APPENDIX A

GEOTECHNICAL INVESTIGATION REPORTS

GEOTECHNICAL SUBSURFACE EXPLORATION FOR

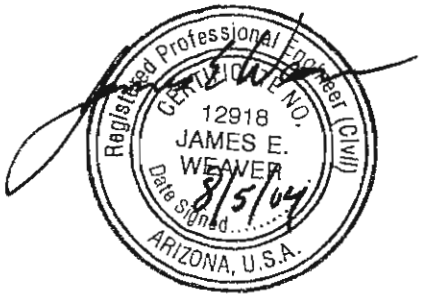
ROSE GARDEN LANE DRAINAGE CHANNEL

NORTH SIDE OF ROSE GARDEN LANE FROM THE AGUA FRIA RIVER TO LAKE PLEASANT ROAD, PHOENIX, ARIZONA

Prepared for:
Wood, Patel & Associates
2051 West Northern Avenue, Suite 100
Phoenix, Arizona 85021

Prepared by:
Alpha Geotechnical & Materials, Inc.
5216 South 40th Street
Phoenix, Arizona 85040

Job # 04-G-00074



ALPHA
Geotechnical & Materials, Inc.

August 5, 2004
Alpha Project #04-G-00074

Wood, Patel & Associates, Inc.
2051 West Northern Avenue, Suite 100
Phoenix, Arizona 85021

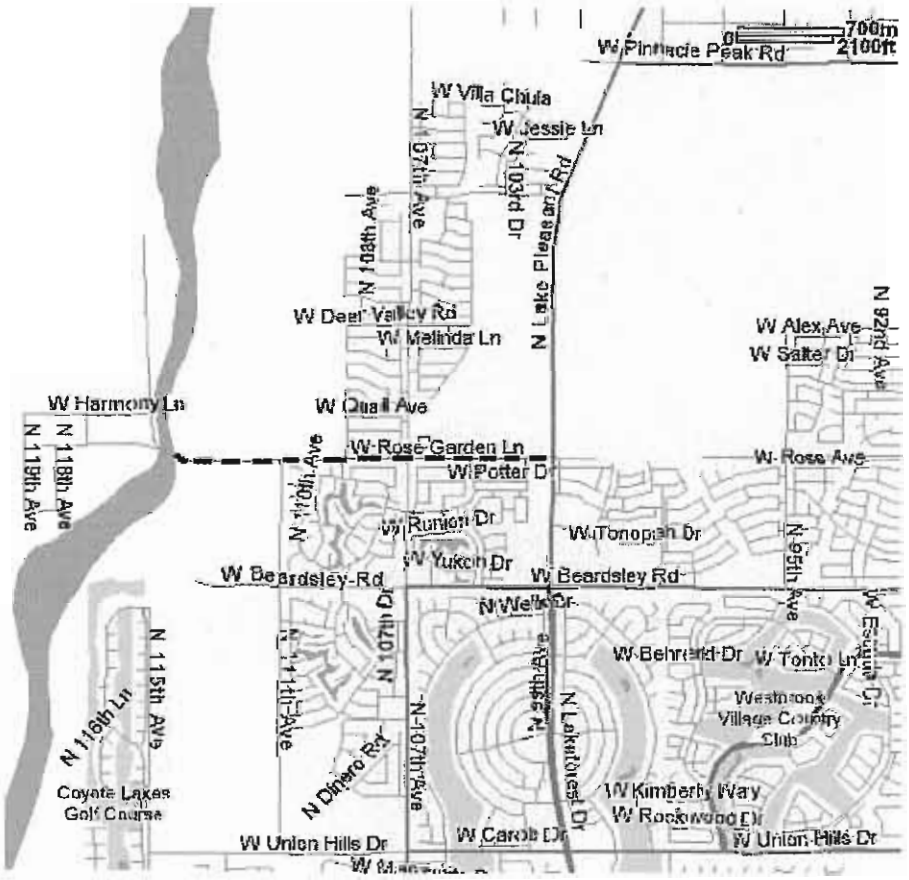
Attn: Mr. David Violette, P.E.

RE: GEOTECHNICAL SUBSURFACE EXPLORATION
Rose Garden Lane Drainage Channel
Phoenix, Arizona

In accordance with your request and authorization, Alpha Geotechnical & Materials, Inc. (Alpha) has performed a geotechnical subsurface exploration for the proposed drainage channel improvement located on the north side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road in Phoenix, Arizona.

INTRODUCTION

The purpose of this geotechnical exploration was to evaluate the general surface and subsurface conditions at the referenced site, and to assess any areas that may be difficult to excavate. Our scope of services was in general accordance with our proposal 04P685B, dated June 17, 2004. This geotechnical report is based on available project information, the site plans provided by the client and our experience with similar construction and soil conditions.



5216 South 40th Street • Phoenix, Arizona 85040 • (602) 453-3265 • FAX (602) 453-3267

SITE AND PROJECT DESCRIPTION

Geotechnical Site Reconnaissance

The westernmost portion of the site (from the Agua Fria River to 109th Avenue) consists of native desert with moderate amounts of vegetation. A depressed landscaped area exists between 109th Avenue and 107th Avenue. A masonry fence was located adjacent to the sidewalk from 107th Avenue to a point 600' east. The remainder of the site extending east to Lake Pleasant Road was dry and flat with little vegetation.

Project Description

It is understood that Phase I of the project consists of a drainage channel approximately 8,000 lineal feet in length along the north side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road. Generally, the depth of the proposed channel varies from 7'-10' below existing grade.

FIELD EXPLORATION AND TESTING

Field Exploration

Ten test borings were drilled to depths ranging from one and a half (1.5) to four (4) feet below existing ground level where auger refusal occurred with a CME-45 power drill rig using hollow-stem augers. The borings were drilled at the approximate locations shown on the site plan included in the Appendix of this report. Bulk soil samples were collected from the test borings. Driving a sampler in general accordance with ASTM D-1586 specifications collected Split spoon samples. Penetration resistance values, or blow counts, were obtained for each sample. These values represent the number of blows required to drive the samplers 6-inch increments into the soil, using a 140-pound hammer falling 30 inches. The blow counts are shown on the boring logs, and are relative indicators of the soil strength and density.

Five test pits were advanced to depths ranging from two (2) to four (4) feet below existing ground level where the backhoe refusal was obtained at the subject site with a John Deere 510 with a eighteen inch bucket. The test pits were excavated at the same locations shown for the soil borings in the Appendix of this report. Bulk soil samples were collected for the test pits.

Samples were collected at various depths for each location. Representative portions of the soil samples were sealed in plastic containers and returned to our

laboratory. The soil samples were then classified in general accordance with the Unified Soil Classification System (USCS). Field boring/test pit logs were prepared and are presented in the Appendix.

Laboratory Testing

Laboratory testing was performed to evaluate the percent silt and clay in the soil (% passing the #200 sieve), and the Plasticity Index of soils. Results of the plasticity and gradation tests are presented in the following table:

Test Boring	Sample Depth (ft)	% Passing #200 Sieve	Plasticity Index
B–1	0'-2'	30	3
B–2	0'-2'	58	7
B–2	2'-3'	41	Not tested
B-3	0'-2'	56	6
B-4	0'-2'	25	12
B-5	0'-2'	20	6
B-6	0'-2'	50	11
B-8	2'	12	Not tested
B-9	2'-4'	28	Not tested
B-10	0'-2'	28	3
B-10	2'-3'	21	Not tested

Most of the native site soils have low to medium percentages of fines and low to medium plasticities. A full sieve analysis was performed on samples from borings B-2, B-4, B-8, B-9 and B-10. Details of the laboratory tests are presented in the Appendix.

GENERAL SITE CONDITIONS

Soil Stratigraphy

The naturally occurring site surface and subsurface soils extending to the depth tests consisted mostly of sandy clay (CL) to clayey sand (SC) with gravel. Clayey/silty gravels (GM/GC) and sandy silty clays (CL-ML) were also found. The site soils were found to be medium dense to very dense and/or very stiff to hard. Carbonate cementation was more evident (and stronger) at the western end of the channel. The cobble/gravel layer caused refusal on the easternmost boring locations.

Groundwater
Soil moisture contents were dry to moist throughout the depth of the test borings. No free groundwater was encountered in the test borings for this project. This condition could change with time and would be influenced by factors such as the amount of precipitation and/or watering and ground water pumping.

Ease of Excavation and Workability
Based on the material types and the blowcounts in the test borings, we anticipate that shallow (less than ten feet) excavations for this site will require a moderate sized (e.g. Caterpillar 345B) track hoe equipped with a rock bucket in order to reach the desired depths. Deeper excavations will be more difficult due to the density and cementation of some of the site soils. Since refusal seemed to be caused by cobbles and cemented soils, as opposed to fragmented rock, blasting would not likely be required to reach the proposed channel depth. Further evaluation of the excavation conditions could be made using a track-hoe with a rock bucket or the same type and capacity equipment as will be used during construction of the project.

Sloped embankments up to, and including the design slope of 4:1 are likely to remain stable under their own weight. This is especially true where chemical cementation is not disturbed during the excavation process.

Wetting of the native soils could result in some soil pumping under dynamic loadings, such as heavy construction equipment driving over the areas. In areas where pumping occurs, the area should be allowed to dry until the soils are workable without pumping, or the wetted areas should be removed and replaced with drier more suitable soils.

Lateral Soil Pressures
Any proposed walls/structures that will retain soil must be designed to withstand lateral soil pressures. Any cantilevered retaining walls, or unrestrained walls subject to lateral earth pressures, should be designed for an equivalent fluid pressure (EFP) of 35 PCF. Restrained walls should be designed to withstand a residual or long-term at-rest (Ko) earth pressure condition of 55 pounds per cubic foot (PCF).

Passive EFP of 300 PCF may be used for shallow spread footings, along with a coefficient of friction of 0.40. Any vehicular surcharge loads and/or hydrostatic pressures will increase the recommended equivalent fluid pressures.

Only cohesionless, free-draining granular materials should be used as backfill, adjacent to earth-retaining structures. We recommend that backfill directly behind the walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within 3 feet of the walls during backfilling, to avoid developing excessive temporary or long-term lateral soil pressures. Positive gravity drainage of the backfill should be provided. We recommend that a one-foot thick layer of clay be used to cap the backfill, and slope away from the structure, to reduce the quantity of surface water that might seep into the backfill soils.

Allowable Bearing Capacity
Structures bearing on undisturbed native soils could be designed using the following allowable bearing capacities.

Bearing Depth Below Finished Grade (ft.)	Allowable Bearing Pressure (psf)
1.5 (min.)	2,000
4.0 or greater	2,500

***Note**: Bearing depth is defined as the depth below the lowest adjacent finished grade elevation within 5 feet of the edge of the foundation.

A one-third increase may be applied to the design bearing pressures when considering short duration loads, such as wind and seismic.

Individual footings or bearing areas should have minimum widths of 24 inches by 24 inches. The minimum width is recommended for ease of construction, and to provide a margin of safety against a local or punching shear failure of the foundation soils. Joints in continuous concrete or masonry structures should be reinforced to reduce potential distress caused by differential foundation movement.

All bearing areas should be observed by the Geotechnical Engineer prior to placement of reinforcing steel and/or concrete. If soil conditions are encountered that are different than indicated by the test borings, revised recommendations may be required.

Settlements for foundations designed in accordance with the above recommendations should not exceed 3/4 inch, and differential settlements should not exceed ½ inch. Additional foundation movements could occur if water from any source infiltrates the foundation soils. As discussed earlier, positive drainage is critical during and after construction.

CLOSURE

Limitations
Our professional services have been performed using that degree and skill ordinarily exercised, under similar circumstances, by reputable Geotechnical Engineers practicing in this or similar localities. No other warranty, express or implied, is made.

The recommendations contained in this report are based on our field exploration, laboratory test results, and our understanding of the proposed construction. The subsurface data used in the preparation of this report was obtained from the test borings excavated during the field subsurface exploration. It is anticipated that some variations in the soil conditions will exist on-

site. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this report, we 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.

It is the Client's responsibility to see that all parties to the project including the designer, contractor, subcontractor, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

This report may be used only by the Client and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on and off-site), or other factors may change over time, and additional work may be required with the passage of time. Any party, other than the Client, who wishes to use this report, shall notify Alpha of such intended use. Based on the intended use of this report, Alpha 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 Alpha from any liability.

Recommended Additional Services

The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be performed during the construction. These tests and observations should be performed by the Geotechnical Engineer's representative and should include, but are not necessarily be limited to the following:

- Observe and document that any existing surficial vegetation and other deleterious materials have been removed from the site as required in site preparation section.
- Approve any material used as engineered fill in building and pavement areas to document it's suitability before placement.
- Perform field density tests, as needed, to verify compaction compliance. The representative should monitor the progress of compaction and filling operations.
- Keep detailed records of on-site activity and progress.

Construction testing, including field and laboratory evaluation of fill and backfill materials, concrete and steel should be performed to determine whether applicable project requirements have been met.

This report is for the exclusive purpose of providing Geotechnical Engineering and/or testing information and recommendations. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the

potential for such contamination, other studies should be undertaken.

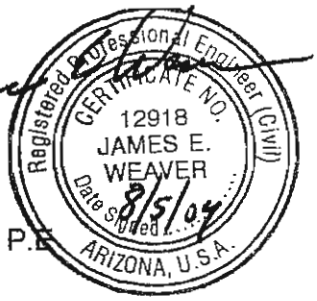
Should you have any questions concerning the contents of this report, please contact the undersigned at (602) 453-3265.

Respectfully submitted,

Alpha Geotechnical & Materials, Inc.

Taylor R. Brown, E.I.T

James E. Weaver, P.E
President



Dist: Addressee (3)

UNIFIED SOIL CLASSIFICATION SYSTEM					CONSISTENCY OR RELATIVE DENSITY
Major Divisions			Group Symbols	Typical Names	CRITERIA
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	**Standard Penetration Test** Density of Granular Soils Penetration Resistance N (blows/ft) — Relative Density
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines	
		Gravels With Fines	GM	Silty gravels, gravel-sand-silt mixtures	
			GC	Clayey gravels, gravel-sand-clay mixtures	0-4 Very Loose 5-10 Loose 11-30 Medium Dense 31-50 Dense >50 Very Dense
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines	
			SP	Poorly graded sands and gravelly sands, little or no fines	
		Sands With Fines	SM	Silty sands, sand-silt mixtures	
			SC	Clayey sands, sand-clay mixtures	
Fine-Grained Soils 50% or more passes No. 200 sieve	Silts and Clays Liquid Limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	**Standard Penetration Test** Consistency of Cohesive Soils Penetration Resistance N (blows/ft) — Consistency — Unconfined Compressive Strength (Tons/ft2)
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL	Organic silts and organic silty clays of low plasticity	<2 Very Soft <0.25 2-4 Soft 0.25-0.50 4-8 Firm 0.50-1.00 8-15 Stiff 1.00-2.00 15-30 Very Stiff 2.00-4.00 >30 Hard >4.0
	Silts and Clays Liquid Limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
			CH	Inorganic clays of high plasticity, fat clays	
			OH	Organic clays of medium to high plasticity	
Highly Organic Soils			PT	Peat, mucic, and other highly organic soils	

3" 3/4" #4 #10 #40 #200 U.S. Standard Sieve

Unified Soil Classification	Cobbles	Gravel		Sand			Silt or Clay
		coarse	fine	coarse	medium	fine	

MOISTURE CONDITIONS

Dry	Absence of moist, dusty, dry to the touch
Slightly Damp	Below optimum moisture content for compaction
Moist	Near optimum moisture content, will moisten the hand
Very Moist	Above optimum moisture content
Wet	Visible free water; below water table

MATERIAL QUANTITY

trace	0 - 5%
few	5 - 10%
little	10 - 25%
some	25 - 45%
mostly	50 - 100%

OTHER SYMBOLS

C Core Sample
S SPT Sample
B Bulk Sample
▾ Groundwater
Qp Pocket Penetrometer

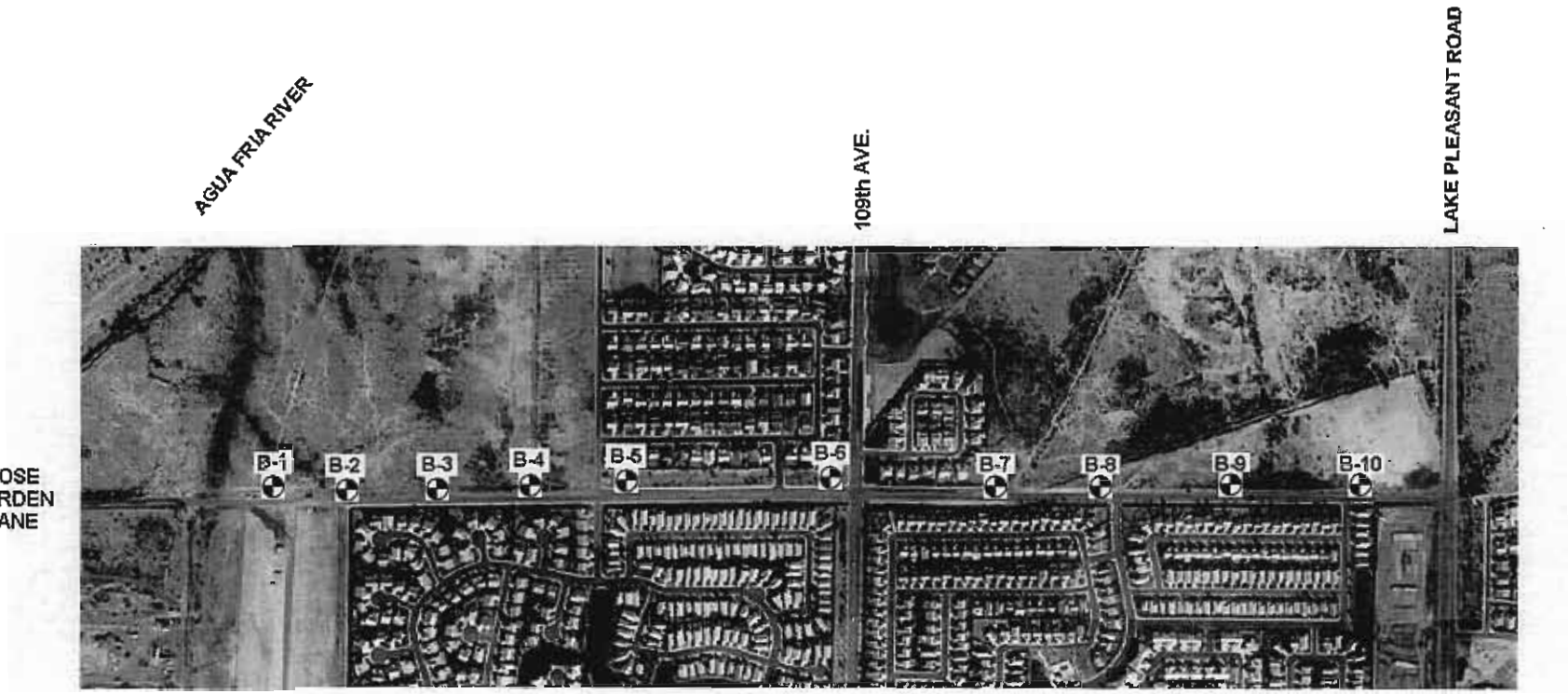
BASIC LOG FORMAT:
Group name, Group symbol, (grain size), color, moisture, consistency or relative density. Additional comments: odor, presence of roots, mica, gypsum, coarse grained particles, etc.

EXAMPLE:
Brown, loose fine to medium Sand (SP), trace silt, little fine gravel, damp

UNIFIED SOIL CLASSIFICATION SYSTEM

ALPHA
Engineering • Testing • Solutions

APPENDIX



LEGEND

SOIL TEST BORING

N

(NOT TO SCALE)

ALPHA
Geotechnical & Materials, Inc.
5216 S. 40th Street
Phoenix, Arizona 85040

Boring Location Plan

Project: Rose Garden Lane Drainage Channel 04-G-00074

Location: Rose Garden Lane, Phoenix, AZ

Date: 8-5-04 **Drawn By:** T. Brown

Alpha Project Number: 04-G-00074	LOG OF BORING NO. B-1
Project: Rose Garden Lane Drainage Channel	
Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona	**Location:** See attached site plan

Longitude: 112° 17.980' | Latitude: 33° 40.472'

Remarks:

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H			1.6	1	GM	**SILTY GRAVEL with SAND** Medium brown, poor gradation, sub angular particles, low plasticity, dry, strong cementation.
				2		**Auger refusal @ 1' no groundwater encountered.**
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon H = Hand Sample NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074	LOG OF BORING NO. B-2
Project: Rose Garden Lane Drainage Channel	
Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona	**Location:** See attached site plan

Longitude: 112° 17.907' Latitude: 33° 40.476'

Remarks: Depth to proposed channel is approximately eight feet at this location. Hand samples were collected from 0'-2' and 2'-3' depth. Deere 510 backhoe with 18" bucket also experienced refusal at 3' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H				1	CL-ML	**SANDY SILTY CLAY** Medium brown, poor gradation, sub angular particles, hard, low plasticity, dry, moderate cementation.
S	29-50/6"			2		
H						Some gravel and strong cementation.
				3		**Auger Refusal @ 3' no groundwater encountered.**
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

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Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074	LOG OF BORING NO. B-3
Project: Rose Garden Lane Drainage Channel	
Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona	**Boring Location:** See attached site plan

Longitude: 112° 17.963' Latitude: 33° 40.472'

Remarks: Depth to proposed channel is approximately nine and a half feet at this location. Hand sample was collected from 0'-2' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H			2.0	1	CL-ML	**SANDY SILTY CLAY with GRAVEL** Medium brown, poor gradation, sub angular particles, low plasticity, dry, moderate cementation.
				2		**Auger Refusal @ 2' no groundwater encountered.**
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

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Sample Type Key: S = Split Spoon H = Hand Sample NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074	LOG OF BORING NO. B-4
Project: Rose Garden Lane Drainage Channel	
Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona	**Location:** See attached site plan

Longitude: 112° 17.784' | Latitude: 33° 40.473'

Remarks: Depth to proposed channel is approximately eight feet at this location. Hand samples were collected from 0'-2' and 2' depth. Deere 510 backhoe with 18" bucket also experienced refusal at 2' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H			2.7	1	GC	**CLAYEY GRAVEL with SAND and trace COBBLES** Medium brown, poor gradation, sub angular particles, medium plasticity, dry, moderate cementation.
H				2		**Auger Refusal @ 2' no groundwater encountered.**
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

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Sample Type Key: S = Split Spoon H = Hand Sample NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074	LOG OF BORING NO. B-5
Project: Rose Garden Lane Drainage Channel	
Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona	**Location:** See attached site plan

Longitude: 112° 17.639' Latitude: 33° 40.478'

Remarks: Depth to proposed channel is approximately nine feet at this location. Hand sample was collected from 0'-1.5' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H				1	SC-SM	**SILTY CLAYEY SAND with GRAVEL** Medium brown, poor gradation, sub angular particles, low plasticity, dry, moderate cementation.
				2		**Auger Refusal @ 1.5' no groundwater encountered.**
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon H = Hand Sample NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074	LOG OF BORING NO. B-6
Project: Rose Garden Lane Drainage Channel	
Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona	**Location:** See attached site plan

Longitude: 112° 17.492' Latitude: 33° 40.482'

Remarks: Depth to proposed channel is approximately seven feet at this location. Hand sample was collected from 0'-2' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H			3.2	1	CL/SC	**SANDY CLAY to CLAYEY SAND with trace COBBLES** Medium brown, poor gradation, sub angular particles, medium plasticity, dry, weak cementation.
				2		**Auger Refusal @ 2' no groundwater encountered.**
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon H = Hand Sample NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074	LOG OF BORING NO. B-7
Project: Rose Garden Lane Drainage Channel	
Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona	**Location:** See attached site plan

Longitude: 112° 17.260' | Latitude: 33° 40.473'

Remarks: Depth to proposed channel is approximately seven feet at this location. Hand sample was collected from 0'-2' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H				1	CL/SC	**SANDY CLAY to CLAYEY SAND with trace COBBLES** Medium brown, poor gradation, sub angular particles, low plasticity, dry, weak cementation.
				2		
				3		**Auger Refusal @ 3' no groundwater encountered.**
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon H = Hand Sample NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074	LOG OF BORING NO. B-8
Project: Rose Garden Lane Drainage Channel	
Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona	**Location:** See attached site plan

Longitude: 112° 17.141' | Latitude: 33° 40.476'

Remarks: Depth to proposed channel is approximately seven feet at this location. Hand samples were collected from 0'-2' and 2' depth. Deere 510 backhoe with 18" bucket also experienced refusal at 2' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H				1	CL/SC	**SANDY CLAY to CLAYEY SAND with trace GRAVEL** Medium brown, poor gradation, sub angular particles, moist, weak cementation.
H				2		**Auger Refusal @ 2' no groundwater encountered.**
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

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Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074	LOG OF BORING NO. B-9
Project: Rose Garden Lane Drainage Channel	
Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona	**Location:** See attached site plan

Longitude: 112° 17.036' | Latitude: 33° 40.481'

Remarks: Depth to proposed channel depth is approximately six feet at this location. Hand samples were collected from 0'-2' and 2'-4' depth. Deere 510 backhoe with 18" bucket also experienced refusal at 4' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H				1	CL/SC	**SANDY CLAY to CLAYEY SAND** Medium brown, poor gradation, sub angular particles, low plasticity, dry, weak cementation.
H				2		
				3		Gravel and cobbles with strong cementation.
				4		**Auger Refusal @ 4' no groundwater encountered.**
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon H = Hand Sample NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074	LOG OF BORING NO. B-10
Project: Rose Garden Lane Drainage Channel	
Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona	**Location:** See attached site plan

Longitude: 112° 16.872' | Latitude: 33° 40.478'

Remarks: Depth to proposed channel is approximately two feet at this location. Hand samples were collected from 0'-2' and 2'-3' depth. Deere 510 backhoe with 18" bucket also experienced refusal at 3' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H			0.9	1	GM	**SILTY GRAVEL with SAND** Medium brown, poor gradation, sub angular particles, dense, low plasticity, dry, weak cementation.
S	10-21-21			2		
H						Becomes strongly cemented.
				3		**Auger Refusal @ 3' no groundwater encountered.**
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon H = Hand Sample NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

PROJECT:	ROSE GARDEN LANE	**JOB NO:**	04-G-00074
LOCATION:	SUN CITY, AZ	**WORK ORDER NO:**	2
MATERIAL:	NATIVE	**LAB NO:**	8
SAMPLE SOURCE:	B-2 (@2'-3')	**DATE SAMPLED:**	7/22/2004

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (AZ 201)
Select Method

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	100
1 1/2 in / 37.5mm	100
1 1/4 in / 32 mm	100
1 in / 25 mm	99
3/4 in / 19 mm	97
1/2 in / 12.5 mm	95
3/8 in / 9.5 mm	94
1/4 in / 6.4 mm	92
#4, 4.75mm	90
#8, 2.36mm	86
#10, 2.00mm	85
#16, 1.18mm	81
#30, 0.60mm	75
#40, .425mm	70
#50, .300mm	66
#100, .150mm	54
#200, .075mm	40.8

NOTES:

Reviewed by: TRB

Alpha Geotechnical Materials, Inc.
5216 South 40th Street
Phoenix, Arizona 85040-3918
(602) 453-3265

PROJECT:	ROSE GARDEN LANE	**JOB NO:**	04-G-00074
LOCATION:	SUN CITY, AZ	**WORK ORDER NO:**	2
MATERIAL:	NATIVE	**LAB NO:**	9
SAMPLE SOURCE:	B-4 (@2')	**DATE SAMPLED:**	7/22/2004

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (AZ 201)

Select Method

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	91
2 in / 50mm	87
1 1/2 in / 37.5mm	81
1 1/4 in / 32 mm	80
1 in / 25 mm	79
3/4 in / 19 mm	77
1/2 in / 12.5 mm	74
3/8 in / 9.5 mm	72
1/4 in / 6.4 mm	69
#4, 4.75mm	67
#8, 2.36mm	65
#10, 2.00mm	65
#16, 1.18mm	63
#30, 0.60mm	59
#40, .425mm	56
#50, .300mm	53
#100, .150mm	46
#200, .075mm	37

NOTES:

Reviewed by: TRB

Alpha Geotechnical Materials, Inc.
5216 South 40th Street
Phoenix, Arizona 85040-3918
(602) 453-3265

PROJECT:	ROSE GARDEN LANE	**JOB NO:**	04-G-00074
LOCATION:	SUN CITY, AZ	**WORK ORDER NO:**	2
MATERIAL:	NATIVE	**LAB NO:**	10
SAMPLE SOURCE:	B-8 (@2')	**DATE SAMPLED:**	7/22/2004

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (AZ 201)
Select Method

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	96
2 in / 50mm	86
1 1/2 in / 37.5mm	80
1 1/4 in / 32 mm	75
1 in / 25 mm	72
3/4 in / 19 mm	67
1/2 in / 12.5 mm	58
3/8 in / 9.5 mm	53
1/4 in / 6.4 mm	46
#4, 4.75mm	42
#8, 2.36mm	35
#10, 2.00mm	34
#16, 1.18mm	30
#30, 0.60mm	25
#40, .425mm	23
#50, .300mm	21
#100, .150mm	16
#200, .075mm	12

NOTES:

Reviewed by: TRB

Alpha Geotechnical Materials, Inc.
5216 South 40th Street
Phoenix, Arizona 85040-3918
(602) 453-3265

PROJECT:	ROSE GARDEN LANE	**JOB NO:**	04-G-00074
LOCATION:	SUN CITY, AZ	**WORK ORDER NO:**	2
MATERIAL:	NATIVE	**LAB NO:**	11
SAMPLE SOURCE:	B-9 (2'-4')	**DATE SAMPLED:**	7/22/2004

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (AZ 201)
Select Method

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	87
1 1/2 in / 37.5mm	83
1 1/4 in / 32 mm	82
1 in / 25 mm	80
3/4 in / 19 mm	78
1/2 in / 12.5 mm	75
3/8 in / 9.5 mm	73
1/4 in / 6.4 mm	70
#4, 4.75mm	68
#8, 2.36mm	63
#10, 2.00mm	62
#16, 1.18mm	59
#30, 0.60mm	53
#40, .425mm	50
#50, .300mm	46
#100, .150mm	38
#200, .075mm	28

NOTES:

Reviewed by: TRB

Alpha Geotechnical Materials, Inc.
5216 South 40th Street
Phoenix, Arizona 85040-3918
(602) 453-3265

PROJECT:	ROSE GARDEN LANE	**JOB NO:**	04-G-00074
LOCATION:	SUN CITY, AZ	**WORK ORDER NO:**	2
MATERIAL:	NATIVE	**LAB NO:**	12
SAMPLE SOURCE:	B-10 (2'-3')	**DATE SAMPLED:**	7/22/2004

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (AZ 201)
Select Method

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	83
1 1/2 in / 37.5mm	75
1 1/4 in / 32 mm	73
1 in / 25 mm	70
3/4 in / 19 mm	67
1/2 in / 12.5 mm	61
3/8 in / 9.5 mm	58
1/4 in / 6.4 mm	52
#4, 4.75mm	49
#8, 2.36mm	46
#10, 2.00mm	45
#16, 1.18mm	43
#30, 0.60mm	40
#40, .425mm	39
#50, .300mm	36
#100, .150mm	29
#200, .075mm	21

NOTES:

Reviewed by: TRB

Alpha Geotechnical Materials, Inc.
5216 South 40th Street
Phoenix, Arizona 85040-3918
(602) 453-3265

GEOTECHNICAL STUDY REPORT
PROPOSED ROSE GARDEN LANE DRAINAGE IMPROVEMENTS
PEORIA PROJECT NO. SS-0203
NORTHWEST CORNER OF 111TH AVENUE AND ROSE GARDEN LANE
PEORIA, ARIZONA

Kleinfelder Project No.: 76793 (1)

Kleinfelder West, Inc.
1335 West Auto Drive
Tempe, Arizona 85284
(480) 763-1200

April 17, 2007

KLEINFELDER
An employee owned company

April 17, 2007
Project No.: 76793 (1)

Mr. Alan Morrice, P.E.
Wood, Patel & Associates, Inc.
2051 West Northern Avenue, Suite 100
Phoenix, Arizona 85021

SUBJECT: Geotechnical Study Report
Rose Garden Lane Drainage Improvements
Peoria Project No. SS-0203
Northwest Corner of 111th Avenue and Rose Garden Lane
Peoria, Arizona

Dear Mr. Morrice:

Kleinfelder West, Inc. (Kleinfelder) is pleased to present the attached geotechnical study report for the subject project. The purpose of our study was to evaluate the subsurface soil conditions at the subject site in order to develop geotechnical-engineering recommendations to aid in project design and construction.

The conclusions and recommendations presented in this report are subject to the limitations presented in Section 6.1.

We appreciate the opportunity of providing our services for this project. If you have questions regarding this report or if we may be of further assistance, please contact the undersigned at (480) 763-1200.

Sincerely,

KLEINFELDER WEST, INC.

Heriberto (Eddie) Coria
Construction Services Manager

Reviewed by:

Registered Professional Engineer (Civil) CERTIFICATE NO. 37875 CAROLYN C. NEWMAN-CRANE Date Signed 4/17/07 ARIZONA U.S.A.

Carolyn Newman-Crane, PE
Geotechnical Department Manager

HC:CCN:wcc

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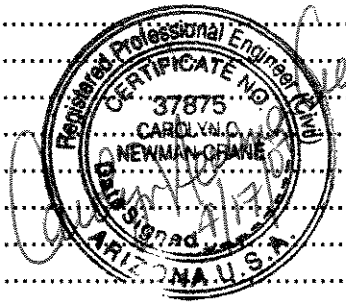


FIGURES

APPENDICES

1 INTRODUCTION

1.1. General

In this report we present the results of our geotechnical study for the proposed design and construction of a portion of the Rose Garden Lane outflow channel and basin in Peoria, Arizona (see Figure 1). The purpose of the study was to explore and evaluate the subsurface conditions at various locations on the site in order to develop geotechnical engineering recommendations for project design and construction.

Our study included a subsurface exploration, representative soil sampling, field-testing, engineering analyses, and preparation of this report. This report presents recommendations for design of suitable foundation types, site grading and structural fill placement, moisture protection, and construction considerations. The recommendations contained in this report are subject to the limitations presented in Section 6.1 of this report.

1.2. Project Description

Based on the information provided by Wood Patel, it is understood that the project consists of the design and construction of a portion of the Rose Garden Lane outflow channel and basin. The project limits of this portion of the project will be considered at the northeast corner of 111th Avenue and Rose Garden Lane (channel station 26+00) northwest to the detention basin at station (sta.) 5+00 in Peoria, Arizona. The proposed channel will be concrete lined and constructed predominately in cut from approximately sta. 26+00 to 12+60 while the channel invert from approximately 12+60 to sta. 8+00, adjacent to the basin, will be built in fill. A concrete single box culvert is proposed at sta. 14+66 to provide SRP access for maintenance of the overhead electrical lines and towers. The proposed detention basin will be constructed within the Agua Fria River and the proposed depth of the basin is approximately 15 feet below the existing ground surface. The proposed slopes for the detention basin vary from 10H:1V to 5H:1V.

The proposed project is located on Arizona State land and will span SRP and APS easements.

2 FIELD EXPLORATION

Two borings were drilled during our field study within the proposed detention basin. In addition, four test pits were excavated within the outflow channel and four test pits in the detention basin.

Based on a previous study performed by Alpha Geotechnical & Material, Inc., borings were advanced utilizing CME-45 truck-mounted drill rigs, utilizing hollow stem auger equipment that experienced shallow refusal due to the presence of cobbles, gravel, and sand. Thus, the borings performed for this study were advanced with a truck-mounted CME-85 drill rig using a Tubex rotary percussion system. Yellow Jacket Drilling Inc. of Phoenix, Arizona was subcontracted to drill the borings. The test pits were excavated by Environmental Response Inc. and were monitored by a Kleinfelder Staff Professional. A CAT 320B track hoe excavator was used to excavate the eight test pits on the subject property. The soils encountered in the borings and test pits were examined, visually classified, and logged by a Kleinfelder Staff Professional. Representative soil samples from the test pits were recovered and transported to our laboratory for additional testing, as appropriate. A detailed description of the field study is presented in Appendix A. A map showing approximate boring and test pit locations is presented on Figure 2.

Prior to the start of drilling, the Arizona Bluestake Center was contacted to locate existing utilities at the boring locations.

Disturbed samples were taken at the direction of the Staff Professional during drilling. Disturbed 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 in an attempt to collect more soil sample than the smaller SPT sampler. The California sampler was driven 18 inches, using a 140-pound hammer falling 30 inches, and blow counts for

successive 6-inch penetration intervals were recorded. After the sampler was withdrawn from the borehole, the samples were removed, and sealed to minimize moisture loss. Samples were taken at 5-foot intervals to the depth explored. Laboratory testing was not performed on soil samples collected from the borings.

Soil classifications made in the field from auger cuttings, test pit spoils, and samples 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 Plate A-1 in Appendix A. Sample classifications, blow counts recorded during sampling, and other related information were recorded on the soil boring logs. The boring logs for the project are presented in Appendix A.

3 LABORATORY TESTING

Representative soil samples from the test pits were tested in the laboratory for classification purposes and to evaluate their engineering properties. The laboratory tests included:

- Seven sieve analyses tests for soil classification;
- Seven Atterberg Limits tests for soil classification; and
- Two sulfate content tests for corrosion potential.

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

4 GENERAL SITE CONDITIONS

4.1. Surface Conditions

The site proposed for drainage improvements is located on the northeast corner of 111th Avenue and Rose Garden Lane in Peoria, Arizona. The proposed channel and detention basin are bounded by Rose Garden Lane, undeveloped desert, and the Auga Fria River. The terrain is generally flat with the exception of a number of dry washes

that meander through the proposed channel. The terrain is generally flat within the proposed detention basin. Scattered shrubs, small cacti, and other desert vegetation also exist on the property.

4.2. Subsurface Conditions

The site is underlain predominantly by sands, gravels, and cobbles with varying amounts of clays and silts. The upper 7 feet of Test Pits TP-1 and TP-2 generally consisted of sandy clays and clayey sands. The sandy clays and clayey sands were underlain generally by clayey gravel and sandy gravels. The remaining test pits in the proposed channel and the proposed detention basin generally consisted of sands, gravels, and cobbles with varying amounts of boulders, clays, and silts. The soils encountered were generally medium plasticity to nonplastic. Detailed soil descriptions are presented on the boring logs in Appendix A.

4.3. Groundwater

Groundwater was not encountered in any of the borings or test pits to the depths explored. A summary of recorded groundwater levels is presented in section 5.5 of this report. It should be noted that soil moisture conditions within the area will vary depending on rainfall and/or runoff conditions not apparent at the time of our field study. The typical monsoon season in Arizona is during July to September. Although less intense in rainfall than the monsoon, additional rainfall occurs from November to March.

4.4. Test Pit Excavation

Eight test pits were excavated using a CAT 320B track hoe. The test pits were excavated 12 to 15 feet below the existing ground surface. Excavation time of the test pits varied somewhat but each test pit was completed in approximately 60 minutes. Therefore, this site can be excavated with similar construction equipment.

5 ENGINEERING ANALYSES AND RECOMMENDATIONS

5.1. General

Based on the results of our field study, the site may be developed as planned using conventional grading techniques. Due to the coarse nature of the site material, overexcavation will be required to provide a uniform bearing surface for the channel, the box culvert, and fill areas. The amount of coarse material, small amount of fines, and the cohesionless soils observed in our test pits caused some difficulty in excavation.

Detailed recommendations regarding the geotechnical aspects of project design and construction are presented below.

5.2. Site Preparation

In areas to receive fill, site preparation should include stripping of all vegetation and topsoil. A minimum stripping depth of approximately 3 inches should be anticipated. However, stripping depths required may vary and should be adjusted to remove all vegetation and root systems. Care should be exercised to separate these materials to avoid incorporation of the organic matter in structural fill sections.

Should site grading be performed during or subsequent to wet weather, near-surface site soils may be significantly above optimum moisture content. This could hamper equipment maneuverability and efforts to compact site soils to the recommended compaction criteria. Disking for aeration, chemical treatment, replacement with drier material, or other methods, may be required to reduce excessive soil moisture and/or otherwise facilitate operations.

Conventional earth-moving equipment should be capable of performing anticipated excavations required for site development.

5.3. Earthwork

5.3.1. Earthwork for Open Channels

Earthwork for open channels should be as presented in Section 206 of Maricopa Association of Governments (MAG) Specifications. Additional earthwork is required to provide a uniform bearing surface for the channel as stated in the following section.

5.3.2. Site Preparation and Grading

Due to the amount of coarse material, overexcavation will be required to provide a uniform bearing surface for the channel, the box culvert, and fill areas.

The following site grading is recommended for the proposed:

- Under box culvert, channel, and areas to receive fill: Remove the site soils a minimum of 1 foot below the bearing depth or exist grade in areas to receive fill.
- Then the exposed cut surface should be proof rolled. Any disturbed areas should be removed.
- Fill, 1 foot below the bearing depth of the box culvert and channel, should meet the requirement of section 5.3.3. Onsite soils will need to be processed to meet the requirements. Thus, overexcavated soils may be used in fills provided they are free of debris and deleterious materials, and are placed and compacted in accordance with the requirements for fill construction in Section 5.3.4.
- All other fill should meet the gradation requirements and be placed and compacted in accordance with the requirements for fill construction in Section 5.3.4.

Where new fills will be placed against existing slopes, the fill material shall be benched into the existing slopes as follows:

- As each lift of the fill joins an existing slope greater than 20% (2 feet vertical to 10 feet horizontal), excavate horizontally into the slope face until clean, undisturbed material or bedrock is encountered, or a minimum depth of 4 feet. Clean excavated material can then be placed as fill. Benching operations may expose organic or deleterious material, which is not suitable for fill material and must be removed.

- The adequacy of the benches must be approved by the on-site representative of the geotechnical engineer of record.
- Excavated soils may be used in fills provided meet the gradation requirements and be placed and compacted in accordance with the requirements for fill construction in Section 5.3.4.

Prior to placing steel or concrete, footing excavations should be cleaned of all debris, loose or soft soil, and water. All footing excavations should be observed by the project Geotechnical Engineer or their representative just prior to placing reinforcing steel to verify bearing conditions.

Should site grading be performed during or subsequent to wet weather, near-surface site soils may be significantly above optimum moisture content. This condition could hamper equipment maneuverability and efforts to compact site soils to the recommended compaction criteria. Disking for aeration, chemical treatment, replacement with drier material, or other methods may be required to reduce excessive soil moisture and facilitate earthwork operations.

5.3.3. Structural Excavation and Backfill

Structural excavation and backfill should be as presented in Section 206 of MAG Specifications.

Structural fill required to bring the site to grade should be free of vegetation and debris, and contain no rocks or lumps larger than 3 inches nominal diameter. Structural fill should meet the following gradation requirements when tested in accordance with ASTM Test Method C 136:

Screen Size (Square Opening)	**Percent Passing By Weight**
3-inch	100
No. 4	40 - 100
No. 200	15 - 40

The soils should possess a plasticity index of no greater than 15 when tested in accordance with ASTM Test Method D 4318.

All structural fill, imported or otherwise, should be uniformly moisture-conditioned to within two percent of the optimum moisture content, placed in horizontal lifts no greater than 8 inches in loose thickness, and compacted by mechanical means only. Structural fill should be compacted to a minimum 95 percent of maximum dry density. Optimum moisture content and maximum dry density should be determined in accordance with ASTM Test Method D 698.

Some site materials do not meet the required gradation for structural backfill. Onsite soils will need to be processed to meet the requirements.

5.3.4. Fill Construction

Fill construction shall be as presented in Section 211 of MAG Specifications. Some site materials do not meet the required gradation for structural backfill. Onsite soils will need to be processed to meet the requirements.

5.3.5. Permanent Slopes

Any permanent slopes should be designed as 5(H) to 1(V) or flatter to maintain long-term stability and to provide ease of maintenance. Steeper slopes are susceptible to erosion, will be difficult to maintain, and could experience problems with instability. Footings near slopes should be deepened as necessary to maintain a depth at least 1.5 feet below the lowest adjacent grade within 5 feet of the footing. It is also recommended that permanent slopes be vegetated or covered with rock mulch, as soon as practical, in order to minimize the potential for erosion.

5.3.6. Temporary Excavations

General

All excavations must comply with applicable local, state, and federal safety regulations including the current 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 consisted predominantly of sands, gravels, and cobbles with varying amounts of clays and silts. In our opinion, these soils would be considered a Type C soil when applying OSHA regulations. For this soil type OSHA recommends a maximum slope inclination of 1½ (h):1(v) or flatter for excavations 20 feet or less in depth. Steeper cut slopes may be utilized for excavations less than 5 feet deep depending on the strength, moisture content, and homogeneity of the soils as observed in the field. Flatter slopes and/or trench shields 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 approved 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.

5.3.7. Trench Excavation, Backfilling, and Compaction

Trench excavation, backfilling, and compaction shall be performed as presented in Section 601 of MAG Specifications.

5.4. Shallow Footing Foundations

5.4.1. Allowable Bearing Pressure

Spread-type footings bearing on recompacted site soils or compacted structural fill, are recommended for support of the structure walls. Providing that the site is developed as outlined in this section, the following bearing pressure is recommended:

	Allowable Bearing Pressure	Depth
Footings	2,500 psf	1.5 ft below finished grade

For the table above, finished grade is defined as floor level for interior footings and the lowest adjacent grade within 5 feet of the footing for the perimeter or exterior footings.

These values apply to full dead plus live loads and can be increased by one-third for total loads including wind or seismic forces. Due to the mild desert climate frost penetration is not a concern for this site. The minimum recommended widths of square and continuous footings are 2.0 and 1.33 feet, respectively.

5.4.2. Estimated Settlements

Under the existing and compacted soil moisture condition, vertical movements of footings designed as recommended above are estimated not to exceed ¾ inch. Significant moisture increases above the existing and compacted soil moisture contents could result in additional movements. In order to minimize the sensitivity of the structure to differential settlements, footings should be reinforced to allow for a degree of load redistribution should a localized zone of supporting soils become saturated.

5.4.3. Resistance to Lateral Loads

The passive soil resistance of properly completed backfill against edges of footings, stem walls, and similar vertical foundation elements should be considered as being equal to forces exerted by a fluid of 350 pounds per cubic foot unit weight. A coefficient of friction of 0.35 is recommended for computing lateral resistance between the bases of footings and slabs and the soils in analyzing lateral loads.

Lateral pressure and resistance parameters provided above are ultimate values. Therefore, a suitable factor of safety should be applied to these values for design purposes. The appropriate factor of safety will depend on the design condition and should be determined by the project Structural Engineer. Depending on the application, typical factors of safety could range from 1.0 to 1.5.

Prior to placing steel or concrete, footing excavations should be cleaned of all debris, loose or soft soil, and water. All footing excavations should be observed by the project

Geotechnical Engineer just prior to placing steel or concrete to verify the recommendations contained herein are implemented during construction.

5.4.4. Retaining Walls

Lateral Earth Pressures

If retaining walls are utilized in this project, they should be designed to resist the earth pressure exerted by the retained, compacted backfill plus any additional lateral force that will be applied to the wall due to surface loads placed at or near the wall. The at-rest earth pressure against walls that are restrained at the top and with level backfill may be taken as equivalent to the pressure exerted by a fluid weighing 55 pounds per cubic foot (pcf). Fifty percent of any uniform aerial surcharge placed at the top of a restrained wall may be assumed to act as a uniform horizontal pressure over the entire height of the wall.

Retaining walls that are not restrained at the top and with level backfill may be designed for an active earth pressure developed by an equivalent fluid weighing 35 pcf. Thirty percent of any uniform surcharge may be assumed to act as a uniform horizontal pressure over the entire height of the wall.

Wall Drainage

The above-recommended values do not include lateral pressures due to hydrostatic forces. Therefore, wall backfill should be free draining and provisions should be made to collect and dispose of excess water that may accumulate behind earth retaining structures.

Wall drainage should be collected by continuous perforated drainpipes, filter fabric, and gravel connected to weep hole(s). The drainpipe must run parallel to the wall. We recommend drain rock consist of durable stone having 100 percent passing the 1-inch

sieve and zero percent passing the No. 4 sieve. Synthetic filter fabric should have an equivalent opening size (EOS), U.S. Standard Sieve, of between 40 and 70, a permeability of at least 0.02 centimeters per second, and a minimum puncture strength of 50 pounds. As an alternative, a geo-composite drainage mat attached to the back of the wall could be used to direct water to the weep holes.

Backfill Placement

All backfill should be placed and compacted in accordance with recommendations provided above for engineered fill. Light equipment should be used during backfill compaction to minimize possible overstressing of the wall.

5.5. Hydrogeologic Evaluation

Well Data Review

A Kleinfelder hydrologist (Darcy Anderson) reviewed all of the well data provided by Wood Patel on July 12, 2006, and the additional well data that was provided by the City of Peoria on September 21, 2006. The purpose of this data review was to evaluate whether filling of the proposed basin would likely have any adverse effects on nearby properties with pits.

Based on information gathered from a site visit with Wood Patel, some of the nearby pits or quarries (operated by Walkers and Sun State) are deeper than lowest elevation of the proposed basin (approximately 50 feet deep), and may be subject to intrusion of water if there were lateral movement of water from the basin, instead of just vertical recharge into the Agua Fria River bed. This review was conducted to evaluate if there was likelihood that the water percolating from the basin would cause impact to the nearby operations.

The review focused on wells that were within approximately two miles and downstream of the proposed basin, and that had well logs available (see Figure 3 and Table 1). The well logs were analyzed specifically for the first 100 feet, because indication of an aquitard or impermeable layer in the first 50 feet might indicate the likelihood of lateral movement of water from the basin. There was no indication of any aquitard or clay layer that would result in lateral movement of water from the basin. Only small amounts of clay were reported in the well logs that were reviewed. The following section contains an evaluation of the additional site borings and the relationship of the proposed basin to the hydrogeology of the area.

Hydrogeologic Evaluation

Additional soils information was acquired to better characterize the soil strata in the basin area. Kleinfelder drilled two borings to depths of 50 feet below the existing ground surface. The borings were drilled in the central part and southwestern part of the proposed basin, because the general movement of groundwater in the area is to the south following the Agua Fria River channel. No water was encountered while drilling the borings, although there were recent rains in the area at the time of our field study. There was no indication of any aquitard or clay layer that would result in lateral movement of water from the basin. The location of the borings and a summary of the soils information are included in Figure 3 and Table 2.

Summary and Evaluation

Tables 1 and 2 of this report summarize the available well log data and boring logs for the area. There is no indication of potential areas of lateral movement of water from the proposed basin.

Table 1 - Well Log Data Summary

Well Reg. Number	Well Name or Owner	Location	Well Depth (ft)	Depth to Water (ft. bls)	Comments (approx. 0-100 ft. bls based on well logs)
55-590059	Salt River Sand & Rock	T4N R1W S24	600	N/A	Cobbles, boulders, sand
55-589029	Salt River Sand & Rock	T4N R1W S24	527	N/A	Boulders, sand, gravel
55-579157	City of Peoria	104th & Deer Valley	1,348	440	Some clay in first 10 ft; cobbles, sand and gravel 10-100 ft
55-515794	City of Peoria	A (4-1) 30 bad	500	N/A	Boulders, sand, gravel
55-516549	City of Peoria	A (4-1) 30 bad	380	N/A	Sand, silt, gravel, boulders, cobbles; some clay at 60-70 ft
55-541996	Del Webb Dev. Co.	T4N R1E S30	425	N/A	Boulders, gravel; some clay at 90 ft
55-541997	Del Webb Dev. Co.	T1N R1E S30	425	N/A	Boulders, gravel, some clay at 90 ft
55-903473	City of Peoria Beardsley MW #4	30° 39' 20.7" N 112° 17' 55.5" W	440	N/A	Silt, sand, gravel; trace clay at 20 ft
55-903471	City of Peoria Beardsley MW #3	33° 39' 20.5" N 112° 18' 10.1" W	460	N/A	Gravel, sand, silt; trace clay at 20 ft & 70 ft
55-540715	Del Webb Dev. Co.	T1N R1E S30	425	N/A	Boulders, gravel; some clay at 90 ft

bls = below land surface
N/A = not available

Table 2 - Boring Log Data Summary

Boring number	Location	Depth (ft)	Comments
B-1	Center of basin	50	Sand, gravel, silt and cobbles; no clay encountered
B-2	Southwest corner of basin	50	Sand, gravel, silt and cobbles; some clayey silty sand at 33 ft; clayey gravel at 49 ft.

5.6. Corrosivity

Some potential for sulfate attack on concrete structures may exist where sources of moisture are present. Two sulfate content tests performed on site soils indicate a slight sulfate exposure. All concrete in contact with the onsite soils should contain Type II or equivalent sulfate-resistant cement, and should be placed with a low water cement ratio.

6 CLOSURE

6.1. Limitations

The recommendations contained in this report are based on our field explorations and our understanding of the proposed construction. The subsurface data used in the preparation of this report were obtained from the test pits excavated and the borings drilled 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. It is the Client's responsibility to see that all parties to the project including the Designer, Contractor, Subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance, but in no event later than three years from the date of the report. Land or facility use, on and off-site conditions, regulations, or other

factors may change over time, and additional work may be required with the passage of time. 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 and client agrees to defend, indemnify, and hold harmless Kleinfelder from any claim or liability associated with such unauthorized use or non-compliance.

6.2. Additional Services

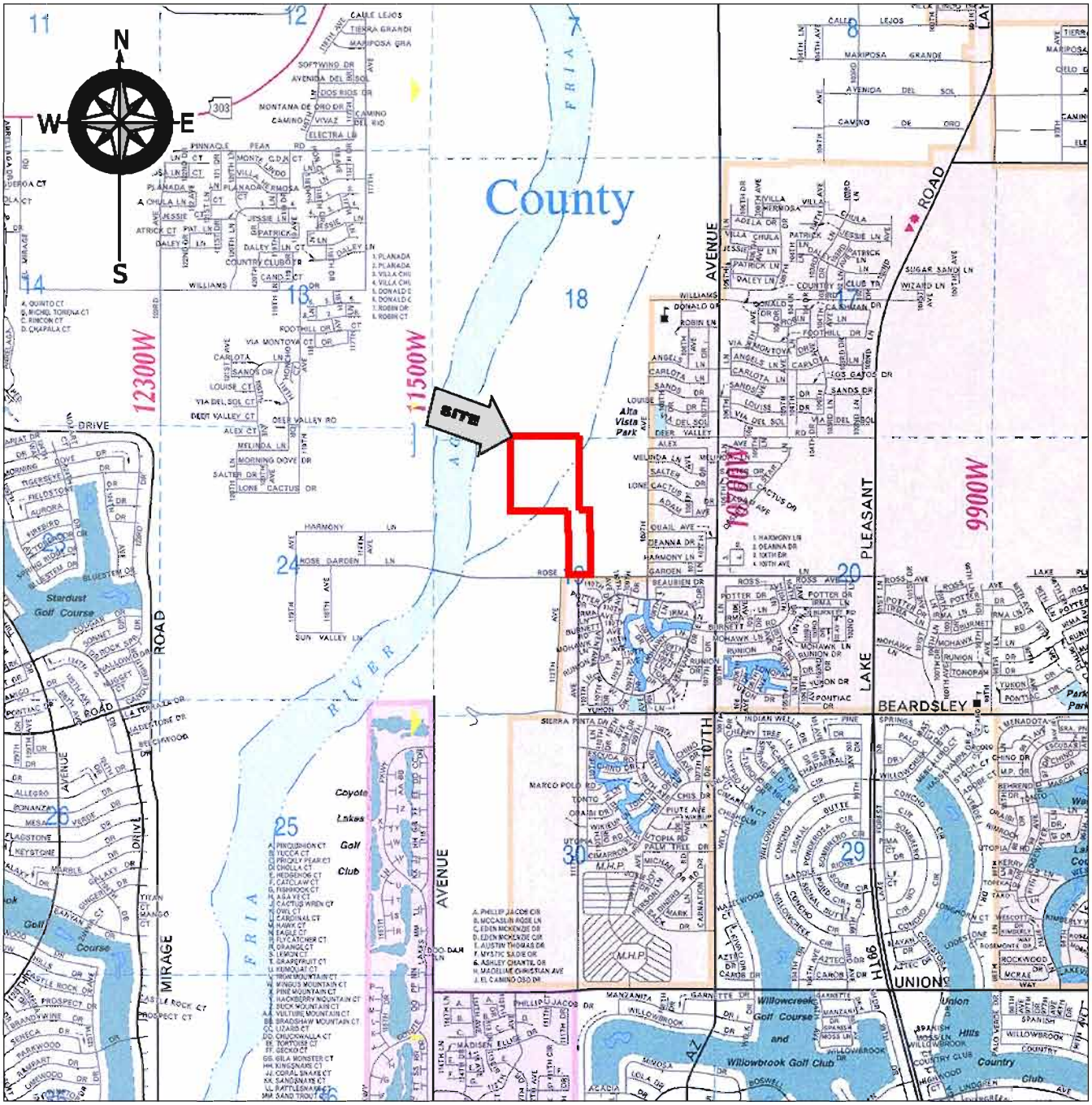
The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be performed during the construction to verify compliance with these recommendations. These tests and observations should include, but are not necessarily be limited to the following:

- observations and testing during site preparation and earthwork;
- observation of footing excavation;
- observation and testing during structural slab construction; and
- consultation as may be required during construction.

We also recommend that we review project plans and specifications to verify compatibility with our conclusions and recommendations. Additional information concerning the scope and cost of these services can be obtained from our office.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding this report or wish to discuss additional services, please do not hesitate to contact us.

FIGURES



Taken from: Phoenix Metropolitan Street Atlas (2006)

LEGEND:

: APPROXIMATE SITE LOCATION

0 3000' 6000'

SCALE IN FEET
1" = 3000'

ATTACHED IMAGES: Images: Map-1.tif Images: Map-2.tif
ATTACHED XREFS:
L:\2007\Projects\76793\Figures\ LAYOUT: 76793-1
CAD FILE: L:\2007\

KLEINFELDER

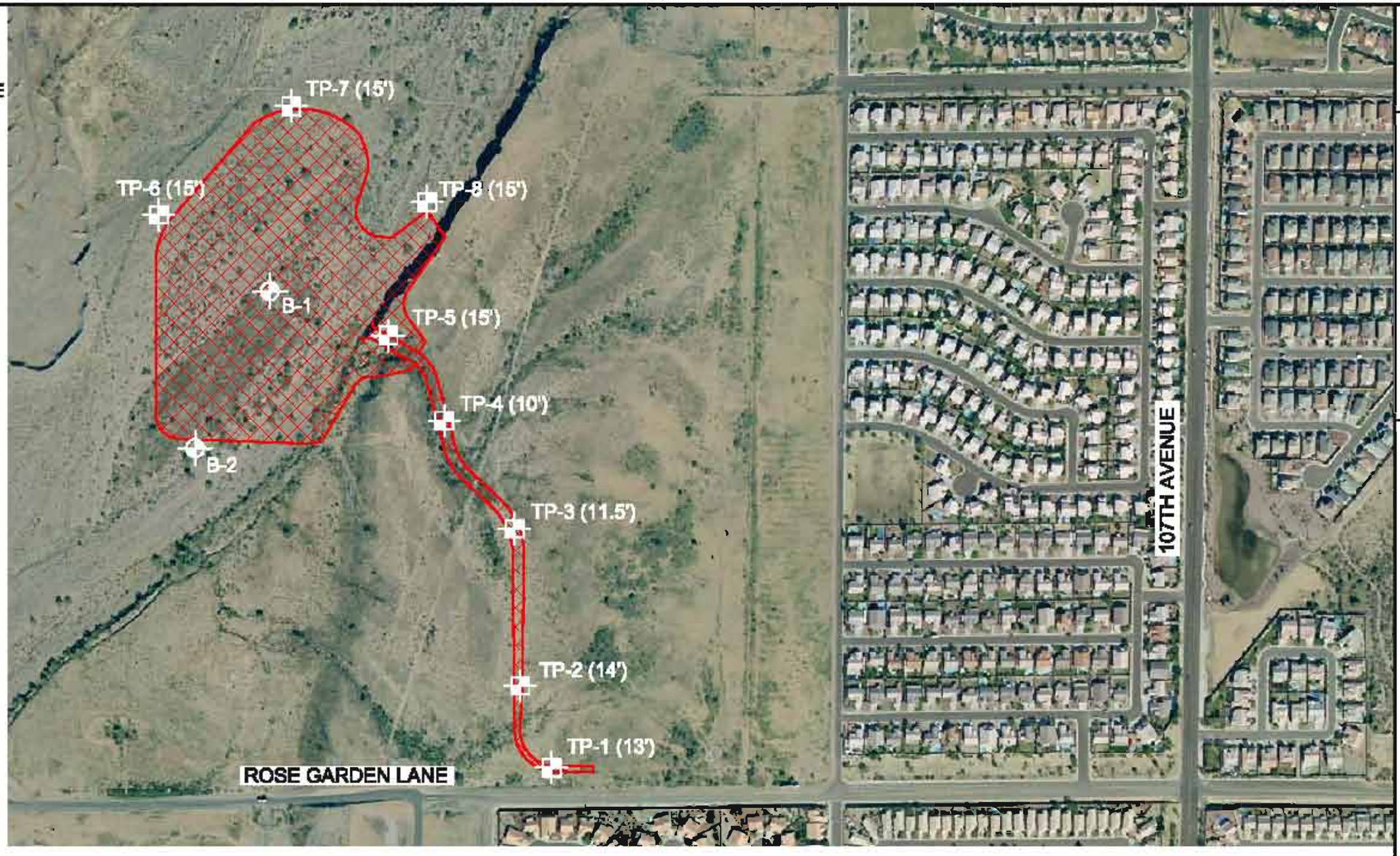
1335 WEST AUTO DRIVE
TEMPE, AZ 85284
PH. 480-763-1200 FAX. 480-763-1212
www.kleinfelder.com

VICINITY MAP

ROSE GARDEN LANE DRAINAGE
NW CORNER OF ROSE GARDEN LANE AND 111TH AVENUE
PHOENIX, ARIZONA

DRAWN BY:	KM
REVISED BY:	SAG
CHECKED BY:	DA
FIGURE	1

DRAWN: APRIL 2007 | APPROVED BY:_____ | PROJECT NO. 76793 | FILE NAME: 76793-Vic.dwg



LEGEND

- TP-1 : TEST PIT (DEPTH)
- B-1 : SOIL BORING (50')
- : APPROXIMATE CHANNEL & BASIN LOCATION

0 400' 800'

SCALE IN FEET
1"=400'

APPROXIMATE BORING AND TEST PIT LOCATIONS PLAN

ROSE GARDEN LANE DRAINAGE
NW CORNER OF ROSE GARDEN LANE AND 111TH AVENUE
PHOENIX, ARIZONA

PROJECT NO. 76763 | FILE NAME: 76763-aerial.dwg

DRAWN BY: KM
REVISED BY: BAG
CHECKED BY: DA
APPROVED BY:
DATE: APRIL 2007

FIGURE 2

KLEINFELDER
1335 WEST AUTO DRIVE
TEMPE, AZ 85284
PH. (480) 783-1200 FAX (480) 783-1212
www.kleinfelder.com

PLOTTED: 16 Apr 2007, 8:52am, sgoldamour

ATTACHED IMAGES: Images: aerial.bmp Images: aerial_2.bmp Images: proposed channel and basin.bmp Images: Section.bmp
ATTACHED XREFS:
CAD FILE: L:\2007\Projects\76763\Figures\ LAYOUT: 76763-2
L:\2007

LEGEND

ADWR REGISTERED WELL

0 1500' 3000'

SCALE IN FEET
1"=1500'

ATTACHED IMAGES: Images: aerial.bmp Images: aerial_2.bmp Images: proposed channel and basin.bmp Images: Section.bmp
ATTACHED XREFS:
CAD FILE: L:\2007\Projects\76763\Figures\ LAYOUT: 76763-3
L:0007

FIGURE 3

KLEINFELDER
1335 WEST AUTO DRIVE
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PLOTTED: 16 Apr 2007, 8:53am, sgaudamour

SITE LOCATION WITH ADJACENT ADWR REGISTERED WELLS

ROSE GARDEN LANE DRAINAGE
NW CORNER OF ROSE GARDEN LANE AND 111TH AVENUE
PHOENIX, ARIZONA

PROJECT NO. 76763
FILE NAME: 76763-aerial.dwg

DRAWN BY: KM
REVISED BY: SAG
CHECKED BY: DA
DATE: APRIL 2007
APPROVED BY:

APPENDIX A

Field Study

APPENDIX A
FIELD STUDY

BORINGS

The subsurface conditions at the site were explored by drilling borings using a CME-75 drill rig equipped with 6 5/8inch hollow-stem auger. The locations of borings performed for this study are shown on Figure 2 of the report.

The locations of borings shown on Figure 2 were located by visual sighting and pacing from existing site features and, therefore, should be considered approximate. Actual boring locations may vary from those indicated on Figure 2.

Our staff professional maintained a log of the borings, 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 Logs of Borings is presented on A-2 of this appendix.

SAMPLING PROCEDURES

Samples were taken at a 5-foot interval to the depth explored. The soil samples were obtained from the borings using either a 2-1/2 inch inside diameter ring sampler driven 18 inches (unless otherwise noted) into undisturbed soil using a 30 inch drop of a 140-pound hammer. Blow counts were recorded at 6-inch intervals for each sample attempt and are reported on the logs in terms of blows-per-foot for the last foot of penetration. 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 the drill cuttings.

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
Logs of Borings

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
			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
			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
			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
			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)

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Date: April, 2007
Project Number: 76793

UNIFIED SOIL CLASSIFICATION SYSTEM
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

KEY
A-1

GEO-KEY A1 SOIL 76793.GPJ 4/13/2007

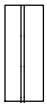
LOG SYMBOLS


BULK / GRAB SAMPLE


MODIFIED CALIFORNIA SAMPLER
(2 inch inside diameter)

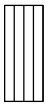

RING (PORTER) SAMPLER
(2.4 - inch inside diameter)

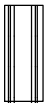

STANDARD PENETRATION
SPLIT SPOON SAMPLER
(2.0-inch O.D. X 1.4-inch I.D.)


SHELBY TUBE
(3 inch outside diameter)


NON-STANDARD PENETRATION
SPLIT SPOON SAMPLER
(1.5-inch O.D. X 0.9-inch I.D.)


BDBGM SIZE CORE BARREL
(1.65-inch I.D.)


BW44 SIZE CORE BARREL
(1.75-inch I.D.)


HQ-3 SIZE CORE BARREL
(2.4-inch I.D.)


NON-STANDARD PENETRATION
SPLIT SPOON SAMPLER
(2.5-inch O.D. X 2.0-inch I.D.)


WATER LEVEL
(level after completion)


WATER LEVEL
(level where first encountered)

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

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Date: April, 2007	76793

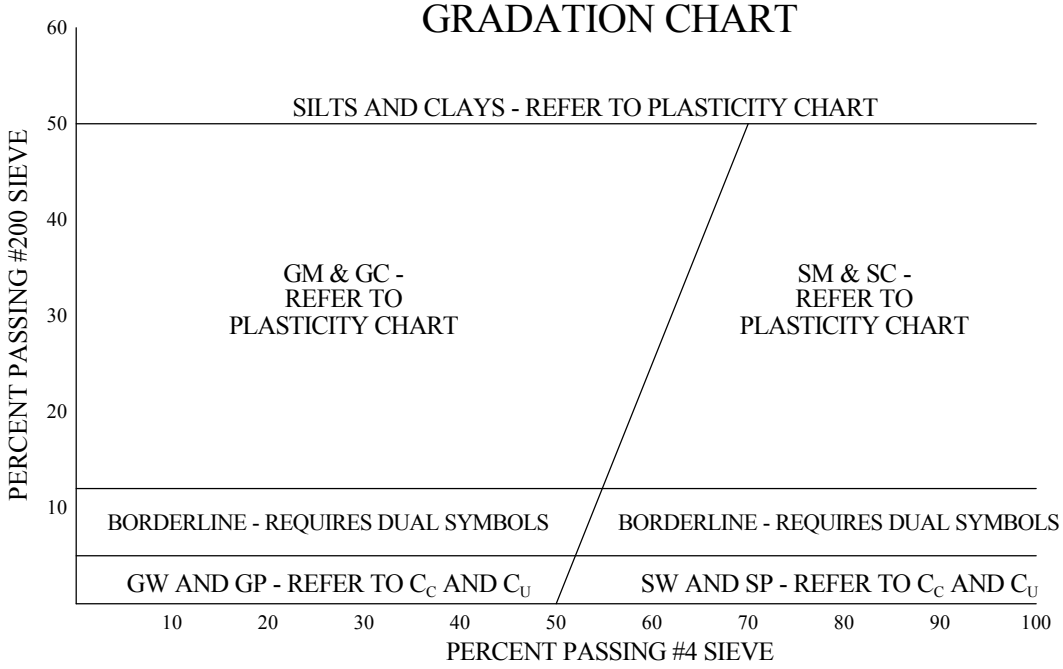
LOG KEY
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

KEY

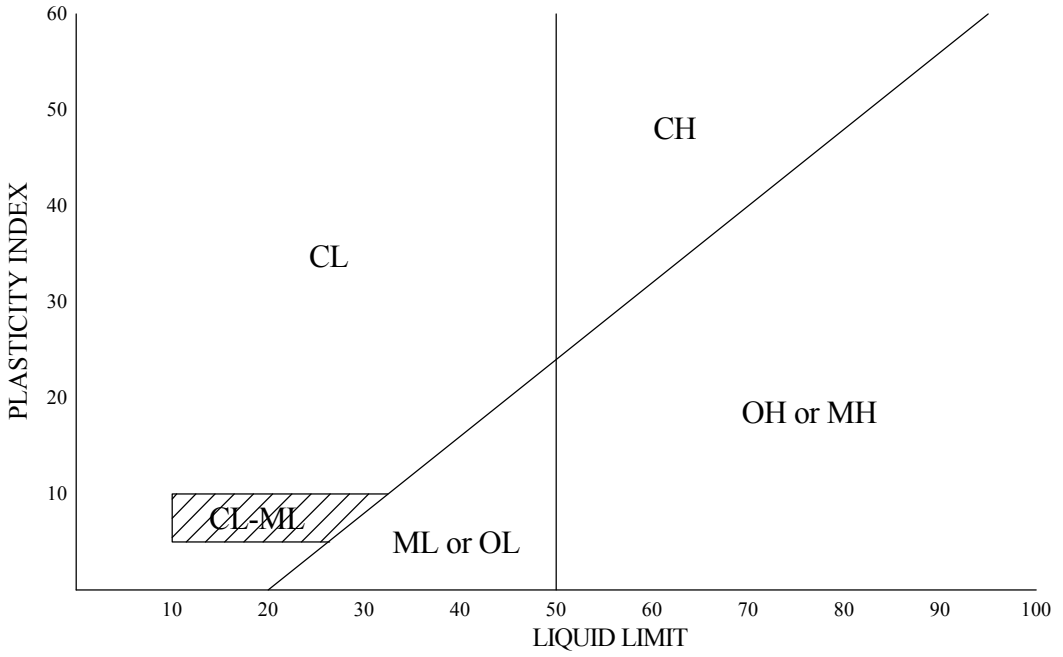
A-2

GEO-KEY A2 LOG 76793.GPJ 4/13/2007

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

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Date: April, 2007
Project Number: 76793

CHARTS & DEFINITIONS
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

KEY

A-3

GEO-KEY A3 CHART 76793.GPJ 4/13/2007

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 76793.GPJ 4/13/2007

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Drafted By: KM
Date: April, 2007
Project Number: 76793

TERMINOLOGY USED TO DESCRIBE SOILS
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

KEY

A-4

Northing and Easting:		Elevation (ft): 1230	Date Started: 10/24/2006
Groundwater (ft):	No Free Groundwater Encountered		Date Completed: 10/24/2006
Excavation Co. :	Environmental Response	Equipment: CAT 320 B	Logged By: Rollina
Excavation Method:	Trackhoe		Total Depth (ft): 13.0

Sample Interval	Sample Type	Nuclear Gage Dry Density (lbs/ft³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests	Graphical Log	USCS Classification	DESCRIPTION (0.0 to 13.0 feet)
				38	19	99.3	65			CL	**Sandy Clay,** light brown, slightly moist, soft, low-medium plasticity, weak cementation
	BULK										
										SC	**Clayey Sand,** with cobbles, with gravel, cobbles 6-8", coarse gravel 3-6", 1-3" gravel, medium grained sand, brown, slightly moist, low plasticity
										GC	**Clayey Gravel,** cobbles 8-12", cobbles 6-8", coarse gravel 3-6", 1-3" gravel, medium to coarse grained sand, brown, slightly moist, hard, low plasticity, Note: Excavation of test pit become more difficult from 7-13'
	BULK									GP-GM	**Sand Gravel,** cobbles 6-18", coarse gravel 3-6", coarse grained sand, subrounded, brown, slightly moist, nonplastic
											Boring terminated at 13.0 feet Sampling stopped at 11.0 feet

5 10 15 20 25 30 35

KLEINFELDER

Drafted By: KM
Date: April, 2007
Project Number: 76793

LOG OF BORING TP-1
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

BORING
TP-1
Page 1 of 1

GEO ADOT TEST-PIT ER1 76793.GPJ 4/13/2007

Northing and Easting:		Elevation (ft): 1232	Date Started: 10/24/2006
Groundwater (ft):	No Free Groundwater Encountered		Date Completed: 10/24/2006
Excavation Co. :	Environmental Response	Equipment: CAT 320 B	Logged By: Rollina
Excavation Method:	Trackhoe		Total Depth (ft): 14.0

	FIELD			LABORATORY								
	Sample Interval	Sample Type	Nuclear Gage Dry Density (lbs/ft^3)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests	Graphical Log	USCS Classification	DESCRIPTION 0.0 to 14.0 feet
0		BULK									CL	**Sandy Clay,** brown, slightly moist, soft to moderately firm, medium plasticity, weak cementation
5					37	17	95.3	48			SC	**Clayey Sand,** with gravel, gravel 3-6", medium grained sand, brown to light brown, slightly moist, low plasticity, weak-moderate cementation
10											GC	**Clayey Gravel,** cobbles 6-12", gravel 1-6", medium to coarse grained sand, brown-light brown, slightly moist, low plasticity, moderate cementation
											GP-GM	**Sand Gravel,** cobbles 6-18", gravel 3-6", coarse grained sand, subrounded gravel, brown, slightly moist, nonplastic
15												Boring terminated at 14.0 feet Sampling stopped at 8.0 feet
20												
25												
30												
35												

KLEINFELDER

Drafted By: KM

Date: April, 2007

Project Number: 76793

LOG OF BORING TP-2
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

BORING

TP-2

GEO ADOT TEST-PIT ER1 76793.GPJ 4/13/2007

Northing and Easting:		Elevation (ft): 1230	Date Started: 10/24/2006
Groundwater (ft):	No Free Groundwater Encountered		Date Completed: 10/24/2006
Excavation Co. :	Environmental Response	Equipment: CAT 320 B	Logged By: Rollina
Excavation Method:	Trackhoe		Total Depth (ft): 12.5

Sample Interval	Sample Type	Nuclear Gage Dry Density (lbs/ft^3)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests	Graphical Log	USCS Classification	DESCRIPTION (0.0 to 12.5 feet)
										SG	**Gravelly Sand,** with cobbles, with gravel, medium grained sand, brown, slightly moist, nonplastic
	BULK			28	6	53.4	17			GC-GM	**Sand Gravel,** trace silt, cobbles 6-18", gravel 2-6", medium grained sand, brown, slightly moist, low plasticity
											Note: Stratified with thin layers of sand gravel and cobbles.
										GP-GM	**Sand Gravel,** cobbles 12-18", cobbles 6-12", gravel 2-6", medium grained sand, brown, slightly moist, nonplastic
										GP	**Sand Gravel,** cobbles 6-12", gravel 2-6", coarse grained sand, brown, slightly moist, nonplastic
	BULK										Note: Cobbles and SP-SM matrix
	BULK										Boring terminated at 12.5 feet Sampling stopped at 12.5 feet

5 10 15 20 25 30 35

KLEINFELDER

Drafted By: KM
Date: April, 2007
Project Number: 76793

LOG OF BORING TP-3
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

BORING
TP-3
Page 1 of 1

GEO ADOT TEST-PIT ER1 76793.GPJ 4/13/2007

Northing and Easting:		Elevation (ft): 1215	Date Started: 10/24/2006
Groundwater (ft):	No Free Groundwater Encountered		Date Completed: 10/24/2006
Excavation Co. :	Environmental Response	Equipment: CAT 320 B	Logged By: Rollina
Excavation Method:	Trackhoe		Total Depth (ft): 15.0

Sample Interval	Sample Type	Nuclear Gage Dry Density (lbs/ft³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests	Graphical Log	USCS Classification	DESCRIPTION (0.0 to 15.0 feet)
	BULK									GC	**Clayey Gravel,** with cobbles 6-12", gravel 0-6", medium grained sand, brown, slightly moist, low plasticity, no cementation
	BULK			42	23	31.9	6			GP-GC	**Sand Gravel** some clay, boulders, cobbles 6-18", gravel 1-6", coarse grained sand, brown, slightly moist, medium plasticity
										GP	**Sand Gravel,** boulders, cobbles, gravel 1-6", coarse grained sand, slightly moist, non plastic
	BULK										Note: Stratified cobbles with coarse grained sand matrix
											Boring terminated at 15.0 feet Sampling stopped at 13.0 feet

5 10 15 20 25 30 35

KLEINFELDER

Drafted By: KM
Date: April, 2007
Project Number: 76793

LOG OF BORING TP-4
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

BORING
TP-4
Page 1 of 1

GEO ADOT TEST-PIT ER1 76793.GPJ 4/13/2007

Northing and Easting:		Elevation (ft): 1195	Date Started: 10/24/2006
Groundwater (ft):	No Free Groundwater Encountered		Date Completed: 10/24/2006
Excavation Co. :	Environmental Response	Equipment: CAT 320 B	Logged By: Rollina
Excavation Method:	Trackhoe		Total Depth (ft): 15.0

FIELD			LABORATORY								
Sample Interval	Sample Type	Nuclear Gage Dry Density (lbs/ft^3)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests	Graphical Log	USCS Classification	DESCRIPTION 0.0 to 15.0 feet
	BULK									GP-GM	**Sand Gravel,** some silt, gravel, subrounded cobbles, brown, slightly moist, nonplastic, with roots Note: Stratified with thin layers ~6-8" SP-SM gray layering
	BULK									SM	**Silty Sand,** with gravel, subrounded gravel, brown, slightly moist, nonplastic
										GP-SM	**Sand Gravel,** with boulders 1.5', cobbles, subrounded gravel, brown, slightly moist, nonplastic
	BULK			38	13	39.5	4	Sulfates=2 ppm Chlorides=4 ppm		GP	**Gravelly Sand,** with cobbles, subrounded, brown, moist, low plasticity Note: Stratified with SP-SM lenses
										GP-GM	**Sand Gravel,** with cobbles, subrounded, brown, moist, nonplastic Note: Test pit side walls continuously caving during excavation
											Boring terminated at 15.0 feet Sampling stopped at 12.0 feet

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Drafted By: KM
Date: April, 2007
Project Number: 76793

LOG OF BORING TP-5
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

BORING
TP-5
Page 1 of 1

GEO ADOT TEST-PIT ER1 76793.GPJ 4/13/2007

Northing and Easting:		Elevation (ft): 1204	Date Started: 10/24/2006
Groundwater (ft):	No Free Groundwater Encountered		Date Completed: 10/24/2006
Excavation Co. :	Environmental Response	Equipment: CAT 320 B	Logged By: Rollina
Excavation Method:	Trackhoe		Total Depth (ft): 15.0

FIELD			LABORATORY								
Sample Interval	Sample Type	Nuclear Gage Dry Density (lbs/ft^3)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests	Graphical Log	USCS Classification	DESCRIPTION 0.0 to 15.0 feet
	BULK									GP-GM	**Sand Gravel,** trace silt, with cobbles, subrounded, brown, slightly moist, nonplastic
										SG	**Gravelly Sand,** trace silt, subrounded gravel, brown, slightly moist, nonplastic Note: Stratified with thin layers of SM and SP-SM 8"-12"
	BULK									GP-GM	**Sand Gravel,** with trace silt, with gravel, cobbles, with clean sand, subrounded cobbles and gravel, brown, slightly moist, nonplastic Note: Stratified with thin layers of moist SM-SC
	BULK			NP	NP	79	14			GM	**Silty Gravel,** > with cobbles, moist, nonplastic
											Boring terminated at 15.0 feet Sampling stopped at 14.0 feet

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LOG OF BORING TP-6
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

BORING
TP-6
Page 1 of 1

Drafted By: KM
Date: April, 2007
Project Number: 76793

GEO ADOT TEST-PIT ER1 76793.GPJ 4/13/2007

Northing and Easting:		Elevation (ft): 1204	Date Started: 10/24/2006
Groundwater (ft):	No Free Groundwater Encountered		Date Completed: 10/24/2006
Excavation Co. :	Environmental Response	Equipment: CAT 320 B	Logged By: Rollina
Excavation Method:	Trackhoe		Total Depth (ft): 15.0

Sample Interval	Sample Type	Nuclear Gage Dry Density (lbs/ft³)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests	Graphical Log	USCS Classification	DESCRIPTION (0.0 to 15.0 feet)
	BULK									SG	**Gravelly Sand,** with gravel, coarse grained sand, brown, slightly moist, nonplastic Note: Stratified with SP-SM, SM layers 8"
										GP-GM	**Sand Gravel,** with silt, subrounded cobbles, brown, slightly moist, nonplastic
	BULK									SM	**Silty Sand,** with gravel, medium to coarse grained sand, brown, slightly moist, nonplastic
											Note: Excavation of test pit become more difficult from 14-15'
										GP	**Sand Gravel,** with boulders, with cobbles, brown, slightly moist, nonplastic Note: Stratified with thin layers of SM and SP-SM
	BULK										
											Boring terminated at 15.0 feet Sampling stopped at 15.0 feet

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LOG OF BORING TP-7
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

BORING
TP-7

Drafted By: KM
Date: April, 2007
Project Number: 76793

Northing and Easting:		Elevation (ft): 1203	Date Started: 10/24/2006
Groundwater (ft):	No Free Groundwater Encountered		Date Completed: 10/24/2006
Excavation Co. :	Environmental Response	Equipment: CAT 320 B	Logged By: Rollina
Excavation Method:	Trackhoe		Total Depth (ft): 16.0

FIELD			LABORATORY								
Sample Interval	Sample Type	Nuclear Gage Dry Density (lbs/ft^3)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests	Graphical Log	USCS Classification	DESCRIPTION 0.0 to 16.0 feet
	BULK							Sulfates=25 ppm Chlorides=22 ppm		GP-GM	**Sand Gravel,** with subrounded cobbles and gravel, trace silt, brown, slightly moist, nonplastic, with roots
	BULK									SP-SM	**Poorly Graded Sand,** with silt, with gravel and cobbles, brown, slightly moist, nonplastic
										GP-GM	**Sand Gravel and Cobbles,** stratified with thin SM layers ~8"
	BULK									GP-GM	**Sand Gravel,** with subrounded cobbles and gravel, trace silt, brown, slightly moist, nonplastic
	BULK			NP	NP	69.6	6			GP-GM	**Sandy Gravel,** trace silt, with gravel, subrounded with coarse sand, brown, moist, low plasticity, Note: Test pit side walls continuously caving during excavation
											Boring terminated at 16.0 feet Sampling stopped at 16.0 feet

5 10 15 20 25 30 35

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LOG OF BORING TP-8
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

BORING
TP-8
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Drafted By: KM
Date: April, 2007
Project Number: 76793

GEO ADOT TEST-PIT ER1 76793.GPJ 4/13/2007

Northing and Easting:		Date Started:	10/20/2006
Groundwater Depth (ft):	No Free Groundwater Encountered	Date Completed:	10/20/2006
Drilling Company:	Yellow Jacket	Equipment:	CME-85
Hole Diameter (in):	6 5/8	Drilling Method:	TUBEX
Hammer Type:	Automatic	Total Depth (ft):	50.0

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Counts per 6" Interval	FIELD: Continuous Pen. Resistance (bpf)	LABORATORY: Dry Density (pcf)	LABORATORY: Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION (0.0 to 35.0 feet; Appx. Surface Elevation (ft): 1205.00)
													SW	**Well Graded Sand,** with gravel, with cobbles, medium to coarse grained sand, brown, slightly moist, loose, nonplastic
1200	5		8 12 9										SP	**Gravelly Sand,** with silt, coarse grained sand, brown, slightly moist, dense, nonplastic Note: Auger chatter on cobbles
1195	10		18 15 15										GM	**Sand Gravel and Cobbles,** with silt, coarse grained sand, brown, slightly moist, dense, nonplastic, Note: stratified with thin layer of silty sand (SM).
1190	15		6 14 21										GW	**Well Graded Gravel,** less 5% fines, subangular gravel, gray, slightly moist, dense, nonplastic
1185	20		12 13 10										SM	**Silty Sand,** some gravel, medium to coarse grained sand, brown, slightly moist, medium dense, nonplastic
1180	25		26 17 21										GM	**Sand Clay and Cobbles,** with silt, subangular gravel, brown, slightly moist, very dense, nonplastic, Note: coarse grained sand, dense Note: stratified with thin layer of silty sand, (SM)
1175	30		20 50/2											Note: Very dense Note: auger chatter on cobbles, very difficult drilling in cobbles
1170	35		23 50/5										SP-SM	

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Drafted By: KM

Date: April, 2007

Project Number: 76793

LOG OF BORING B-1
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

BORING

B-1

GEO ADOT EW/EL 76793.GPJ 4/13/2007

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Counts per 6" Interval	FIELD: Continuous Pen. Resistance (bpf)	LABORATORY: Dry Density (pcf)	LABORATORY: Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION 35.0 to 50.0 feet
1165													SP-SM	**Poorly Graded Sand,** with silt, with gravel, with cobbles, subangular, brown, slightly moist, very dense, nonplastic,
1160	40		19 42 41										SM	**Silty Sand,** with gravel, medium grained sand, brown, slightly moist, very dense, nonplastic,
1155	45		28 50/3										GP-GM	**Sand Gravel and Cobbles,** trace silt, medium to coarse grained sand, brown, slightly moist, very dense, nonplastic,
1150	50		38 49 50/3										SG	**Gravelly Silty Sand,** with silt, with cobbles, medium grained sand, brown, slightly moist, very dense, nonplastic, Boring terminated at 50.0 feet Sampling stopped at 50.3 feet Caved to 1.0 feet
1145	55													
1140	60													
1135	65													
1130	70													
1125	75													

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Drafted By: KM

Date: April, 2007

Project Number: 76793

LOG OF BORING B-1 (Continued)
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

BORING
B-1

GEO ADOT EW/EL 76793.GPJ 4/13/2007

Northing and Easting:

Groundwater Depth (ft): No Free Groundwater Encountered

Drilling Company: Yellow Jacket | Equipment: CME-85

Hole Diameter (in): 6 5/8 | Drilling Method: TUBEX

Hammer Type: Automatic

Date Started: 10/20/2006

Date Completed: 10/20/2006

Logged By: Rollina

Total Depth (ft): 50.0

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Counts per 6" Interval	FIELD: Continuous Pen. Resistance (bpf)	LABORATORY: Dry Density (pcf)	LABORATORY: Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION (0.0 to 35.0 feet; Appx. Surface Elevation (ft): 1204.00)
													SW	**Well Graded Sand,** some gravel, less 5% fines, with cobbles, medium grained sand, brown, slightly moist, loose, nonplastic
1200	5		3 3 6										SP	**Fine Sand,** fine to medium grained sand, brown, slightly moist, loose, nonplastic
1195	10		6 14 21										SP-SM	**Poorly Graded Sand,** with silt, with gravel, medium grained sand, brown, slightly moist, dense, nonplastic,
													GM	**Sand Gravel and Cobbles,** with silt, medium grained sand, subangular gravel, brown, slightly moist, very dense, nonplastic, (slow drilling)
1190	15		13 33 27										SG	**Gravelly Sand,** with silt, with cobbles, subangular gravel, medium coarse grained, brown, slightly moist, very dense, nonplastic Note: Stratified with layers of silty sand with gravel, easier drilling, non-plastic Note: subangular to subrounded gravel, coarse grained sand
1185	20		10 40 40										GP-GM	**Sand Gravel and Cobbles,** with sand, subangular, brown, slightly moist, very dense, nonplastic, Note: Auger grinding on gravel and cobbles, stratified with SM lenses
1180	25		50/4										GW	**Well Graded Gravel,** with cobbles, greater 5% fines, subangular, gray, slightly moist, very dense, nonplastic,
1175	30		22 50/4										GM	**Sand Gravel and Cobbles,** subangular gravel, gray and brown, slightly moist, very dense, nonplastic, Note: Stratified with lenses of gravelly silty sand, no-low plasticity, no cementation
													SP-SM	**Poorly Graded Sand,** with silt, with gravel, medium grained sand, brown, slightly moist, very dense, nonplastic, no cementation
1170	35		41 50/2										SM-SC	**Clayey Silty Sand,** with gravel, subangular sand, medium grained sand, brown, slightly moist, hard, low plasticity, no cementation

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Date: April, 2007

Project Number: 76793

LOG OF BORING B-2

Rose Garden Lane Drainage Improvements

Wood , Patel & Associates

NW Corner of Rose Garden Lane and 111th Avenue

Peoria, Arizona

BORING

B-2

GEO ADOT EWEL 76793.GPJ 4/13/2007

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Counts per 6" Interval	FIELD: Continuous Pen. Resistance (bpf)	LABORATORY: Dry Density (pcf)	LABORATORY: Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION 35.0 to 50.0 feet
													SM-SC	
													SM	**Silty Sand,** with gravel, medium grained sand, brown, slightly moist, very dense, nonplastic
1160	40		17 50/6										SM	**Silty Sand,** some gravel, medium grained sand, brown, slightly moist, very dense, nonplastic
													GM-SM	Note: Trace to some gravel
1155	45		50/6											**Sand Gravel and Cobbles,** subangular to subrounded gravel, brown, slightly moist, very dense, nonplastic,
1150	50		50/6 50/3										GC	**Clayey Gravel,** with clay, subangular gravel, medium grained sand, brown, slightly moist, hard, low plasticity, no cementation
														Boring terminated at 50.0 feet Sampling stopped at 49.8 feet Caved to 5.0 feet
1145	55													
1140	60													
1135	65													
1130	70													
1125	75													

GEO ADOT EW/EL 76793.GPJ 4/13/2007

KLEINFELDER

Drafted By: KM
Date: April, 2007
Project Number: 76793

LOG OF BORING B-2 (Continued)
Rose Garden Lane Drainage Improvements
Wood , Patel & Associates
NW Corner of Rose Garden Lane and 111th Avenue
Peoria, Arizona

BORING
B-2
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APPENDIX B

Laboratory Tests

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.

Sieve Analysis

Sieve analyses were performed to evaluate the gradation 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 ASTM Test Method D 4318.

Soluble Sulfates and Chlorides

A soluble sulfates and chlorides test was performed on a bulk soil sample to evaluate soil characteristics on concrete and reinforcing bar. Test procedures were in general accordance with ADOT ARZ 733 and ARZ 736 respectively.

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PROJECT:	ROSE GARDEN LANE DRAINAGE	**PROJECT NO:**	76793
LOCATION:	NWC OF 109TH AVENUE & ROSE GARDEN LANE	**WORK ORDER NO:**	06481
MATERIAL:	SEE BELOW	**DATE SAMPLED:**	10/20-10/24
SAMPLE SOURCE:	SEE BELOW	**REVIEWED BY:**	S.STEEL

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

SIEVE SIZES

					COBBLES	GRAVEL									SAND								Silt or Clay	
						Coarse					Fine				Coarse		Medium			Fine				
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 #**

PERCENT PASSING BY WEIGHT

TP-1 @ 0-4.5'	CL	38	19	19	100	100	100	100	100	100	100	100	100	100	99.3	97.3	96.7	94.1	89.1	86.5	83.4	76.2	65.3	1
TP-2 @ 4-7'	SC	37	20	17	100	100	100	100	100	100	100	99.3	98.3	96.5	95.3	93.4	92.9	90.9	87.5	85.5	81.6	66.8	48.3	6
TP-3 @ 1-5'	GC-GM	28	22	6	100	93.6	93.6	83.5	78.2	71.9	68.9	63.7	60.4	56.1	53.4	48.7	47.3	42.6	34.1	30.4	27.0	21.9	17.0	8
TP-4 @ 3-8'	GP-GC	42	19	23	100	100	92.3	85.9	78.9	68.8	61.2	50.4	44.5	36.3	31.9	24.4	22.9	18.6	14.1	12.1	10.2	7.6	5.8	12
TP-5 @ 10-11'	GP	38	25	13	100	100	100	98.1	85.4	75.6	66.0	54.2	48.8	42.4	39.5	34.3	32.7	26.6	17.0	12.9	9.5	5.4	3.7	16
TP-6 @ 12-14'	SM	NV	NP	NP	100	100	100	100	98.7	96.8	91.3	85.8	83.4	80.7	79.0	76.1	75.2	71.7	63.2	55.2	40.2	20.1	13.8	20
TP-8 @ 13-16'	SP-SM	NV	NP	NP	100	100	100	96.9	92.6	86.8	83.5	78.5	76.0	71.8	69.6	63.6	61.9	54.7	37.3	26.9	17.5	8.2	5.8	28

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PROJECT:	ROSE GARDEN LANE DRAINAGE	**JOB NO:**	76793
LOCATION:	NWC OF 109TH AVENUE & ROSE GARDEN LANE	**WORK ORDER NO:**	06481
MATERIAL:	CL	**LAB NO:**	1
SAMPLE SOURCE:	TP-1 **DEPTH:** 0-4.5'	**TESTED BY:**	MOTZZ LAB.

ANALYSES RESULTS

ANALYSIS	RESULTS	UNITS
SULFATE	25	ppm
CHLORIDE	22	ppm

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PROJECT:	ROSE GARDEN LANE DRAINAGE	**JOB NO:**	76793
LOCATION:	NWC OF 109TH AVENUE & ROSE GARDEN LANE	**WORK ORDER NO:**	06481
MATERIAL:	GP	**LAB NO:**	16
SAMPLE SOURCE:	TP-5 **DEPTH:** 10-11'	**TESTED BY:**	MOTZZ LAB.

ANALYSES RESULTS

ANALYSIS	RESULTS	UNITS
SULFATE	2	ppm
CHLORIDE	4	ppm