by the project team to assist in the design of the bank protection, levees, and floodwalls planned along Sols Wash.

The scope of our study was outlined in our proposal to you dated November 3, 2005. Subsequent to completion of the field study, you contacted us and requested that we reduce our scope of the analysis portion of our study. As you requested, we eliminated all items from our original scope related to stability analyses, bearing capacity, seepage pressures, earth pressures, and completion of FEMA Form 81-89G. It is our understanding that the wall and levee designers, Gannett-Fleming, will assume these responsibilities. Our revised scope included primarily providing logs of borings and test pits, providing laboratory test results, and recommending basic engineering parameters of the soil including shear strength and density of the various formations encountered. A detailed listing of our reduced scope is presented below. In this report we are presenting the following:

1. Vicinity map and site plan showing the approximate boring locations;
2. Logs of Borings;
3. A soil profile for the site;
4. Results of laboratory tests;
5. Basic engineering parameters of the soil including shear strength and density of the various formations encountered.
6. Discussion of general subsurface conditions, including ground water levels if encountered, in our field exploration;
7. Earthwork shrink/swell recommendation for excavation area in the wash; and
8. Pavement design parameters for soils excavated from the area in the wash.

Subsequent to the submission of draft report for the subject site, you contacted us and requested that we drill and sample three additional borings, sample soft soils with Shelby tubes, provide station and offset for the all the borings, update our site plan with the most recent plans provided by EEC, provide interpretations for each of the shear tests performed, and update the report will the additional information.

1.2. Proposed Project

The project site is located in Wickenburg, Arizona, at the confluence of Sols Wash and the Hassayampa River. Grading and bank improvements are planned along both sides of Sols Wash for a distance of about one mile upstream from the junction of Sols Wash and the Hassayampa River. New retaining structures walls are planned along the banks in some areas, which include concrete cantilever walls, gabion walls, and a gabion-faced MSE (mechanically stabilized earth) wall/embankment. In some areas, bank stabilization will include tiered walls consisting of a gabion wall at the lower level with a retaining wall/flood wall above. Excavation from an island area within the Sols Wash channel is planned to improve the flow characteristics of the channel, and to serve as a potential borrow source for future construction of the nearby proposed SR 93 roadway embankment.

2 FIELD EXPLORATION

The originally proposed field study was performed between December 7 and 15, 2005. At your request, three additional borings were drilled on March 10 and 15, 2006. The additional boring are labeled B-3A, B-8A, and B-10A. A total of 24 hollow stem auger borings were drilled and sampled. Sixteen shallow backhoe pits were excavated at various locations within the channel and within the island "borrow" area. The approximate boring and test pit locations are shown on the Site Plan, Figure 1A to 1E. The locations of the borings and test pits were determined based on plans provided by the Flood Control District of Maricopa County (FCDMC), which included aerial

photography of the site. The selection of exploration locations included input from FCDMC personnel, and FCDMC personnel reviewed and approved the locations during a pre-exploration site visit. At the time of exploration, the Latitude and Longitude of each test boring and test pit were determined by hand-held GPS equipment and were noted on the previous logs. At your request, the Latitude and Longitude of each test boring and test pit has been omitted and the station and offset has been noted on the logs in Appendix A.

Prior to the start of exploration, the Arizona Bluestake Center was contacted to locate existing utilities at the boring locations. In addition, a private utility locator was contracted to assist in locating all existing underground utilities. Upon completion of the exploration, the boreholes and test pits were filled with soil cuttings.

The hollow stem auger borings were drilled using a truck-mounted drill rig equipped with six 5/8-inch hollow-stem augers owned and operated by Geomechanics Southwest Inc. of Phoenix, Arizona. The three additional borings were advanced using a truck-mounted drill rig equipped hollow-stem auger owned and operated by Boart Longyear Inc. of Phoenix, Arizona. The hollow stem auger borings were drilled to depths ranging from about 15 to 40 feet below existing site grade.

Disturbed samples, relatively undisturbed samples, and undisturbed samples were taken at the direction of the Field Engineer during drilling. Relatively undisturbed samples of the subsurface materials were obtained using a California sampler with a 2.5-inch inside diameter and a 3.0-inch outside diameter. Disturbed samples were obtained using a Standard Penetration/Split Spoon Sampler (SPT) with a 1.5-inch inside diameter and 2.0-inch outside diameter. The California and the SPT samplers were driven 12 and 18 inches, respectively, using a 140-pound hammer falling 30 inches, and blow counts for successive 6-inch penetration intervals were recorded. At your request, undisturbed samples were attempted by using Shelby tubes to sample the

soft soils in the three additional borings. All but one Shelby tube samples were not testable as the tube walls collapses during sampling. After the sampler was withdrawn from the borehole, the samples were removed, sealed to reduce moisture loss, and submitted to the laboratory. At the request of Gannett Fleming, no additional laboratory testing was performed on samples collected from the three additional borings.

The shallow backhoe pits were excavated to depths up to 13.5 feet, using a CAT rubber-tired backhoe equipped with a 24-inch bucket. Samples and density tests were taken at selected intervals. Densities were determined using a nuclear density gauge. During the course of our study, a Kleinfelder, Inc. (Kleinfelder) Staff Professional observed the exploration, classified the encountered soils, prepared exploration logs, and collected soil samples for laboratory examination and testing.

Soil classifications made in the field from samples obtained from test pits and borings were re-evaluated in the laboratory after further examination and testing. The soils were classified in accordance with the Unified Soil Classification System presented on A-1 in Appendix A. Detailed sample classifications, blow counts recorded during sampling, and other related information were recorded on the soil exploration logs presented in Appendix A.

3 LABORATORY TESTING

Representative soil samples from the borings were tested in the laboratory for classification purposes and to evaluate their engineering properties. The laboratory tests include the following:

- Sieve analyses
- Atterberg limits tests
- Unit Weight tests
- Moisture content tests

- Consolidation tests
- Direct Shear tests
- pH tests
- Resistivity tests
- Sulfates and chlorides tests
- R-Value test
- Moisture-Density Relationship of Compacted Soils (Standard Proctor)

Detailed descriptions of the test procedures and the test results are presented in Appendix B.

4 SITE AND SUBSURFACE CONDITIONS

4.1. Site Description

The Sols Wash improvements will be constructed along a significant stretch of downtown Wickenburg. Existing development along the banks of the wash included parks, residential housing, apartments, retail stores, and commercial properties.

4.2. Subsurface Soil Conditions

The soil profile encountered at the boring and test pit locations was highly stratified and variable, as illustrated on the graphical boring and test pit logs presented in Appendix A. The majority of the deposits encountered were coarse-grained soils including primarily clayey sands, silty sands, silty to clayey gravels, and sands. The sandy soils contained variable amounts of gravel. Interlayered with the coarse-grained soils were layers of fine-grained soils including primarily lean clays with sand and lean sandy clays. Plasticities of the soils generally ranged from non-plastic to medium plasticity; however, high-plasticity fat clay was encountered at a depth of 15 feet in Boring B-04. Consistencies/relative densities of the soils encountered ranged from soft to firm for the fine-grained soils and from loose to dense for the coarse-grained soils.

4.3. Groundwater and Soil Moisture Conditions

Groundwater was encountered at a depth of 15, 10, and 23.3 feet in Test Boring B-01, 3A, and 10A respectively. In addition, groundwater was encountered at a depth of 12 feet in Test Pits TP-01 and 02. Above the groundwater levels, the soil moisture contents were described as generally slightly moist to moist. It should be noted that groundwater and soil moisture conditions within the area could vary depending on rainfall and/or runoff conditions not apparent at the time of our field study.

5 CONCLUSION AND RECOMMENDATIONS

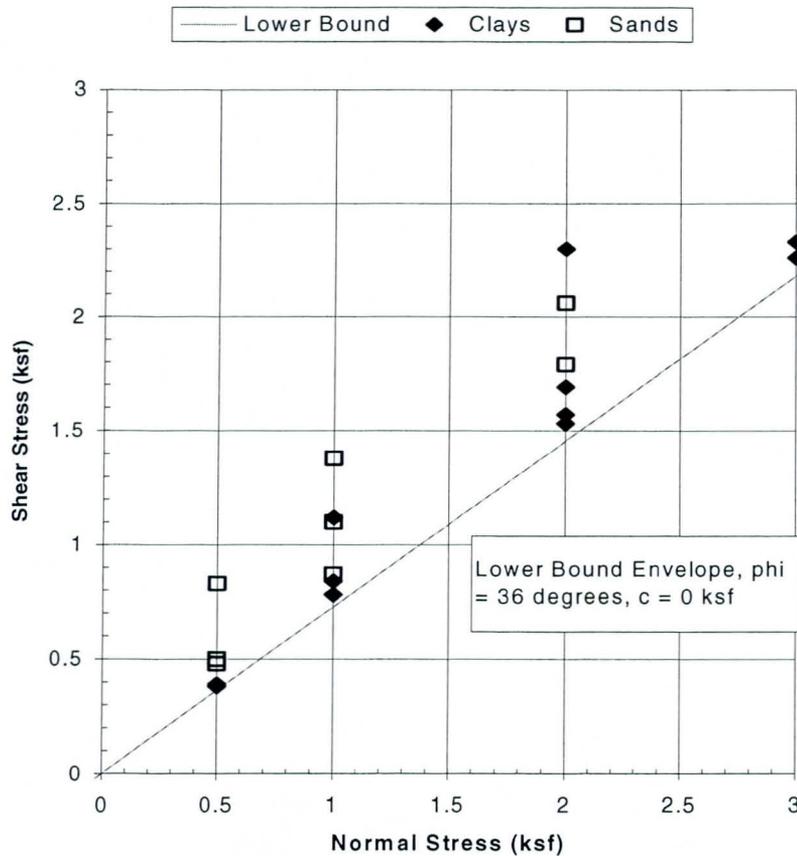
5.1. Soil Properties

Soil properties recommended for use in geotechnical analyses are presented in the following table.

Material	USCS Classification	In-situ (above water table)			Submerged (buoyant) Effective Unit Weight (pcf)	Conservative Shear Strength Parameters	
		Effective Dry Unit Weight (pcf)	Moisture Content (%)	Total Unit Weight (pcf)		Phi (degrees)	Cohesion (ksf)
Silty Gravel, Sandy Gravel, Clayey Gravel	GP, GM, GC	110	4	114	69	37	0
Clayey Sand, Silty Sand, Silty, Clayey Sand, Sand	SC, SM, SM- SC, SP-SM, SW-SM, SP	102	5	107	64	34	0
Clay with Sand, Sandy Clay, Clay	CL, CH	89	16	103	56	31	0

The densities shown in the table above were primarily based on averages for laboratory data from driven ring samples. Field (nuclear gage) densities obtained from test pits in the channel were somewhat lower than the tabulated values, which may not be representative of the somewhat denser soils under foundations on the banks of the wash. No testable undisturbed samples were obtained of the gravel soils, and the values shown are estimates based on engineering judgment.

Direct shear testing was performed on several ring samples obtained from the test borings. See Appendix B of this report for laboratory testing results. A summary of all direct shear testing is shown on the following figure:



Based on the direct shear test results, the lower bound shear strength for the clays was about $\phi = 36$ degrees, and for the coarse-grained soils, the lower bound shear

strength was about $\phi = 40$ degrees. Gravel traces in some of the coarse-grained soils probably resulted in unrealistically high ϕ angles. Based on the low blow counts and relatively low densities for many of the samples, the direct shear strength parameters were considered to be unconservatively high. Therefore, we recommend using the reduced values tabulated above. These values were assigned based on published correlations of shear strength with blow count for coarse-grained soils and plasticity indices for normally consolidated clay soils (U.S. Army Corps of Engineers, 1989).

5.2. Temporary Excavations

General

All excavations must comply with applicable local, state, and federal safety regulations including the current Occupational Safety and Health Administration (OSHA) Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing the information below solely as a service to our client. Under no circumstances should the information be interpreted to mean that Kleinfelder is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

Excavations and Slopes

The Contractor should be aware that slope height, slope inclination, or excavation depths (including utility trench excavations) should in no case exceed those specified in local, state, and/or federal safety regulations (e.g., OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations). Such regulations are strictly enforced and, if they are not followed, the Owner, Contractor, and/or earthwork and utility subcontractors could be liable for substantial penalties.

Near-surface soils encountered during our field study varied from sandy clays to clean sands. In our opinion, these soils would be conservatively be considered to range from Type B soil to Type C, respectively, when applying OSHA regulations. For Type B, OSHA recommends a maximum slope inclination of 1(h):1(v) or flatter for excavations 20 feet or less in depth. For Type C, OSHA recommends a maximum slope inclination of 1.5(h):1(v) or flatter for excavations 20 feet or less in depth. Steeper cut slopes may be utilized for excavations less than five feet deep depending on the strength, moisture content, and homogeneity of the soils as observed in the field. Flatter slopes and/or trench shield may be required if loose, cohesionless soils and/or water are encountered along the slope face.

Construction Considerations

Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed within one-third the slope height from the top of any excavation. Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning may be required to provide structural stability and to protect personnel working within the excavation. Shoring, bracing, or underpinning required for the project (if any) should be designed by a professional engineer registered in the State of Arizona.

During wet weather, earthen berms or other methods should be used to prevent runoff water from entering all excavations. All runoff water should be collected and disposed of outside the construction limits.

5.3. Sols Wash Island Borrow Area

An island in the Sols Wash Channel will be used as a borrow area. The location of the island is shown on the attached Site Plan following this report.

5.3.1. Earthwork Shrink-Swell Evaluation

In-place density tests were performed at selected depths within test pits for the project. These values were compared with the results of laboratory moisture-density relationship (Standard Proctor) tests to evaluate earthwork shrink, swell, and ground compaction. An overall shrink factor for the project is estimated at 20 percent. A summary of the in-place density tests, laboratory tests, and calculated earthwork shrinkage values are presented in the following table:

Test No.	Depth (ft)	Field Nuclear Gage		Laboratory		Estimated Maximum Dry Density (lb/ft ³)	Corrected Maximum Dry Density (lb/ft ³)	Shrink (-) @ 95% Compaction (%)
		Dry Density (lb/ft ³)	Moisture Content (%)	Optimum Moisture (%)	Maximum Dry Density (lb/ft ³)			
TP-9	0.0	112.9	3.7	*	*	*	*	*
TP-9	3.5	99.8	12.3	13.9	*	113.5	113.5	-7.4
TP-13	0.0	86.7	2.4	16.2	109.3	*	109.3	-16.5
TP-13	4.0	96.3	3.5	13.9		113.5	113.5	-10.7
TP-14	0.0	98.8	1.5	12.1	110.9	*	111.2	-6.5
TP-14	6.0	71.0	10.2	13.9	*	113.5	113.5	-34.2
TP-15	0.0	74.2	5.1	15.5	*	108.7	108.7	-28.1
TP-15	4.0	70.3	10.8	15.5	108.7	*	109.4	-32.3
TP-16	0.0	97.3	3.8	13.9	*	113.5	113.8	-10.0
TP-16	6.0	75.1	8.1	13.9	113.5	*	115.0	-31.3

In the table above, the field density and moisture content at each location represents the average of several readings taken with the nuclear gage at different orientations. The corrected maximum density is based on a rock correction to the laboratory maximum density.

5.4. Corrosion Potential

Soil samples were tested for pH and resistivity to provide some information regarding the corrosivity of the on-site soils. The pH and resistivity testing results are presented in Appendix B.

One factor for evaluating soil corrosivity is electrical resistivity. The electrical resistivity for a soil is a measure of resistance to the flow of electrical current. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportional to the flow of electrical current (DC) from the metal into the soil. As soil's resistivity decreases, its corrosivity increases. A commonly accepted correlation between soil resistivity and corrosivity towards ferrous metals is provided below:

Resistivity in ohm-centimeters

0 to 1,000
 1,000 to 2,000
 2,000 to 10,000
 Over 10,000

Corrosivity Category

severely corrosive
 corrosive
 moderately corrosive
 mildly corrosive

Results of the laboratory testing for pH, resistivity, soluble sulfates, and soluble chlorides are presented in the following table:

Location	Depth (ft)	Resistivity (ohm-cm)	pH	Soluble Sulfates (ppm)	Soluble Chlorides (ppm)
TP-13	0 to 0.5'	2013	8.2	10	<5
TP-14	6.0' to 6.5'	592	8.4	47	33
TP-15	4.0' to 4.5'	402	9.2	155	570
TP-16	6.0' to 6.5'	731	8.8	87	159

Based on laboratory testing, minimum resistivities of between 402 and 2013 ohm-cm indicate that on-site soils would be categorized as severely corrosive to corrosive toward ferrous metals.

Protection from corrosion may be necessary for metallic conduits. While in dry field conditions of our arid environment, these soils may not contribute to significant corrosion; however, increases in soil moisture may result in reduced resistivities, and thus, could increase the potential for corrosion. According to ADOT's MPE&D Manual the following types of culvert pipe may be used for various resistivity ranges:

- For resistivities greater than 2000 ohm-cm, galvanized-coated steel AASHTO M-36, aluminum coated steel AASHTO M-36, aluminum alloy AASHTO M-196 or bituminous-coated AASHTO M-190 pipe should be used.
- For resistivities between 500 and 1999 ohm-cm, aluminum alloy AASHTO M-196 or bituminous-coated AASHTO M-190 pipe should be used.
- For resistivities less than 500 ohm-cm, bituminous coated AASHTO M-190 pipe should be used.

The above-recommended culvert types are applicable for soils with a pH in the range of 5.0 to 9.0.

- Regardless of resistivity, for pH greater than 7.2, bituminous-coated AASHTO M-190 pipe may be used.

Laboratory tests indicate pH values vary between 8.2 and 9.2.

Based on laboratory results, sulfate (SO₄) contents vary between less than 5 ppm and 570 ppm. Therefore, special precautions are not expected to be necessary to protect concrete, and Type II cement may be used for concrete in contact with soil.

5.5. Pavements

5.5.1. R-value Testing

Correlated R-values and tested R-values are presented in the following table:

Correlated R-values and Tested R-values

Test Pit & Depth	USCS	PI	Passing #200	Correlated R-value	Tested R-value
TP-13 0 to 0.5'	CL	10	82.2	22	45
TP-14 0 to 0.5'	SM	0	18.3	78	*
TP-14 6.0' to 6.5	SC	18	13.2	41	34
TP-15 4.0' to 4.5'	CL	16	74.1	19	18
TP-16 6.0' to 6.5'	CL	12	53.4	30	30
B-19 @ 10.0'-11.5'	CL	14	82.4	19	*
B-20 @ 5.0'-6.5'	SM	3	12.0	75	*

The overall average correlated R-value and tested R-value is 39 and 32 respectively. The standard deviation of the correlated R-value and tested R-value is 25 and 11 respectively. An ADOT mean R-value of 34 was calculated based on the above information. In subsection 9.1.4 of a report written by Ninyo and Moore entitled, "Draft Geotechnical Evaluation US-93, Wickenburg Interim Bypass, Wickenburg, Arizona", it is recommended that soils within the upper three feet of finished subgrade used in the support of the pavement have a design R-value of 30 or less. Based the calculated mean R-value of the proposed "island" cut area within Sols Wash, it appears that excavated soils from the proposed cut area may be used to support the proposed US 93 pavement.

5.6. Scour

Eleven test pits were excavated within Sols Wash to collect samples to aid in scour analysis to be performed by others. The test pits were excavated to depths varying from about 11.5 feet to 13.5 feet below the existing wash bottom. Test pits excavated and sampled for scour analysis in the wash include; TP-1 thru TP-5, TP-10 thru TP-12, and TP-17 thru TP-19. Please see Appendix B for the relevant laboratory testing.

The wash is underlain predominantly by coarse-grained soils. The upper five feet to nine feet below the existing wash bottom consists primarily of stratified layers of sands and gravels with varying amounts of silts and clays. The sands and gravels were underlain generally by clayey sands and sands with a small amount of silt. At the time of our field study a historic scour depth was not reasonably identifiable. Less permeable layers such as bedrock, large clay deposits, undisturbed strong granular soils with cementation where not observed to the depth explored.

Detailed soil descriptions are presented on the boring logs in Appendix A.

6 CLOSURE

6.1. Limitations

The recommendations contained in this report are based on our field explorations, laboratory tests, and our understanding of the proposed construction. The subsurface data used in the preparation of this report were obtained from the hollow stem auger borings and test pits performed during the field study. It is anticipated that some variations in the soil conditions will exist between the points explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site, which are different from those described in this report, our firm should be immediately notified so that we may make any necessary revisions to the recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, our firm should also be notified.

This report was prepared in accordance with the generally accepted standard of practice in Arizona at the time the report was written. No warranty, expressed or implied, is made. This report is not a part of the project specifications. The use of information contained in this report for bidding purposes should be done at the Contractor's own risk.

Our evaluation of subsurface conditions at the site has considered subgrade soil and groundwater conditions present at the time of our study. The influence(s) of post-construction changes to these conditions, such as introduction of water into the subsurface, will likely influence future performance of the proposed project.

This report may be used only by the Owner and the Client and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on and offsite) or other factors may change over time, and additional work may be required with the passage of time. This report is intended for use by the Owner for their specific project. Other parties who wish to use this report should do so at their own risk.

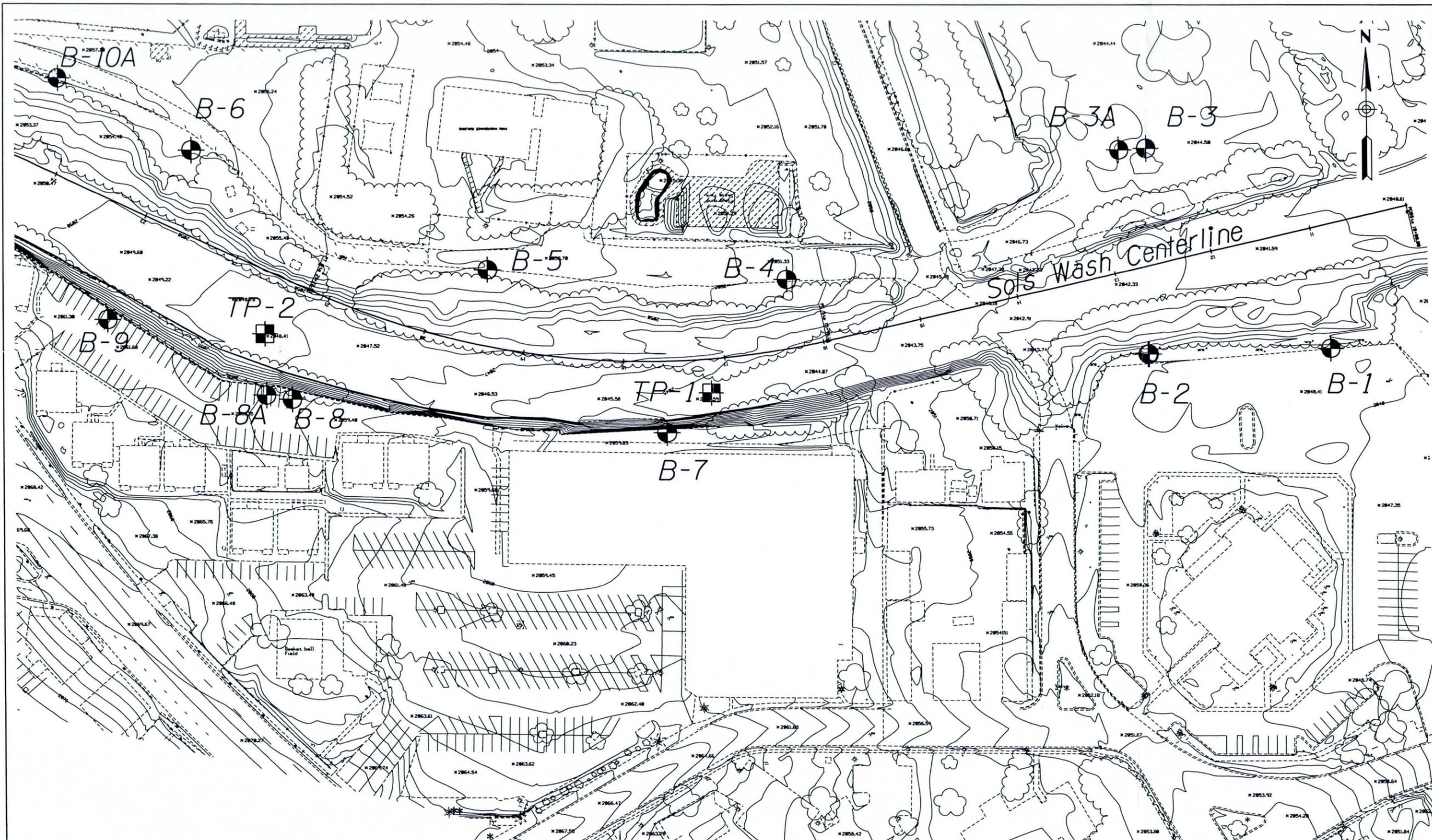
Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party.

The construction process is an integral design component with respect to the geotechnical aspects of a project, particularly with regard to the known history of earthwork activities at these sites. Because geotechnical engineering is an inexact science due to the variability of natural processes and because we sample only a small portion of the soils affecting the performance of the proposed structure, unanticipated or changed conditions can be disclosed during grading. Proper geotechnical observation and testing during construction is imperative to allow the Geotechnical Engineer the opportunity to verify assumptions made during the design process.

7 REFERENCES

U.S. Army Corps of Engineers, 1989, Engineering and Design, RETAINING AND FLOOD WALLS, Engineer Manual EM 1110-2-2502

FIGURES



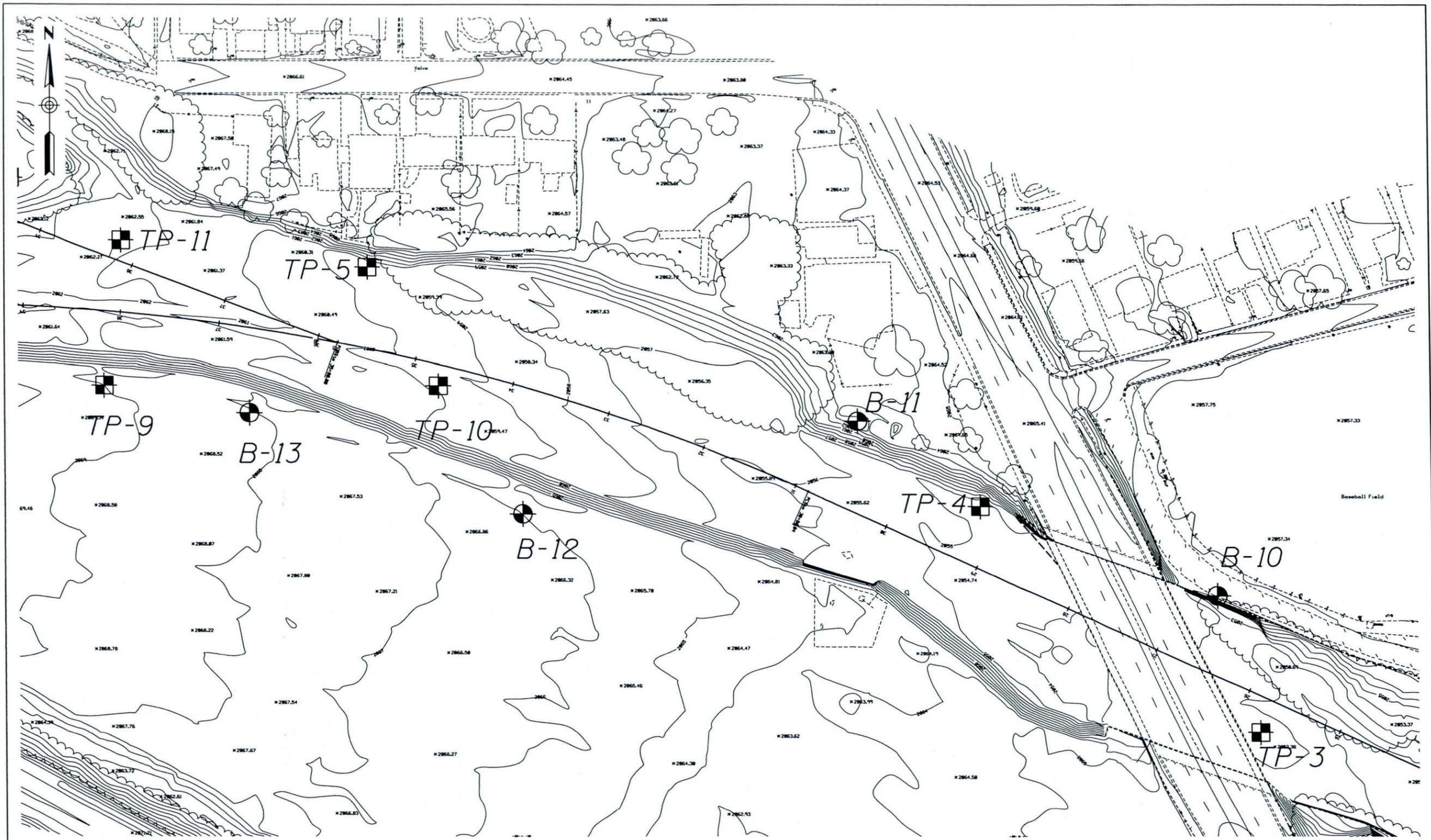
LEGEND:

B-18 : Boring

TP-17 : Tespit

Scale: 1" = 100'

DRAWN BY: H. Coria		SITE PLAN	KLEINFELDER	FIGURE 1A
REVISED BY: S. Guedamour				
CHECKED BY: H. Coria		SOLS WASH WICKENBURG DOWNTOWN FLOODING HAZARD MITIGATION WICKENBURG, ARIZONA	1335 West Auto Drive Tempe, Arizona 85284 PH(480) 763-1200 - FAX(480) 763-1212	
DATE: 5/11/06	APPROVED BY:			
		PROJECT NO. 63683 (I)	FILE NAME: FIG 1A.dgn	



LEGEND:

- B-18  : Boring
- TP-17  : Tespit

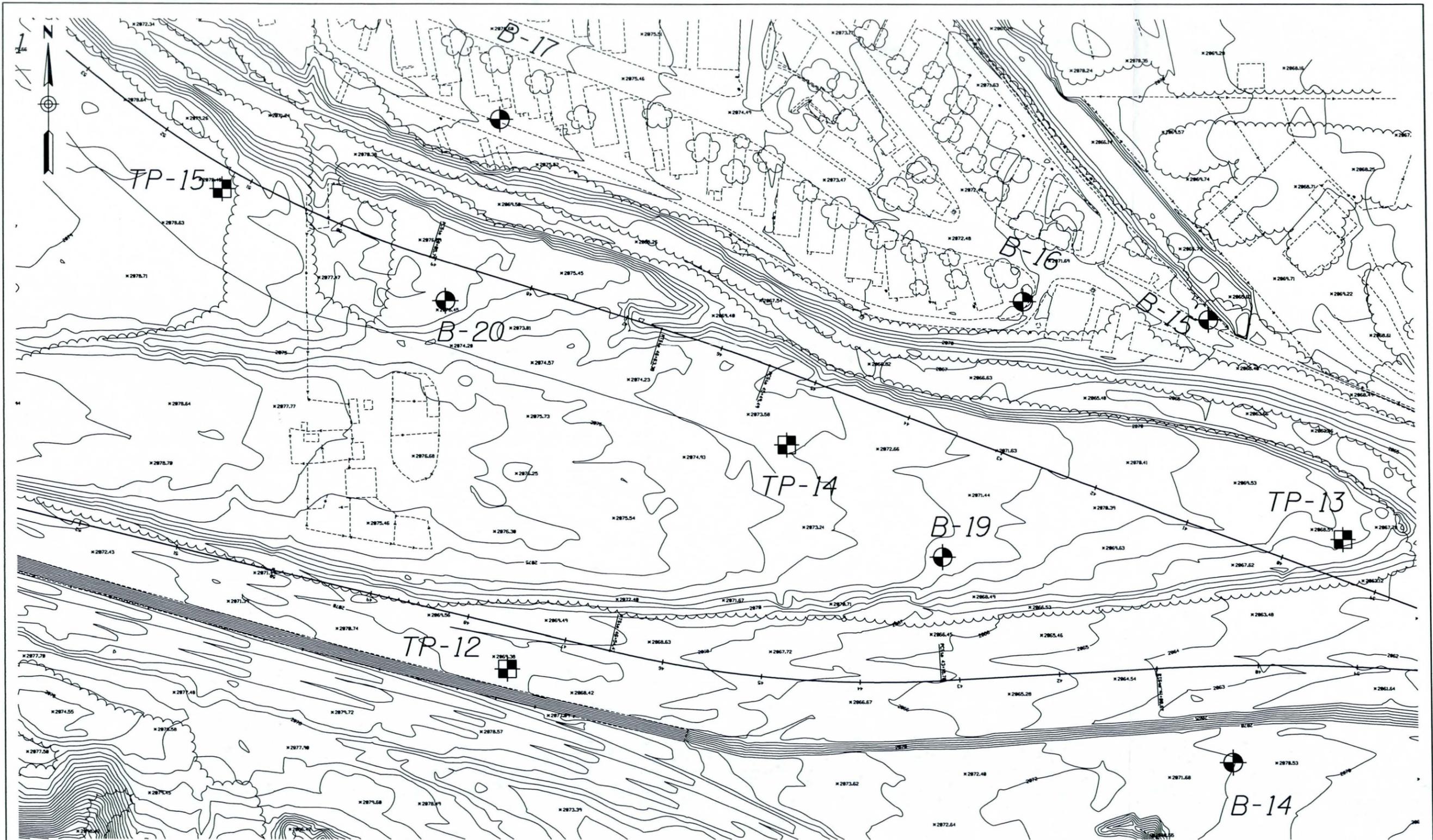
Scale: 1" = 100'

DRAWN BY: H. Coria	
REVISED BY: S. Guedamour	
CHECKED BY: H. Coria	
DATE: 5/11/06	APPROVED BY:

SITE PLAN	
SOLS WASH WICKENBURG DOWNTOWN FLOODING HAZARD MITIGATION WICKENBURG, ARIZONA	
PROJECT NO. 63683 (I)	FILE NAME: FIG 1B.dgn

 **KLEINFELDER**
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FIGURE
1B



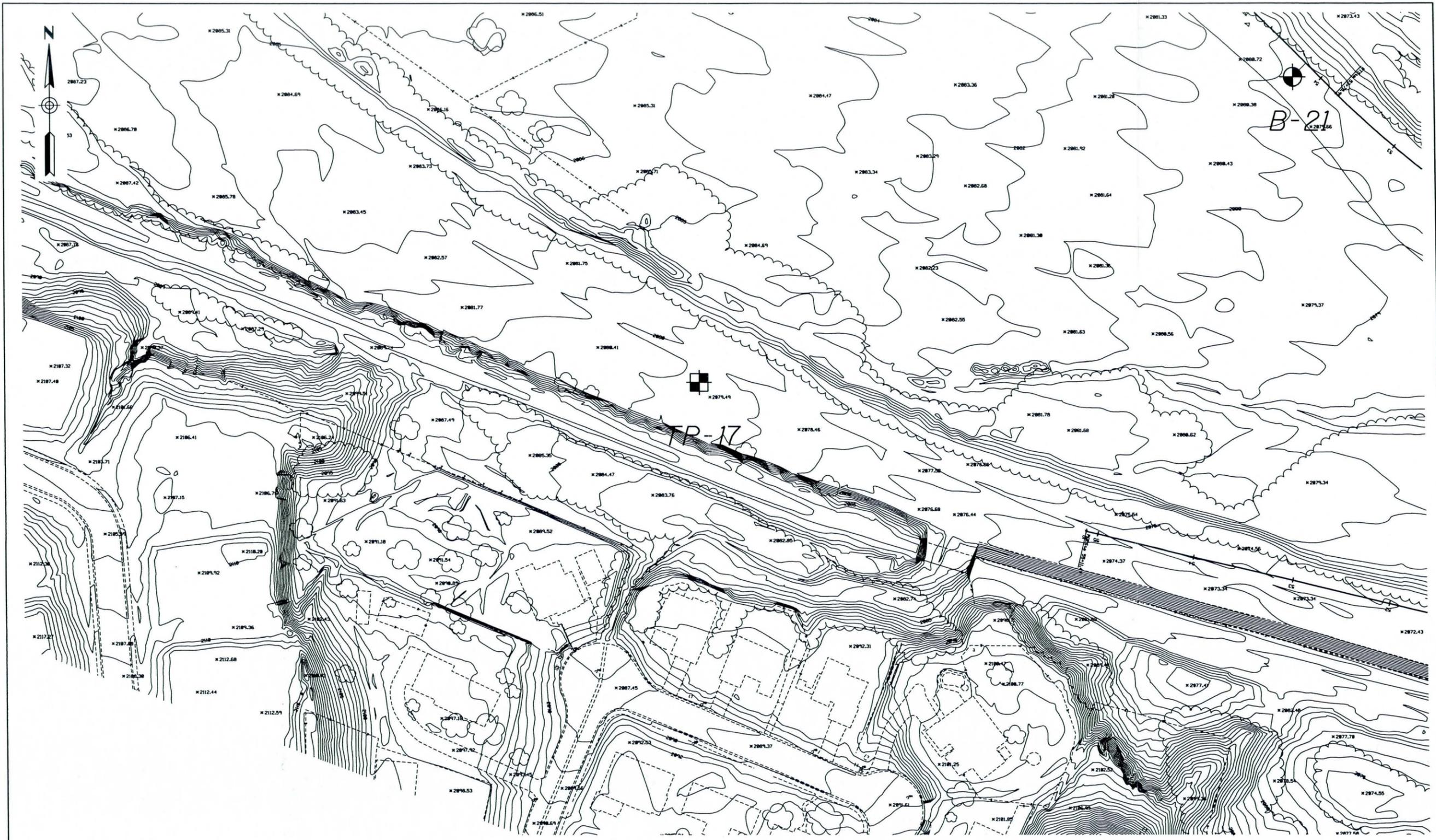
LEGEND:

B-18 : Boring

TP-17 : Test pit

Scale: 1" = 100'

DRAWN BY: H. Coria		SITE PLAN	KLEINFELDER	FIGURE 1C
REVISED BY: S. Guedamour				
CHECKED BY: H. Coria		SOLS WASH WICKENBURG DOWNTOWN FLOODING HAZARD MITIGATION WICKENBURG, ARIZONA		
DATE: 5/11/06	APPROVED BY:	PROJECT NO. 63683 (1) FILE NAME: FIG 1C.dgn		1335 West Auto Drive Tempe, Arizona 85284 PH(480) 763-1200 - FAX(480) 763-1212

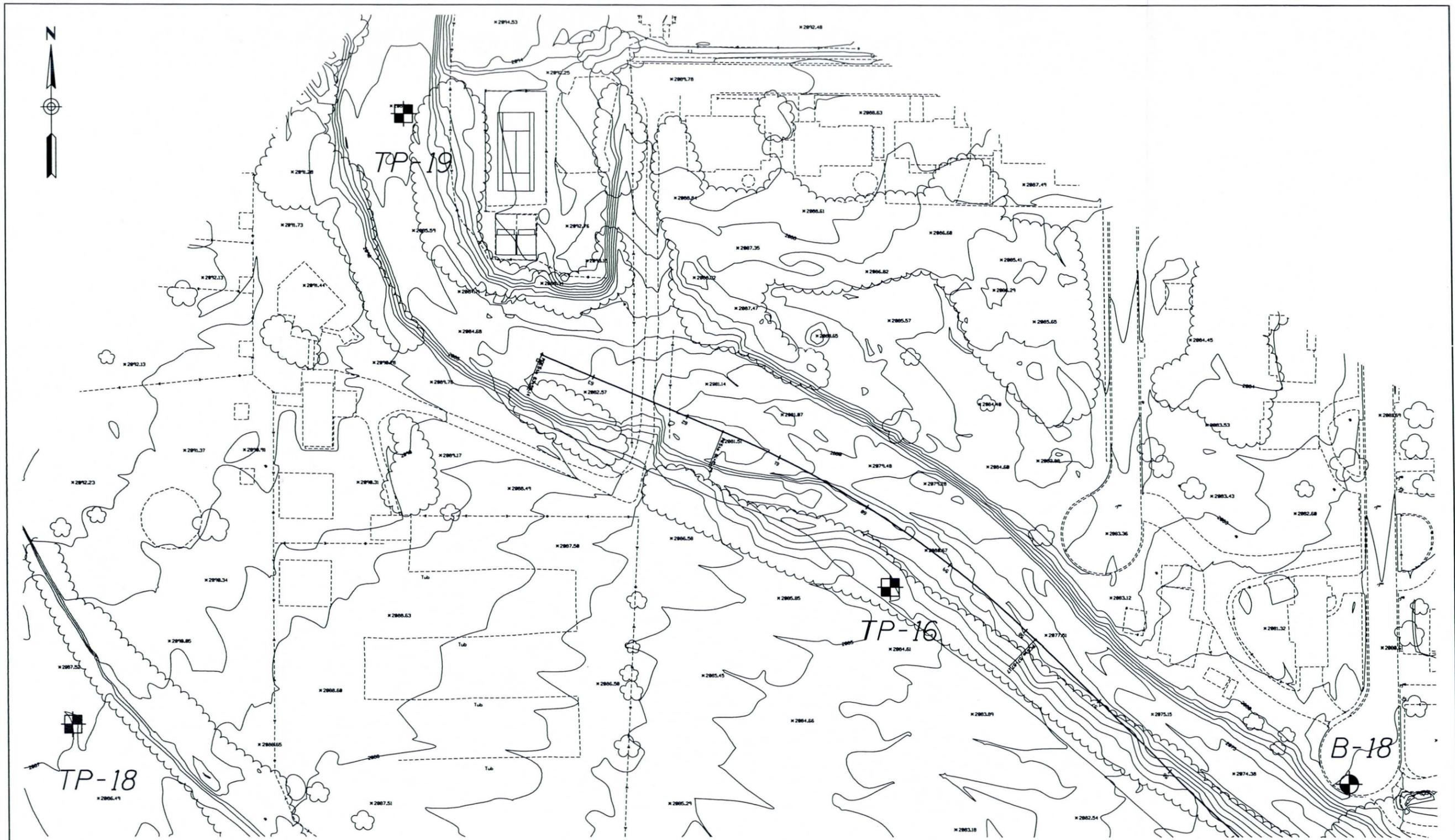


LEGEND:

- B-18  : Boring
- TP-17  : Test pit

Scale: 1" = 100'

DRAWN BY: H. Coria		SITE PLAN	 KLEINFELDER	FIGURE 1D
REVISED BY: S. Guedamour				
CHECKED BY: H. Coria		SOLS WASH WICKENBURG DOWNTOWN FLOODING HAZARD MITIGATION WICKENBURG, ARIZONA		
DATE: 5/11/06	APPROVED BY:	PROJECT NO. 63683 (1) FILE NAME: FIG 1D.dgn		
		1335 West Auto Drive Tempe, Arizona 85284 PH(480) 763-1200 - FAX(480) 763-1212		



LEGEND:

- B-18  : Boring
- TP-17  : Tespit

Scale: 1" = 100'

DRAWN BY: H. Coria		SITE PLAN	KLEINFELDER	FIGURE 1E
REVISED BY: S. Guedamour				
CHECKED BY: H. Coria		SOLS WASH WICKENBURG DOWNTOWN FLOODING HAZARD MITIGATION WICKENBURG, ARIZONA		1335 West Auto Drive Tempe, Arizona 85284 PH(480) 763-1200 - FAX(480) 763-1212
DATE: 5/11/06	APPROVED BY:	PROJECT NO. 63683 (1) FILE NAME: FIG 1E.dgn		

APPENDIX A

Field Study

APPENDIX A FIELD STUDY

BORINGS

The subsurface conditions at the site were explored during December, 2005, by drilling a total of 21 hollow stem auger borings and excavating 16 backhoe test pits within the proposed development area. The locations of exploration performed for this study are shown on Figure 1A to 1E of this report.

Our field engineer maintained a log of the borings and test pits, visually classified soils encountered according to the Unified Soil Classification System (see A-1), and obtained samples of the subsurface materials. A key to the Boring and Test Pit Logs is presented on A-2 of this appendix. Detailed Logs of Borings and Test Pits are also presented in this appendix.

SAMPLING PROCEDURES

Soil samples obtained from the borings were packaged and sealed in the field to reduce moisture loss and disturbance, and returned to our laboratory for further testing. After borings were completed, they were backfilled with excavated soils.

LIST OF ATTACHMENTS

The following plates are attached and complete this appendix:

- A-1 Unified Soil Classification System
- A-2 Log Key
- A-3 Charts & Definitions
- A-4 Terminology Used to Describe Soils
- Boring Logs
- Test Pit Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS	USCS SYMBOL	TYPICAL DESCRIPTIONS	
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LESS THAN 5% PASSING NO. 200 SIEVE 	GW WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% PASSING NO. 200 SIEVE 	GP POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% PASSING NO. 200 SIEVE 	GM SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
		GRAVELS WITH OVER 12% PASSING NO. 200 SIEVE 	GC CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LESS THAN 5% PASSING NO. 200 SIEVE 	SW WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% PASSING NO. 200 SIEVE 	SP POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% PASSING NO. 200 SIEVE 	SM SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
		SANDS WITH OVER 12% PASSING NO. 200 SIEVE 	SC CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)		ML INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)		MH INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

Note: Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing No. 200 sieve require dual USCS symbols. (See KEY A-3 if provided)

GEO-KEY A1 SOIL 63683.GPJ 5/11/2006



KLEINFELDER

UNIFIED SOIL CLASSIFICATION SYSTEM

Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

KEY

Drafted By: SCH
 Date: May 2006

Project Number:
 63683

A-1

LOG SYMBOLS

 <p>BULK / GRAB SAMPLE</p>  <p>MODIFIED CALIFORNIA SAMPLER (2 inch inside diameter)</p>  <p>RING (PORTER) SAMPLER (2.4 - inch inside diameter)</p>  <p>STANDARD PENETRATION SPLIT SPOON SAMPLER (2.0-inch O.D. X 1.4-inch I.D.)</p>  <p>SHELBY TUBE (3 inch outside diameter)</p>	 <p>NON-STANDARD PENETRATION SPLIT SPOON SAMPLER (1.5-inch O.D. X 0.9-inch I.D.)</p>  <p>BDBGM SIZE CORE BARREL (1.65-inch I.D.)</p>  <p>BW44 SIZE CORE BARREL (1.75-inch I.D.)</p>  <p>HQ-3 SIZE CORE BARREL (2.4-inch I.D.)</p>  <p>NON-STANDARD PENETRATION SPLIT SPOON SAMPLER (2.5-inch O.D. X 2.0-inch I.D.)</p>
 <p>WATER LEVEL (level after completion)</p>  <p>WATER LEVEL (level where first encountered)</p>	

GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
3. Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
4. In general, the Unified Soil Classification designations presented on the logs were based on visual classification in the field, modified where appropriate by visual classifications in the office, and/or laboratory gradation and index testing.
5. NA = Not Analyzed

GEO-KEY A2 LOG 63683.GPJ 5/11/2006



KLEINFELDER

LOG KEY

Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

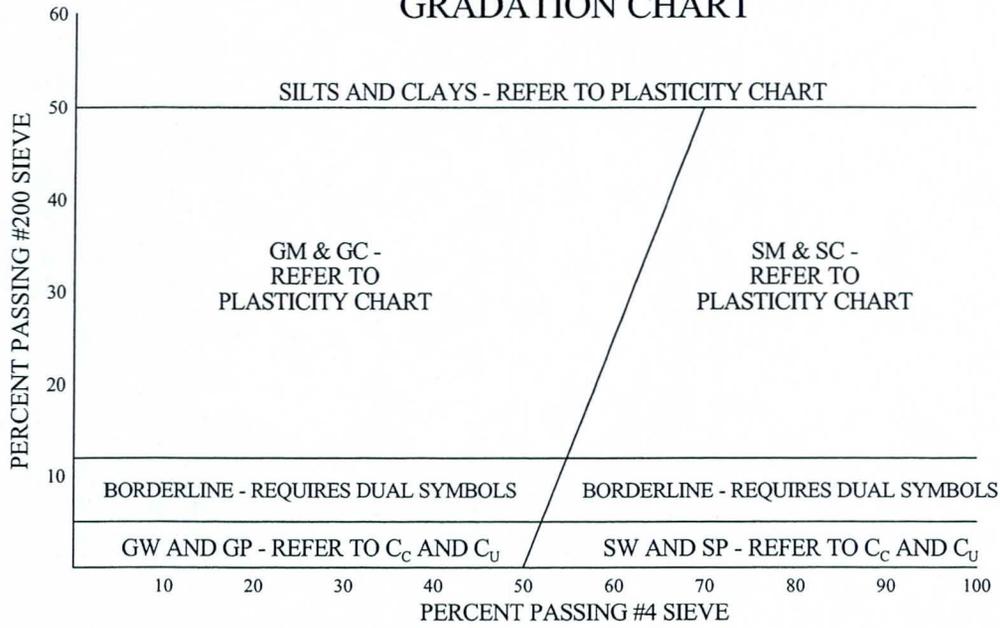
KEY

A-2

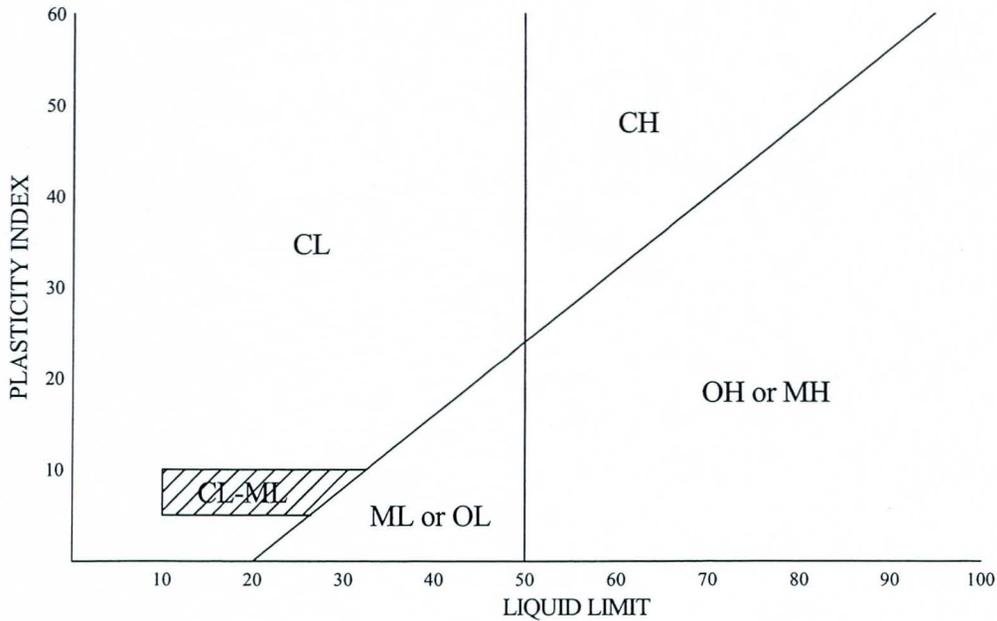
Drafted By: SCH
 Date: May 2006

Project Number:
 63683

GRADATION CHART



PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL FRACTION	PARTICLE SIZE RANGE
Boulders	Greater than 300mm (12in.)
Cobbles	300mm to 75mm (12in. to 3in.)
Coarse Gravel	75mm to 19mm (3in. to 3/4in.)
Fine Gravel	19mm (3/4in.) to No. 4 sieve
Coarse Sand	No. 4 sieve to No. 10 sieve
Medium Sand	No. 10 sieve to No. 40 sieve
Fine Sand	No. 40 sieve to No. 200 sieve
Fines	less than No. 200 sieve

GEO-KEY A3 CHART 63683.GPJ 5/11/2006



CHARTS & DEFINITIONS

Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

KEY

A-3

Drafted By: SCH Project Number: 63683
 Date: May, 2006

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**TERMINOLOGY USED ON THE BORING LOGS TO DESCRIBE
THE FIRMNESS, DENSITY, OR CONSISTENCY OF SOILS**

The standard penetration resistance (N) in blows per foot is obtained by the ASTM D1586 procedure using 2" O.D., 1 3/8" I.D. samplers.

1. Terms for description of partially saturated and/or cemented soils including clays, cemented granular materials, silts and silty and clayey granular soils.

N	Relative Firmness
0 - 4	Very soft
5 - 8	soft
9 - 15	Moderately firm
16 - 30	Firm
31 - 50	Very firm
51+	Hard

2. Terms for description of cohesionless, uncemented sands and sand-gravel mixtures.

N	Relative Density
0 - 4	Very loose
5 - 10	Loose
11 - 30	Medium dense
31 - 50	Dense
51+	Very dense

3. Terms for description of clays which are saturated or near saturation.

N	Relative Consistency
0 - 2	Very soft
3 - 4	soft
5 - 8	Moderately stiff
9 - 15	Stiff
16 - 30	Very Stiff
31+	Hard

GEO-KEY A4 SOIL-TERMINOLOGY 63683.GPJ_5/11/2006



TERMINOLOGY USED TO DESCRIBE SOILS
Wickenburg Downtown Flooding Hazard Mitigation Project
Maricopa County Flood Control District
Sols Wash
Wickenburg, Arizona

KEY

A-4

Drafted By: SCH Project Number:
Date: May 2006 63683

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Station and Offset: 11+10, 122 ft. L
 Groundwater Depth (ft): Initial (X): 15.0
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/7/2005
 Date Completed: 12/7/2005
 Logged By: SCH
 Total Depth (ft): 31.5

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY						Graphical Log	USCS Classification	DESCRIPTION 0.0 to 31.5 feet Appx. Surface Elevation (ft): 2048.00 Surface Condition: Community Center Parking Lot
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			
2045	5	7/12			99	13.9	30	9	70	40	consolidation	SC	Asphaltic Concrete Pavement Clayey Sand with Gravel, fine grained sand, sub-angular, red-brown, slightly moist, soft, low plasticity
2040	10	8/12			91	17.9	34	14	100	86	direct shear	CL	Lean Clay with Sand, red-brown, slightly moist, soft to moderately firm, low to medium plasticity
2035	15	1 2											
2030	20	1 2							40	23	100	84	
2025	25	6 5 7											
2020	30	5 5 10											
2015	35												

SW-SM Sand with Silt, coarse grained sand, sub-angular, brown, wet, medium dense, no plasticity

Note: could not obtain sample at 30' because auger kept plugging

Boring terminated at 31.5 feet
 Sampling stopped at 30.0 feet
 Caved to 20.0 feet

GEO. ADOT_EWIEL_63683.GPJ_5/11/2006



LOG OF Boring B-01
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring

B-01

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 12+85, 87 ft. L
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/12/2005
 Date Completed: 12/12/2005
 Logged By: SCH
 Total Depth (ft): 16.0

ELEVATION (ft)	DEPTH (ft)	FIELD				LABORATORY				Other Tests	Graphical Log	USCS Classification	DESCRIPTION
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)				Passing #200 Sieve (%)
2045	5	5 3					32	12	88	59		CL	Asphaltic Concrete Pavement Sandy Clay, dark brown, slightly moist, soft, low plasticity
2040	10	2 3 2										SM	Silty Sand, fine grained sand, sub-angular, brown, slightly moist, loose to very dense, low plasticity
2035	15	6 8 9											
2030	16.0	75/12											Boring terminated due to proximity of water table at 16.0 feet Sampling stopped at 16.0 feet

GEO. ADOT_EWEL 63683.GPJ 5/11/2006



LOG OF Boring B-02
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-02

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 12+40, 115 ft. R
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/12/2005
 Date Completed: 12/12/2005
 Logged By: SCH
 Total Depth (ft): 11.5

ELEVATION (ft)	DEPTH (ft)	FIELD				LABORATORY						Graphical Log	USCS Classification	DESCRIPTION 0.0 to 11.5 feet
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
2040	5	6 8											SP	Sand with Gravel , fine to coarse grained sand, sub-angular, light brown, slightly moist, medium dense, no plasticity Note: at 10' medium to coarse grained sand, loose Boring terminated due to proximity of water table at 11.5 feet Sampling stopped at 11.5 feet
		7 8 21					NV	NP	86	5				
2035	10	8 8 9												
		2 2 2												
2030	15													
2025	20													
2020	25													
2015	30													
2010	35													

GEO ADOE EWJEL 63683.GPJ 5/11/2006



LOG OF Boring B-03
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-03
 Page 1 of 1

Drafted By: SCH Project Number: 63683
 Date: May 2006
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Station and Offset: 12+70, 120 ft. R
 Groundwater Depth (ft): Initial (X): 10.0
 Drilling Company: Boart Longyear Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 3/15/2006
 Date Completed: 3/15/2006
 Logged By: Eddie Coria
 Total Depth (ft): 31.5

ELEVATION (ft)	DEPTH (ft)	FIELD				LABORATORY					Graphical Log	USCS Classification	DESCRIPTION
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			Other Tests
			4 3 2									SM	Silty Sand , fine grained sand, sub-angular, yellow-brown, slightly moist, loose, no plasticity Note: medium grained sand, trace gravel @ 3' Note: gravel in shoe of SPT sample @ 4'
2040	5		2 5 5									SP	Sand , some gravel, trace silt, medium to coarse grained sand, sub-angular, light brown, slightly moist, medium dense, no plasticity Note: Groundwater @ 10'
2035	10		8 7 8									GP	Gravel , with sand, trace silt, fine grained sand, sub-angular, light brown, moist, medium dense, no plasticity Note: driller added water to hole @ 10'
2030	15		3 4 8									SM	Silty Sand , fine grained sand, sub-angular, light brown, wet, medium dense, no plasticity
2025	20		8 9 18									SP	Sand , some gravel, trace silt, medium to coarse grained sand, sub-angular, light brown, wet, medium dense, no plasticity
2020	25		9 14 12										
2015	30		10 12 12										
													Boring terminated at 31.5 feet Sampling stopped at 31.5 feet
2010	35												

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LOG OF Boring B-03A
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-03A

Drafted By: SCH Project Number: 63683
 Date: May 2006

Station and Offset: 16+25, 69 ft. R
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/8/2005
 Date Completed: 12/8/2005
 Logged By: SCH
 Total Depth (ft): 16.5

ELEVATION (ft)	DEPTH (ft)	FIELD				LABORATORY				Graphical Log	USCS Classification	DESCRIPTION	
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)				Passing #200 Sieve (%)
2050	0	10										CL	Lean Clay with Sand, brown, slightly moist, moderately firm, medium plasticity, trace gravel
	5	5										SM	Silty Sand, fine grained sand, sub-angular, brown, slightly moist, loose, low plasticity to nonplastic
2045	2	2										CH	Fat Clay, brown, moist, moderately firm, high plasticity
2040	10	12/12		94	24.6	55	30	100	89	direct shear		CL	Lean Clay with Sand, fine grained sand, brown, moist, very soft, low plasticity
2035	15	1											
	20												
	25												
	30												
	35												

Boring terminated at 16.5 feet
 Sampling stopped at 16.5 feet
 Caved to 13.0 feet

GEO. ADOT. EWIEL. 63683.GPJ. 5/11/2006



LOG OF Boring B-04
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-04

Drafted By: SCH
 Date: May 2006

Project Number:
 63683

Station and Offset: 19+50, 76 ft. R
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/8/2005
 Date Completed: 12/8/2005
 Logged By: SCH
 Total Depth (ft): 16.5

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY					Other Tests	Graphical Log	USCS Classification	DESCRIPTION
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)				Passing #200 Sieve (%)
2050	5	6 9 6	15/12		92	3.9	21	1	100	12	direct shear	GM	Silty Gravel with Sand , fine to coarse grained gravel, sub-angular, grey, slightly moist, very loose, no plasticity
		10 11 11										SC	Clayey Sand , fine grained sand, sub-angular, brown, slightly moist, firm, low to medium plasticity
2045	10	6 9 9										SP-SM	Sand with Silt , fine grained sand, sub-angular, brown, slightly moist, medium dense, no plasticity
2040	15	2 2 3										CL	Sandy Clay , fine grained sand, sub-angular, brown, slightly moist, soft to firm, low to medium plasticity
2035	20												Boring terminated at 16.5 feet Sampling stopped at 16.5 feet
2030	25												
2025	30												
2020	35												

GEO ADOT_EWIEL_63683.GPJ 5/11/2006



LOG OF Boring B-05
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-05

Drafted By: SCH Project Number: 63683
 Date: May 2006
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Station and Offset: 17+60, 72 ft. L
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/12/2005
 Date Completed: 12/12/2005
 Logged By: SCH
 Total Depth (ft): 16.5

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY						Graphical Log	USCS Classification	DESCRIPTION 0.0 to 16.5 feet	
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)				Other Tests
2055	5	50/12			115	4.7	19	2	90	13		SM	Asphaltic Concrete Pavement	
		7 10 10												Silty Sand, fine to medium grained sand, sub-angular, brown to dark brown, slightly moist, medium dense to very dense, no plasticity
														Note: dark brown, medium dense
2050	10	5 5												Note: medium to fine grained sand, dark brown
2045	15	12 14 16											Note: Grey	
2040	20												Boring terminated at 16.5 feet Sampling stopped at 16.5 feet	
2035	25													
2030	30													
2025	35													

GEO ADOT_EWIEL_63683.GPJ_5/11/2006



LOG OF Boring B-07
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring

B-07

Drafted By: SCH Project Number: 63683
 Date: May 2006

Station and Offset: 12+95, 98 ft. L
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/12/2005
 Date Completed: 12/12/2005
 Logged By: SCH
 Total Depth (ft): 6.5

ELEVATION (ft)	DEPTH (ft)	FIELD				LABORATORY				Other Tests	Graphical Log	USCS Classification	DESCRIPTION
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)				Passing #200 Sieve (%)
2060			3 3 4					25	5	93	43		SM-SC Asphaltic Concrete Pavement Silty, Clayey Sand , fine grained sand, with fine gravel throughout, sub-angular, light brown to brown, slightly moist, loose to medium dense, low plasticity
2055	5		8 12 18									SM	Silty Sand , fine grained sand, with fine gravel throughout, sub-angular, light brown to brown, slightly moist, medium dense to dense, no plasticity Boring Boring Terminated Due to Refusal on Suspected Cobble Layer at 6.5 feet Sampling stopped at 6.5 feet
2050	10												
2045	15												
2040	20												
2035	25												
2030	30												
	35												

GEO_ADOT_EWIEL_63683.GPJ 5/11/2006



LOG OF Boring B-08
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-08

Drafted By: SCH Project Number: 63683
 Date: May 2006

Station and Offset: 21+22, 113 ft. L
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: Boart Longyear Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 3/10/2006
 Date Completed: 3/10/2006
 Logged By: Eddie Coria
 Total Depth (ft): 26.5

ELEVATION (ft)	DEPTH (ft)	FIELD				LABORATORY					Graphical Log	USCS Classification	DESCRIPTION
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			
2060	7	7										SC	Asphaltic Concrete
	8	14/12											Clayey Sand, fine grained sand, sub-angular, brown, slightly moist, moderately firm, low plasticity
2055	5												Note: gravel from 3' to 15'
2050	10	6	13	12								SM	Silty Sand, with gravel, fine grained sand, sub-angular, brown, slightly moist, medium dense, no plasticity
2045	15	4	4	4									Note: trace fine gravel, loose
2040	20	21	19	20									Note: dense
2035	25	11	10	21								GM	Silty Gravel, with sand, sub-angular to sub-rounded, brown, slightly moist, dense, no plasticity
2030													Boring terminated at 26.5 feet Sampling stopped at 26.5 feet Caved to 13.8 feet

GEO. ADOT_EWEL_63683.GPJ 5/11/2006



LOG OF Boring B-08A
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-08A

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 22+90, 111 ft. L
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/12/2005
 Date Completed: 12/12/2005
 Logged By: SCH
 Total Depth (ft): 6.5

ELEVATION (ft)	DEPTH (ft)	FIELD				LABORATORY						Graphical Log	USCS Classification	DESCRIPTION 0.0 to 6.5 feet
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
2060	5	4 4 8											GC	Asphaltic Concrete Pavement Clayey Gravel , visual observation -- a rock blocked the sampler, fine to coarse grained gravel, sub-angular, brown, slightly moist, medium dense, low plasticity
2055		6 8 17											SM	Silty Sand , medium grained sand, with fine gravel throughout, sub-angular, brown, moist, medium dense, nonplastic to low plasticity Boring terminated due to proximity of water table at 6.5 feet Sampling stopped at 6.5 feet
2050	10													
2045	15													
2040	20													
2035	25													
2030	30													
2025	35													

GEO ADOT_EWEL 63683.GPJ 5/11/2006



KLEINFELDER
 Drafted By: SCH Project Number: 63683
 Date: May 2006

LOG OF Boring B-09
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-09
 Page 1 of 1

Station and Offset: 26+70, 75 ft. R
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/12/2005
 Date Completed: 12/12/2005
 Logged By: SCH
 Total Depth (ft): 16.5

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY						Graphical Log	USCS Classification	DESCRIPTION 0.0 to 16.5 feet
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			
2055	5	2 7 9					20	4	89	31		SC-SM	Asphaltic Concrete Pavement Silty, Clayey Sand , fine to medium grained sand, sub-angular, brown, slightly moist, loose to medium dense, low plasticity
2050		2 3 5										CL	Lean Clay with Sand , fine grained sand, brown, moist, moderately firm, low plasticity
2045	10	30/12			88	12.2	30	13	100	79	direct shear		
2040	15	4 5 6											Boring terminated due to proximity of water table at 16.5 feet Sampling stopped at 16.5 feet
2035													
2030													
2025													
2020													
2015													
2010													
2005													
2000													
1995													
1990													
1985													
1980													
1975													
1970													
1965													
1960													
1955													
1950													
1945													
1940													
1935													
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1925													
1920													
1915													
1910													
1905													
1900													
1895													
1890													
1885													
1880													
1875													
1870													
1865													
1860													
1855													
1850													
1845													
1840													
1835													
1830													
1825													
1820													
1815													
1810													
1805													
1800													
1795													
1790													
1785													
1780													
1775													
1770													
1765													
1760													
1755													
1750													
1745													
1740													
1735													
1730													
1725													
1720													
1715													
1710													
1705													
1700													
1695													
1690													
1685													
1680													
1675													
1670													
1665													
1660													
1655													
1650													
1645													
1640													
1635													
1630													
1625													
1620													
1615													
1610													
1605													
1600													
1595													
1590													
1585													
1580													
1575													
1570													
1565													
1560													
1555													
1550													
1545													
1540													
1535													
1530													
1525													
1520													
1515													
1510													
1505													
1500													
1495													
1490													
1485													
1480													
1475													
1470													
1465													
1460													
1455													
1450													
1445													
1440													
1435													
1430													
1425													
1420													
1415													
1410													
1405													
1400													
1395													
1390													
1385													
1380													
1375													
1370													
1365													
1360													
1355													
1350													
1345													

Station and Offset: 24+40, 88 ft. R
 Groundwater Depth (ft): Initial (3): 23.3
 Drilling Company: Boart Longyear Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 3/10/2006
 Date Completed: 3/10/2006
 Logged By: Eddie Coria
 Total Depth (ft): 41.0

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY						Graphical Log	USCS Classification	DESCRIPTION 0.0 to 35.0 feet
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			
2055	5	16/12										SM	Asphaltic Concrete Silty Sand, trace gravel, fine grained sand, sub-angular, brown, slightly moist, medium dense, no plasticity
2050		26/12											Note: increase in percent silt @ 5.5'
2045	10												Note: fine grained gravel
2040	15	3 5 6										ML	Sandy Silt, brown, slightly moist, medium dense, no plasticity
2035	20	26/12										CL	Sandy Clay, brown, slightly moist, moderately firm, low plasticity
2030	25	10 11 10										SM	Silty Sand, fine to medium grained sand, sub-angular, brown, slightly moist, medium dense, no plasticity Note: increase in grain size with depth Note: watertable @ 23.3'
2025	30	2 2 2										SP	Sand, trace silt, coarse grained sand, sub-angular, brown, slightly moist, wet, medium dense, no plasticity
2020	35											SM	Silty Sand, fine grained sand, sub-angular, brown, slightly moist to wet, very loose, no plasticity

GEO. ADOT_EWIEL_63683.GPJ 5/11/2006



LOG OF Boring B-10A
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-10A

Drafted By: SCH Project Number: 63683
 Date: May 2006

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY						Graphical Log	USCS Classification	DESCRIPTION 35.0 to 41.0 feet
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			
2015	3/12											SM	Note: slight increase in percent silt
40	30/12												Note: fine to medium grained sand, decrease in percent silt, medium dense Boring terminated at 41.0 feet Sampling stopped at 41.0 feet Caved to 29.6 feet
2010													
45													
2005													
50													
2000													
55													
1995													
60													
1990													
65													
1985													
70													
1980													
75													

GEO. ADOT_EWIEL_63683.GPJ_5/11/2006



LOG OF Boring B-10A (Continued)
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-10A
 Page 2 of 2

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 30+70, 96 ft. R
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/8/2005
 Date Completed: 12/8/2005
 Logged By: SCH
 Total Depth (ft): 16.5

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY					Other Tests	Graphical Log	USCS Classification	DESCRIPTION
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)				Passing #200 Sieve (%)
		2 5 11										SC	Appx. Surface Elevation (ft): 2063.00 Surface Condition: Dirt Parking Lot of Cowboy Cafe
2060		16 15 16										GM	Silty Gravel , coarse grained gravel, sub-angular, light brown, slightly moist, medium dense, no plasticity
	5	23/12		102	4	NV	NP	98	18	direct shear		SC SM	Clayey Sand , fine grained sand with fine gravel throughout, moderately cemented, sub-angular, red-brown, slightly moist, moderately firm, low plasticity
2055												CL	Silty Sand , fine to medium grained sand, sub-angular, brown, slightly moist, medium dense, very low plasticity
	10	4 3 5				39	20	100	82				Lean Clay with Sand , moderately cemented, brown, slightly moist, soft, medium plasticity
2050												SM	Silty Sand , fine grained sand, sub-angular, brown, slightly moist, loose, nonplastic
	15	3 4 5											
2045													Boring terminated at 16.5 feet Sampling stopped at 16.5 feet Caved to 10.5 feet
	20												
	2040												
	25												
	2035												
	30												
	2030												
	35												

GEO. ADOT_EWEL 63683.GPJ 5/11/2006



LOG OF Boring B-11
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring

B-11

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 33+55, 124 ft. L
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/12/2005
 Date Completed: 12/12/2005
 Logged By: SCH
 Total Depth (ft): 16.5

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY						Graphical Log	USCS Classification	DESCRIPTION 0.0 to 16.5 feet Appx. Surface Elevation (ft): 2066.00 Surface Condition: Dirt Lot on South bank of Sols Wash
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			
2065		28 12 20										GC	Clayey Gravel , fine grained gravel, sub-angular, brown, slightly moist, firm, low plasticity
	5	16/12			97	10.7	30	9	97	64	direct shear	CL	Sandy Clay , with fine gravel, sub-angular, brown to light brown, slightly moist, moderately firm to firm, low plasticity
2060		4 3 6											
	10	6 3 6											
2055													
	15	4 3 5										SM-SC	Silty Clayey Sand , fine grained sand, sub-angular, brown, slightly moist, soft, low plasticity
2050													
	20												
2045													
	25												
2040													
	30												
2035													
	35												
													Boring terminated at 16.5 feet Sampling stopped at 16.5 feet

GEO_ADOT_EWEL_63683.GPJ_5/11/2006



LOG OF Boring B-12
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-12

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 36+60, 85 ft. L
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/12/2005
 Date Completed: 12/12/2005
 Logged By: SCH
 Total Depth (ft): 3.0

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY				Other Tests	Graphical Log	USCS Classification	DESCRIPTION	
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index				Passing #4 Sieve (%)	Passing #200 Sieve (%)
2065	7 15 23						43	24	90	45		SC	<p>Appx. Surface Elevation (ft): 2068.00 Surface Condition: Dirt Lot on South bank of Sols Wash</p> <p>Clayey Sand, fine to coarse grained sand with some gravel, sub-angular, brown, slightly moist, very firm to hard, medium plasticity</p> <p>Boring Boring Terminated Due to Refusal on Suspected Cobble Layer at 3.0 feet Sampling stopped at 2.9 feet</p>
	50/5												
2060													
2055													
2050													
2045													
2040													
2035													
35													

GEO. ADOT_EWEL 63683.GPJ_5/11/2006



LOG OF Boring B-13
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-13

Drafted By: SCH Project Number: 63683
 Date: May 2006

Station and Offset: 40+30, 98 ft. L
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/12/2005
 Date Completed: 12/12/2005
 Logged By: SCH
 Total Depth (ft): 16.5

ELEVATION (ft)	DEPTH (ft)	FIELD				LABORATORY					Graphical Log	USCS Classification	DESCRIPTION 0.0 to 16.5 feet
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			
2070		5 15 25					29	12	80	28		SC	<p>Appx. Surface Elevation (ft): 2071.00 Surface Condition: Dirt Lot on South bank of Sols Wash</p> <p>Clayey Sand, fine to coarse grained sand with some gravel, sub-angular, brown, slightly moist, very firm, medium plasticity</p> <p>Sand, medium grained sand, trace fine gravel, sub-angular, light brown, slightly moist, loose, nonplastic</p> <p>Silty Gravel, fine grained gravel, some medium grained sand, sub-angular, light brown, slightly moist, dense, no plasticity</p> <p>Silty Sand, medium grained sand, sub-angular, light brown, slightly moist, medium dense, no plasticity</p>
	5	4 3 7				NV	NP	89	5		SP		
2065		35/12									GM		
2060	10	4 6 5									SM		
2055	15	14 15 15											
2050	20												
2045	25												
2040	30												
	35												
												Boring terminated at 16.5 feet Sampling stopped at 16.5 feet	

GEO_ADOT_EWIEL_63683.GPJ 5/11/2006



LOG OF Boring B-14
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring

B-14

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 41+38, 203 ft. R
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/8/2005
 Date Completed: 12/8/2005
 Logged By: SCH
 Total Depth (ft): 16.5

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY						Graphical Log	USCS Classification	DESCRIPTION 0.0 to 16.5 feet Appx. Surface Elevation (ft): 2070.00 Surface Condition: Asphaltic Concrete
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			
2065	5	17/12	55		101	2.8	NV	NP	89	7	direct shear	SP-SM	Asphaltic Concrete Pavement Sand with Silt , medium to coarse grained sand, trace gravel, sub-angular, light brown, slightly moist, medium dense, nonplastic
2060	10	767											Note: medium grained sand, trace gravel, medium dense
2055	15	688										SC	Clayey Sand , fine grained sand, sub-angular, brown, slightly moist, firm, low plasticity
2050	20												Boring terminated at 16.5 feet Sampling stopped at 16.5 feet
2045	25												
2040	30												
2035	35												

GEO. ADOT. EWJEL. 63683.GPJ 5/11/2006



LOG OF Boring B-15
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-15

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 43+30, 151 ft. R
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/8/2005
 Date Completed: 12/8/2005
 Logged By: SCH
 Total Depth (ft): 16.5

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY							Graphical Log	USCS Classification	DESCRIPTION 0.0 to 16.5 feet
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
2070			3/12		87	12.7	28	9	95	65		CL	Asphaltic Concrete Pavement Sandy Clay, brown, slightly moist, very soft, low plasticity	
	5		2 3 3									SM	Silty Sand, fine to medium grained sand, sub-angular, brown, slightly moist, loose, very low plasticity	
2065												SC	Clayey Sand, fine grained sand, sub-angular, brown, slightly moist, very soft, low plasticity	
	10		2 3 2											
2060														
	15		5 6 8									SM	Silty Sand, fine grained sand, sub-angular, brown, slightly moist, medium dense, no plasticity Boring terminated at 16.5 feet Sampling stopped at 16.5 feet Caved to 10.0 feet	
2055														
	20													
2050														
	25													
2045														
	30													
2040														
	35													

GEO. ADOT_EWIEL_63683.GPJ_5/11/2006



LOG OF Boring B-16
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-16
 Page 1 of 1

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 48+80, 153 ft. R
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/8/2005
 Date Completed: 12/8/2005
 Logged By: SCH
 Total Depth (ft): 16.5

ELEVATION (ft)	DEPTH (ft)	FIELD				LABORATORY				Other Tests	Graphical Log	USCS Classification	DESCRIPTION
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)				Passing #200 Sieve (%)
2075	5	2 3 3	21/12	107	4.3	22	5	91	36		SM-SC	Asphaltic Concrete Pavement Silty, Clayey Sand , fine grained sand, sub-angular, brown, slightly moist, soft, low plasticity	
2070	10	2 2 3									SM	Silty Sand , fine grained sand, sub-angular, brown, slightly moist, medium dense to loose, nonplastic	
2065	15	5 7 8										Note: medium to coarse-grained sand at 15'	
2060												Boring terminated at 16.5 feet Sampling stopped at 16.5 feet Caved to 12.0 feet	
2055													
2050													
2045													
35													

GEO ADOT EWIEL 63683.GPJ 5/11/2006



LOG OF Boring B-17
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-17

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 54+70, 114 ft. R
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/8/2005
 Date Completed: 12/8/2005
 Logged By: SCH
 Total Depth (ft): 16.5

ELEVATION (ft)	DEPTH (ft)	FIELD			LABORATORY					Graphical Log	USCS Classification	DESCRIPTION 0.0 to 16.5 feet
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)			
2075	5	2-5					NV NP	81	9		SP-SM	Sand with Silt , fine to medium grained sand, sub-angular, brown to light brown, slightly moist, loose to dense, very low plasticity Note: medium grained sand, light brown, medium dense Note: medium grained sand, light brown, loose
2070	10	48/12										Note: with fine gravel, dense
2065	15	12-22										Note: medium grained sand, trace fine gravel
2060	20											Boring terminated at 16.5 feet Sampling stopped at 16.5 feet Caved to 12.0 feet
2055	25											
2050	30											
2045	35											

GEO ADOT EWIEL 63683.GPJ 5/11/2006



LOG OF Boring B-18
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring
B-18

Drafted By: SCH Project Number: 63683
 Date: May 2006

Station and Offset: 54+20, 20 ft. L
 Groundwater Depth (ft): No Free Groundwater Encountered
 Drilling Company: GSI Equipment: CME-75
 Hole Diameter (in): 6 5/8 Drilling Method: Hollow Stem Auger
 Hammer Type: Automatic

Date Started: 12/8/2005
 Date Completed: 12/8/2005
 Logged By: SCH
 Total Depth (ft): 16.0

ELEVATION (ft)	DEPTH (ft)	FIELD				LABORATORY				Graphical Log	USCS Classification	DESCRIPTION 0.0 to 16.0 feet Appx. Surface Elevation (ft): 2079.50 Surface Condition: Island-Horse Property
		Sample Interval	Blow Counts per 6" Interval	Continuous Pen. Resistance (bpf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)			
2075	5	1-3	3									CL Sandy Clay , brown, slightly moist, soft, low to medium plasticity
		1-2	1				33	14	98	61		
2070	10	1-2	1									SM Silty Sand , fine grained sand, sub-angular, brown, slightly moist, very loose, very low plasticity SC Clayey Sand , fine grained sand, sub-angular, brown, slightly moist, soft, low plasticity GM Silty Gravel , fine grained gravel, sub-angular, brown, slightly moist, dense, no plasticity
		1-2	1									
2065	15	11/12	11		95	6.5						SM Silty Sand , fine to medium grained sand, sub-angular, light brown, slightly moist, dense to medium dense, nonplastic
2060	20											Boring terminated at 16.0 feet Sampling stopped at 16.0 feet
2055	25											
2050	30											
2045	35											

GEO.ADOT.EWIEL.63683.GPJ 5/11/2006



LOG OF Boring B-21
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Boring

B-21

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 17+20, 34 ft. L Elevation (ft): 2044.5 Date Started: 12/14/2005
 Groundwater (ft): Initial (X): 12.0 Date Completed: 12/14/2005
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe Logged By: SCH
 Excavation Method: Backhoe with 24" bucket Total Depth (ft): 11.5

Sample Interval	FIELD		LABORATORY						Graphical Log	USCS Classification	DESCRIPTION
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 to 11.5 feet										DESCRIPTION 0.0 to 11.5 feet	
Surface Condition: Sols Wash - East of Tegner Bridge											
5	BULK								SP	Sand, fine to medium grained sand, slightly moist, sub-angular, light brown	
									GW	Gravel, fine to coarse grained, sub-angular, brown	
									SP	Sand, fine to medium grained sand, moist, sub-angular, light brown	
									GW	Gravel, fine grained, sub-angular, brown, moist	
									SP	Sand, fine to medium grained sand, moist, sub-angular, light brown	
									GC	Clayey Gravel, fine grained sand, fine grained gravel, sub-angular, brown, moist Note: Large rebar present Note: Roots present	
10	BULK								SC	Clayey Sand, fine grained sand, sub-angular, wet, higher plasticity, close to water table	
15										Test Pit terminated at 11.5 feet Sampling stopped at 11.5 feet	
20											
25											
30											
35											

GEO ADOT TEST-PIT ERI 63683.GPJ 5/11/2006



LOG OF Test Pit TP-01
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Test Pit
TP-01

Drafted By: SCH Project Number: 63683
 Date: May 2006

Station and Offset: 21+40, 56 ft. L
 Groundwater (ft): Initial (▽): 12.0
 Excavation Co. : Riggs Enterprise
 Excavation Method: Backhoe with 24" bucket

Elevation (ft): 2048.5
 Equipment: CAT Backhoe

Date Started: 12/14/2005
 Date Completed: 12/14/2005
 Logged By: SCH
 Total Depth (ft): 12.0

Sample Interval	FIELD				LABORATORY				Graphical Log	USCS Classification	DESCRIPTION 0.0 to 12.0 feet
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0 - 12.0	BULK									SP GW SP GW SP GW SC GW SP	<p>Surface Condition: Sols Wash - East of Tegner Bridge</p> <p>Sand, fine to medium grained sand, slightly moist, sub-angular, light brown</p> <p>Gravel, fine to coarse grained gravel, sub-angular, brown</p> <p>Sand, fine to medium grained sand, slightly moist, sub-angular, light brown</p> <p>Gravel, fine to coarse grained gravel, sub-angular, brown, slightly moist</p> <p>Sand, fine to medium grained sand, slightly moist, sub-angular, light brown</p> <p>Gravel, fine to coarse grained gravel, sub-angular, brown, moist Note: Increase in moisture, trace cobbles from 5'-8' throughout soil layers</p> <p>Clayey Sand, fine grained sand, sub-angular, moist, dark brown</p> <p>Gravel, fine to coarse grained gravel, sub-angular, brown, moist</p> <p>Sand, fine to medium grained sand, moist, sub-angular, light brown, wet</p>
12.0 - 12.0	BULK										<p>Test Pit terminated at 12.0 feet Sampling stopped at 12.0 feet</p>

GEO ADOT TEST-PIT ER1 63683.GPJ 5/11/2006



KLEINFELDER

Drafted By: SCH Project Number: 63683
 Date: May 2006

LOG OF Test Pit TP-02
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Test Pit
TP-02
 Page 1 of 1

Station and Offset: 25+70, 32 ft. L Elevation (ft): 2052.5
 Groundwater (ft): No Free Groundwater Encountered
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe
 Excavation Method: Backhoe with 24" bucket

Date Started: 12/14/2005
 Date Completed: 12/14/2005
 Logged By: SCH
 Total Depth (ft): 12.0

Sample Interval	FIELD				LABORATORY				Graphical Log	USCS Classification	DESCRIPTION 0.0 to 12.0 feet
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 - 1.0	BULK								SP	Sand, fine to medium grained sand, slightly moist, sub-angular, light brown	
1.0 - 2.0									GC SP	Clayey Gravel, coarse grained gravel, cobbles to boulders, sub-angular, brown, moist Sand, fine to medium grained sand, moist, sub-angular, light brown, some cobbles mixed throughout	
2.0 - 3.0									GC	Clayey Gravel, coarse grained gravel, sub-angular, brown, moist	
3.0 - 4.0									CL SP	Sandy Clay, fine grained sand, moist, sub-angular, brown Sand, fine to medium grained sand, slightly moist, sub-angular, light brown	
4.0 - 5.0									GC	Clayey Gravel, coarse grained gravel, sub-angular, brown, moist	
5.0 - 6.0									CL	Sandy Clay, fine grained sand, moist, sub-angular, brown	
6.0 - 7.0									GC	Sand, fine to medium grained sand, slightly moist, sub-angular, light brown	
7.0 - 8.0									GC	Clayey Gravel, coarse grained gravel, sub-angular, brown, moist	
8.0 - 9.0									CL	Sandy Clay, fine grained sand, moist, sub-angular, brown	
9.0 - 10.0	BULK										
10.0 - 12.0										Test Pit terminated at 12.0 feet Sampling stopped at 12.0 feet	

GEO. ADOT TEST-PIT_ER1_63683.GPJ_5/11/2006



LOG OF Test Pit TP-03
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Test Pit
TP-03

Drafted By: SCH Project Number: 63683
 Date: May 2006

Station and Offset: 29+35, 56 ft. R Elevation (ft): 2055
 Groundwater (ft): No Free Groundwater Encountered
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe
 Excavation Method: Backhoe with 24" bucket

Date Started: 12/14/2005
 Date Completed: 12/14/2005
 Logged By: SCH
 Total Depth (ft): 13.5

Sample Interval	FIELD				LABORATORY				Graphical Log	USCS Classification	DESCRIPTION
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 to 13.5 feet										DESCRIPTION	
										Surface Condition: Sols Wash - West of Bridge	
5	BULK								SC	Clayey Sand, fine grained sand, slightly moist, sub-angular, large pieces (cobbles sized) of rip-rap in soil	
									GC	Clayey Gravel, coarse grained gravel with cobbles, rip-rap throughout gravel layer	
									SC	Note: Rebar Clayey Sand, fine grained sand, slightly moist, sub-angular, no cobbles	
10	BULK								SP	Sand, moisture increasing, moist, no plasticity, very little fines	
										Note: Amount of fines increasing in soil	
15										Test Pit terminated at 13.5 feet Sampling stopped at 13.5 feet	
20											
25											
30											
35											

GEO ADOT TEST-PIT ERI 63683.GPJ 5/11/2006

	LOG OF Test Pit TP-04 Wickenburg Downtown Flooding Hazard Mitigation Project Maricopa County Flood Control District Sols Wash Wickenburg, Arizona		Test Pit TP-04
	Drafted By: <u>SCH</u> Date: <u>May 2006</u>	Project Number: <u>63683</u>	Page 1 of 1

Station and Offset: 34+95, 80 ft. R Elevation (ft): 2060 Date Started: 12/14/2005
 Groundwater (ft): No Free Groundwater Encountered Date Completed: 12/14/2005
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe Logged By: SCH
 Excavation Method: Backhoe with 24" bucket Total Depth (ft): 13.0

Sample Interval	FIELD			LABORATORY					Graphical Log	USCS Classification	DESCRIPTION
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 to 13.0 feet										DESCRIPTION	
										Surface Condition: Sols Wash - West of Bridge	
0 - 1.5	BULK								SP	Sand, fine to medium grained sand, slightly moist, sub-angular, light brown	
1.5 - 2.5									CL	Sandy Clay, fine grained sand, in layers, dark brown, sub-angular, moist	
2.5 - 3.5									SP	Sand, fine to medium grained sand, moist, sub-angular, light brown	
3.5 - 4.5									GW	Sand, fine to medium grained sand, moist, sub-angular, light brown	
4.5 - 5.5									SP	Gravel, gravel seam, fine grained, sub-angular, brown	
5.5 - 6.5									GW	Sand, fine to medium grained sand, moist, sub-angular, light brown	
6.5 - 7.5									SP	Sand, fine to medium grained sand, moist, sub-angular, light brown	
7.5 - 8.5									GW	Gravel, gravel seam, fine grained, sub-angular, brown	
8.5 - 9.5									GW	Sand, fine to medium grained sand, moist, sub-angular, light brown	
9.5 - 10.5									SP	Gravel, fine grained gravel, sub-angular, brown, moist	
10.5 - 13.0	BULK								SP	Sand, fine to medium grained sand, moist, sub-angular, light brown	
13.0 - 15.0										Test Pit terminated at 13.0 feet Sampling stopped at 13.0 feet	

GEO.ADOT TEST-PIT ERI 63683.GPJ 5/11/2006

 KLEINFELDER	LOG OF Test Pit TP-05 Wickenburg Downtown Flooding Hazard Mitigation Project Maricopa County Flood Control District Sols Wash Wickenburg, Arizona		Test Pit TP-05
	Drafted By: <u>SCH</u> Date: <u>May 2006</u>	Project Number: <u>63683</u>	Page 1 of 1

Station and Offset: 38+20, 72 ft. L Elevation (ft): 2069 Date Started: 12/14/2005
 Groundwater (ft): No Free Groundwater Encountered Date Completed: 12/14/2005
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe Logged By: SCH
 Excavation Method: Backhoe with 24" bucket Total Depth (ft): 6.5

Sample Interval	FIELD		LABORATORY						Graphical Log	USCS Classification	DESCRIPTION
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 to 6.5 feet										0.0 to 6.5 feet	
										Surface Condition: Dirt Lot on South bank of Sols Wash	
0.0 - 1.0	BULK									GC Clayey Gravel , fine grained, cobble/gravel fill with fine sand, brown, sub-angular, slightly moist	
1.0 - 4.0	BULK									SM Silty Sand , fine grained sand, sub-angular, slightly moist, brown Note: Roots	
4.0 - 6.5										SP Sand , medium grained, slightly moist, sub-angular, no visible moisture, brown	
Test Pit terminated at 6.5 feet Sampling stopped at 4.0 feet											

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	LOG OF Test Pit TP-09 Wickenburg Downtown Flooding Hazard Mitigation Project Maricopa County Flood Control District Sols Wash Wickenburg, Arizona		Test Pit TP-09
	Drafted By: SCH Date: May 2006	Project Number: 63683	Page 1 of 1

Station and Offset: 34+95, 80 ft. R Elevation (ft): 2060
 Groundwater (ft): No Free Groundwater Encountered
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe
 Excavation Method: Backhoe with 24" bucket

Date Started: 12/14/2005
 Date Completed: 12/14/2005
 Logged By: SCH
 Total Depth (ft): 13.5

Sample Interval	FIELD		LABORATORY					Graphical Log	USCS Classification	DESCRIPTION
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			
0.0 to 13.5 feet									DESCRIPTION 0.0 to 13.5 feet	
Surface Condition: Sols Wash - West of Bridge										
0 - 1.5	BULK							SP	Sand, fine to medium grained sand, slightly moist, sub-angular, light brown	
1.5 - 2.5								GW SP	Gravel, gravel seam, fine grained, sub-angular, slightly moist, brown	
2.5 - 3.5									Sand, fine to medium grained sand, moist, sub-angular, light brown	
3.5 - 4.5	BULK									
4.5 - 5.5	BULK							GW SP	Gravel, gravel seam, fine grained, sub-angular, slightly moist, brown	
5.5 - 6.5								SP	Sand, fine to medium grained sand, moist, sub-angular, light brown	
6.5 - 7.5	BULK							SC	Clayey Sand, fine grained sand, dark brown, moist, layers of sands and clays	
7.5 - 8.5	BULK							SP	Sand, fine to medium grained sand, moist, amount of fines increasing with depth	
8.5 - 9.5	BULK								Note: Some clay, cobbles, coarse gravel increasing in frequency	
9.5 - 10.5	BULK								Note: Trace gravel	
10.5 - 13.5	BULK								Test Pit terminated at 13.5 feet Sampling stopped at 13.5 feet	

GEO_ADOT_TEST-PIT_ER1_63683.GPJ_5/11/2006



LOG OF Test Pit TP-10
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Test Pit
TP-10

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 38+25, 18 ft. R Elevation (ft): 2062
 Groundwater (ft): No Free Groundwater Encountered
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe
 Excavation Method: Backhoe with 24" bucket

Date Started: 12/14/2005
 Date Completed: 12/14/2005
 Logged By: SCH
 Total Depth (ft): 13.0

Sample Interval	FIELD				LABORATORY				Graphical Log	USCS Classification	DESCRIPTION 0.0 to 13.0 feet
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 - 1.0	BULK								SP	Sand, fine to medium grained sand, sub-angular, slightly moist, light brown	
1.0 - 2.0									GM	Silty Gravel, fine grained gravel seam, sub-angular, brown, slightly moist	
2.0 - 3.0									SM		
3.0 - 4.0									SP	Silty Sand, fine grained sand, moist, dark brown, sub-angular Note: Roots	
4.0 - 5.0										Sand, fine to medium grained sand, sub-angular, moist, light brown	
5.0 - 6.0											
6.0 - 7.0											
7.0 - 8.0											
8.0 - 9.0											
9.0 - 10.0	BULK								GM	Silty Gravel, fine grained gravel seam, sub-angular, slightly moist, brown	
10.0 - 11.0									SP	Sand, fine to medium grained sand, sub-angular, slightly moist, light brown	
11.0 - 12.0									SM		
12.0 - 13.0									SP	Silty Gravel, fine grained gravel seam, sub-angular, brown, moist Sand, fine to medium grained sand, sub-angular, moist, light brown Note: Roots	
13.0 - 15.0										Test Pit terminated at 13.0 feet Sampling stopped at 13.0 feet	

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LOG OF Test Pit TP-11
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Test Pit
TP-11
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Drafted By: SCH Project Number: 63683
 Date: May 2006

Station and Offset: 47+40, 41 ft. L Elevation (ft): 2069.5 Date Started: 12/15/2005
 Groundwater (ft): No Free Groundwater Encountered Date Completed: 12/15/2005
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe Logged By: SCH
 Excavation Method: Backhoe with 24" bucket Total Depth (ft): 13.0

Sample Interval	FIELD			LABORATORY					Graphical Log	USCS Classification	DESCRIPTION 0.0 to 13.0 feet
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 - 1.0										SP	Sand, fine to medium grained sand, sub-angular, slightly moist, light brown
1.0 - 2.0										GM SC	Silty Gravel, fine grained gravel seam, sub-angular, brown, slightly moist Clayey Sand, fine to medium grained sand, sub-angular, moist, dark brown
2.0 - 3.0										GW SC	Note: Roots Gravel, gravel seam, fine grained gravel, sub-angular, brown, moist Clayey Sand, fine to medium grained sand, sub-angular, moist, dark brown
3.0 - 4.0										GW	Note: More clay in this layer Gravel, gravel seam, fine grained gravel, sub-angular, moist, brown
4.0 - 13.0											Test Pit terminated at 13.0 feet Sampling stopped at 13.0 feet

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LOG OF Test Pit TP-12
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Test Pit
TP-12
 Page 1 of 1

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: 39+55, 37 ft. R Elevation (ft): 2068
 Groundwater (ft): No Free Groundwater Encountered
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe
 Excavation Method: Backhoe with 24" bucket

Date Started: 12/15/2005
 Date Completed: 12/15/2005
 Logged By: SCH
 Total Depth (ft): 6.0

Sample Interval	FIELD		LABORATORY					Graphical Log	USCS Classification	DESCRIPTION
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			
0.0 to 6.0 feet									CL	Sandy Clay , fine grained sand, slightly moist, sub-angular, brown, low plasticity Note: Roots
5	BULK								SM	Silty Sand , fine to medium grained, slightly moist, layers of dark brown to light brown
6.0										Test Pit terminated at 6.0 feet Sampling stopped at 4.5 feet

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LOG OF Test Pit TP-13
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Test Pit
TP-13

Drafted By: SCH Project Number: 63683
 Date: May 2006

Station and Offset: 45+00, 67 ft. L Elevation (ft): 2073
 Groundwater (ft): No Free Groundwater Encountered
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe
 Excavation Method: Backhoe with 24" bucket

Date Started: 12/15/2005
 Date Completed: 12/15/2005
 Logged By: SCH
 Total Depth (ft): 6.5

Sample Interval	FIELD		LABORATORY					Graphical Log	USCS Classification	DESCRIPTION
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			
0.0 to 6.5 feet										0.0 to 6.5 feet
										Surface Condition: Island-Horse Property
	BULK								SM	Silty Sand , medium to coarse grained sand, slightly moist, light brown
									GM SC	Silty Gravel , fine grained gravel, sub-angular, slightly moist, brown Clayey Sand , fine grained sand, slightly moist, sub-angular, light brown, low plasticity
5										
	BULK									
10										
15										
20										
25										
30										
35										Test Pit terminated at 6.5 feet Sampling stopped at 6.5 feet

GEO.ADOT TEST-PIT-ER1 63683.GPJ 5/11/2006



LOG OF Test Pit TP-14
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Test Pit
TP-14

Drafted By: SCH Project Number: 63683
 Date: May, 2006

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Station and Offset: 51+20, 18 ft. L Elevation (ft): 2078.5
 Groundwater (ft): No Free Groundwater Encountered
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe
 Excavation Method: Backhoe with 24" bucket

Date Started: 12/15/2005
 Date Completed: 12/15/2005
 Logged By: SCH
 Total Depth (ft): 6.0

Sample Interval	FIELD		LABORATORY						Graphical Log	USCS Classification	DESCRIPTION
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 - 4.5	BULK								SC	Clayey Sand, fine grained sand, slightly moist, sub-angular, light brown, low plasticity	
4.5 - 5.0	BULK								CL	Sandy Clay, fine grained sand, slightly moist, sub-angular, brown, low plasticity	
5.0 - 6.0										Test Pit terminated at 6.0 feet Sampling stopped at 4.5 feet	

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LOG OF Test Pit TP-15
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Drafted By: SCH Project Number: 63683
 Date: May 2006

Test Pit
TP-15
 Page 1 of 1

Station and Offset: 59+40, 51 ft. L Elevation (ft): 2084.5 Date Started: 12/15/2005
 Groundwater (ft): No Free Groundwater Encountered Date Completed: 12/15/2005
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe Logged By: SCH
 Excavation Method: Backhoe with 24" bucket Total Depth (ft): 6.5

Sample Interval	FIELD		LABORATORY						Graphical Log	USCS Classification	DESCRIPTION
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 to 6.5 feet										DESCRIPTION 0.0 to 6.5 feet	
										Surface Condition: Island-Horse Property	
5	BULK								SC	Clayey Sand , fine grained sand, slightly moist, sub-angular, light brown, low plasticity	
									CL	Sandy Clay , fine grained sand, slightly moist, sub-angular, brown, low plasticity	
	BULK									Test Pit terminated at 6.5 feet Sampling stopped at 6.5 feet	
10											
15											
20											
25											
30											
35											

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LOG OF Test Pit TP-16
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Drafted By: SCH Project Number: 63683
 Date: May, 2006

Test Pit
TP-16

Station and Offset: 56+30, 653 ft. L Elevation (ft): 2079.5
 Groundwater (ft): No Free Groundwater Encountered
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe
 Excavation Method: Backhoe with 24" bucket

Date Started: 12/15/2005
 Date Completed: 12/15/2005
 Logged By: SCH
 Total Depth (ft): 13.0

Sample Interval	FIELD		LABORATORY						Graphical Log	USCS Classification	DESCRIPTION 0.0 to 13.0 feet
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 - 1.0	BULK								SP	Sand, fine to medium grained, slightly moist, layered from 1'-3' with alternating dark brown and light brown layers	
1.0 - 1.5									GW	Gravel, gravel seam, fine grained gravel, sub-angular, brown, slightly moist	
1.5 - 2.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
2.0 - 2.5									GW	Gravel, gravel seam, fine grained gravel, sub-angular, brown, moist	
2.5 - 3.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
3.0 - 3.5									GW	Gravel, gravel seam, fine grained gravel, sub-angular, brown, moist	
3.5 - 4.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
4.0 - 4.5									GW	Gravel, gravel seam, fine grained gravel, sub-angular, brown, moist	
4.5 - 5.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
5.0 - 5.5									GW	Gravel, gravel seam, fine grained gravel, sub-angular, brown, moist	
5.5 - 6.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
6.0 - 6.5									GW	Gravel, gravel seam, fine to coarse grained gravel, cobbles, sub-angular, brown, moist	
6.5 - 7.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
7.0 - 7.5									GW	Gravel, gravel seam, fine to coarse grained gravel, cobbles, sub-angular, brown, moist	
7.5 - 8.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
8.0 - 8.5									GW	Gravel, gravel seam, fine to coarse grained gravel, cobbles, sub-angular, brown, moist	
8.5 - 9.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
9.0 - 9.5									GW	Gravel, gravel seam, fine to coarse grained gravel, cobbles, sub-angular, brown, moist	
9.5 - 10.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
10.0 - 10.5									GW	Gravel, gravel seam, fine to coarse grained gravel, cobbles, sub-angular, brown, moist	
10.5 - 11.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
11.0 - 11.5									GW	Gravel, gravel seam, fine to coarse grained gravel, cobbles, sub-angular, brown, moist	
11.5 - 12.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
12.0 - 12.5									GW	Gravel, gravel seam, fine to coarse grained gravel, cobbles, sub-angular, brown, moist	
12.5 - 13.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
13.0 - 13.5										Test Pit terminated at 13.0 feet Sampling stopped at 13.0 feet	

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LOG OF Test Pit TP-17
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Test Pit
TP-17
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Drafted By: SCH Project Number: 63683
 Date: May, 2006

Station and Offset: _____ Elevation (ft): 2067
 Groundwater (ft): No Free Groundwater Encountered
 Excavation Co.: Riggs Enterprise Equipment: CAT Backhoe
 Excavation Method: Backhoe with 24" bucket

Date Started: 12/15/2005
 Date Completed: 12/15/2005
 Logged By: SCH
 Total Depth (ft): 12.0

Sample Interval	FIELD		LABORATORY						Graphical Log	USCS Classification	DESCRIPTION
	Sample Type	Nuclear Gage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 to 12.0 feet										DESCRIPTION 0.0 to 12.0 feet	
Surface Condition: Sols Wash - West of Bridge											
0 - 1.5	BULK								SP	Sand, fine to medium grained sand, sub-angular, slightly moist, light brown	
1.5 - 2.5									SM	Silty Sand, fine to medium grained sand, slightly moist, layered alternating dark brown and light brown, sub-angular	
2.5 - 3.5									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
3.5 - 4.5									GW		
4.5 - 5.5									SP	Gravel, gravel seam, fine grained gravel, sub-angular, brown, moist	
5.5 - 6.5									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
6.5 - 11.0	BULK								SC	Clayey Sand, fine grained sand, brown, sub-angular, moist, low plasticity	
Note: Plasticity increases with depth											
11.0 - 12.0									SP	Sand, fine to medium grained sand, sub-angular, moist, light brown	
Test Pit terminated at 12.0 feet Sampling stopped at 12.0 feet											

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LOG OF Test Pit TP-18
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Test Pit
TP-18

Drafted By: SCH Project Number: 63683
 Date: May 2006

Station and Offset: _____ Elevation (ft): 2086.5 Date Started: 12/15/2005
 Groundwater (ft): No Free Groundwater Encountered Date Completed: 12/15/2005
 Excavation Co. : Riggs Enterprise Equipment: CAT Backhoe Logged By: SCH
 Excavation Method: Backhoe with 24" bucket Total Depth (ft): 13.0

Sample Interval	FIELD		LABORATORY						Graphical Log	USCS Classification	DESCRIPTION 0.0 to 13.0 feet
	Sample Type	Nuclear Cage Dry Density (lbs/ft ³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests			
0.0 - 5.0	BULK								SP	Sand , fine to medium grained sand, sub-angular, slightly moist, light brown Note: Moisture increase at 2'	
5.0 - 8.0									GW	Gravel , gravel seam, fine grained gravel, sub-angular, brown, moist	
8.0 - 13.0	BULK								SP-SM	Sand , some silt, fine to medium grained sand, sub-angular, moist, light brown, low plasticity Note: Roots	
Test Pit terminated at 13.0 feet Sampling stopped at 13.0 feet											

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LOG OF Test Pit TP-19
 Wickenburg Downtown Flooding Hazard Mitigation Project
 Maricopa County Flood Control District
 Sols Wash
 Wickenburg, Arizona

Test Pit

TP-19

Drafted By: SCH Project Number: 63683
 Date: May, 2006

APPENDIX B
Laboratory Testing

APPENDIX B LABORATORY TESTING

LABORATORY TESTS

Laboratory tests were performed on selected samples to aid in soil classification and to evaluate physical properties of the soils, which may affect the geotechnical aspects of project design and construction. A description of the laboratory testing program is presented below.

Moisture Content and Dry Unit Weight

Moisture content and dry unit weight tests were performed to provide basic soil properties. Moisture content was evaluated in general accordance with ASTM Test Method D 2216. For backhoe test pits, dry unit weight was evaluated in the field using an average of four readings of a nuclear density gage. For test borings, dry unit weight was determined in the lab from ring samples, using procedures similar to ASTM Test Method D 2937.

Sieve Analysis

Sieve analyses were performed to evaluate the gradational characteristics of the material and to aid in soil classification. Tests were performed in general accordance with ASTM Test Method C 136

Atterberg Limits

Atterberg Limits tests were performed to aid in soil classification and to evaluate the plasticity characteristics of the material. Additionally, test results were correlated to published data to evaluate the shrink/swell potential of near-surface site soils. Tests were performed in general accordance with AASHTO T 90.

Moisture/Density Relationship

Standard proctor tests were performed on bulk soil samples to evaluate maximum dry density and optimum moisture content. Test procedures were in general accordance with ASTM D 698.

R-Value

Resistance value (R-value) tests were performed on bulk soil samples to evaluate pavement support characteristics of the near-surface site soils. Test procedures were in general accordance with AASHTO T 190.

Consolidation

Consolidation tests were performed on selected undisturbed samples to evaluate the settlement potential of the site soils when subjected to typical foundation loads and wetting.

Direct Shear

Direct shear tests were performed on selected undisturbed soil samples to evaluate the strength parameters of the site soils. The direct shear tests were performed over the range of expected normal loading.

Resistivity and pH

Resistivity and pH tests were performed to evaluate the corrosive potential of the site soils. Tests were performed in general accordance with ADOT Test Method 236.

Sulfate and Chloride

Sulfate and Chloride tests were performed to evaluate the corrosive potential of site soils toward Portland cement concrete and steel. Tests were performance in general accordance with California Test Methods 417 and 422 (sulfate and chloride, respectively).



PROJECT: SOLS WASH
 LOCATION: WICKENBURG, ARIZONA
 MATERIAL: SEE BELOW
 SAMPLE SOURCE: SEE BELOW

PROJECT NO: 63683
 WORK ORDER NO: 05457
 DATE SAMPLED: 12/14 - 12/16/2005
 REVIEWED BY: S.STEEL

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES		GRAVEL								SAND							Silt or Clay	Lab #
					6"	4"	Coarse				Fine				Coarse		Medium			Fine			
					3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#10	#16	#30	#40	#50	#100	#200		

PERCENT PASSING BY WEIGHT

Location & Depth	USCS	LL	PL	PI	6"	4"	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#10	#16	#30	#40	#50	#100	#200	Lab #
TP-19 0-8'	SP	NV	NP	NP	100	100	100	100	100	100	99.2	96.8	94.6	90.3	86.3	72.8	67.7	48.9	48.8	18.0	10.8	5.1	3.6	1
TP-19 8-13'	SP-SM	20	18	2	100	100	100	100	100	98.9	97.8	95.2	93.0	88.1	84.1	71.9	67.5	52.4	35.2	28.2	21.8	14.8	11.6	2
TP-15 4'	CL	34	18	16	100	100	100	100	100	100	99.7	99.3	99.0	98.6	98.2	96.6	96.1	94.7	92.6	91.4	89.3	83.0	74.1	4
TP-16 6'	CL	28	16	12	100	100	100	100	100	99.3	98.9	98.1	97.4	95.7	94.6	91.0	89.9	87.0	82.2	78.8	73.5	62.7	53.4	6
TP-14 6'	SC	35	17	18	100	100	100	100	100	100	99.6	99.5	99.4	99.2	99.0	85.9	80.8	61.1	38.7	30.2	23.3	16.3	13.2	8
TP-13 SURFACE	CL	30	20	10	100	100	100	100	100	100	100	100	100	100	100	99.8	99.8	99.5	98.8	98.2	97.0	92.1	82.2	9
TP-2 0-8'	SP-SM	NV	NP	NP	100	100	100	100	100	99.0	97.9	96.1	94.6	92.1	89.4	77.1	71.3	51.2	32.7	25.9	19.1	12.1	7.6	13
TP-1 8-11.5'	SP	NV	NP	NP	71.0	71.0	71.0	71.0	69.8	67.5	65.5	61.7	59.2	55.4	52.6	43.7	40.8	30.9	18.0	11.8	6.6	2.4	1.5	16
TP-3 0-8'	SP-SM	NV	NP	NP	100	100	100	98.9	97.0	95.1	92.5	87.2	83.2	77.2	72.7	60.8	56.8	43.1	26.4	19.3	13.6	8.2	6.2	17
TP-3 8-14'	CL	36	20	16	100	100	100	96.6	96.6	94.5	93.4	90.6	89.0	86.7	85.2	81.1	79.7	75.6	69.9	67.2	64.9	61.3	57.0	18



KLEINFELDER

PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SEE BELOW
SAMPLE SOURCE: SEE BELOW

PROJECT NO: 63683
WORK ORDER NO: 05457
DATE SAMPLED: 12/14 - 12/16/2005
REVIEWED BY: S.STEEL

MECHANICAL SIEVE ANALYSIS
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES		GRAVEL								SAND							Silt or Clay	Lab #		
					6"	4"	Coarse				Fine				#4	#8	Medium			Fine					
							3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"			#10	#16	#30	#40	#50			#100	#200

PERCENT PASSING BY WEIGHT

TP-18 0-8'	SW-SM	NV	NP	NP	100	100	100	100	97.7	96.6	95.9	94.1	92.5	89.5	86.7	75.1	69.5	48.9	26.9	18.8	12.5	7.4	5.7	19
TP-18 8-12'	SP-SC	21	17	4	100	100	100	100	100	99.3	97.9	96.0	94.5	91.5	89.4	74.1	68.5	47.7	24.0	15.7	10.1	6.5	5.6	20
TP-17 0-8'	SP	NV	NP	NP	100	100	100	100	99.4	98.8	97.9	96.1	94.2	90.6	87.2	74.4	67.9	44.2	19.8	12.3	7.6	4.0	3.0	21
TP-12 0-8'	SC-SM	22	18	4	100	100	100	100	98.9	98.5	98.2	96.8	95.4	92.6	90.3	76.4	72.3	54.8	36.8	29.3	22.7	15.3	12.1	23
TP-12 8-13'	SP-SM	NV	NP	NP	100	100	86.0	86.0	84.9	81.0	77.9	72.6	69.4	64.4	61.1	52.5	49.3	38.4	24.9	18.8	13.2	8.1	6.3	24
TP-11 0-8'	SP-SM	NV	NP	NP	100	100	100	100	100	98.9	98.5	96.9	95.4	92.2	89.8	81.4	78.1	65.1	46.3	35.9	24.8	11.9	8.0	25
TP-4 0-8'	SM	NV	NP	NP	100	100	100	97.5	95.9	94.8	93.8	92.6	91.6	89.6	88.1	82.1	79.9	71.1	56.6	47.6	37.8	22.8	15.2	27
TP-5 0-8'	ML	NV	NP	NP	100	100	100	100	100	98.9	98.4	95.7	93.8	90.3	86.8	86.3	86.2	85.4	83.8	81.9	79.0	71.1	60.8	29
TP-5 8-13'	SP	NV	NP	NP	100	100	94.9	92.8	91.7	91.2	90.4	88.9	87.8	85.4	83.3	72.4	67.6	48.1	25.3	16.7	10.5	5.7	4.4	30
TP-10 5' & 8'	SP	NV	NP	NP	100	100	100	100	100	98.7	97.6	94.9	92.1	86.8	82.5	70.5	66.1	49.0	26.1	17.6	11.6	6.3	4.8	31&32



KLEINFELDER

PROJECT: SOLS WASH
 LOCATION: WICKENBURG, ARIZONA
 MATERIAL: SEE BELOW
 SAMPLE SOURCE: SEE BELOW

PROJECT NO: 63683
 WORK ORDER NO: 05457
 DATE SAMPLED: 12/14 - 12/16/2005
 REVIEWED BY: S.STEEL

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES		GRAVEL								SAND							Silt or Clay	Lab #
					6"	4"	Coarse				Fine				Coarse		Medium			Fine			
					3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#10	#16	#30	#40	#50	#100	#200		

PERCENT PASSING BY WEIGHT

Location & Depth	USCS	NV	NP	NP	100	100	94.1	92.1	90.3	88.4	86.1	80.8	76.4	69.1	63.8	49.1	44.3	29.6	16.4	11.5	7.4	3.6	0.0	33-35	
TP-10 10', 12.5', 13.5'	SP	NV	NP	NP	100	100	94.1	92.1	90.3	88.4	86.1	80.8	76.4	69.1	63.8	49.1	44.3	29.6	16.4	11.5	7.4	3.6	0.0	33-35	
TP-14 SURFACE	SM	NV	NP	NP	100	100	100	100	100	100	100	99.8	99.6	99.5	99.3	98.9	98.7	97.3	91.3	82.1	64.7	32.0	18.3	7	



KLEINFELDER

PROJECT: SOLS WASH
 LOCATION: WICKENBURG, ARIZONA
 MATERIAL: SEE BELOW
 SAMPLE SOURCE: SEE BELOW

PROJECT NO: 63683
 WORK ORDER NO: 05452
 DATE SAMPLED: 12/15/2005
 REVIEWED BY: S.STEEL

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES		GRAVEL								SAND							Silt or Clay	Lab #
					6"	4"	Coarse				Fine				Coarse		Medium			Fine			
							3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#10	#16	#30	#40	#50		

PERCENT PASSING BY WEIGHT

B-1 @ 2.5-3.5'	SC	30	21	9	100	100	100	100	75.8	75.8	75.8	72.8	72.8	71.4	70.2	66.7	65.2	60.6	54.4	52.1	50.1	46.6	40.1	1
B-1 @ 5.0-6.0'	CL	34	20	14	100	100	100	100	100	100	100	100	100	99.7	99.7	99.4	99.4	99.1	98.5	98.2	97.9	95.8	85.8	2
B-1 @ 15-16.5'	CL	40	17	23	100	100	100	100	100	100	100	100	100	100	100	99.6	99.2	98.7	97.5	96.6	95.8	92.4	84.0	4
B-2 @ 2.5-4'	CL	32	20	12	100	100	100	100	100	100	88.9	88.9	88.9	88.4	87.9	84.8	83.8	80.3	75.2	73.2	70.7	66.7	59.1	8
B-3 @ 2.5-4'	SP	NV	NP	NP	100	100	100	100	100	100	90.3	88.9	87.8	87.1	86.3	82.8	81.3	74.5	56.5	43.6	30.0	12.0	4.8	13
B-4 @ 0-1.5'	CL	36	18	18	100	100	100	100	100	100	100	100	98.2	97.3	97.3	96.4	96.4	96.4	95.5	94.6	93.7	88.3	73.0	17
B-4 @ 10-11'	CH	55	25	30	100	100	100	100	100	100	100	100	100	100	100	100	100	99.7	99.1	98.8	97.4	96.2	89.2	19
B-5 @ 5-6'	SP-SM	21	20	1	100	100	100	100	100	100	100	100	100	100	99.7	99.1	98.8	98.2	97.3	96.1	90.1	38.2	11.9	22
B-6 @ 5-6.5'	SC-SM	22	17	5	100	100	100	100	100	100	100	100	100	97.3	93.6	87.3	85.5	77.3	62.8	54.6	46.4	31.0	21.9	27
B-7 @ 2.5-3.5'	SM	19	17	2	100	100	100	100	100	100	100	98.2	96.4	93.4	90.3	78.6	74.0	59.2	41.1	34.2	27.3	18.2	13.3	30



KLEINFELDER

PROJECT: SOLS WASH
 LOCATION: WICKENBURG, ARIZONA
 MATERIAL: SEE BELOW
 SAMPLE SOURCE: SEE BELOW

PROJECT NO: 63683
 WORK ORDER NO: 05452
 DATE SAMPLED: 12/15/2005
 REVIEWED BY: S.STEEL

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES		GRAVEL							SAND							Silt or Clay	Lab #
					6"	4"	Coarse			Fine				Coarse		Medium			Fine			
					3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#10	#16	#30	#40	#50	#100		

PERCENT PASSING BY WEIGHT

B-8 @ 2.5-4'	SC-SM	25	20	5	100	100	100	100	100	100	100	100	100	96.4	92.8	85.5	82.8	75.5	66.5	61.9	58.3	51.1	42.9	34		
B-10 @ 2.5-4'	SC-SM	20	16	4	100	100	100	100	100	100	100	100	98.0	94.1	90.2	88.9	83.7	81.7	75.8	66.7	60.8	53.6	39.9	30.7	38	
B-10 @ 10-11'	CL	30	17	13	100	100	100	100	100	100	100	100	100	100	100	100	99.4	99.1	97.8	95.6	93.4	89.7	83.8	79.4	40	
B-11 @ 5-6'	SM	NV	NP	NP	100	100	100	100	100	100	100	100	100	98.4	97.8	94.3	93.2	88.1	75.9	64.6	49.5	27.6	17.8	17.8	44	
B-11 @ 10-11.5'	CL	39	19	20	100	100	100	100	100	100	100	100	100	100	100	100	98.9	98.9	98.9	96.6	95.5	93.2	87.6	82.0	45	
B-12 @ 2.5-3.5'	CL	30	21	9	100	100	100	100	100	100	100	100	100	98.9	98.0	97.2	93.7	92.9	89.5	84.9	82.1	78.1	70.7	64.4	48	
B-13 @ 0-1.5'	SC	43	19	24	100	100	100	100	100	100	100	100	97.7	94.6	93.1	90.0	83.0	81.5	74.5	66.8	62.9	59.1	52.1	45.2	52	
B-14 @ 2.5-4.0'	SP	NV	NP	NP	100	100	100	100	100	100	100	100	100	98.9	98.3	92.4	88.8	73.4	68.7	53.3	35.1	25.6	16.3	7.4	4.6	56
B-15 @ 2.5-3.5'	SP-SM	NV	NP	NP	100	100	100	100	100	100	100	100	100	97.3	95.1	92.7	89.4	76.1	71.5	53.0	29.9	20.7	13.9	8.4	6.5	60
B-16 @ 2.5-3.5'	CL	28	19	9	100	100	100	100	100	100	100	100	100	97.9	97.1	96.1	95.3	92.8	92.1	90.0	87.1	85.7	83.2	77.1	65.3	64



KLEINFELDER

PROJECT: SOLS WASH
 LOCATION: WICKENBURG, ARIZONA
 MATERIAL: SEE BELOW
 SAMPLE SOURCE: SEE BELOW

PROJECT NO: 63683
 WORK ORDER NO: 05452
 DATE SAMPLED: 12/15/2005
 REVIEWED BY: S.STEEL

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES		GRAVEL							SAND							Silt or Clay	Lab #
					6"	4"	Coarse			Fine				Coarse		Medium			Fine			
					3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#10	#16	#30	#40	#50	#100		

PERCENT PASSING BY WEIGHT

Location & Depth	USCS	LL	PL	PI	6"	4"	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#10	#16	#30	#40	#50	#100	#200	Lab #	
B-17 @ 2.5-4'	SC-SM	22	17	5	100	100	100	100	100	100	100	97.4	95.8	93.2	91.4	84.3	81.9	73.6	64.6	60.5	55.7	45.3	35.8	69	
B-18 @ 2.5-4'	SP-SM	NV	NP	NP	100	100	100	100	100	100	100	94.9	92.1	83.7	80.9	70.3	66.9	52.9	34.9	26.5	20.3	12.5	8.5	73	
B-19 @ 10-11.5'	CL	34	20	14	100	100	100	100	100	100	100	100	100	100	100	98.4	97.8	96.2	94.0	93.4	92.3	89.0	82.4	80	
B-20 @ 5-6.5'	SM	21	18	3	100	100	100	100	100	100	100	99.0	97.4	94.8	91.6	76.4	71.7	55.0	35.1	26.7	20.4	14.6	12.0	84	
B-21 @ 2.5-4'	CL	33	19	14	100	100	100	100	100	100	100	100	100	98.5	97.8	94.9	93.4	88.3	81.7	78.8	75.9	69.3	60.5	88	
B-14 @ 0-5'	SC	29	17	12	100	100	100	100	100	96.9	95.5	92.3	89.4	84.0	80.2	70.1	67.4	58.5	49.4	45.3	41.2	33.7	27.5	92	



PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SOIL SAMPLES
SAMPLE SOURCE: SEE BELOW

PROJECT NO: 63683
WORK ORDER NO: 05457
LAB NO: SEE BELOW
DATE SAMPLED: 12/14 - 12/16/05
REVIEWED BY: S.STEEL

MOISTURE CONTENT OF SOIL (ASTM D2216)

LAB #	BORING	DEPTH RANGE	USCS	WET WT. (gram)	DRY WT. (gram)	MOISTURE CONTENT
1	TP-19	0-8'	SP	541.0	518.6	4.3%
2	TP-19	8-13'	SP-SM	513.1	489.2	4.9%
4	TP-15	4'	CL	589.4	547.6	7.6%
6	TP-16	6'	CL	590.0	555.9	6.1%
7	TP-14	SURFACE	SM	432.1	428.0	1.0%
8	TP-14	6'	SC	562.5	515.2	9.2%
9	TP-13	SURFACE	CL	534.0	512.2	4.3%
13	TP-2	0-8'	SP-SM	512.0	479.7	6.7%
16	TP-1	8-11.5'	SP	514.4	466.7	10.2%
17	TP-3	0-8'	SP-SM	558.3	535.3	4.3%
18	TP-3	8-14'	CL	606.8	505.4	20.1%
19	TP-18	0-8'	SW-SM	564.2	535.9	5.3%
20	TP-18	8-12'	SP-SC	647.8	599.7	8.0%
21	TP-17	0-8'	SP	508.9	484.7	5.0%
23	TP-12	0-8'	SC-SM	541.4	501.5	8.0%
24	TP-12	8-13'	SP-SM	565.6	532.6	6.2%
25	TP-11	0-8'	SP-SM	563.9	538.9	4.6%
27	TP-4	0-8'	SM	564.9	544.3	3.8%
29	TP-5	0-8'	ML	506.5	492.9	2.8%
30	TP-5	8-13'	SP	573.8	554.7	3.4%
31&32	TP-10	5' & 5'	SP	545.1	525.4	3.7%
33-35	TP-10	10', 12.5', 13.5'	SW	567.2	546.4	3.8%



PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SOIL SAMPLES
SAMPLE SOURCE: SEE BELOW

PROJECT NO: 63683
WORK ORDER NO: 05452
LAB NO: SEE BELOW
DATE SAMPLED: 12/15/2005
REVIEWED BY: S.STEEL

DENSITY OF SOIL IN PLACE BY THE DRIVE-CYLINDER METHOD(ASTM D2937)

LAB #	BORING	USCS	MOISTURE			NUMBER OF RINGS	WET WGT. + RINGS (g)	WEIGHT OF RINGS (g)	DRY DENSITY (pcf)
			WET WT. (g)	DRY WT. (g)	MOISTURE CONTENT				
26	B-6 @ 2.5-3.5'	SM-SC	688.0	669.3	2.8%	5.0	867.3	220.6	104.2
30	B-7 @ 2.5-3.5'	SM	495.1	472.8	4.7%	5.0	949.8	222.1	115.1
64	B-16 @ 2.5-3.5'	CL	399.4	354.5	12.7%	5.0	813.7	219.0	87.4
69	B-17 @ 5-6'	SC-SM	447.8	429.2	4.3%	6.0	1,073.8	262.9	107.3
81	B-19 @ 15-16'	CL	579.2	494.2	17.2%	5.0	770.6	218.5	78.0
85	B-20 @ 10-11'	SM	793.7	765.4	3.7%	5.0	849.8	218.7	100.8
91	B-21 @ 15-16'	SM	736.7	691.8	6.5%	6.0	996.4	262.6	95.1

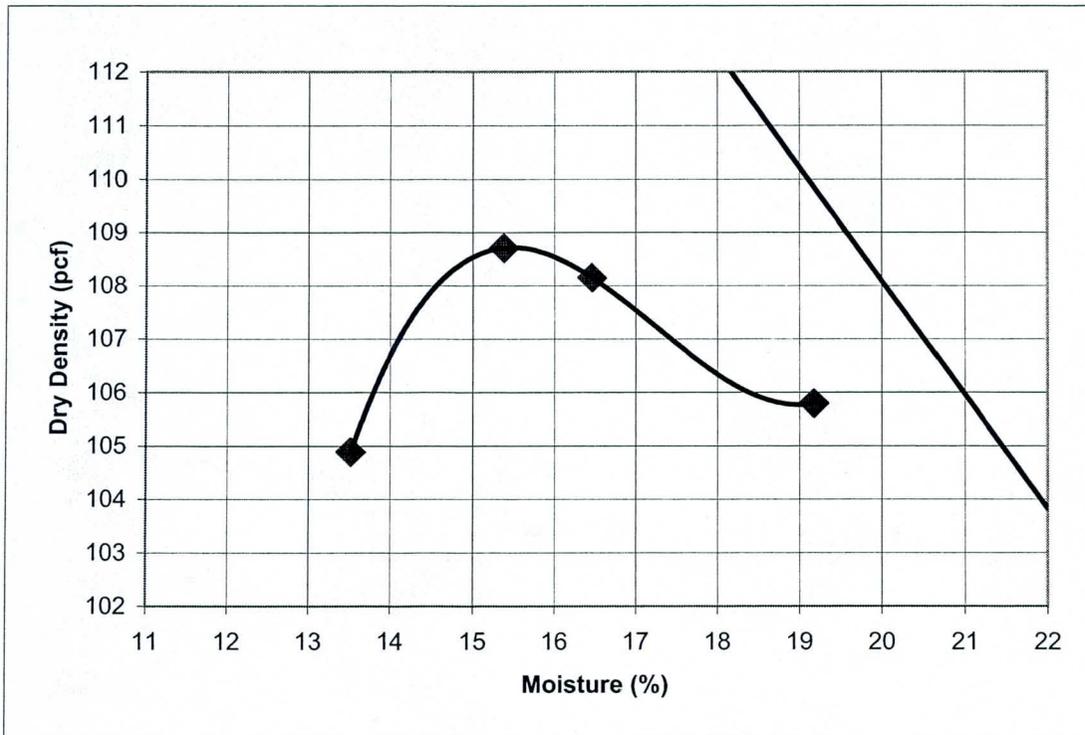
PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SOIL SAMPLES
SAMPLE SOURCE: TP-15 4'

JOB NO: 63683
WORK ORDER NO: 05457
LAB NO: 4
SAMPLE DATE: 12/14 - 12/16/05

**LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
 STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)**

CURVE: 05457-4
Maximum dry density:
Optimum moisture (%):

	English (pcf)	Metric (kg/ cu.m.)
Maximum dry density:	108.7	1741
Optimum moisture (%):	15.5	15.5



NOTES:

- The zero air void curve represents a specific gravity of: 2.65 (assumed).
- This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at clients request.

Reviewed by: _____

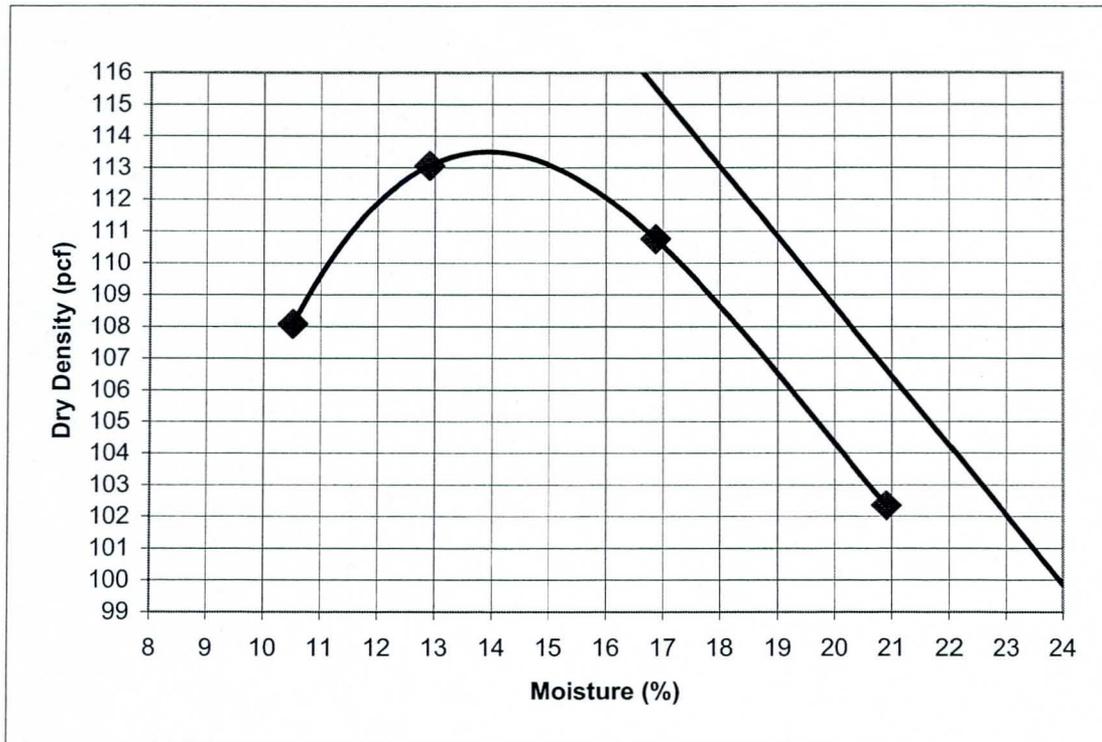
PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SOIL SAMPLES
SAMPLE SOURCE: TP-16 6'

JOB NO: 63683
WORK ORDER NO: 05457
LAB NO: 6
SAMPLE DATE: 12/14 - 12/16/05

**LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
 STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)**

CURVE: 05457-6
Maximum dry density:
Optimum moisture (%):

English (pcf)	Metric (kg/ cu.m.)
113.5	1818
13.9	13.9



NOTES:

- The zero air void curve represents a specific gravity of: 2.65 (assumed).
- This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at clients request.

Reviewed by: _____

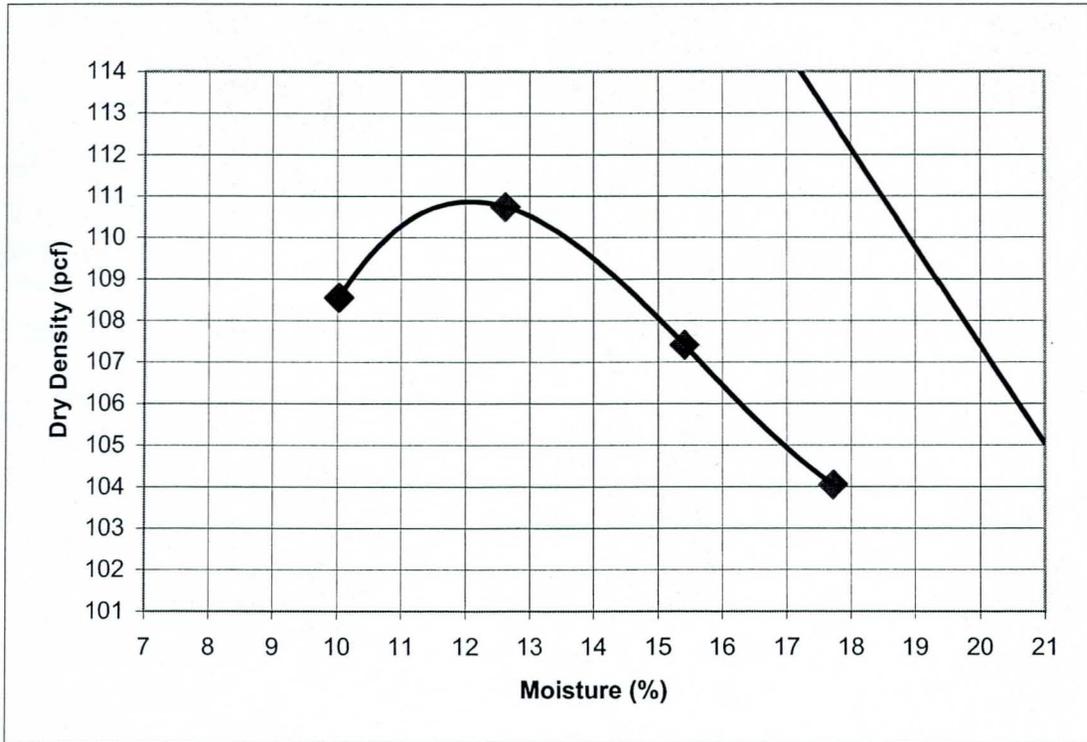
PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SOIL SAMPLES
SAMPLE SOURCE: TP-14 SURFACE

JOB NO: 63683
WORK ORDER NO: 05457
LAB NO: 7
SAMPLE DATE: 12/14 - 12/16/05

**LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
 STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)**

CURVE: 05457-7
Maximum dry density:
Optimum moisture (%):

English (pcf)	Metric (kg/ cu.m.)
110.9	1776
12.1	12.1



NOTES:

- The zero air void curve represents a specific gravity of: 2.65 (assumed).
- This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at clients request.

Reviewed by: _____

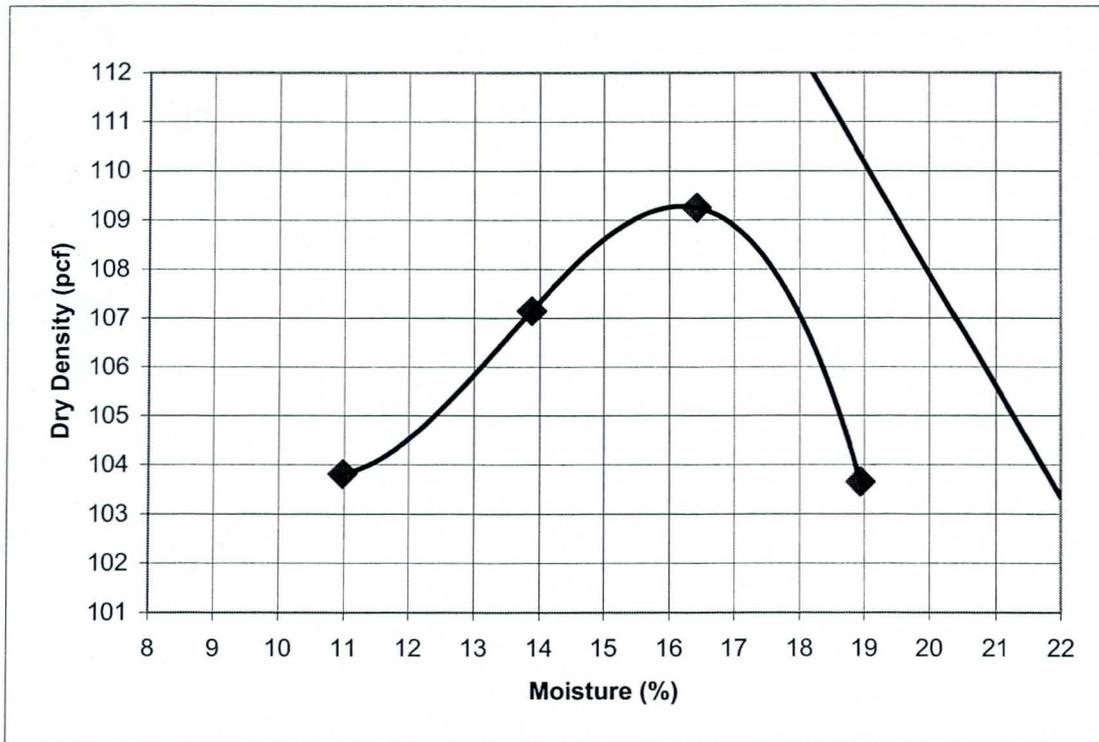
PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SOIL SAMPLES
SAMPLE SOURCE: TP-13 SURFACE

JOB NO: 63683
WORK ORDER NO: 05457
LAB NO: 9
SAMPLE DATE: 12/14 - 12/16/05

**LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
 STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)**

CURVE: 05457-9
 Maximum dry density:
 Optimum moisture (%):

English (pcf)	Metric (kg/ cu.m.)
109.3	1750
16.2	16.2



NOTES:

- The zero air void curve represents a specific gravity of: 2.65 (assumed).
- This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at clients request.

Reviewed by: _____



PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SEE BELOW
SAMPLE SOURCE: SEE BELOW

PROJECT NO: 63683
WORK ORDER NO: 05457
LAB NO: SEE BELOW
DATE SAMPLED: 12/14 - 12/16/05
REVIEWED BY: S.STEEL

PH & RESISTIVITY (AZ 236)

LAB NO	SAMPLE SOURCE	MATERIAL	RESISTIVITY (Ohm-cm)	pH
4	TP-15 4'	CL	402	9.2
6	TP-16 6'	CL	731	8.8
8	TP-14 6'	SC	592	8.4
9	TP-13 SURFACE	CL	2,013	8.2



PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: CL
SAMPLE SOURCE: TP-13 DEPTH: 13 SURFACE

JOB NO: 63683
WORK ORDER NO: 05457
LAB NO: 9
TESTED BY: MOTZZ LAB.

ANALYSES RESULTS

ANALYSIS	RESULTS	UNITS
SULFATE	10	ppm
CHLORIDE	<5	ppm



PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SC
SAMPLE SOURCE: TP-14 DEPTH: 6'

JOB NO: 63683
WORK ORDER NO: 05457
LAB NO: 8
TESTED BY: MOTZZ LAB.

ANALYSES RESULTS

ANALYSIS	RESULTS	UNITS
SULFATE	47	ppm
CHLORIDE	33	ppm



PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: CL
SAMPLE SOURCE: TP-15 DEPTH: 4'

JOB NO: 63683
WORK ORDER NO: 05457
LAB NO: 4
TESTED BY: MOTZZ LAB.

ANALYSES RESULTS

ANALYSIS	RESULTS	UNITS
SULFATE	155	ppm
CHLORIDE	570	ppm



PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: CL
SAMPLE SOURCE: TP-16 DEPTH: 6'

JOB NO: 63683
WORK ORDER NO: 05457
LAB NO: 6
TESTED BY: MOTZZ LAB.

ANALYSES RESULTS

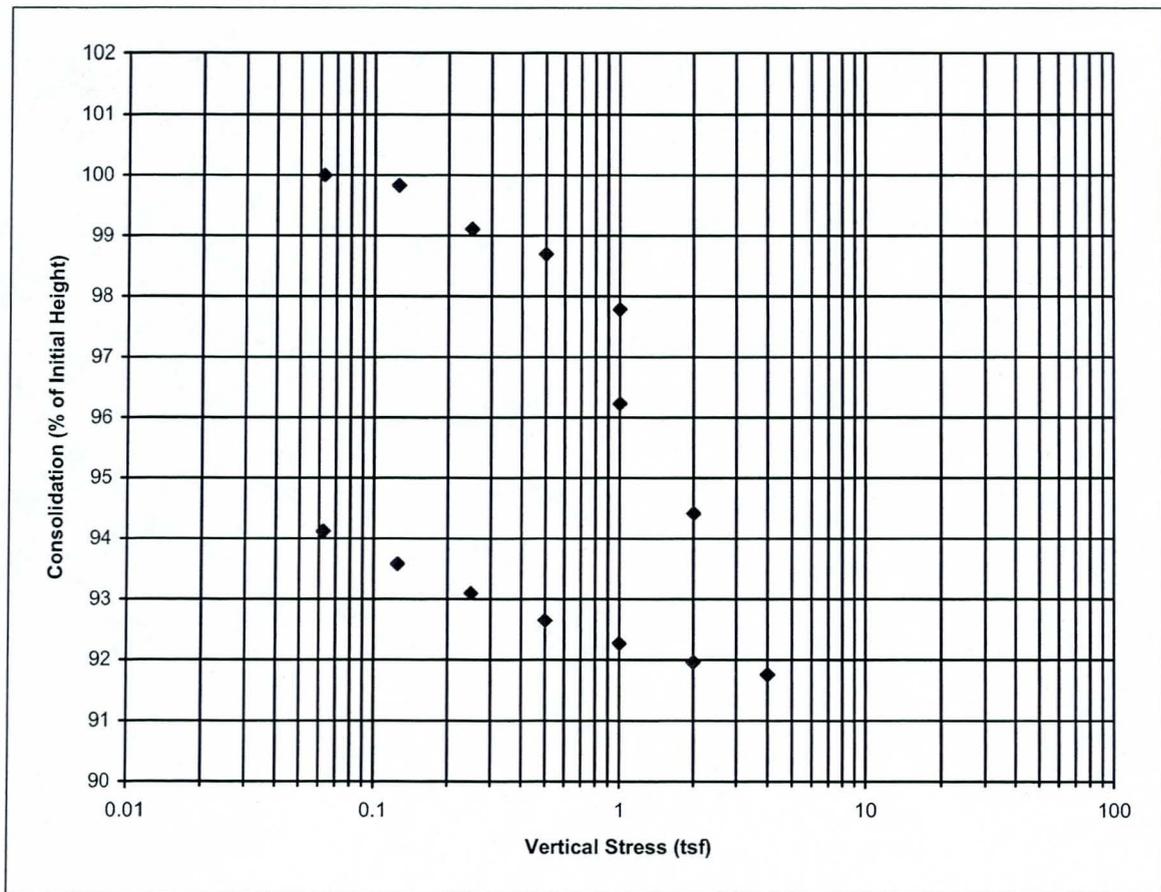
ANALYSIS	RESULTS	UNITS
SULFATE	87	ppm
CHLORIDE	159	ppm

PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: CLAYEY SAND
SAMPLE SOURCE: B-1 @ 2.5-3.5'
REIVEWED BY: S.STEEL

PROJECT NO: 63683
WORK ORDER NO 05452
LAB NO: 1
DATE SAMPLED: 12/15/2005

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D2435)

INITIAL VOLUME (cu.in)	4.60	FINAL VOLUME (cu.in)	4.22
INITIAL MOISTURE CONTENT	13.9%	FINAL MOISTURE CONTENT	21.3%
INITIAL DRY DENSITY(pcf)	98.7	FINAL DRY DENSITY(pcf)	107.1
INITIAL DEGREE OF SATURATION	54%	FINAL DEGREE OF SATURATION	103%
INITIAL VOID RATIO	0.7	FINAL VOID RATIO	0.5
ESTIMATED SPECIFIC GRAVITY	2.651	SATURATED AT	1tsf



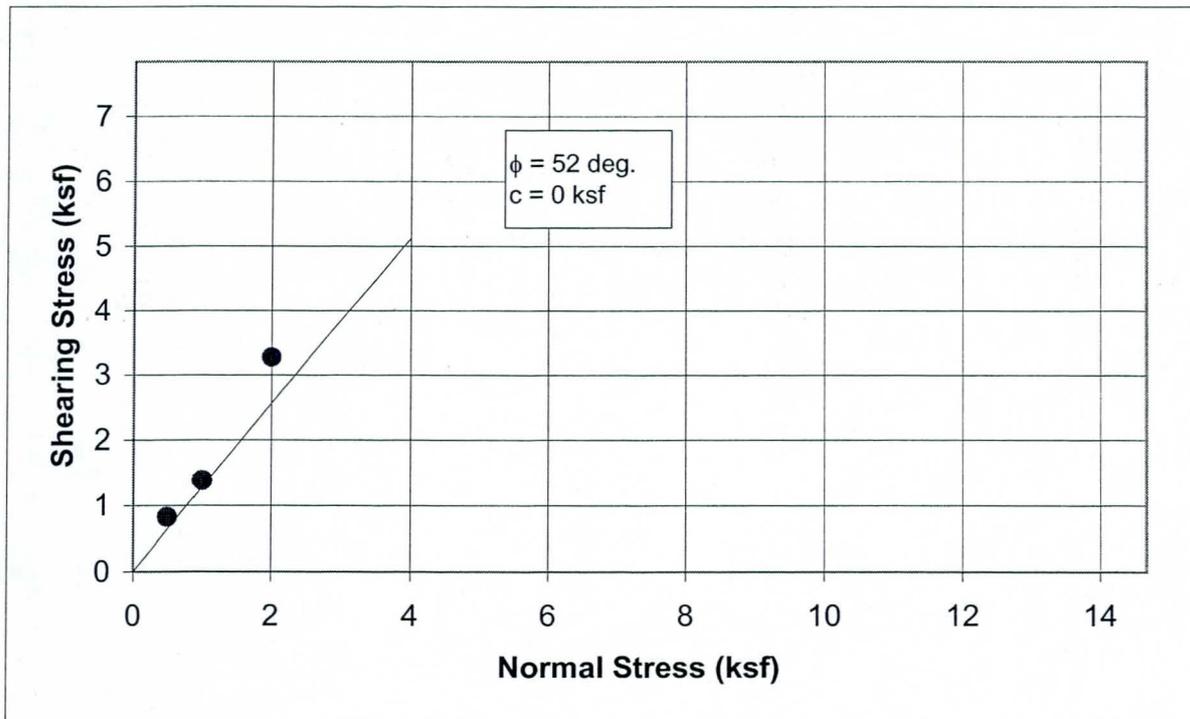


PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SAND WITH SILT
SAMPLE SOURCE: B-15 @ 2.5-3.5'
SAMPLE PREP.: SUBMERGED
TARGET: N/A

JOB NO: 63683
W.O. NUMBER: 05452
LAB NO: 60
DATE SAMPLED: 12/15/2005

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS(ASTM D3080)

Initial thickness of specimen (in.):	1.00		
Initial diameter of specimen (in.):	2.42		
Shearing device used:	Created by DigiShear Version 1.2; Copyright 2000, GEOTAC		
Rate of deformation (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	122.7	122.8	122.4
Initial Moisture Content:	2.8%	2.7%	2.8%
Initial Wet Density (lb per cu.ft):	104.5	104.4	104.2
Initial Dry Density (lb per cu.ft):	101.6	101.7	101.4
Final Moisture Content:	20.6%	19.0%	18.0%
Final Wet Density (lb per cu.ft):	122.0	119.3	115.4
Final Dry Density (lb per cu.ft):	101.1	101.2	100.9
Normal Stress (kips per sq. ft):	0.50	1.00	2.00
Maximum Shearing Stress (kips per sq. ft):	0.83	1.38	3.27
Vertical Deformation @ Max Shear (in):	0.005	0.014	0.036
Horizontal Deformation @ Max Shear (in):	0.481	0.483	0.453



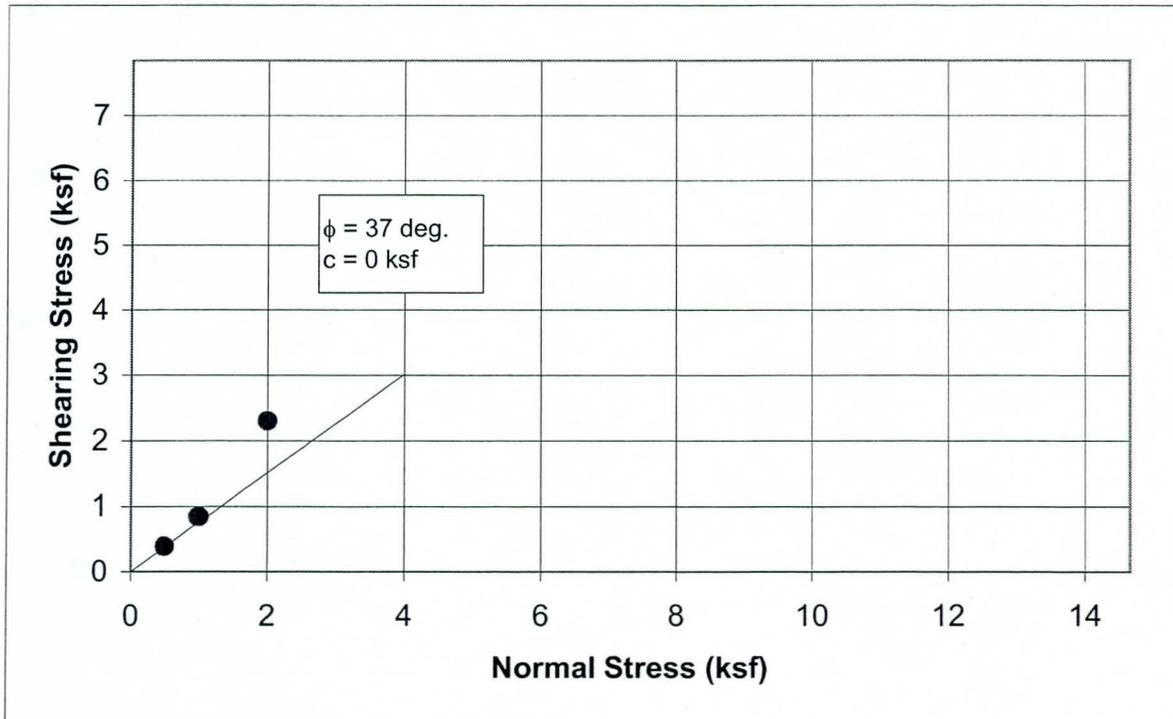


PROJECT: SOLS WASH
 LOCATION: WICKENBURG, ARIZONA
 MATERIAL: SANDY CLAY
 SAMPLE SOURCE: B-12 @ 2.5-3.5'
 SAMPLE PREP.: SUBMERGED
 TARGET: N/A

JOB NO: 63683
 W.O. NUMBER: 05452
 LAB NO: 48
 DATE SAMPLED: 12/15/2005

DIRECT SHEAR TEST OF SOILS

Initial thickness of specimen (in.):	1.00		
Initial diameter of specimen (in.):	2.42		
Shearing device used:	Created by DigiShear Version 1.2; Copyright 2000, GEOTAC		
Rate of deformation (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	113.1	110.6	126.8
Initial Moisture Content:	11.4%	10.9%	9.8%
Initial Wet Density (lb per cu.ft):	104.2	101.5	115.3
Initial Dry Density (lb per cu.ft):	93.6	91.6	105.0
Final Moisture Content:	31.5%	32.5%	26.3%
Final Wet Density (lb per cu.ft):	122.4	117.1	130.2
Final Dry Density (lb per cu.ft):	93.1	91.0	104.4
Normal Stress (kips per sq. ft):	0.50	1.00	2.00
Maximum Shearing Stress (kips per sq. ft):	0.39	0.84	2.30
Vertical Deformation @ Max Shear (in):	0.005	0.036	0.018
Horizontal Deformation @ Max Shear (in):	0.493	0.479	0.341



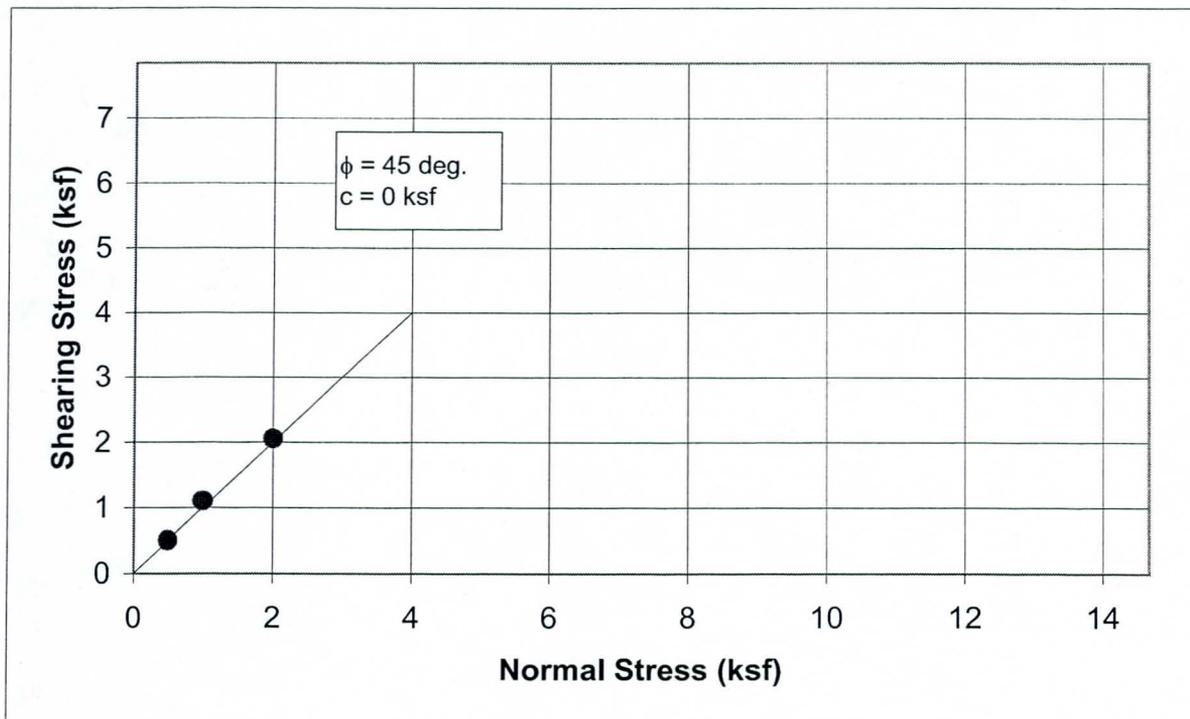


PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SILTY SAND
SAMPLE SOURCE: B-11 @ 5-6'
SAMPLE PREP.: SUBMERGED
TARGET: N/A

JOB NO: 63683
W.O. NUMBER: 05452
LAB NO: 44
DATE SAMPLED: 12/15/2005

DIRECT SHEAR TEST OF SOILS

Initial thickness of specimen (in.):	1.00		
Initial diameter of specimen (in.):	2.42		
Shearing device used:	Created by DigiShear Version 1.2; Copyright 2000, GEOTAC		
Rate of deformation (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	126.1	125.2	118.5
Initial Moisture Content:	4.2%	3.9%	4.0%
Initial Wet Density (lb per cu.ft):	108.7	107.7	102.0
Initial Dry Density (lb per cu.ft):	104.4	103.7	98.2
Final Moisture Content:	22.0%	22.7%	21.1%
Final Wet Density (lb per cu.ft):	128.5	123.6	115.3
Final Dry Density (lb per cu.ft):	105.3	104.6	99.0
Normal Stress (kips per sq. ft):	0.50	1.00	2.00
Maximum Shearing Stress (kips per sq. ft):	0.50	1.10	2.06
Vertical Deformation @ Max Shear (in):	-0.009	0.029	0.030
Horizontal Deformation @ Max Shear (in):	0.473	0.484	0.494



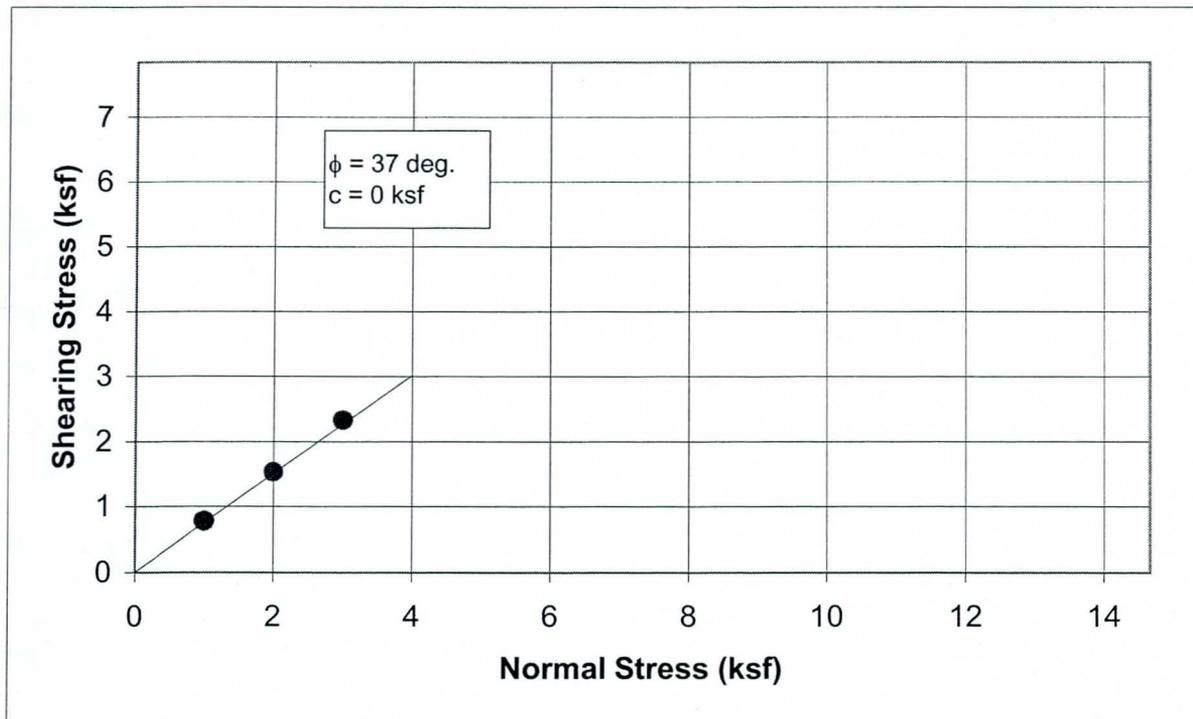


PROJECT: SOLS WASH
 LOCATION: WICKENBURG, ARIZONA
 MATERIAL: LEAN CLAY WITH SAND
 SAMPLE SOURCE: B-10 @ 10-11'
 SAMPLE PREP.: SUBMERGED
 TARGET: N/A

JOB NO: 63683
 W.O. NUMBER: 05452
 LAB NO: 40
 DATE SAMPLED: 12/15/2005

DIRECT SHEAR TEST OF SOILS

Initial thickness of specimen (in.):	1.00		
Initial diameter of specimen (in.):	2.42		
Shearing device used:	Created by DigiShear Version 1.2; Copyright 2000, GEOTAC		
Rate of deformation (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	98.7	104.9	116.0
Initial Moisture Content:	14.6%	12.9%	9.0%
Initial Wet Density (lb per cu.ft):	93.6	98.1	104.8
Initial Dry Density (lb per cu.ft):	81.7	86.9	96.1
Final Moisture Content:	40.2%	36.1%	27.3%
Final Wet Density (lb per cu.ft):	108.7	112.0	117.1
Final Dry Density (lb per cu.ft):	77.5	82.4	91.2
Normal Stress (kips per sq. ft):	1.00	2.00	3.00
Maximum Shearing Stress (kips per sq. ft):	0.78	1.53	2.33
Vertical Deformation @ Max Shear (in):	0.054	0.056	0.044
Horizontal Deformation @ Max Shear (in):	0.489	0.476	0.491



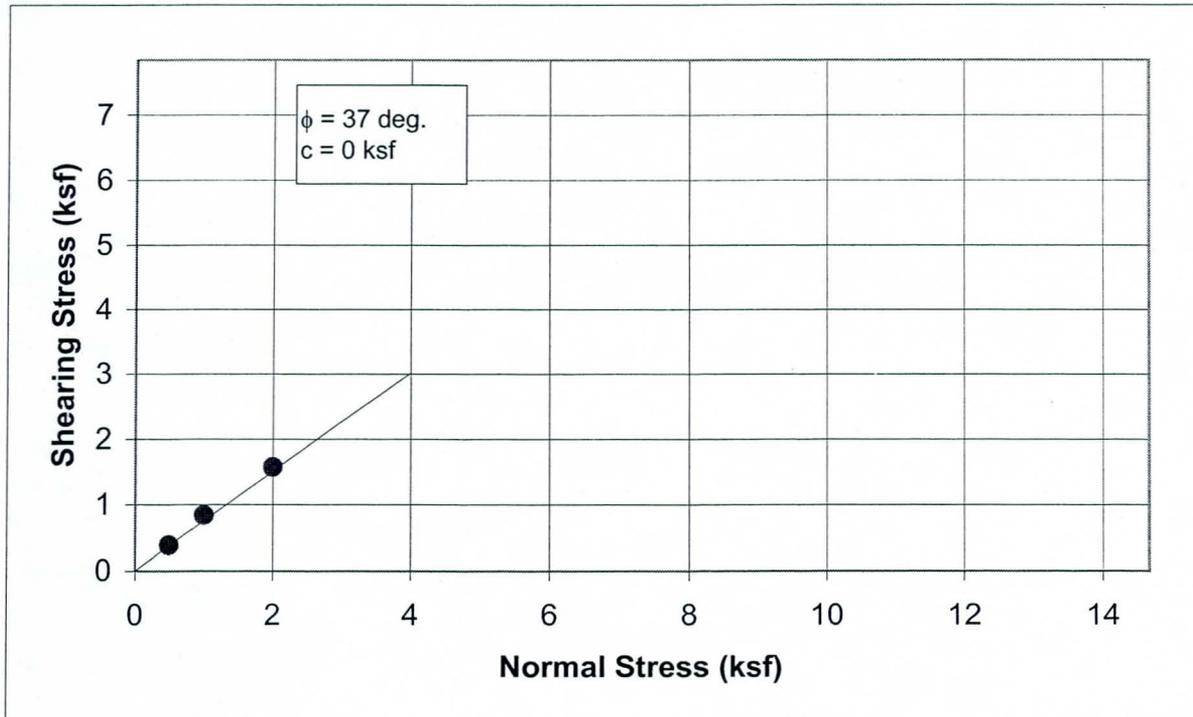


PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: LEAN CLAY WITH SAND
SAMPLE SOURCE: B-1 @ 5.0-6.0'
SAMPLE PREP.: SUBMERGED
TARGET: N/A

JOB NO: 63683
W.O. NUMBER: 05452
LAB NO: 2
DATE SAMPLED: 12/15/2005

DIRECT SHEAR TEST OF SOILS

Initial thickness of specimen (in.):	1.00		
Initial diameter of specimen (in.):	2.42		
Created by DigiShear Version 1.2; Copyright 2000, GEOTAC			
Shearing device used:			
Rate of deformation (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	109.7	109.9	110.3
Initial Moisture Content:	17.3%	18.8%	17.6%
Initial Wet Density (lb per cu.ft):	106.5	108.0	107.4
Initial Dry Density (lb per cu.ft):	90.9	91.0	91.4
Final Moisture Content:	33.3%	30.3%	29.2%
Final Wet Density (lb per cu.ft):	121.0	116.9	114.6
Final Dry Density (lb per cu.ft):	90.8	91.0	91.4
Normal Stress (kips per sq. ft):	0.50	1.00	2.00
Maximum Shearing Stress (kips per sq. ft):	0.38	0.84	1.57
Vertical Deformation @ Max Shear (in):	0.000	0.014	0.029
Horizontal Deformation @ Max Shear (in):	0.448	0.452	0.486

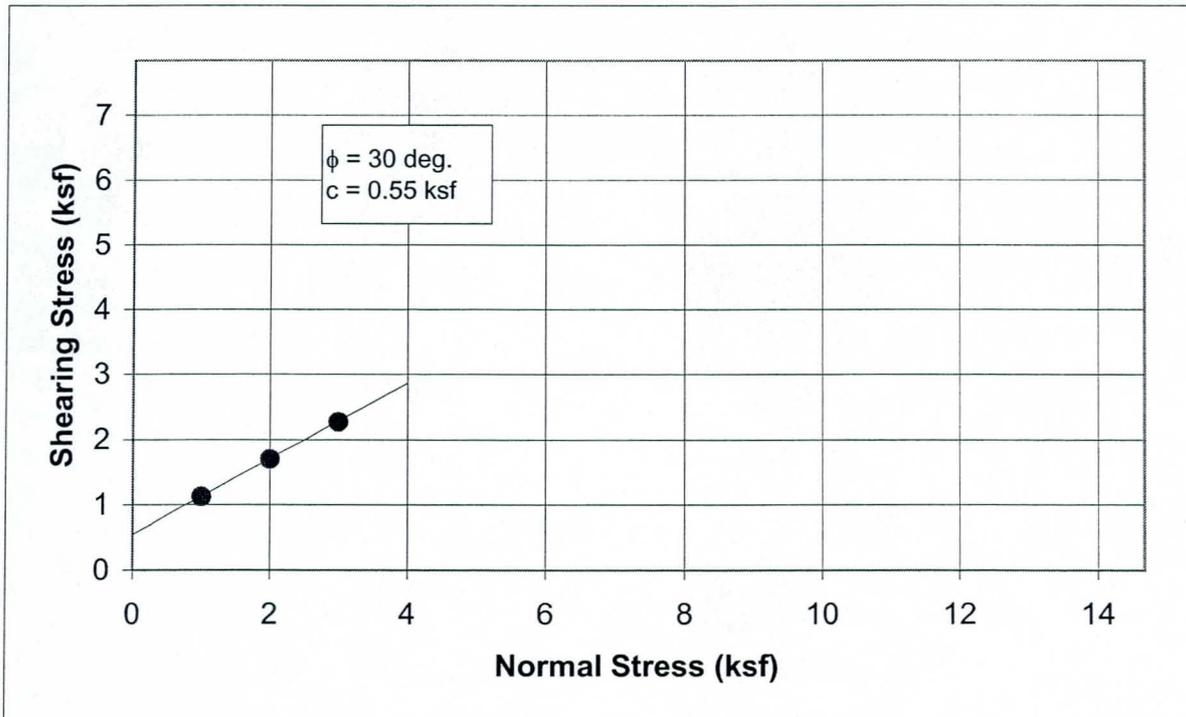


PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: FAT CLAY
SAMPLE SOURCE: B-4 @ 10-11
SAMPLE PREP.: SUBMERGED
TARGET: N/A

JOB NO: 63683
W.O. NUMBER: 05452
LAB NO: 19
DATE SAMPLED: 12/15/2005

DIRECT SHEAR TEST OF SOILS

Initial thickness of specimen (in.):	1.00		
Initial diameter of specimen (in.):	2.42		
Shearing device used:	Created by DigiShear Version 1.2; Copyright 2000, GEOTAC		
Rate of deformation (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	112.7	115.3	113.8
Initial Moisture Content:	26.5%	23.5%	23.9%
Initial Wet Density (lb per cu.ft):	118.1	117.9	116.7
Initial Dry Density (lb per cu.ft):	93.4	95.5	94.2
Final Moisture Content:	33.1%	32.9%	33.2%
Final Wet Density (lb per cu.ft):	124.7	126.6	123.1
Final Dry Density (lb per cu.ft):	93.7	95.8	94.6
Normal Stress (kips per sq. ft):	1.00	2.00	3.00
Maximum Shearing Stress (kips per sq. ft):	1.12	1.69	2.26
Vertical Deformation @ Max Shear (in):	-0.004	0.002	0.019
Horizontal Deformation @ Max Shear (in):	0.053	0.091	0.451



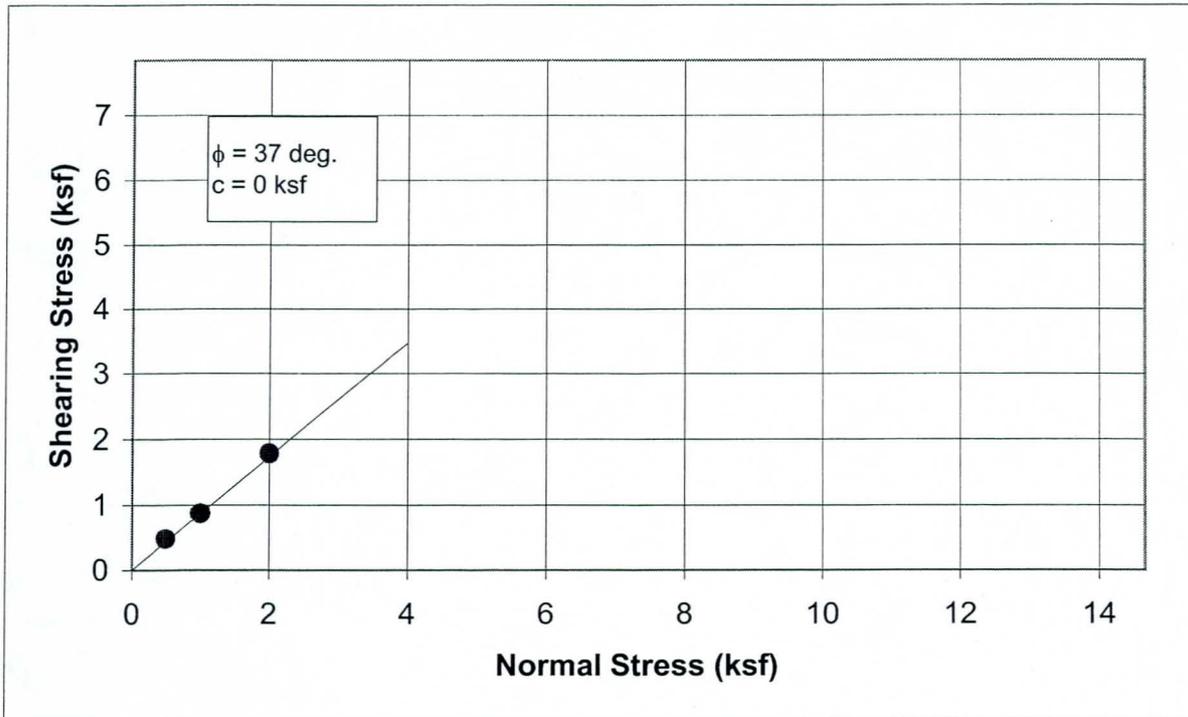


PROJECT: SOLS WASH
 LOCATION: WICKENBURG, ARIZONA
 MATERIAL: SAND WITH SILT
 SAMPLE SOURCE: B-5 @ 5-6'
 SAMPLE PREP.: SUBMERGED
 TARGET: N/A

JOB NO: 63683
 W.O. NUMBER: 05452
 LAB NO: 22
 DATE SAMPLED: 12/15/2005

DIRECT SHEAR TEST OF SOILS

Initial thickness of specimen (in.):	1.00		
Initial diameter of specimen (in.):	2.42		
Shearing device used:	Created by DigiShear Version 1.2; Copyright 2000, GEOTAC		
Rate of deformation (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	113.2	110.0	110.8
Initial Moisture Content:	4.0%	4.0%	3.6%
Initial Wet Density (lb per cu.ft):	97.5	94.7	95.1
Initial Dry Density (lb per cu.ft):	93.8	91.1	91.8
Final Moisture Content:	26.0%	27.5%	26.5%
Final Wet Density (lb per cu.ft):	117.3	114.4	115.2
Final Dry Density (lb per cu.ft):	93.1	90.4	91.1
Normal Stress (kips per sq. ft):	0.50	1.00	2.00
Maximum Shearing Stress (kips per sq. ft):	0.48	0.87	1.79
Vertical Deformation @ Max Shear (in):	0.007	0.015	0.008
Horizontal Deformation @ Max Shear (in):	0.309	0.380	0.493

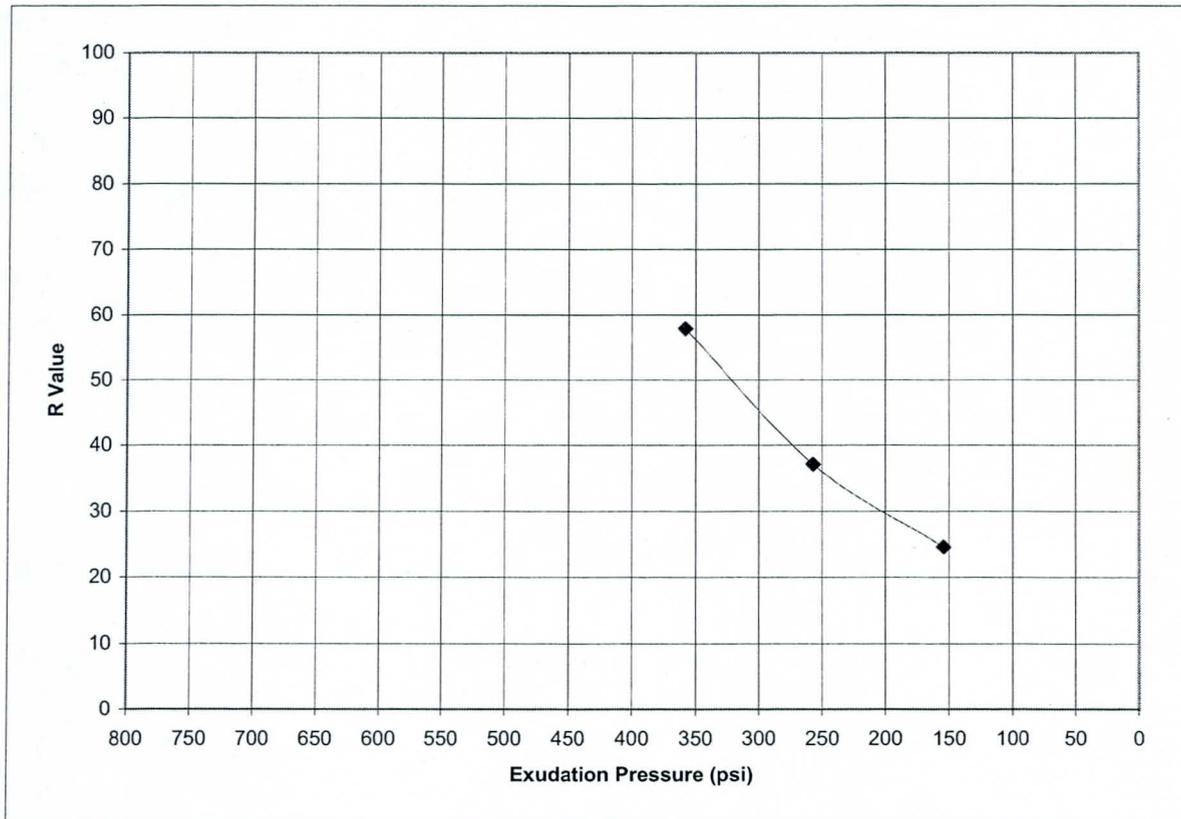


PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SOIL SAMPLES
SAMPLE SOURCE: TP-13 SURFACE

PROJECT NO: 63683
WORK ORDER NO: 05457
LAB NO: 9
DATE SAMPLED: 12/14 - 12/16/05
REVIEWED BY: S.STEEL

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	A	B	C
Moisture Content	14.9%	15.8%	16.6%
Compaction Pressure (psi)	275	175	75
Specimen Height (inches)	2.46	2.50	2.56
Dry Density (pcf)	107.1	105.3	103.3
Horiz. Pres. @ 1000lbs (psi)	21.0	32.0	42.0
Horiz. Pres. @ 2000lbs (psi)	42.0	65.0	85.0
Displacement	5.12	6.19	7.17
Expansion Pressure (psi)	3.7	1.0	0.3
Exudation Pressure (psi)	358	257	154
R Value	58	37	25



R Value at 300 PSI = 45

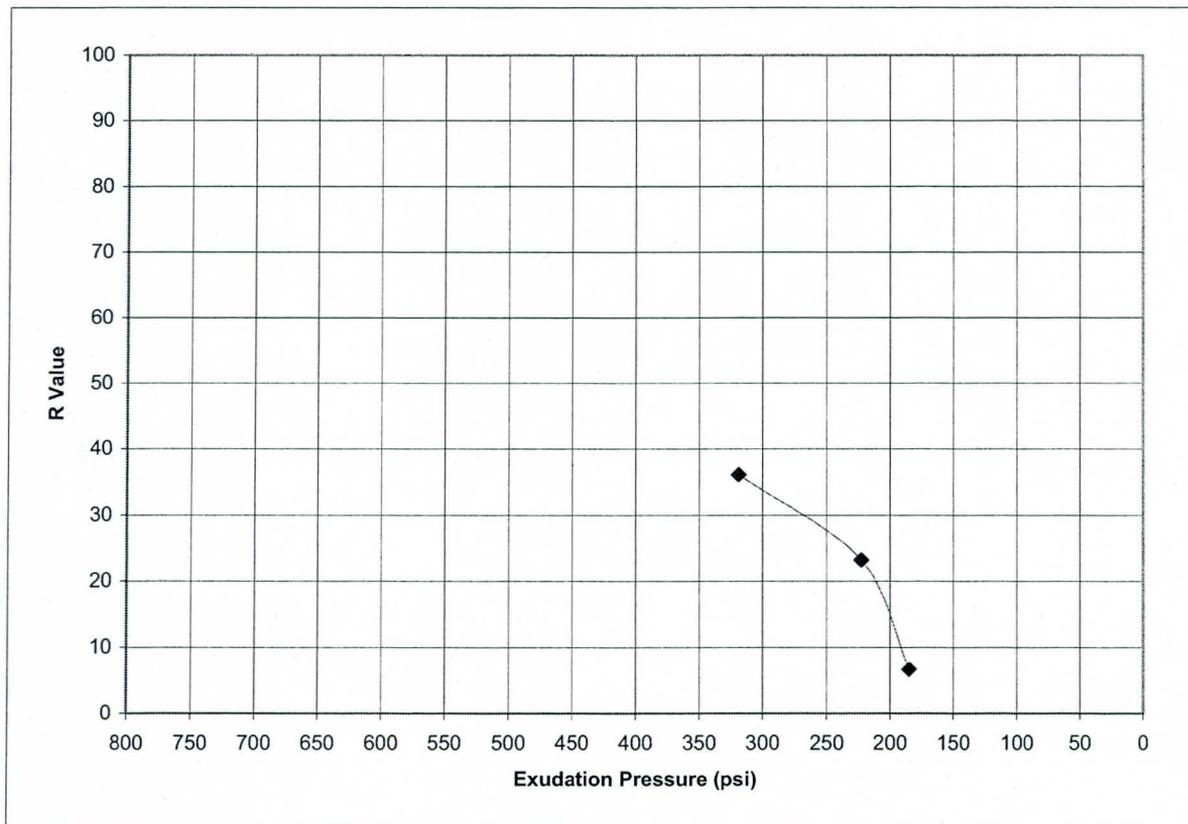
PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SOIL SAMPLES
SAMPLE SOURCE: TP-14 6'

PROJECT NO: 63683
WORK ORDER NO: 05457
LAB NO: 8
DATE SAMPLED: 12/14 - 12/16/05
REVIEWED BY: S.STEEL

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	A	B	C
Moisture Content	15.0%	16.3%	17.6%
Compaction Pressure (psi)	100	75	*
Specimen Height (inches)	2.48	2.53	2.60
Dry Density (pcf)	109.3	106.2	103.1
Horiz. Pres. @ 1000lbs (psi)	32.0	39.0	58.0
Horiz. Pres. @ 2000lbs (psi)	75.0	96.0	138.0
Displacement	5.01	5.50	6.12
Expansion Pressure (psi)	2.6	0.9	0.4
Exudation Pressure (psi)	319	223	185
R Value	36	23	7

* HAND TAMPED



R Value at 300 PSI = 34

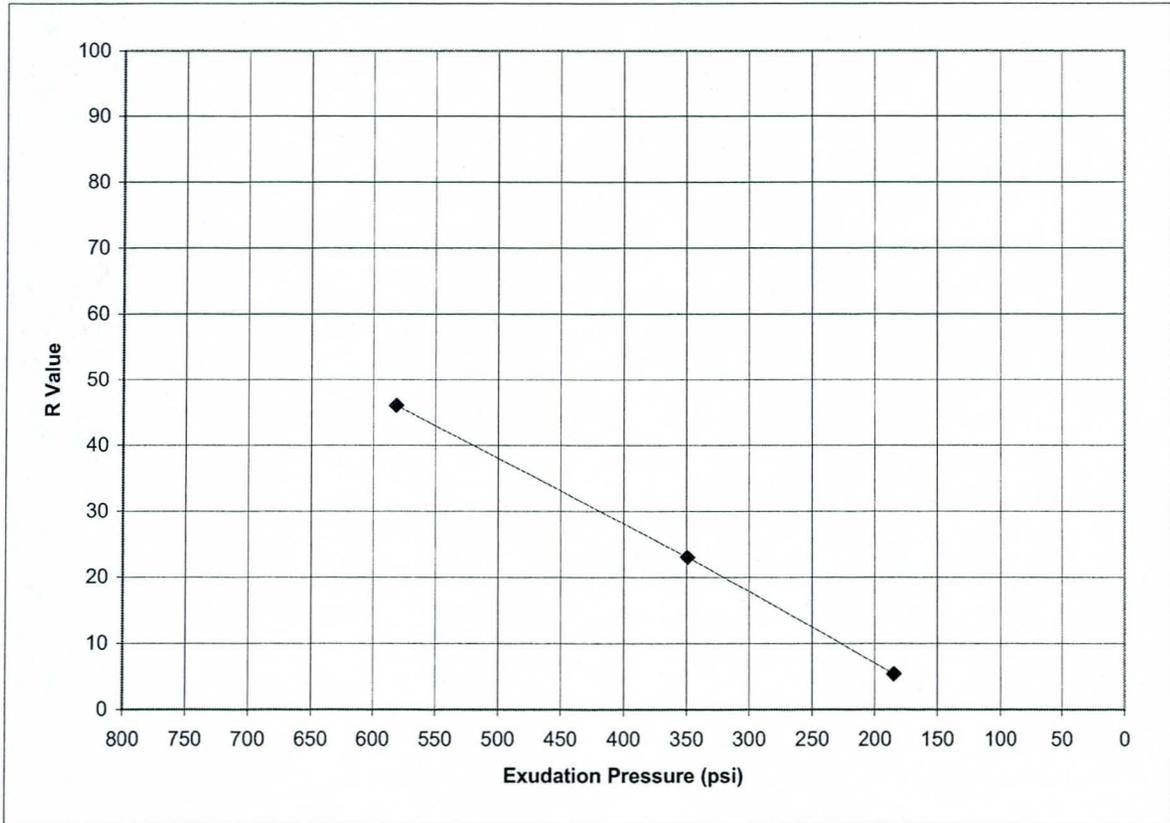
PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SOIL SAMPLES
SAMPLE SOURCE: TP-15 4'

PROJECT NO: 63683
WORK ORDER NO: 05457
LAB NO: 4
DATE SAMPLED: 12/14 - 12/16/05
REVIEWED BY: S.STEEL

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	A	B	C
Moisture Content	14.4%	16.2%	18.8%
Compaction Pressure (psi)	275	150	*
Specimen Height (inches)	2.43	2.56	2.55
Dry Density (pcf)	112.0	107.5	102.4
Horiz. Pres. @ 1000lbs (psi)	26.0	43.0	64.0
Horiz. Pres. @ 2000lbs (psi)	59.0	101.0	140.0
Displacement	4.67	5.18	6.28
Expansion Pressure (psi)	5.8	2.0	1.4
Exudation Pressure (psi)	582	349	185
R Value	46	23	5

* HAND TAMPED



R Value at 300 PSI = 18

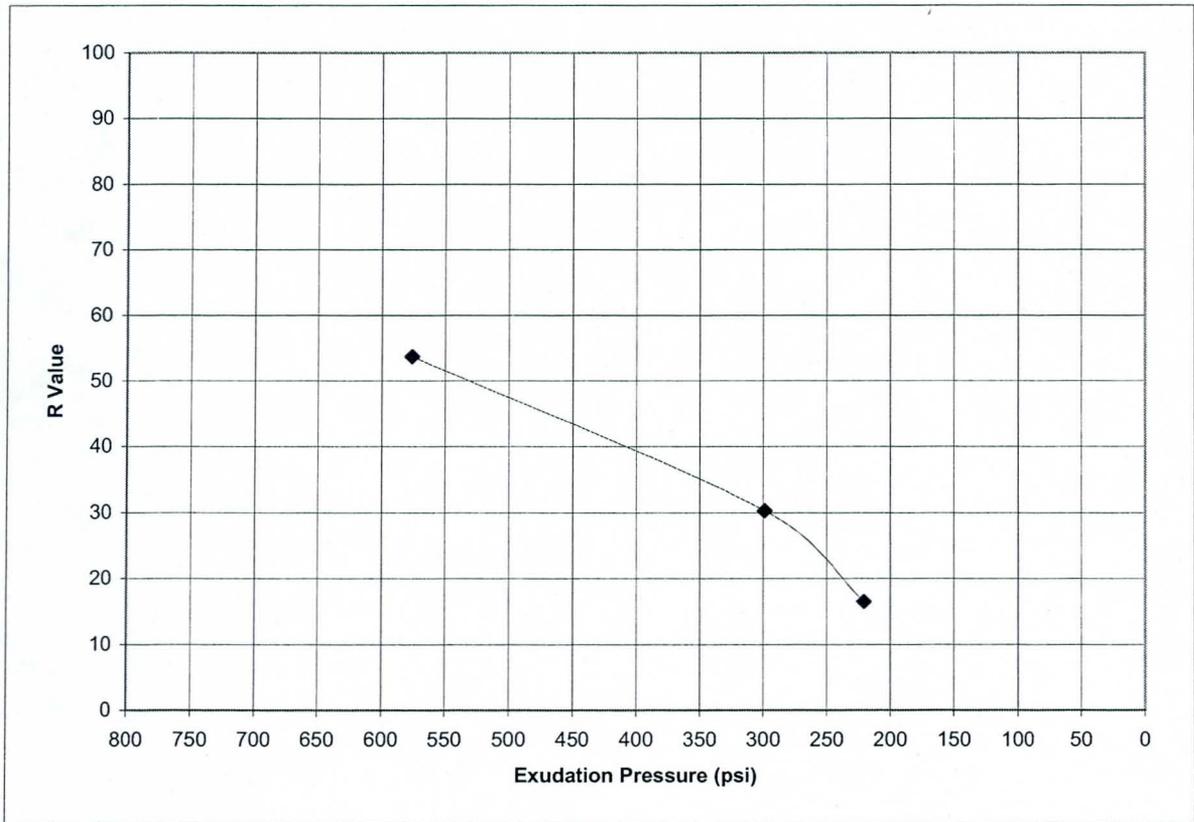
PROJECT: SOLS WASH
LOCATION: WICKENBURG, ARIZONA
MATERIAL: SOIL SAMPLES
SAMPLE SOURCE: TP-16 6'

PROJECT NO: 63683
WORK ORDER NO: 05457
LAB NO: 6
DATE SAMPLED: 12/14 - 12/16/05
REVIEWED BY: S.STEEL

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	A	B	C
Moisture Content	12.3%	13.6%	15.0%
Compaction Pressure (psi)	275	150	*
Specimen Height (inches)	2.40	2.44	2.47
Dry Density (pcf)	116.7	113.4	109.9
Horiz. Pres. @ 1000lbs (psi)	22.0	36.0	48.0
Horiz. Pres. @ 2000lbs (psi)	53.0	86.0	113.0
Displacement	3.94	4.65	5.26
Expansion Pressure (psi)	8.1	3.4	1.8
Exudation Pressure (psi)	576	299	221
R Value	54	30	17

* HAND TAMPED



R Value at 300 PSI = 30