Final

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GEOTECHNICAL INVESTIGATION REPORT
SOUTHBANK PROTECTION
RED MOUNTAIN FREEWAY - PHASE II
DOBSON ROAD TO MCKELLIPS ROAD
ECS CONTRACT NO. 94-29
TRACS NO. H 0875 02D
MARICOPA COUNTY, ARIZONA

AGRA
Earth & Environmental

Final

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MARICOPA COUNTY, ARIZONA

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Submitted To:

Stanley Consultants, Inc.
2929 East Camelback Road
Phoenix, Arizona 85016

Submitted By:

AGRA Earth & Environmental, Inc.
3232 West Virginia Avenue
Phoenix, Arizona 85009

21 November 1995

AEE Job No. E94-124
Phase II - Report No. 6
Revision No. 1

Registered Professional Engineer (Civil)
CERTIFICATE NO.
12176
NORMAN HAROLD
WETZ
Date Signed 11/21/95
ARIZONA U.S.A.

AGRA
Earth & Environmental

STANLEY CONSULTANTS, INC.

2929 East Camelback Road, Suite 130 • Phoenix, AZ 85016-4425 Tel: 602/912-6500 Fax: 602/912-6599

FLOOD CONTROL DISTRICT
RECEIVED
FEB 05 1996
REMARKS

February 5, 1996

Richard Perreault
Chief, Planning Branch
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Planning and Project Management
2801 West Durango
Phoenix, Arizona 85009

RE: Contract No. 94-29
Project No. STP 600-8-(002)
TRACS No. H087503D
Design of Red Mountain Freeway
(Price Freeway - McKellips Road)

Dear Mr. Perreault:

Enclosed please find two (2) copies of the Final Geotechnical Investigation Report for the new Salt River bank protection, which will be constructed as part of the Red Mountain Freeway project between SR101L and McKellips Road.

This information was inadvertently omitted from your latest submittal package.

If you need additional information or have any questions, please contact this office.

Sincerely;

STANLEY CONSULTANTS, INC.

Steven Wilcox, P.E.
Project Manager

sw/tlb:FEB004.60/12168

cc: J. Holzmeister - WPA
Project Files (12168)

AGRA
Earth & Environmental

AGRA Earth &
Environmental, Inc.
3232 West Virginia Avenue
Phoenix, Arizona 85009-1502
Tel (602) 272-6848
Fax (602) 272-7239

18 January 1996
AEE Job No. E94-124
Phase II, Report No. 6
Revision No. 1
Addendum No. 1

Stanley Consultants, Inc.
2929 East Camelback Road
Phoenix, Arizona 85016

Attention: **Steven D. Wilcox, P.E.**
Project Manager

Gentlemen:

RE: SOUTHBANK PROTECTION
RED MOUNTAIN FREEWAY - PHASE II
DOBSON ROAD TO MCKELLIPS ROAD
ECS CONTRACT NO. 94-29
TRACS NO. H 0875 02D
MARICOPA COUNTY, ARIZONA

We have performed additional geotechnical borings in the vicinity of the aggregate washout ponds located from Station 484+00 to about Station 494+00. The aggregate wash ponds currently are active and contain saturated clays. In order to avoid the clays and limit right-of-way requirements, a vertical wall in conjunction with a sloped portion of the Salt River bank protection is proposed for this area.

Nine borings were advanced with our AP-1000 hammer drill rig utilizing 9 1/4-inch dual wall pipe. Boring Nos. 1V, 3V, 5V, 7V, and 9V were advanced vertically to a depth of about 40 feet below existing grades. Boring Nos. 2A, 4A, 6A, and 8A were advanced at a 30 degree angle from the vertical toward the existing clay ponds to a total length of about 50 feet. Logs of the test borings and a site plan showing the boring locations are attached.

Man-made fill consisting of sand, gravel and cobbles with varying amounts of construction debris were encountered in the borings. Large concrete particles should be expected in at least some of the excavations, along with asphaltic concrete, bricks and some wood and steel. The fill extends about 30 to 32 feet below existing grade or to about elevation 1171 to 1176 feet. Native deposits of sand, gravel and cobbles with some to occasional boulders underlie the fill material. No free groundwater was encountered in the borings, however, seepage of

water from the existing ponds could affect construction. Estimated limits of the fill are shown on the attached site plans.

In the area where available right-of-way and the clay pond restricts construction, it is recommended that the upper 20 feet (vertical height) of the Salt River bank protection consist of cement stabilized alluvium at a 1H:1V (horizontal to vertical) slope. A vertical, 4-foot wide reinforced concrete wall should extend from the bottom of the sloped bank protection to at least 10 feet below the estimated scour elevation. This will result in a vertical wall height of about 27 feet.

Due to the granular nature of the soils, it is anticipated that trenching will require slurry assistance techniques. Slurry properties and concreting techniques should meet the same requirements as those presented for drilled shafts in Section 609 of the Arizona Department of Transportation (ADOT) Special Provisions. Reinforcement requirements are anticipated to be minimal.

The global stability of the proposed system was analyzed utilizing the computer program STABL5 developed by Purdue University. A safety factor of 2.4 was calculated for a 20 foot high, 1H:1V slope above a 27 foot vertical slope, as recommended. The 10 feet of toe down below scour depth is necessary for the stability of the vertical portion of the wall.

This addendum should be attached to the original report and made a part thereof. If there are any questions, please do not hesitate to contact us.

Respectfully submitted,

AGRA Earth & Environmental, Inc.

Registered Professional Engineer (Civil) CERTIFICATE NO. 12176 NORMAN HAROLD WETZ Date Signed 1/18/96 ARIZONA, U.S.A.

Norman H. Wetz, P.E.
Senior Geotechnical Engineer

Reviewed by:

Registered Professional Engineer (Civil) CERTIFICATE NO. 13872 LAWRENCE A. HANSEN Date Signed 1/18/96 ARIZONA, U.S.A.

Lawrence A. Hansen, Ph.D., P.E.
Executive Vice President

c: Addressee (10)
mcb/J96-2/1-18-96

TEST DRILLING EQUIPMENT & PROCEDURES

Description of Subsurface Exploration Methods

Auger Boring Drilling through overburden soils is performed with 6 5/8" O.D., 3 1/4" I.D. hollow stem auger or 4 1/2" solid stem continuous flight auger. Carbide insert teeth are normally used on bits so they can penetrate soft rock or very strongly cemented soils. A CME-55 or CME-75 truck-mounted drill rig is used to advance the auger. The drill rigs are powered with six-cylinder Ford industrial engines capable of delivering about 7,000 to 8,400 foot-pounds torque to the drill spindle. The spindle is advanced with twin hydraulic rams capable of exerting 16,000 to 20,000 pounds downward force.

Generally, refusal to penetration of the auger is adopted as top of the SGC or river-run material, which normally requires other techniques for penetration. Grab samples or auger cuttings may be taken as necessary. Standard penetration tests or 2.42" diameter ring samples are taken in conjunction with the auger borings as needed, with the sampling interval and type being indicated on the boring logs.

Hammer Drill Drilling with the Hammer drill is accomplished with a Drill Systems AP1000 drill rig advancing a double-walled drive casing with a link-belt 180 diesel pile driving hammer, having a rated energy of 8,100 foot-pounds per blow. Where noted on the boring log, the hammer is equipped with a supercharger which can boost the energy to approximately 12,000 foot-pounds per blow. The supercharger is used only in portions of the boring where blow counts are relatively high. Cuttings are removed with compressed air by a reverse circulation process, and are collected in a cyclone from which grab samples are obtained. The drive casing is either 9" O.D. by 6" I.D. or 6 5/8" O.D. by 4" I.D. and employs an expendable bit of slightly larger diameter than the O.D. of the casing. Hammer blows required to advance the drive casing are recorded in 1′ increments, as noted on the boring logs. Standard penetration tests or 2.42" diameter ring samples taken are noted on the boring logs.

Odex System The Odex (overburden drilling with the eccentric method) system, also referred to as the DTH (down-the-hole hammer) system, consists of a pneumatic-rotary percussion down-the-hole hammer operating at the bottom being drilled through a 5" diameter steel casing. The eccentric button percussion bit overreams the boreholes and allows advancement of the casing. The same compressed air or air-detergent (foam) mixture that operates the hammer also serves to expel the cuttings from the borehole, where they can be collected as grab samples. Retraction of the eccentric drill bit allows removal of the hammer from the center of the casing to facilitate standard penetration testing (ASTM D1586) where noted on the boring logs.

TEST DRILLING EQUIPMENT & PROCEDURES (CONT.)

Schramm Rotadrill The Schramm T64H truck-mounted drill rig is a top drive rotary rig capable of up to 85,500 inches/pounds of torque with a pulldown capacity of 35,000 lbs. Drilling is performed with either 4", or larger, diameter Tricone roller bits or 4" to 6" diameter down-the-hole hammer. Cutting removal is facilitated by compressed air or air/water mixtures and collected in a cyclone. Where noted on the boring logs, grab samples of the cuttings were collected. When casing is required to stabilize the borehole, an Aardvark drill through casing hammer is utilized, permitting simultaneous drilling and driving of the casing. Casing penetration is recorded on the boring logs in feet per minute. Standard penetration, 2.42" diameter ring samples, Shelby tubes, pitcher tube or Denison samples taken are noted on the boring logs.

Sampling Procedures Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D1586 test procedure. In many cases, 2" O.D., 1 3/8" I.D. samplers are used to obtain the standard penetration resistance. "Undisturbed" samples of firmer soils are often obtained with 3" O.D. samplers lined with 2.42" I.D. brass rings. The driving energy is generally recorded as the number of blows of a 140-pound, 30-inch free fall drop hammer required to advance the samplers in 6-inch increments. However, in stratified soils, driving resistance is sometimes recorded in 2- or 3-inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and the realistic penetration values obtained for consideration in design. These values are expressed in blows per 6 inches on the boring logs. "Undisturbed" sampling of softer soils is sometimes performed with thin walled Shelby tubes (ASTM D1587), pitcher samplers, Denison samplers or continuous CME samplers. Where samples of rock are required, they are obtained by NQ diamond core drilling (ASTM D2113). Tube samples are labeled and placed in watertight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings. Also, representative samples are obtained from the cuttings from the hammer and Schramm drill rig.

Boring Records Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares the boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487), with appropriate group symbols being shown on the boring logs.

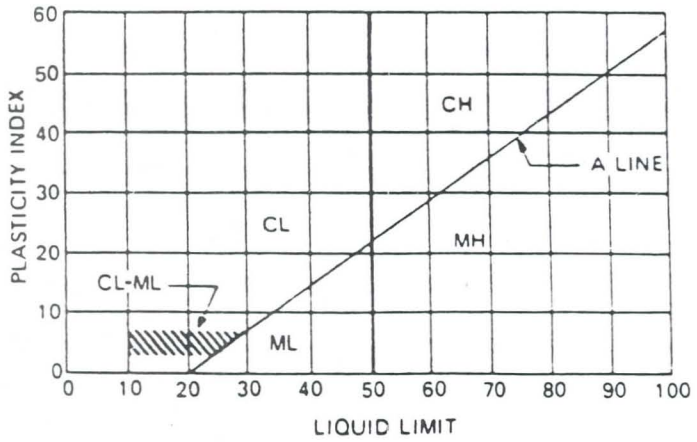
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-66T.

MAJOR DIVISIONS				GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
					GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 seive)			SW	Well graded sands, gravelly sands.
					SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)			ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)			MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.
	CLAYS (LIMITS PLOT ABOVE "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)			CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to ¾ in.
Fine gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve

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TERMINOLOGY USED TO DESCRIBE THE RELATIVE DENSITY, CONSISTENCY OR FIRMNESS OF SOILS

The terminology used on the boring logs to describe the relative density, consistency or firmness of soils relative to the standard penetration resistance is presented below. 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. Relative Density. Terms for description of relative density of cohesionless, uncemented sands and sand-gravel mixtures.

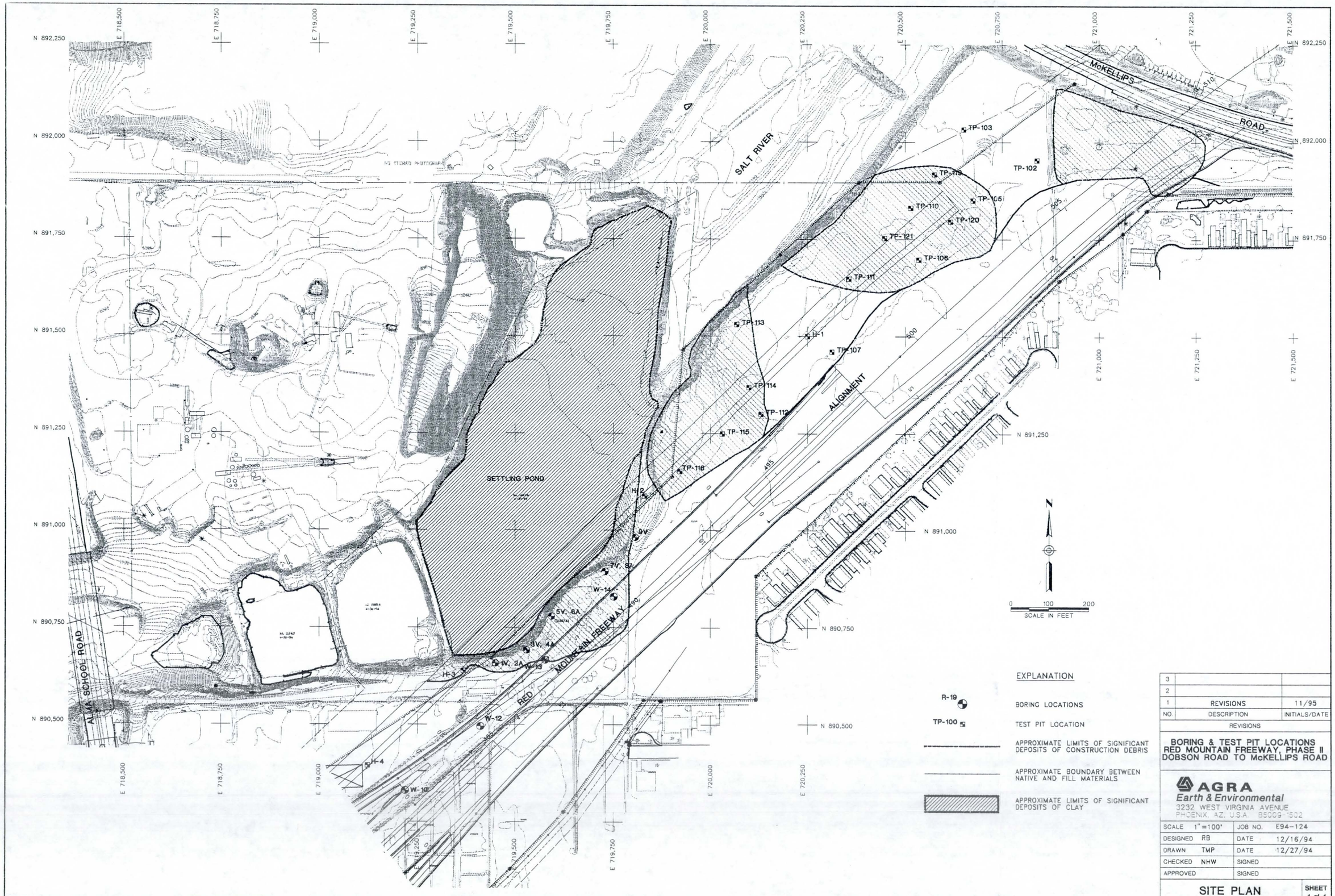
N	Relative Density
0-4	Very loose
5-10	Loose
11-30	Medium dense
31-50	Dense
50+	Very dense

2. Relative Consistency. Terms for description of clays which are saturated or near saturation.

N	Relative Consistency	Remarks
0-2	Very soft	Easily penetrated several inches with fist.
3-4	Soft	Easily penetrated several inches with thumb.
5-8	Medium stiff	Can be penetrated several inches with thumb with moderate effort.
9-15	Stiff	Readily indented with thumb, but penetrated only with great effort.
16-30	Very stiff	Readily indented with thumbnail.
30+	Hard	Indented only with difficulty by thumbnail.

3. Relative Firmness. Terms for description of partially saturated and/or cemented soils which commonly occur in the Southwest 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
50+	Hard



NO.	DESCRIPTION	INITIALS/DATE
3		
2		
1	REVISIONS	11/95

REVISIONS

BORING & TEST PIT LOCATIONS
RED MOUNTAIN FREEWAY, PHASE II
DOBSON ROAD TO McKELLIPS ROAD

AGRA
Earth & Environmental
3232 WEST VIRGINIA AVENUE
PHOENIX, AZ, U.S.A. 85009-1502

SCALE	1"=100'	JOB NO.	E94-124
DESIGNED	RB	DATE	12/16/94
DRAWN	TMP	DATE	12/27/94
CHECKED	NHW	SIGNED	
APPROVED		SIGNED	

SITE PLAN

SHEET 4 of 4

AGRA EARTH & ENVIRONMENTAL, INC. DWG No. 124A11-4

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. 1V

JOB NO. E94-124 DATE 1-2-96

LOCATION Sta. 486+43, 148' L
RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1203.12'
DATUM Stanley Consultants Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	N/A								slightly moist	Man-made FILL
	N/A									**SANDY GRAVEL**, some silt, predominantly fine to medium grained sand, coarse grained subrounded gravel, nonplastic, light brown
	8									
	125								loose to very dense	
	115									
5	150									
	150			A						note: some construction debris including concrete, brick & trace of wire, asphaltic, plastic
	88									
	136									
	199									
10	132									note: dark brown from 24' to 25', slightly moist to moist
	175									
	57							GP		
	60									
	66									
15	84									
	108									
	134			A						
	121									
	74									
20	N/A									
	51									
	57									
	87									
	82									
25	50									
	70									
	45									
	35			A						
	140									
30	50									
	106			A						NATIVE
	173								slightly moist	**SAND, GRAVEL & COBBLES**, some boulders, predominantly medium grained sand, subrounded cobbles & gravel, poorly graded, nonplastic, light brown
	350									
	529							GP		
35	200								very dense	
	104									
	74									
	69			A						note: increase in cobbles & small boulders at 37', estimated maximum particle size of 36"
40										Stopped Drill at 39'
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. 2A

JOB NO. E94-124 DATE 1-2-96

LOCATION Sta. 486+45, 152' L
RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1202.76'
DATUM Stanley Consultants Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	N/A								slightly moist to moist	note: drilled at 30 degree angle from vertical
	N/A									Man-made FILL
	20									**SANDY GRAVEL**, trace to some silt, predominantly medium grained sand, subrounded, nonplastic, brown to light gray
	33								medium dense to very dense	
	36									
5	90									
	101									
	226									
	>150									note: some concrete debris
	162									
10	254									note: considerable voids with large pieces of concrete debris from 19' to 27'
	N/A									
	N/A							GP		
	N/A									
	57									note: increase in silt & clay from 28' to 32', possible pond sediments
15	63									
	62			A						
	70									note: considerable asphalt, rubber & some concrete debris from 32' to 36'
	67									
	23									
20	22									
	33									
	30									
	32									
	36									
25	30									
	30									
	26									
	40			A						
	N/A									
30	20									
	43									
	69									
	77									
	129									
35	88									
	28								slightly moist to moist, medium dense to very dense	NATIVE
	123			A				SP		**GRAVELLY SAND**, some to trace of silt, some cobbles, predominantly coarse grained subrounded gravel, poorly graded, nonplastic, brown
	150									
	56									
40	>100									
	>100									
	>500								slightly moist	**SAND, GRAVEL & COBBLES**, some boulders, medium grained sand, subrounded gravel & cobbles, poorly graded, nonplastic, brown, note: boulder at 42'
	110							GP		
	105									
45	N/A			A						
	N/A									
	N/A								very dense	Stopped Drill at 49'
	N/A									
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. 3V

JOB NO. E94-124 DATE 1-3-96

LOCATION Sta. 487 + 18, 121' L
RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1204.20'
DATUM Stanley Consultants Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	N/A								slightly moist	Man-made FILL
	5									**SANDY GRAVEL**, some small cobbles, some debris, predominantly medium grained sand, coarse grained, subrounded, nonplastic, light brown
	3									
	2								very loose to medium dense	
	5									
5	4									note: debris includes concrete, metal
	4									
	3									
	5									note: increase in fine grained sand at 26'
	N/A									
10										
								GP		
15										
	12									
	16									
	25									
	23			A						
20	18									
	14									
	10									
	16									
	17									
25	20									
	17									
	14			A						
	15									
	17									
30	28									
	21									
	22									
	171									NATIVE
	437			A					slightly moist	**SAND, GRAVEL & COBBLES**, fine to medium grained sand, subrounded grave & cobbles, nonplastic, light brown
35	525									
	140							GP		
	441								very dense	
	304									
	N/A									note: medium grained sand from 32' to 33'
40										note: possible boulder from 33' to 35'
										Stopped Drill at 39'
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. 4A

JOB NO. E94-124 DATE 1-3-96

LOCATION Sta. 487+20, 123' L
RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1204.26'
DATUM Stanley Consultants Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	5								slightly moist	note: drilled at 30 degree angle from vertical
	4									Man-made FILL
	5									
	3								very loose to dense	**SANDY GRAVEL**, some cobbles, some debris, predominantly fine to medium grained sand, coarse grained, subrounded, nonplastic, brown
	4									
5	6									
	5									
	6									
	6									note: debris in fill includes concrete & wood
	5									
10	12									
	12									note: increase in fine grained sand at 24'
	16									
	10									
	31									note: large pieces of concrete at 37', with possible voids
15	45							GP		
	34									
	50									
	27			A						
	21									
20	24									
	26									
	23									
	22									
	16									
25	20									
	50									
	43			A						
	40									
	35									
30	25									
	25									
	27									
	23									
	39									
35	46									
	43									
	129									
	218									NATIVE
	477								slightly moist to moist	**SAND, GRAVEL & COBBLES**, some boulders, medium to coarse grained subangular to subrounded sand, subrounded gravel & cobbles, nonplastic, brown
40	409			A						
	383									
	>500							GP		
	>500								very dense	
	369									
45	403									
	>400									
	>400									Stopped Drill at 49'
	>400									
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. 5V

JOB NO. E94-124 DATE 1-3-96

LOCATION Sta. 488+32, 136' L
RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1207.27'
DATUM Stanley Consultants Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	N/A								slightly moist	Man-made FILL
	N/A									**SANDY GRAVEL**, trace of cobbles, some debris, fine grained sand, subrounded, poorly graded, nonplastic, brown
	N/A									
	N/A								loose to dense	
5	10									
	11									
	10									note: debris in fill includes concrete, brick, plastic & metal
	13									
	12									
10	18			A						
	11									
	11									
	13							GP		
	13									
15	12									
	11									
	14									
	14									
	10									
20	13			A						
	29									
	53									
	38									
	30									
25	43									
	35									
	38									
	55									
	51									
30	22									
	26									
	43									
	74			A						NATIVE
	101								moist	**SAND, GRAVEL & COBBLES**, some boudlers, considerable clay, predominantly medium grained sand, subrounded, poorly graded gravel & cobbles, nonplastic to low plasticity, brown
35	125									
	317							GP	very dense	
	429									
	>500									
	>500									
40										note: decrease in clay below 33'
										Stopped Drill at 39'
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. 6A

JOB NO. E94-124 DATE 1-3-96

LOCATION Sta. 488+34, 140' L
RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1206.46'
DATUM Stanley Consultants Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	N/A								slightly moist	note: drilled at 30 degree angle from vertical Man-made FILL
									medium dense to very dense	**SANDY GRAVEL**, some clay, some debris, predominantly fine to medium grained sand, poorly graded, subrounded, nonplastic, brown
5	19									
	18									
	25									
	25									note: debris in fill includes plastic, wood & concrete
	11									
10	14									
	19									note: considerable fine grained sand & silt below 15'
	19									
	29									
	27									
15	27							GP		
	27									
	34			A						
	12									
	26									
20	23									
	35									
	61									
	77									
	56									
25	60									
	33									
	25			A						
	25									
	27									
30	25									
	30									
	31									
	34									
	39									
35	31									
	24									
	31									
	29									
	18									
40	45									
	135			A						**SAND, GRAVEL & COBBLES**, trace to some boulders, predominantly medium grained sand, subangular to subrounded cobbles & gravel, nonplastic, brown, note: increase in medium grained sand at 46'6"
	304								slightly moist	
	151									
	317							GP		
45	>400								very dense	
	179									
	110									
	130									Stopped Drill at 49'
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. 7V

JOB NO. E94-124 DATE 1-4-96

LOCATION Sta. 490 + 10, 127' L
RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1205.96'
DATUM Stanley Consultants Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	N/A								slightly moist	Man-made FILL
	3									**SANDY GRAVEL**, trace to some cobbles, some debris, fine to medium grained sand, subrounded, nonplastic, brown
	5									
	5								loose to very dense	
	4									
5	6									
	10									note: debris includes plastic, concrete, asphalt & metal
	12									
	22									
	26									note: possible voids, soft material from 15' to 17'
10	26							GP		
	35									
	47									note: increase in silt at 21'
	44									
	49									
15	21									
	19									
	25			A						
	15									
	15									
20	18									
	10									
	20									
	24									
	31									
25	35									
	31			A						
	36									
	52									
	78									NATIVE
30	215								slightly moist	**SAND, GRAVEL & COBBLES**, some boulders, predominantly medium grained sand, subrounded cobbles & gravel, nonplastic, brown
	291									
	>500									
	109			A				GP	very dense	
	175									
35	210									note: increase in medium grained sand from 33'6" to 35' & at 37'
	>200									
	>200									
	>200									
40										Stopped Drill at 39'
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. 8A

JOB NO. E94-124 DATE 1-4-96

LOCATION Sta. 490+12, 132' L
RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1205.44'
DATUM Stanley Consultants Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	0								slightly moist	note: drilled at 30 degree angle from vertical
	5									Man-made FILL
	24									**SANDY GRAVEL**, some silt, some, debris, some cobbles, predominantly fine to medium grained, subrounded, nonplastic, brown
	27								very loose to very dense	
	29									
5	30									
	30									
	19									
	17									note: debris includes concrete, brick & metal
	22									
10	14									
	15									note: considerable sand from 9' to 13'
	20							GP		
	28									note: fine grained sand, wet, dark brown, poorly graded (possible pond sediments) from 30' to 35'
	32									
15	41									
	75									
	78			A						note: large debris includes bricks at 35'
	38									
	26									
20	18									
	24									
	23									
	26									
	15									
25	15									
	23			A						
	14									
	15									
	19									
30	16									
	16			A						
	12									
	12									
	19									
35	60									
	185									NATIVE
	377									**SAND, GRAVEL & COBBLES**, some boulders, predominantly medium grained sand, subrounded gravel & cobbles, nonplastic, brown
	410								slightly moist to moist	
	750									
40	>500									
	>500							GP	very dense	
	>400									
	>400									
	>400									
45	>400			A						
	>400									
	>400									Stopped Drill at 49'
	>400									
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. 9V

JOB NO. E94-124 DATE 1-4-96

LOCATION Sta. 491+24, 143' L
RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV.
DATUM Stanley Consultants Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	N/A								slightly moist	**GRAVELLY SAND**, some to considerable silt, fine grained subrounded gravel, predominantly fine to medium grained, nonplastic, light brown
									medium dense to very dense	
5	13							GP		
	17									
	34									note: increase in coarse grained gravel below 6'
	20			A						
	23									
10	52									
	45									
	50								slightly moist	**SAND, GRAVEL & COBBLES**, predominantly fine to medium grained sand, subrounded gravel & cobbles, nonplastic, light brown
	174			A						
	175									
15	190								very dense	
	185									
	110									note: small boulders below 16'
	163									
	213									note: decrease in cobbles at 18', increase in medium to coarse grained sand
	258									
20	334							GP		
	183									
	152									
	215									
	115									
25	131									
	100			A						
	100									
	96									
	N/A									
30	N/A									
	N/A									
	N/A									
	134									
	315									
35										Stopped Drill at 35'
40										
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

AGRA
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21 November 1995
AEE Job No. E94-124
Phase II, Report No. 6
Revision No. 1

Stanley Consultants, Inc.
2929 East Camelback Road
Phoenix, Arizona 85016

Attention: Steven D. Wilcox, P.E.

Gentlemen:

Re: SOUTHBANK PROTECTION
RED MOUNTAIN FREEWAY - PHASE II
DOBSON ROAD TO MCKELLIPS ROAD
ECS CONTRACT NO. 94-29
TRACS NO. H 0875 02D
MARICOPA COUNTY, ARIZONA

Our revised Geotechnical Investigation Report addressing the Southbank Protection for the referenced project is herewith submitted. The report includes the results of a current investigation as well as pertinent results of previous investigations in the vicinity of the proposed hardbank. In addition, results of laboratory testing are submitted, and recommendations for materials to be used in construction are presented.

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

Respectfully submitted,
AGRA Earth & Environmental, Inc.

Norman H. Wetz, P.E.
Senior Geotechnical Engineer

Reviewed by:

Lawrence A. Hansen, Ph.D., P.E.
Executive Vice President

c: Addressee (7)
klp/94J-7/11-20-95

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APPENDICES

Appendix A - Field Investigation
Appendix B - Laboratory Test Data
Appendix C - Stability Analysis Diagrams

MAP POCKET

Sheets 1 through 4

Registered Professional Engineer (Civil)
CERTIFICATE NO.
12176
NORMAN HAROLD
WETZ
Date Signed 11/21/95
ARIZONA, U.S.A.

1.0 INTRODUCTION

This report presents the results of a geotechnical investigation addressing the southbank protection for the north side of the Red Mountain Freeway in Maricopa County, Arizona. The report provides information and recommendations for materials to be used for construction of the hardbank between Dobson Road and McKellips Road.

2.0 PROJECT DESCRIPTION

It is understood that the southbank protection will provide flood and scour protection for the Red Mountain Freeway, located on the south bank of the adjacent Salt River, during flood flows in the river. The southbank protection will consist of a hardbank constructed of a cement-stabilized alluvium embankment that will extend from Dobson Road to about McKellips Road, for a total length of about 9,000 feet. The cement-stabilized alluvium embankment will extend above the proposed channel grade about 2 to 32 feet and will extend below the proposed channel grade about 23 to 35 feet. The embankment will be about 8 feet in thickness and will be placed at a slope of 1H:1V (horizontal to vertical).

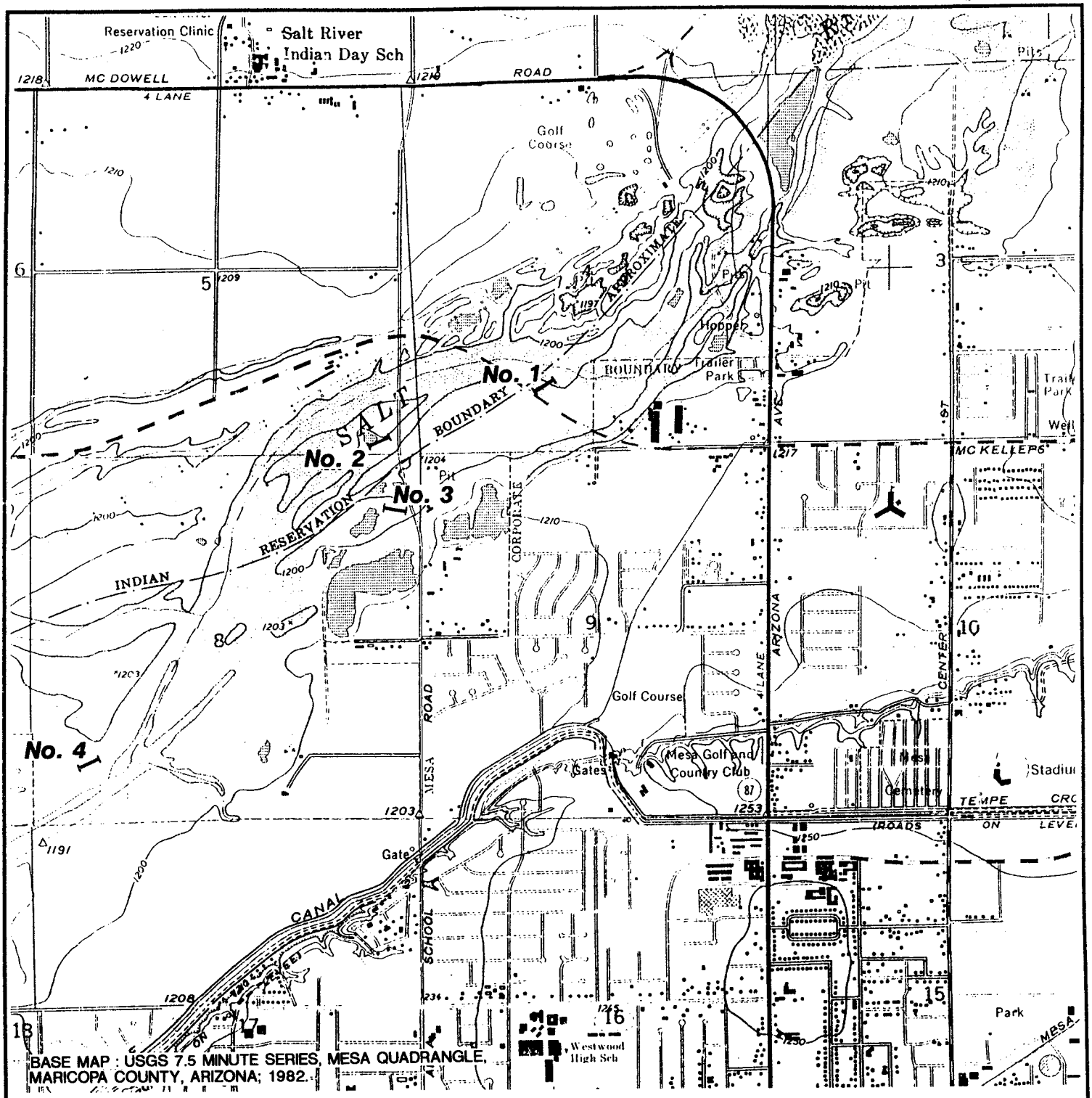
3.0 INVESTIGATION

3.1 REVIEW OF EXISTING DATA

Reports of previous geotechnical investigations performed by this firm in the project area were reviewed. Borings and test pits completed for these previous reports were included in this report if considered pertinent to the project. Results of laboratory testing performed on samples obtained from the previous borings and test pits are included. The locations of borings and test pits included in the previous reports are shown on the site plans, Sheets 1 through 4 in the map pocket.

3.2 SURFICIAL EXPLORATION

The grain-size distribution of channel bed materials was determined at four locations in the Salt River channel adjacent to the planned Red Mountain Freeway, including two determinations at Alma School Road, and one each at McKellips Road and Dobson Road. The locations of these surveys are shown in Figure 1. The surficial deposits in the Salt River in this reach include a large percentage of cobbles and boulders, and it was not possible to perform laboratory sieve analysis testing to determine grain-size distribution. Therefore, grain-size distribution characteristics were estimated utilizing particle-count techniques presented by



NORTH

LEGEND

No. 1 — LOCATION OF TRAVERSE LINE

AGRA
Earth & Environmental
3232 WEST VIRGINIA AVENUE
PHOENIX, AZ, U.S.A. 85009-1502

JOB NO.	E94-124
DESIGN	KAR
DRAWN	SPG
DATE	6/95
SCALE	1" = 2000'

FIGURE 1 - SITE PLAN
SHOWING BEDDING ANALYSIS TRAVERSE LOCATIONS

Kellerhals and Bray (1971)*. Details of these surveys are presented in Letter No. 3, AEE Job No. E94-124, dated 15 June 1995.

The calculated results and the grain-size distribution plots are presented in Appendix B. It should be emphasized that the estimated grain-size distributions represent only the surficial bed materials at the locations investigated. It appears that the surficial materials at all four locations may represent a relatively thin armoring layer, and may not represent the channel sediments at some depth below the surface.

3.3 SUBSURFACE EXPLORATION

Twelve backhoe test pits (H-1 through H-12) were excavated to depths varying between about 10 to 25 feet below existing grade utilizing an LS-4300 excavator. Our field geologist continuously observed the excavation of the test pits, visually classified the materials encountered, packaged and labeled soil samples, and prepared the logs of the test pits. Results of the field investigation are presented in Appendix A, which includes logs of previous borings and test pits and Test Pits H-1 through H-12. The locations of the test pits and borings are shown on Sheets 1 through 4 located in the map pocket.

Some of the test pits and borings from earlier reports were located by coordinates rather than by station and offset distance from the main alignment centerline. The test pits and borings which are included in this report subsequently were located with respect to the main alignment centerline, with this data presented in Table 1.

3.4 LABORATORY ANALYSIS

Grain-size analysis and Atterberg limits tests were performed on selected samples. Results of these tests are presented in Appendix B along with tests performed on samples from the earlier borings and test pits. Density determinations were made on relatively undisturbed samples from some of the earlier borings included herein. The results of these tests are shown on the boring logs.

4.0 SITE CONDITIONS & GEOTECHNICAL PROFILE

4.1 SITE CONDITIONS

The southbank protection generally is located near the south bank of the existing channel of the Salt River. Much of the alignment has been subjected to aggregate mining operations.

*References are listed at the end of this report.

TABLE 1

Test Hole	Coordinates	Station & Offset, Main Alignment Centerline
TP-102	N891,945-E720,838	130′ Lt. Sta. 505+30
TP-103	N892,033-E720,649	320′ Lt. Sta. 504+50
TP-105	N891,850-E720,674	170′ Lt. Sta. 503+47
TP-119	N891,917-E720,573	285′ Lt. Sta. 503+20
TP-120	N891,795-E720,615	165′ Lt. Sta. 502+68
TP-110	N891,830-E720,514	260′ Lt. Sta. 502+20
TP-106	N891,670-E720,534	145′ Lt. Sta. 501+43
TP-121	N891,753-E720,448	245′ Lt. Sta. 501+20
TP-111	N891,648-E720,357	232′ Lt. Sta. 499+84
TP-107	N891,461-E720,313	130′ Lt. Sta. 498+20
TP-113	N891,530-E720,069	350′ Lt. Sta. 496+95
TP-114	N891,369-E720,100	210′ Lt. Sta. 496+02
TP-112	N891,299-E720,131	140′ Lt. Sta. 495+78
TP-115	N891,249-E720,031	170′ Lt. Sta. 494+70
TP-116	N890,986-E719,991	180′ Lt. Sta. 493+25
HB-3	N886,476-E513,119	350′ Lt. Sta. 405+30
HP-6	N886,486-E512,758	415′ Lt. Sta. 402+50

These areas feature stockpiles of overburden soils from the mining operations as well as mixtures of sand, gravel and construction debris.

4.2 GEOTECHNICAL PROFILE

4.2.1 Fill Deposits

Man-made fill deposits were encountered throughout much of the alignment. These deposits are described as follows:

- Man-made fill consisting of silty and sandy gravel and sand, gravel and cobbles mixed with a trace to a considerable amount of debris was encountered from about Stations 401+5 to 404+50 and Stations 412+40 to 425+30. The debris consists of concrete and asphaltic concrete rubble, with some bricks, glass, wood, wire, plastic, water heater tanks and vegetation. The concrete rubble fragments range in size up to 3 to 4 feet in maximum dimension. The fill deposits generally are loose, nonplastic and brown.

- Mine road fill is present from Stations 442+00 to 451+00 and Stations 458+50 to 467+60. The mine road fill consists of sand, gravel and cobble mixtures with varying amounts of silt, clay and boulders. Some deposits with cobbles and boulders ranging in size from 4 to 24 inches were encountered in the borings. These fills vary in thickness from 10 to 50 feet. Concrete mixer truck washout deposits are present along the north bank of the mine road adjacent to the Salt River between Stations 451+00 to 454+20, approximately. In general, only minor amounts of construction debris were encountered in these fills. However, a larger amount of construction debris was encountered between Stations 463+00 to 467+60.

- Construction debris is present between Stations 467+60 and 469+00 and in isolated areas between Stations 485+10 and 503+00. These deposits consist of sand, gravel and cobble mixtures, with varying amounts of silt and clay, and contain considerable to minor amounts of construction debris. The construction debris consists primarily of large concrete and asphaltic concrete fragments and rubble, with some wood, metal and plastic. Also, tree trunks and carpet were encountered in isolated areas east of Alma School Road.

  The construction debris landfill deposits are about 35 to 55 feet thick in the Alma School Landfill, and are typically 5 to 10 feet thick, with zones up to 20 feet thick, in isolated areas east of Alma School Road. These deposits vary from dense to loose and have been dumped and placed with little or no compactive effort.

- Clayey fills are present from Station 485 + 80 to about Station 491 + 90. No borings were advanced in these areas due to inaccessibility. However, it is estimated that the bottom elevation of the clayey fill is at about elevation 1175 feet. The estimated thickness of the clay deposits is 30 to 35 feet. It is anticipated that the materials in the active clay settling ponds consist predominantly of silty clay. These clays have been deposited hydraulically, and are anticipated to be near saturation and very soft.

  Approximate limits of the fill materials are shown on Sheets 1 through 4 in the map pocket. A summary of the fill materials is presented in Table 2.

4.3 NATIVE DEPOSITS

The native soils underlying the hardbank alignment generally consist of sand, gravel and cobbles (SGC) with minor layers of silt, sand and gravel mixtures. The near-surface natural deposits contain little to no fine material and are generally nonplastic, with the exception of an occasional layer of medium plasticity sandy or silty clay. Below a depth of about 20 feet below existing grade, the fines and clay content of the material increases and the sand, gravel and cobble mixtures are of low plasticity. The soils typically are dense to very dense. The sand, gravel and cobbles are generally poorly graded and contain occasional boulders from 18 to 36 inches in diameter.

4.4 SOIL MOISTURE & GROUNDWATER CONDITIONS

Groundwater was encountered at depths of 22, 49, 25 and 20 feet in Test Pit HP-6 (Station 402 + 50), Boring HB-3 (Station 405 + 30), Boring B-1 (Station 444 + 20) and Test Pit H-9, respectively. Soil moisture contents above the water table generally were low. It is expected that the groundwater level will fluctuate seasonally and, therefore, dewatering may be necessary during construction, depending upon the time of year construction takes place and if flows are occurring in the Salt River.

5.0 DISCUSSION & RECOMMENDATIONS

5.1 ANALYSIS OF RESULTS

Based on the information provided by the test pits, test borings and estimated grain-size distributions, there is sufficient granular material along the alignment for the construction of the hardbank proposed as the southbank protection. However, the granular material will need to be processed to provide a reasonably uniform and properly graded material. The cement content required for the cement-stabilized hardbank will be higher for the SGC materials which contain clay than those that are relatively clean. It is recommended that where clay layers are

TABLE 2

Location (Stations)	Anticipated Subsurface Conditions
399+50 to 401+50	Native soils consisting of sand, gravel and cobbles.
401+50 to 404+50	Man-made fills with some construction debris in portions of the proposed embankment.
404+50 to 412+40	Native soils consisting of sand, gravel and cobbles.
412+40 to 425+30	Man-made fill with some to considerable construction debris.
425+30 to 442+00	Native soils consisting of silty sands and sand and gravel mixtures overlying sand, gravel and cobbles.
442+00 to 451+00	Mine haul road fill consisting of sand, gravel, cobble and boulder mixtures.
451+00 to 454+20	Concrete mixer truck washout materials overlying mine haul road fill and native sand, gravel and cobbles.
454+20 to 458+50	Native soils consisting of sand and gravel mixtures overlying sand, gravel and cobbles.
458+50 to 467+60	Fills consisting of sand, gravel and cobble mixtures with a trace to considerable construction debris. Construction debris increase towards Station 467+60.
467+60 to 469+00	Construction debris landfill.
480+00 to 485+10	Native soils consisting of silty sand and sand with gravel overlying sand, gravel and cobbles.
485+10 to 485+80	Construction debris landfill overlying sand, gravel and cobbles.
485+80 to 491+90	Clayey fills (settling ponds for aggregate washing).
491+90 to 503+00	Construction debris landfills with deeper portions between Stations 492+50 to 496+70 and Stations 499+40 to 503+00.

encountered within excavations, these materials be wasted due to the difficulty in blending these materials with the SGC.

5.2 CEMENT-STABILIZED HARDBANK

Soil-cement and roller-compacted concrete (RCC) can be used for hardbank construction. However, availability of the required type of aggregate for these two alternatives governs construction costs. The fines content (defined as percent finer than the No. 40 sieve) of the SGC does not meet conventional requirements for either soil-cement or RCC construction. If either of these alternatives are to be used, fines will have to be imported from a borrow source to achieve a conventional mix.

It is our opinion that the Salt River alluvium can provide adequate bank protection without the addition of fines if the embankment material is plant-mixed on the site to produce cement stabilized aggregate (CSA). Based on the results of laboratory analyses, the following guidelines for gradation are recommended:

Sieve Size (square openings)	Percent Passing by weight
3-inch	100
No. 4	30-65
No. 200	0-8

The materials should be free of organic or other deleterious material and should contain no clay lumps larger than 1.0 inch in diameter. The plasticity index of the material should be no greater than 25 when determined in accordance with the requirements of AASHTO T-90.

Where materials are nonplastic, a cement content of 6 to 7 percent is estimated to be required to achieve a 7-day minimum compressive strength of 750 psi. Where the SGC materials are clayey and have a plasticity index of 15 to 25, a cement content of 8 to 10 percent is estimated to be required. The clay will have an adverse effect on the strength of the proposed hardbank materials. It is recommended that a mix design be performed using the specific materials proposed for construction. Where possible, the clayey SGC should be avoided in the production of cement-stabilized embankment materials.

5.3 TEMPORARY CUT SLOPES

Temporary cut slopes of 1-1/2H:1V are recommended for the upper, cleaner portions of the SGC. Temporary cut slopes of 1-1/4H:1V are recommended for the more clayey SGC strata. Where loose man-made fill, construction debris or loose cohesionless sands are present, the

slopes should be laid back at a slope of 2H:1V or flatter. Although benches are not required for stability, benches at selected elevations would provide greater protection for workmen at the bottom of the excavation. Some minor raveling as a result of precipitation and drying should be anticipated. All surface runoff should be diverted from the top of cut slopes to help prevent surface erosion of the slope. The temporary cut slopes in the clayey fill (settlement ponds) will require relatively flat slopes, possibly as flat as 4:1 to 5:1. Special techniques such as use of draglines may be required to make the necessary excavation for construction.

5.4 PERMANENT SLOPES

Permanent slopes consisting of CSA should be placed in horizontal lifts 8 feet in horizontal width. The hardbank will extend from a surface elevation of about 1186.2 to 1209.4 feet with a toe-down elevation of about 1120 to 1174 feet. This results in embankment heights of about 34 to 66 feet. The bed elevation of the Salt River varies from elevation 1156.3 to 1203 feet. The embankment above grade is about 2 to 32 feet in height. Stability analyses were performed on one of the higher sections utilizing the computer program STABL5 (Achilleos, 1988), developed by Purdue University. A height of 66 feet and a finished slope of 1H:1V was analyzed for three cases.

Case 1, which analyzes the end of construction, determined a calculated safety factor of 1.3. Case 2, which considered the maximum water level and maximum scour, determined a safety factor of 1.8. Case 3, which considered the rapid drawdown at maximum scour, determined a safety factor of 1.2. Diagrams for each case, showing the geometry and calculated slip surfaces, are presented in Appendix C. Based on the results of the stability analyses, the 1H:1V slope will provide an adequate degree of stability. The phreatic surfaces assumed for the analyses are relatively high and will not be achieved due to the low permeability of the CSA. Lower phreatic surfaces will result in higher safety factors.

5.5 MAN-MADE FILL

It is recommended that a monitoring plan for excavation of the existing man-made fill be prepared and implemented by the Contractor. The monitoring plan should address the removal of any hazardous or potentially hazardous materials that may be encountered during excavation. The monitoring plan should include, as a minimum, the following items:

- Organizational structure and personnel responsibilities.
- Emergency response procedures.
- Extended investigations and remedial actions.

Excavated man-made fill materials can be reused as hardbank material, provided that all oversized material, hazardous or potentially hazardous material, organic material and debris have been removed. It is estimated that 10 to 20 percent of the existing man-made fill will have to be wasted.

REFERENCES

Achilleos, E., 1988, User Guide for PC STABL 5M, Purdue University and Indiana Department of Highways, Joint Highway Research Project, Report JHRP-88/19, December.

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APPENDIX A

Field Investigation

AGRA
Earth & Environmental

TEST DRILLING EQUIPMENT & PROCEDURES

Description of Subsurface Exploration Methods

Auger Boring Drilling through overburden soils is performed with 6 5/8" O.D., 3 1/4" I.D. hollow stem auger or 4 1/2" solid stem continuous flight auger. Carbide insert teeth are normally used on bits so they can penetrate soft rock or very strongly cemented soils. A CME-55 or CME-75 truck-mounted drill rig is used to advance the auger. The drill rigs are powered with six-cylinder Ford industrial engines capable of delivering about 7,000 to 8,400 foot-pounds torque to the drill spindle. The spindle is advanced with twin hydraulic rams capable of exerting 16,000 to 20,000 pounds downward force.

Generally, refusal to penetration of the auger is adopted as top of the SGC or river-run material, which normally requires other techniques for penetration. Grab samples or auger cuttings may be taken as necessary. Standard penetration tests or 2.42" diameter ring samples are taken in conjunction with the auger borings as needed, with the sampling interval and type being indicated on the boring logs.

Hammer Drill Drilling with the Hammer drill is accomplished with a Drill Systems AP1000 drill rig advancing a double-walled drive casing with a link-belt 180 diesel pile driving hammer, having a rated energy of 8,100 foot-pounds per blow. Where noted on the boring log, the hammer is equipped with a supercharger which can boost the energy to approximately 12,000 foot-pounds per blow. The supercharger is used only in portions of the boring where blow counts are relatively high. Cuttings are removed with compressed air by a reverse circulation process, and are collected in a cyclone from which grab samples are obtained. The drive casing is either 9" O.D. by 6" I.D. or 6 5/8" O.D. by 4" I.D. and employs an expendable bit of slightly larger diameter than the O.D. of the casing. Hammer blows required to advance the drive casing are recorded in 1′ increments, as noted on the boring logs. Standard penetration tests or 2.42" diameter ring samples taken are noted on the boring logs.

Odex System The Odex (overburden drilling with the eccentric method) system, also referred to as the DTH (down-the-hole hammer) system, consists of a pneumatic-rotary percussion down-the-hole hammer operating at the bottom being drilled through a 5" diameter steel casing. The eccentric button percussion bit overreams the boreholes and allows advancement of the casing. The same compressed air or air-detergent (foam) mixture that operates the hammer also serves to expel the cuttings from the borehole, where they can be collected as grab samples. Retraction of the eccentric drill bit allows removal of the hammer from the center of the casing to facilitate standard penetration testing (ASTM D1586) where noted on the boring logs.

TEST DRILLING EQUIPMENT & PROCEDURES (CONT.)

Schramm Rotadrill The Schramm T64H truck-mounted drill rig is a top drive rotary rig capable of up to 85,500 inches/pounds of torque with a pulldown capacity of 35,000 lbs. Drilling is performed with either 4", or larger, diameter Tricone roller bits or 4" to 6" diameter down-the-hole hammer. Cutting removal is facilitated by compressed air or air/water mixtures and collected in a cyclone. Where noted on the boring logs, grab samples of the cuttings were collected. When casing is required to stabilize the borehole, an Aardvark drill through casing hammer is utilized, permitting simultaneous drilling and driving of the casing. Casing penetration is recorded on the boring logs in feet per minute. Standard penetration, 2.42" diameter ring samples, Shelby tubes, pitcher tube or Denison samples taken are noted on the boring logs.

Sampling Procedures Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D1586 test procedure. In many cases, 2" O.D., 1 3/8" I.D. samplers are used to obtain the standard penetration resistance. "Undisturbed" samples of firmer soils are often obtained with 3" O.D. samplers lined with 2.42" I.D. brass rings. The driving energy is generally recorded as the number of blows of a 140-pound, 30-inch free fall drop hammer required to advance the samplers in 6-inch increments. However, in stratified soils, driving resistance is sometimes recorded in 2- or 3-inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and the realistic penetration values obtained for consideration in design. These values are expressed in blows per 6 inches on the boring logs. "Undisturbed" sampling of softer soils is sometimes performed with thin walled Shelby tubes (ASTM D1587), pitcher samplers, Denison samplers or continuous CME samplers. Where samples of rock are required, they are obtained by NQ diamond core drilling (ASTM D2113). Tube samples are labeled and placed in watertight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings. Also, representative samples are obtained from the cuttings from the hammer and Schramm drill rig.

Boring Records Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares the boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487), with appropriate group symbols being shown on the boring logs.

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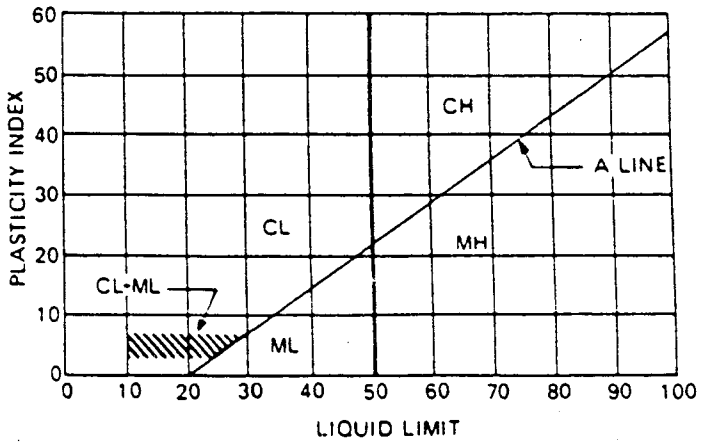
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-66T.

MAJOR DIVISIONS				GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
					GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 seive)			SW	Well graded sands, gravelly sands.
					SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)			ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)			MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.
	CLAYS (LIMITS PLOT ABOVE "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)			CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to ¾ in.
Fine gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve

TERMINOLOGY USED TO DESCRIBE THE RELATIVE DENSITY, CONSISTENCY OR FIRMNESS OF SOILS

The terminology used on the boring logs to describe the relative density, consistency or firmness of soils relative to the standard penetration resistance is presented below. 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. Relative Density. Terms for description of relative density 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
50+	Very dense

2. Relative Consistency. Terms for description of clays which are saturated or near saturation.

N	Relative Consistency	Remarks
0-2	Very soft	Easily penetrated several inches with fist.
3-4	Soft	Easily penetrated several inches with thumb.
5-8	Medium stiff	Can be penetrated several inches with thumb with moderate effort.
9-15	Stiff	Readily indented with thumb, but penetrated only with great effort.
16-30	Very stiff	Readily indented with thumbnail.
30+	Hard	Indented only with difficulty by thumbnail.

3. Relative Firmness. Terms for description of partially saturated and/or cemented soils which commonly occur in the Southwest 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
50+	Hard

njf/M1-95/7-11-95

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. B-1

JOB NO. E94-124 DATE 2-28-95 Location: Sta. 444+20, 173' L

RIG TYPE AP-1000
BORING TYPE 9 1/2" Dual Wall Percussion
SURFACE ELEV. 1200.0'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	47								slightly moist	Man-made FILL **SAND, GRAVEL & COBBLES**, some boulders, trace of silt & clay, poorly graded, nonplastic, brown
	66									
	54									
	64								very dense to medium dense	
	49									
5	62									note: predominantly cobbles & boulders 4" to 24" particle size from 2' to 8'
	66									
	52			A				GP		
	20									
	32			S	20-19-		4			
10	24				27					
	22									
	23									
	28									
	29									
15	25									
	27									
	26			A						
	6									
	22									
20	31									**SAND, GRAVEL & COBBLES**, occasional clay, poorly graded, nonplastic, brown
	55								slightly moist	
	33									
	23									
	23								dense to very dense	
25	26									
	38									
	26			A				GP		
	18									
	26			S	5-17-					
30	16				20					
	12									
	16									
	22									
	44									
35	35									
	28									
	46			A						
	105									
	78									
40	44									**CLAYEY SAND, GRAVEL & COBBLES**, some silt, poorly graded, subrounded gravel & cobbles, low plasticity, brown
	88									
	87									
	53							GC-		
	81							GP		
45	61									
	149									
	111			A						Stopped Drilling at 49'
▽	76			S	50-					Stopped Sampler at 49'8 1/2"
50					50/2"					

GROUNDWATER

DEPTH	HOUR	DATE
49.0	10:30a	2-28-95

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. B-1

JOB NO. E94-124 DATE 2-28-95 Location: Sta. 444+20, 173' L

RIG TYPE AP-1000
BORING TYPE 9 1/2" Dual Wall Percussion
SURFACE ELEV. 1200.0'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	47								slightly moist	Man-made FILL **SAND, GRAVEL & COBBLES**, some boulders, trace of silt & clay, poorly graded, nonplastic, brown
	66									
	54									
	64								very dense to medium dense	
	49									
5	62									note: predominantly cobbles & boulders 4" to 24" particle size from 2' to 8'
	66									
	52			A				GP		
	20									
	32			S	20-19-		4			
10	24				27					
	22									
	23									
	28									
	29									
15	25									
	27									
	26			A						
	6									
	22									
20	31									**SAND, GRAVEL & COBBLES**, occasional clay, poorly graded, nonplastic, brown
	55								slightly moist	
	33									
	23									
	23								dense to very dense	
25	26									
	38									
	26			A				GP		
	18									
	26			S	5-17-					
30	16				20					
	12									
	16									
	22									
	44									
35	35									
	28									
	46			A						
	105									
	78									
40	44									**CLAYEY SAND, GRAVEL & COBBLES**, some silt, poorly graded, subrounded gravel & cobbles, low plasticity, brown
	88									
	87									
	53							GC-		
	81							GP		
45	61									
	149									
	111			A						Stopped Drilling at 49'
▽	76			S	50-					Stopped Sampler at 49'8 1/2"
50					50/2"					

GROUNDWATER

DEPTH	HOUR	DATE
49.0	10:30a	2-28-95

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. B-2

JOB NO. E94-124 DATE 2-28-95

Location: Sta. 450+38, 241' L

RIG TYPE AP-1000
BORING TYPE 9 1/2" Dual Wall Percussion
SURFACE ELEV. 1202.1'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	29								slightly moist to moist	Man-made FILL **CLAYEY SAND, GRAVEL & COBBLES**, some silt, poorly graded, low plasticity, brown
	51									
	57									
	47									
	58								very dense to medium dense	note: predominantly cobbles & boulders 4" to 24" particle size from 1' to 11' & 25' to 31' & 35' to 41'
5	62									
	65									
	61			A						
	35									
	48			S	41-		3			note: possible concrete or large boulders from 36' to 41'
10	32				50/3"					
	19									
	10							GP-		
	9							GC		
	14									
15	10									
	9									
	8			A						
	8									
	11									
20	9									
	13									
	13									
	19									
	15									
25	17									
	23									
	11			A						
	10									
	18									
30	34									
	87									
	69									
	65									
	35									
35	59									
	133									
	280			A						
	400									
	216									
40	98									
	99								moist	**CLAYEY SAND, GRAVEL & COBBLES**, poorly graded, low plasticity, brown
	86									
	76									
	108							GC-	very dense	
45	70							GP		
	66									Stopped Drilling at 49' Sampler refused at 49'5"
	86			A						
	80			S	50/2"					
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. BC-2

JOB NO. E94-124 DATE 3-1-95 Location: Sta. 428+00, 190' L

RIG TYPE AP-1000
BORING TYPE 9 1/2" Dual Wall Percussion
SURFACE ELEV. 1177.8'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	10								wet to slightly moist	**SAND, GRAVEL & COBBLES**, occasional silt & boulders, poorly graded, nonplastic, brown
	28									
	57									
	31									
	34								dense to very dense	note: maximum estimated particle size of 18"
5	28									
	37									
	60			A				GP		
	64									
	86			S	50/2"					
10	100									
	94									
	32									
	38									
	54									
15	91									
	161									
	98			A						
	75									
	81									
20	64									
	62									**CLAYEY SAND, GRAVEL & COBBLES**, some silt, occasional boulders, poorly graded, low plasticity, brown
	66									
	66								very moist to wet	
	55									
25	43									
	45								very dense to dense	
	26			A						
	68							GC-		
	80							GP		
30	44									
	41									
	28									
	18									
	35									
35	64									
	43									
	45			A						
	66									
40				S	50/2"					Stopped Drilling at 39' Sampler refused at 39'3"
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-1

JOB NO. E94-124 DATE 6-15-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-4300
LOCATION Sta.489+00, 200' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					GM-GP	slightly moist	Man-made FILL **SAND, GRAVEL & COBBLES**, poorly graded, some silt, subrounded, nonplastic, light brown note: some construction debris
			A				
5					SM	slightly moist	**SILTY SAND**, predominantly fine grained, trace of fine grained gravel, nonplastic, dark brown to brown
10						slightly moist to moist	**SAND, GRAVEL & COBBLES**, well graded, trace of silt, subrounded, nonplastic, brown
15					GW		
20			A				
25							Stopped Trackhoe at 25'

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-2

JOB NO. E94-124 DATE 6-15-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-4300
LOCATION Sta.491+50, 195' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	Man-made FILL **SILTY SAND**, predominantly medium grained, some gravel, nonplastic, light brown note: considerable construction debris
5					SM		
10							
15			A		GP	moist	**SAND, GRAVEL & COBBLES**, poorly graded, subrounded, nonplastic, brown
20							Stopped Trackhoe at 20'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-3

JOB NO. E94-124 DATE 6-15-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-4300
LOCATION Sta.485+70, 195' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					GM-GP	slightly moist	Man-made FILL **SAND & GRAVEL**, poorly graded, some silt, nonplastic, light brown note: considerable contruction debris
5						slightly moist to moist	**SILTY SAND**, well graded, considerable gravel & cobbles, nonplasti, brown
10					SM		
15							
20			A				
25							Stopped Trackhoe at 23'

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-4

JOB NO. E94-124 DATE 6-15-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-4300
LOCATION Sta.482+30, 190' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0							6" Asphaltic Concrete
					SM	slightly moist	**SILTY SAND**, predominantly fine grained, trace of fine grained gravel, nonplastic, brown
5			A				
10					SP	slightly moist to moist	**SAND**, predominantly medium to coarse grained, considerable gravel, occasional cobbles, small amount of silt, subrounded, nonplastic, brown note: cobble layer at 10' & 16'
15			A				
20							Stopped Trackhoe at 20'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-5

JOB NO. E94-124 DATE 6-16-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-4300
LOCATION Sta.469+00, 295' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					SM	slightly moist	Man-made FILL **SILTY SAND**, predominantly fine grained, some fine grained gravel, nonplastic, tan
					SM		Man-made FILL **SILTY SAND**, some gravel, nonplastic, light brown note: considerable consitruction debris (concrete, rebar, drywall, etc.)
5							
10							Stopped Trackhoe at 10
15							
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-6

JOB NO. E94-124 DATE 6-16-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-4300
LOCATION Sta.465+65, 270' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	Man-made FILL **SAND & GRAVEL**, poorly graded, some silt, occasional cobbles, nonplastic, light brown note: considerable construction debris note: boulders to 18" diameter from 9' to 17'
5							
					GP		
10							
15							
20							Stopped Trackhoe at 25'
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-7

JOB NO. E94-124 DATE 6-17-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-4300
LOCATION Sta.461 + 25, 200' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	Man-made FILL **SAND & GRAVEL**, poorly graded, occasional cobbles, nonplastic, brown note: considerable construction debris note: occasional boulder to 18"
5					GM		
10							
15							
20							Stopped Trackhoe at 20'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-8

JOB NO. E94-124 DATE 6-17-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-4300
LOCATION Sta.458 + 10, 230' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist to very moist	**SAND & GRAVEL**, poorly graded, occasional cobbles, subrounded, nonplastic, light brown to brown
5							
					GP		
10							
15			A				
20							
							Stopped Trackhoe at 23'6"
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-9

JOB NO. E94-124 DATE 6-16-95

GROUNDWATER		
DEPTH	HOUR	DATE
22.0	8:30a	6-16-95

BACKHOE TYPE LS-4300
LOCATION Sta.453+70, 205' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0			A			slightly moist to moist	Man-made FILL **SAND, GRAVEL & COBBLES**, poorly graded, nonplastic, grayish brown note: some to considerable construction debris
					GP		
							Man-made FILL Transit Track wash-out material
5						moist	**SAND, GRAVEL & COBBLES**, poorly graded, subrounded, nonplastic, reddish brown
10					GP		
15							
20			A				
							Stopped Trackhoe at 25'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA
Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-10

JOB NO. E94-124 DATE 6-16-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-4300
LOCATION Sta.422+84, 270' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					GP	slightly moist	Man-made FILL **SAND & GRAVEL**, poorly graded, nonplastic, light brown note: small amount of construction debris
5			A		SP-SM	slightly moist	**SAND**, predominantly fine grained, some silt, nonplastic, tan
10					GW	moist	**SAND & GRAVEL**, well graded, occasional cobbles, subrounded, nonplastic, light brown
15			A				
20							Stopped Trackhoe at 20'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-11

JOB NO. E94-124 DATE 6-16-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-4300
LOCATION Sta.417+00, 230' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					GM	slightly moist	Man-made FILL **SILTY SAND, GRAVEL & COBBLES**, poorly graded, nonplastic, light brown note: some construction debris
5					SP	slightly moist	Man-made FILL **SAND**, predominantly fine grained, small amount of gravel, nonplastic, tan note: some construction debris
10							
			A		SW	moist	**SAND**, well graded, some gravel, occasional cobbles, subrounded, nonplastic, brown
15							
20							
							Stopped Trackhoe at 22'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. H-12

JOB NO. E94-124 DATE 6-16-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-4300
LOCATION Sta.413+00, 250' L of centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	Man-made FILL **SILTY SAND & GRAVEL**, poorly graded, some cobbles, nonplastic, light brown note: considerable asphalt & other construction debris
					GM		
5							
			A			moist	**SILTY CLAY**, high plasticity, dark brown to brown
10					CH		
						moist	**SAND**, well graded, considerable gravel, occasional cobbles, nonplastic, brown
15			A				
					SW		
20							
							Stopped Trackhoe at 23'
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Traffic Interchange

LOG OF TEST BORING NO. HB-3

JOB NO. E89-42 DATE 3-20-91 Location N886,476.1 E513,110.4

RIG TYPE AP-1000
BORING TYPE Hammer with 9" Casing
SURFACE ELEV. 1167.9'
DATUM Anderson-Nelson Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	14								very moist	**SAND, GRAVEL & COBBLES,** trace of boulders & silt, poorly graded, subrounded, nonplastic, brown
	25							GW		
	40								dense to very dense	
	35			D						
	131									
5	110									note: estimated about 50% coarser than 3"
	78									
	112									
	69									note: maximum estimated particle size of 24"
	100									
10	72			D						
	134									**SAND, GRAVEL & COBBLES,** some clay & boulders, poorly graded, subrounded, medium plasticity, brown
	125							GP-	very moist to wet	
	140							GC		
15	172			D						
	90								very dense	
	54									note: estimated about 30% to 40% coarser than 3"
	36									
	63									
	50									
20	105			D						note: maximum estimated particle size of 18"
	141									
	75									
	94									
	42									
▽ 25	47			D						
	39									
	43									
	80									
	28									
30	60									
	64									
	74			D						
	37									
	77									
35	60									
	64									
	43									
	35									
	41									
40	87									
	40									
	41									
	39			D						
	57									
45	61									
	53									
	45									
	58									
50										Stopped Hammer at 49'

GROUNDWATER

	DEPTH	HOUR	DATE
▽	25.0	9:45a	3-20-91
▼			

SAMPLE TYPE

A - Drill cuttings.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

AGRA Earth & Environmental

PROJECT Red Mountain Traffic Interchange

LOG OF TEST PIT NO. HP-6

JOB NO. E89-42 DATE 1-24-91

BACKHOE TYPE Mitsubishi 280 TH
LOCATION N886486 E512758
ELEVATION 1164'
DATUM Anderson-Nelson Survey

GROUNDWATER

DEPTH	HOUR	DATE
20.0	11:45	1-24-91

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0					GW	moist to very moist	**SAND, GRAVEL & COBBLES**, trace of silt and clay, boulders up to 16" in diameter, angular sand, subrounded to rounded gravel, well graded, nonplastic, brown to reddish brown note: predominantly boulders up to 20" in diameter at the surface note: estimated about 5% coarser than 3" from 0 to 4' & 20% coarser from 9' to 21' note: predominantly sand from 4' to 5'
			D				
5							
10							
			D				
15							
			D				
					GC	moist to wet	**CLAYEY SAND, GRAVEL & COBBLES**, some silt and boulders, medium grained angular sand, subrounded to rounded gravel, poorly graded, medium plasticity, brown to reddish brown
20							
							Stopped Backhoe at 21'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
J - Jar Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. L-2

JOB NO. E94-124 DATE 2-27-95 Location: Sta. 468+25, 180' L

RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1203.7'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	23								slightly moist	FILL
	18									**GRAVELLY SAND**, predominantly fine to medium grained angular gravel, noncemented, low plasticity, light brown
	13									
	12									
	8									
5	10									
	12									
	16			A						note: construction debris including asphalt, concrete & some wood
	16									
	10			S	9-8-					note: very loose material with some considerable voids
10	10				16					
	10									
	10									note: large concrete pieces from 46' to 48'
	9									
	11									
15	11							SP/		
	9							GP		
	7			A						
	11									
	3									
20	3									
	4									
	3									
	4									
	3									
25	5									
	4									
	5			A						
	10									
	9			S	22-11-					
30	9				6					
	13									
	18									
	16									
	13									
35	13									
	11									
	14			A						
	12									
	15									
40	16									
	12									
	10									
	10									
	10									
45	10									
	40									
	74			A						
	70							GP/		NATIVE
50	76							GC		**SAND, GRAVEL & COBBLES**

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. L-2

JOB NO. E94-124 DATE 2-27-95 Location: Sta. 468+25, 180' L

RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1203.7'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	40								moist	NATIVE **SAND, GRAVEL & COBBLES**, considerable clay, predominantly medium grained sand, subrounded to rounded gravel & cobbles, noncemented, low plasticity to nonplastic, orangish brown
	40									
	34									
	46							GP/		
	28							GC		
55	51									
	53									
	50			A						
	43									
60				S	40-46-50/2"					Stopped Drilling at 59' Sampler refused at 60'2"
65										
70										
75										
80										
85										
90										
95										
100										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. L-5

JOB NO. E94-124 DATE 2-27-95 Location: Sta. 469+90, 187' L

RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1205.2'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										FILL
	7								slightly moist	**SILTY SAND & GRAVEL**, some silt with construction debris, predominantly fine to medium grained, low plasticity, brown
	10									
	9								medium dense	
	10									
5	8									
	11									note: construction debris consists of concrete, plastic, asphaltic concrete
	19									
	9									
	11			S	6-13-					note: some voids from 23' to 29'
10	11				7					
	9									note: large concrete particles from 31' to 35'
	11									
	12									
	15									note: considerable fine grained silty sand, slightly moist with some brick debris from 41' to 43'
15	10									
	7									
	9									
	6			A						note: increase in silt below 41'
	10							GP-		
20	8							GM		
	10									
	10									
	11									
	9									
25	10									
	10									
	8									
	7									
	14			S	7-8-					
30	20				11					
	32									
	40									
	64									
	41									
35	32									
	28			A						
	28									
	22									
	25									
40	15									
	15									
	35									
	35									
	30									
45	15									
	32			A						
	28									
	22									
50	23									

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. L-5

JOB NO. E94-124 DATE 2-27-95 Location: Sta. 469+90, 187' L

RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1205.2'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	16									**SILTY SAND & GRAVEL**, continued
	20							GP-		
	34							GM		
	42									
	37									
55	109			A						NATIVE
	93							GP	slightly moist	**SAND, GRAVEL & COBBLES**, some boulders & clay, poorly graded, nonplastic,
	220									
	206									
60				S	50/3"				very dense	brown
										Stopped Drilling at 59'
										Sampler refused at 59'3"
65										
70										
75										
80										
85										
90										
95										
100										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. L-6

JOB NO. E94-124 DATE 2-27-95 Location: Sta. 470+82, 180' L

RIG TYPE AP-1000
BORING TYPE 9 1/4" Dual Wall Percussion
SURFACE ELEV. 1205.6'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	10								moist	FILL **SILTY SAND & GRAVEL**, some cobbles & silt, occasional clay with construction debris consisting of concrete, asphaltic concrete, plastic & trace of wood, low plasticity to nonplastic, brown to gray
	13									
	12									
	10									
	13									
5	14									
	10									
	11									
	11			A						
	24			S	11-9-					
10	12				8			GP		
	11									
	16									
	24									
	16									
15	15									
	18									
	26									
	13									
	31			A						
20	26									
	47									
	33									
	48									
	47									
25	38									
	46									
	33			A						
	30									
	31			S	50/5"					
30	28			A						
	33									
	23									
	24									
	35									
35	30									
	26									
	28									
	35			A						
	24									
40	29									
	47									
	76								moist	**SAND, GRAVEL & COBBLES**, some clay, poorly graded, low plasticity, light brown
	94									
	86									
45	50							GP-	very dense	
	56							GC		Stopped Drilling at 49' Stopped Sampler at 49'6"
	69			A						
	70				29-					
50				S	50/1"					

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.12" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. R-3

JOB NO. E94-124 DATE 2-6-95

Location: Sta. 424+10, 205' L

RIG TYPE CME-75
BORING TYPE 6 5/8" Hollow Stem Auger
SURFACE ELEV. 1195.3'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				U	17	107	8		slightly moist to moist	**SILTY SAND**, trace of gravel, predominantly fine grained, nonplastic, brown
				U	19					
				S	2-3-3					
				S	4-4-4				soft to moderately firm	
5								SM		
10				S	7-6-7					
15										Stopped Auger at 9'6" Stopped Sampler at 11'
20										
25										
30										
35										
40										
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. R-7

JOB NO. E94-124 DATE 2-7-95 Location: Sta. 435+45, 90' L

RIG TYPE CME-75
BORING TYPE 6 5/8" Hollow Stem Auger
SURFACE ELEV. 1195.4'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				A					slightly moist	**SILTY SAND**, trace of gravel, predominantly fine grained, nonplastic, brown
				U	14	97	16			
				U	18					
				S	6-10-			SM	moderately firm to firm	
5				S	11					
					9-11-					
					16					
										Auger refused at 7'6"
10										
15										
20										
25										
30										
35										
40										
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TB-1

JOB NO. E94-124 DATE 02-16-95

GROUNDWATER

DEPTH	HOUR	DATE
23.5	2:00p	2-16-95

BACKHOE TYPE Linkbelt LS-5800
LOCATION Sta. 429+70, 420' L
ELEVATION 1185.4'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						moist	**SAND**, some subrounded gravel, poorly graded, nonplastic, brown note: sand is interbedded with occasional 3" to 4" lenses of coarse grained subrounded gravel
			D				
					SP		
5							
10						very moist to wet	**SAND, GRAVEL & COBBLES**, poorly graded, subrounded gravel & cobbles, nonplastic, brown
15					GP		
20							
			D				
25							Stopped Backhoe at 24' in SGC

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TB-2

JOB NO. E94-124 DATE 02-15-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Linkbelt LS-5800
LOCATION Sta. 431+00, 200' L
ELEVATION 1192.3'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0			D		SM	moist	**SILTY SAND**, trace of gravel, predominantly fine grained, nonplastic, brown
5			D		GP	moist	**SAND & GRAVEL TO GRAVELLY SAND**, trace to some cobbles up to 7", subrounded gravel, poorly graded, nonplastic, brown note: increase in cobbles at 9'6"
15			D		GP	moist	**SAND, GRAVEL & COBBLES**, trace of boulders, poorly graded, nonplastic, brown note: boulders up to 14"
20							Stopped Backhoe at 24' in SGC
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TB-3

JOB NO. E94-124 DATE 02-16-95

GROUNDWATER

DEPTH	HOUR	DATE
23.5	10:00a	2-16-95

BACKHOE TYPE Linkbelt LS-5800
LOCATION Sta. 432+85, 380' L
ELEVATION 1185.7'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						moist to wet	**SAND, GRAVEL & COBBLES** up to 7", trace of boulders, poorly graded, nonplastic, brown
							note: increase in boulders at 8' (up to 14")
5							
			D				
10					GP		
15							
20							
							Stopped Backhoe at 24'6"
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TB-4

JOB NO. E94-124 DATE 02-16-95

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Linkbelt LS-5800
LOCATION Sta. 434+50, 150' L
ELEVATION 1194.8'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						moist	**SANDY SILT TO SILTY SAND**, trace of gravel, nonplastic, brown
			D				
					ML/ SM		
5							
						moist	**SILTY SAND & GRAVEL**, some to considerable cobbles, predominantly fine to medium grained sand, poorly graded, cobbles up to 5", nonplastic, brown
10			D				
15					SP- SM		
20							Stopped Backhoe at 24'6" in SGC
			D				
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TB-5

JOB NO. E94-124 DATE 02-15-95

GROUNDWATER

DEPTH	HOUR	DATE
17.5	10:00a	2-15-95

BACKHOE TYPE Linkbelt LS-5800
LOCATION Sta. 435+83, 310' L
ELEVATION 1184.1'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						moist to very moist	**SAND, GRAVEL & COBBLES**, trace of boulders, subrounded to rounded, poorly graded, nonplastic, brown note: cobbles up to 11" note: some boulders up to 20" below 18'
5			D				
					GP		
10							
15							
▽			D				
20							Stopped Backhoe at 19'6" in SGC
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TB-6

JOB NO. E94-124 DATE 02-16-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Linkbelt LS-5800
LOCATION Sta. 437 + 39, 130' L
ELEVATION 1194.8'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SILTY SAND**, trace of fine grained gravel, poorly graded, nonplastic, brown note: increase in gravel & small cobbles at 6'
			D				
					SM/ SP		
5							
10					GP	moist	**SANDY GRAVEL**, trace of cobbles, poorly graded, subrounded, nonplastic, brown
			D				**SAND, GRAVEL & COBBLES**, poorly graded, subrounded gravel & cobbles up to 11", nonplastic, brown
15						moist to very moist	
					GP-GM		
20							
			D				
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TB-6

JOB NO. E94-124 DATE 02-16-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Linkbelt LS-5800
LOCATION Sta. 437+39, 130' L
ELEVATION 1194.8'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
25							**SAND, GRAVEL & COBBLES**, continued
							Stopped Backhoe at 26'4" in SGC
30							
35							
40							
45							
50							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TB-7

JOB NO. E94-124 DATE 02-16-95

GROUNDWATER

DEPTH	HOUR	DATE
19.2	8:00a	2-16-95

BACKHOE TYPE Linkbelt LS-5800
LOCATION Sta. 438+77, 258' L
ELEVATION 1184.5'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					GP	slightly moist	**SAND, GRAVEL & COBBLES**, poorly graded, subrounded gravel & cobbles up to 7", nonplastic, brown
			D		SP	moist	**SAND**, some gravel, poorly graded, nonplastic, brown
5			D			moist to wet	**SAND, GRAVEL & COBBLES**, trace of boulders, poorly graded, subrounded gravel & cobbles up to 5", nonplastic, brown
10					GP		
15			D				
20							
							Stopped Backhoe at 20'6"
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TB-8

JOB NO. E94-124 DATE 02-09-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

RACKHOE TYPE LS-2650
LOCATION Sta. 441+81, 208' L
ELEVATION 1182.4'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0							**SAND, GRAVEL & COBBLES**, trace of silt, predominantly subangular to angular sand, rounded to subrounded gravel & cobbles, poorly graded, nonplastic, light brown
5							
10			D		GP		
15							
20							
25							Stopped Backhoe at 25'

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TB-9

JOB NO. E94-124 DATE 02-16-95

GROUNDWATER

DEPTH	HOUR	DATE
20.0	9:00a	2-16-95

BACKHOE TYPE Linkbelt LS-5800
LOCATION Sta. 445+32, 350' L
ELEVATION 1184.0'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						moist	**GRAVELLY SAND**, trace of cobbles, well graded sand, predominantly fine grained subrounded to rounded gravel, nonplastic, brown
			D		SW		
5						moist	**SAND, GRAVEL & COBBLES**, poorly graded, subrounded gravel & cobbles up to 9", nonplastic, brown
			D				
10					GP		
15							
			D				
▽ 20							
							Stopped Backhoe at 23'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TB-10

JOB NO. E94-124 DATE 02-09-95

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE LS-2650
LOCATION Sta. 453+40, 441' L
ELEVATION 1173.4'
DATUM Topo

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						moist dense	**SAND, GRAVEL & COBBLES**, trace of silt, predominantly subangular to angular, poorly graded, nonplastic, light brown
5					GP		
10			D				
15							
20							Stopped Backhoe at 25'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TP-102

JOB NO. E94-124 DATE 11-14-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,945 E720,838
ELEVATION 1211.4'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	FILL **SAND, GRAVEL & COBBLES**, trace of boulders up to 1 1/2' in diameter, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, nonplastic, brown
			D			dense to very dense	note: trace of construction debris from surface to a depth of 3', debris appears to have been washed in
5					GP		
10							
15			D			moist	FILL **GRAVELLY SAND**, predominantly fine to medium grained, subangular to subrounded, weakly lime cemented, nonplastic, brown
					SP	medium dense	note: trace of debris, including alumminum cans & rags
20							Stopped Backhoe at 19'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TP-103

JOB NO. E94-124 DATE 11-14-94

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N892,033 E720,649
ELEVATION 1211.0'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist to moist dense to very dense	**SAND, GRAVEL & COBBLES**, occasional boulders up to 1 1/2' in diameter, predominantly medium to fine grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, nonplastic, brown note: possible fill with trace of construction debris from the surface to a depth of 6', debris appears to have been washed in
5					GP		
10							
15							
20							Stopped Backhoe at 19'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TP-105

JOB NO. E94-124 DATE 11-14-94

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,850 E720,674
ELEVATION 1211.0'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0					GP	moist	FILL **SAND, GRAVEL & COBBLES**, occasional boulders up to 1 1/2' in diameter, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, some lime, nonplastic, brown
			D			dense to very dense	
5					SM/ GM	slightly moist to moist medium dense to dense	FILL **SILTY SAND & GRAVEL**, occasional small cobbles, predominantly medium grained subangular to subrounded sand, predominantly coarse grained subangular to subrounded gravel, some lime, nonplastic to low plasticity, brown to dark brown note: considerable concrete blocks up to 2 1/2' in length from the surface to a depth of 5 1/2' & considerable asphaltic concrete fragments below a depth of 5 1/2'
			D				
10							note: considerable concrete blocks encountered at 14'
15							Backhoe refused at 14'
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TP-106

JOB NO. E94-124 DATE 11-14-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,670 E720,534
ELEVATION 1211.1'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	FILL **SILTY SAND**, some to considerable gravel lenses, predominantly fine grained, subangular to subrounded, some lime, nonplastic to low plasticity, brown
					SM	loose to medium dense	note: occasional concrete block up to 2' to 3' in diameter
			D				note: clayey silt lens with considerable lime from 6" to 10"
					SM		
5						moist	NATIVE **SILTY SAND**, predominantly fine grained, subangular to subrounded, weakly lime cemented, nonplastic, brown
						medium dense	
						slightly moist to moist	**SAND, GRAVEL & COBBLES**, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, moderately stratified with 1' thick sand lenses, nonplastic, brown
10					GP	very dense	
15							Stopped Backhoe at 15'
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TP-107

JOB NO. E94-124 DATE 11-14-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,461 E720,313
ELEVATION 1210.7'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0					SM/ GM	slightly moist	FILL **SILTY SAND & GRAVEL**, some clay, predominantly fine to medium grained subangular to subrounded sand, predominantly fine grained subrounded gravel, considerable lime, low plasticity, light brown
			D			loose to medium dense	
					SM	slightly moist	NATIVE **SILTY SAND**, trace of gravel, predominantly fine grained, subangular to subrounded, weakly lime cemented, nonplastic, brown
5						medium dense	
						slightly moist	**SAND, GRAVEL & COBBLES**, occasional boulders up to 1' in diameter, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, nonplastic, brown
						very dense	
					GP		
10							
							Stopped Backhoe at 13'
15							
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TP-110

JOB NO. E94-124 DATE 11-14-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,830 E720,514
ELEVATION 1210.6'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0					GP	slightly moist dense to very dense	FILL **SAND, GRAVEL & COBBLES**, predominantly medium to coarse grained subangular to subrounded sand, coarse grained subrounded gravel, nonplastic, brown
5			D		SP/ GP	moist medium dense to very dense	FILL **SAND & GRAVEL**, occasional small cobble, predominantly medium grained sand, predominantly coarse grained subrounded gravel, nonplastic, brown note: considerable concrete blocks up to 5' in length & some asphaltic concrete
10							
15							Backhoe refused at 11'
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TP-111

JOB NO. E94-124 DATE 11-15-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,648 E720,357
ELEVATION 1210.4'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0					SM	moist loose	FILL **SILTY SAND**, considerable gravel, predominantly fine grained, subangular to subrounded, trace of lime, nonplastic, brown
			D				
5					SM/ GM	slightly moist medium dense to very dense	FILL **SILTY SAND & GRAVEL**, predominantly fine to medium grained subangular to subrounded sand, predominantly coarse grained subangular to subrounded gravel, some lime, nonplastic, brown note: considerable concrete & asphaltic concrete blocks up to 5' in length
10					SM	slightly moist medium dense	NATIVE **SILTY SAND**, trace of gravel, predominantly fine grained, subangular to subrounded, nonplastic, brown
15					GP	slightly moist dense to very dense	**SAND, GRAVEL & COBBLES**, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, weakly stratified, nonplastic, brown
20							Stopped Backhoe at 15'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TP-112

JOB NO. E94-124 DATE 11-15-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,299 E720,131
ELEVATION 1210.7'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	FILL **SILTY SAND & GRAVEL**, some cobbles, predominantly fine grained, subangular to subrounded, nonplastic, brown
					SM/ GM	medium dense	
						slightly moist	NATIVE **SILTY SAND**, trace of gravel, predominantly fine grained, subangular to subrounded, nonplastic, brown
5					SM	medium dense	
						slightly moist	**SAND, GRAVEL & COBBLES**, occasional boulders up to 1' in diameter, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, some lime, nonplastic, brown
10					GP	very dense	
15							Stopped Backhoe at 15'
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TP-113

JOB NO. E94-124 DATE 11-15-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,530 E720,069
ELEVATION 1210.7'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	FILL **SAND, GRAVEL & COBBLES**, occasional boulder up to 1' in diameter, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, nonplastic, brown
					GP	dense to very dense	
5						slightly moist	FILL **SILTY SAND & GRAVEL**, occasional cobbles, predominantly fine to medium grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, some lime, nonplastic to low plasticity, dark brown
					SM/ GM	medium dense to very dense	note: considerable concrete blocks & construction debris
10							note: 20' of fill exposed on Salt River bank adjacent to test pit
							Backhoe refused at 13'
15							
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TP-114

JOB NO. E94-124 DATE 11-15-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,369 E720,100
ELEVATION 1211.0'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0					GP	slightly moist dense to very dense	FILL **SAND, GRAVEL & COBBLES**, occasional boulders, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, nonplastic, brown
			D		SM/ GM	slightly moist to moist medium dense to dense	FILL **SILTY SAND & GRAVEL**, well graded subangular to subrounded sand, predominantly coarse grained subrounded gravel, some lime, nonplastic to low plasticity, dark brown
5					SM		
10					GP	moist medium dense	NATIVE **SILTY SAND**, trace of gravel, predominantly fine grained, subangular to subrounded, nonplastic, brown
						slightly moist very dense	**SAND, GRAVEL & COBBLES**, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, weakly stratified, nonplastic, brown
15							Stopped Backhoe at 15'
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TP-115

JOB NO. E94-124 DATE 11-15-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,249 E720,031
ELEVATION 1208.1'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist medium dense to very dense	FILL **SILTY SAND & GRAVEL**, some small cobbles, predominantly fine to medium grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, some lime, nonplastic to low plasticity, brown to dark brown
					SM/ GM		
5							
						slightly moist very dense	NATIVE **SAND, GRAVEL & COBBLES**, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded to rounded gravel, moderately stratified with 2' thick gravelly sand lenses, nonplastic, brown
10					GP		
			D				
15							
							Stopped Backhoe at 15'6"
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Red Mountain Freeway

LOG OF TEST PIT NO. TP-116

JOB NO. E94-124 DATE 11-15-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N890,986 E719,991
ELEVATION 1208.5'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist medium dense to very dense	FILL **SILTY SAND & GRAVEL**, occasional cobbles, predominantly fine to medium grained subangular to subrounded sand, well graded subrounded gravel, some lime, nonplastic, dark brown to light brown note: considerable concrete blocks up to 3' in length, trace of asphaltic concrete fragments up to 2' in length & trace of wood
5					SM/ GM		
						slightly moist very dense	NATIVE **SAND, GRAVEL & COBBLES**, occasional boulders up to 1' in diameter, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, weakly stratified, nonplastic, brown
10					GP		
							Stopped Backhoe at 12'
15							
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TP-119

JOB NO. E94-124 DATE 11-15-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,917 E720,573
ELEVATION 1210.9'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0					GM	slightly moist medium dense	FILL **SILTY SAND, GRAVEL & COBBLES**, occasional boulders up to 1 1/2' in diameter, predominantly fine to medium grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, trace of lime, nonplastic, dark brown
5					GP	slightly moist very dense	FILL from 1' to 5' **SAND, GRAVEL & COBBLES**, occasional boulders, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, nonplastic, brown note: some debris from 1' to 5', debris appears to have been washed in
10							Stopped Backhoe at 10'
15							
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TP-120

JOB NO. E94-124 DATE 11-15-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,795 E720,615
ELEVATION 1209.4'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist loose to very dense	FILL **SILTY SAND & GRAVEL**, occasional cobbles, predominantly fine to medium grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, some lime, nonplastic to low plasticity, brown to dark brown note: considerable concrete blocks up to 4' in length, asphaltic concrete & construction debris
5					SM/ GM	slightly moist to moist below 5'	
10							
15							
					GP		NATIVE **SAND, GRAVEL & COBBLES**, predominantly medium to coarse grained subangular to subrounded sand, predominantly coarse grained subrounded gravel, nonplastic, brown
20							Stopped Backhoe at 19'
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TP-121

JOB NO. E94-124 DATE 11-15-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Link Belt LS 2650
LOCATION N891,753 E720,448
ELEVATION 1211.1'
DATUM Stanley Consultants Survey

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist loose to very dense	FILL **SILTY GRAVEL**, considerable sand, occasional cobbles, predominantly coarse grained, subrounded, nonplastic, brown note: considerable concrete & asphaltic concrete blocks below a depth of 1 1/2'
5					GM		
10							
							Backhoe refused at 11'
15							
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST BORING NO. W-10

JOB NO. E94-124 DATE 2-8-95 Location: Sta. 482+50, 70' L

RIG TYPE CME-75
BORING TYPE 6 5/8" Hollow Stem Auger
SURFACE ELEV. 1206.8'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				A					moderately firm to firm	**SILTY SAND**, predominantly fine grained, nonplastic, dark brown
				U	18			SM		
				U	36	89	12			
				S	12-10-9					
5				S	4-6-9			SP	slightly moist	**SAND**, some silt & gravel, trace of cobbles, predominantly fine grained, nonplastic, brown
				S	6-13-29					
10									medium dense to dense	
15										Auger refused at 8'6"
20										
25										
30										
35										
40										
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.12" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

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PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. W-12

JOB NO. E94-124 DATE 2-8-95 & 2-28-95 Location: Sta. 485+00, 69' L

RIG TYPE CME-75 & AP-1000
BORING TYPE 6 5/8" HSA/9 1/4" Daul Wall Percussion
SURFACE ELEV. 1207.1'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	3			A			6		slightly moist	**SILTY SAND**, predominantly fine grained, nonplastic, dark brown
	4			U	14	89	9	SM		
	8			U	28					
	8			S	4-3-3				soft to moderately firm	
	10									
5	9			S	6-5-5					
	14									**SAND & GRAVEL**, some cobbles & silt, predominantly fine grained, nonplastic, brown
	13			A					slightly moist	
	8									
	5			S	7-10-					
10	10				10				medium dense to dense	
	8			S	8-8-8			SP		note: coarse grained subangular gravel & some large cobbles at 7'
	13									
	7									note: considerable medium to coarse grained sand below 8'
	8									
15	10									
	11									
	24			A						note: increasing cobbles & gravel with depth
	18									
	30									
20	20									
	29									**SAND, GRAVEL & COBBLES**, trace of silt, poorly graded, occasional boulder, subrounded, nonplastic, brown
	44									
	37								slightly moist	
	34									
25	14									
	33								very dense	
	27			A						
	30									
	21			S	50/3"					
30	21							GP		
	15									
	20									
	20									
	28									
35	31									
	53									
	54			A						
	48									
	51			S	50/6"					
40	47									
										Stopped Drilling at 41'6"
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

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PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. W-13

JOB NO. E94-124 DATE 2-8-95

Location: Sta. 487+40, 68' L

RIG TYPE CME-75

BORING TYPE 6 5/8" Hollow Stem Auger

SURFACE ELEV. 1206.9'

DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				A				GW	slightly moist	Man-made FILL **SAND & GRAVEL**, some cobbles, trace of silt, well graded, nonplastic, grayish to light brown
				U	34					
				U	84					
				S	6-6-6		12	CL	dense	
5				S	6-9-15				slightly moist	**SANDY CLAY**, weakly cemented, low to medium plasticity, dark brown
10				S	6-16-19			SM	moderately firm	
									slightly moist	**SILTY SAND**, some gravel, trace of cobbles, poorly graded, nonplastic, brown
15				S	15-15-23				medium dense to dense	
20										Auger refused at 17'
25										
30										
35										
40										
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

AGRA Earth & Environmental

PROJECT Red Mountain Freeway

LOG OF TEST BORING NO. W-14

JOB NO. E94-124 DATE 2-8-95 & 3-1-95 Location: Sta. 489+40, 70' L

RIG TYPE CME-75 & AP-1000
BORING TYPE 6 5/8" HSA/9 1/4" Dual Wall Percussion
SURFACE ELEV. 1207.7'
DATUM Stanley Consultants Survey

Depth in Feet	Blows Per Foot	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	15			A				SM	slightly moist	Man-made FILL **SILTY SAND**, some gravel, predominantly fine grained, nonplastic, brown
	16			S	18-21-					
	11			U	23	122	5			
	8				84					
	8			S	36-34-					
5	8				39					
	11								very moist to moist	**SAND & GRAVEL**, considerable cobbles, some clay, poorly graded, nonplastic, brown
	9			A						
	8									
	6			S	4-4-3				loose to medium dense	
10	9							GP		
	8									
	10									
	7									
	8									
15	9									
	9									
	9			A						
	8									
	14			S	3-9-					
20	10				10					
	11									
	14									
	18									**SAND & GRAVEL**, some silt, some cobbles, poorly graded, subrounded, nonplastic, brown
	21								slightly moist	
25	27							GP		
	21									
	32			A					dense to very dense	
	18									
30				S	50/3"					Stopped Drilling at 29' Sampler refused at 29'3" HSA refused at 3'
35										
40										
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

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APPENDIX B

Laboratory Test Data

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PROJECT: RED MOUNTAIN FREEWAY - PHASE II
LOCATION: DOBSON RD TO MCKELLIPS RD

JOB NO: E94-124
WORK ORDER NO: 15
DATE SAMPLED: 06-19-95

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

SIEVE SIZES

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

PERCENT PASSING BY WEIGHT

H-1 @ 2 - 3.5'	SM	NV	NP	44	69	85	89	92	95	97	97	98	98	99	99	100	100	100	100	100	100	100	587
H-1 @ 20 - 25'	GW	NV	NP	1.2	2	5	8	14	29	35	37	41	43	47	50	57	63	74	81	92	92	100	588
H-2 @ 15 - 20'	GP	NV	NP	1.3	2	5	7	10	20	29	32	45	49	55	60	67	74	81	86	93	100	100	589
H-3 @ 19 - 23'	SW	NV	NP	1.6	5	15	23	33	48	55	57	67	69	72	75	80	84	91	92	96	100	100	590
H-4 @ 5 - 10'	SM	NV	NP	34	68	81	82	83	85	86	87	88	90	93	94	97	99	100	100	100	100	100	591
H-4 @ 15 - 20'	SP	NV	NP	3.4	6	13	19	26	41	48	50	56	58	61	62	67	70	77	81	91	100	100	592
H-8 @ 15 - 20'	GP	69	48	3.3	4	6	8	10	13	16	17	22	25	32	37	46	55	68	82	100	100	100	593
H-9 @ 20 - 25'	GP	39	16	2.1	3	6	10	14	20	23	24	27	29	33	36	44	51	63	75	98	100	100	594
H-10 @ 5 - 7.5'	SP-SM	NV	NP	5.3	16	54	73	88	97	98	98	99	99	99	99	99	99	100	100	100	100	100	596
H-11 @ 12 - 17'	SW	NV	NP	1.5	8	24	30	35	44	49	51	58	60	64	66	71	74	79	81	88	88	100	597

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PROJECT: RED MOUNTAIN FREEWAY - PHASE II
LOCATION: DOBSON RD TO MCKELLIPS RD

JOB NO: E94-124
WORK ORDER NO: 15
DATE SAMPLED: 06-19-95

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

SIEVE SIZES

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

PERCENT PASSING BY WEIGHT

H-12 @ 8 - 12.5'	CH	50	24	91	93	96	97	98	99	100	100	100	100	100	100	100	100	100	100	100	100	100	598
H-12 @ 15 - 20'	SW	NV	NP	3.2	4	12	22	32	47	52	54	57	59	62	64	69	72	80	87	93	100	100	599

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PROJECT: RED MOUNTAIN FREEWAY
LOCATION: DOBSON ROAD TO MCKELLIPS ROAD

JOB NO: E94-124

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

SIEVE SIZES

	Depth (ft)					SILT/ CLAY	SAND								GRAVEL								COBBLES		
							Fine			Medium			Coarse		Fine				Coarse						
Location	From	To	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	Lab #
						PERCENT PASSING BY WEIGHT																			
TB-4	2	3	ML	NV	NP	64	87	98	99	99	100	100	100	100	100	100	100	100	100	100	100	100	100	100	369
TB-4	10	11	SP-SM	NV	NP	11	20	31	37	43	53	58	59	62	64	66	68	72	76	82	85	93	100	100	370
TB-6	2	3	SM	NV	NP	25	46	69	81	91	99	100	100	100	100	100	100	100	100	100	100	100	100	100	375
TB-6	14	15	GP-GM	NV	NP	7.7	15	26	30	34	41	45	45	48	49	51	53	57	59	64	72	78	97	100	376
L-2	17	19	GM	NV	NP	13	18	24	29	32	41	48	49	56	60	67	73	85	92	96	100	100	100	100	396
L-2	37	39	GP-GM	NV	NP	5.2	8	13	16	20	27	33	34	40	43	50	55	66	72	79	84	94	100	100	399
L-5	18	19	GP-GM	NV	NP	11	14	18	21	24	30	35	37	45	51	63	74	90	94	96	100	100	100	100	404
L-5	55	59	GP-GM	NV	NP	11	16	22	26	29	37	43	44	53	57	65	71	81	92	98	100	100	100	100	408
L-6	19	21	GP-GM	NV	NP	10	14	21	25	29	36	42	43	51	56	64	69	78	88	100	100	100	100	100	467
L-6	38.5	41	SM	NV	NP	15	19	26	31	36	46	52	53	60	64	71	75	84	90	93	93	100	100	100	470

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PROJECT: RED MOUNTAIN FREEWAY
LOCATION: DOBSON ROAD TO MCKELLIPS ROAD

JOB NO: E94-124

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

SIEVE SIZES

	Depth (ft)					SILT/ CLAY	SAND								GRAVEL								COBBLES		
							Fine			Medium			Coarse		Fine				Coarse						
Location	From	To	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	Lab #
						PERCENT PASSING BY WEIGHT																			
L-6	47	49	GP	31	9	3.5	4	6	7	9	13	16	16	19	21	25	27	32	39	50	59	77	100	100	471
B-2	17	19	GC	31	12	13	17	22	25	28	34	38	39	44	48	54	58	66	71	80	85	92	100	100	487
B-1	7	9	GP	32	11	4.2	6	9	11	12	15	16	16	19	21	25	29	39	46	57	71	100	100	100	511
BC-2	7	9	GP	NV	NP	3.6	5	8	10	13	18	22	23	28	31	35	40	49	56	66	76	86	100	100	531
HB-3	3	7	GW	NV	NP	3.3	4	7	8	11	16	21	22	26	28	32	36	43	51	61	72	83	100	100	433
HB-3	10	13	GP-GC	35	14	5.0	7	9	10	13	18	20	21	26	30	37	43	56	65	93	100	100	100	100	434
HB-3	25	27	GP	27	8	2.4	3	5	6	7	9	11	11	14	17	23	29	41	52	84	100	100	100	100	437
HP-6	11	14	GW	NV	NP	1.1	2	4	10	16	26	28	28	29	30	32	33	37	41	48	51	100	100	100	321

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AGRA Earth & Environmental, Inc.

PROJECT: RED MOUNTAIN FREEWAY
LOCATION: DOBSON ROAD TO MCKELLIPS ROAD

JOB NO: E94-124

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

SIEVE SIZES

	Depth (ft)					SILT/ CLAY	SAND								GRAVEL								COBBLES		
							Fine			Medium			Coarse		Fine				Coarse						
Location	From	To	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	Lab #
						PERCENT PASSING BY WEIGHT																			
TP-105	1	5	SM	NV	NP	29	39	48	52	56	62	66	66	70	73	77	80	85	91	91	100	100	100	100	70
TP-107	2	4	SM	NV	NP	46	78	94	96	97	99	99	99	100	100	100	100	100	100	100	100	100	100	100	74
TP-114	2	4	GM	NV	NP	13	17	24	29	34	42	46	47	52	55	62	67	77	83	85	100	100	100	100	78
W-14	0	3	SM	NV	NP	42	57	67	70	72	74	74	75	77	83	87	89	94	97	97	100	100	100	100	296
W-13	2.5	4	CL	28	11	69	78	94	97	98	99	99	99	100	100	100	100	100	100	100	100	100	100	100	288
W-12	0	4.5	SM	NV	NP	24	41	78	91	97	99	99	99	100	100	100	100	100	100	100	100	100	100	100	287
TB-10	10	20	GP	NV	NP	1.9	3	6	8	12	23	33	34	42	46	52	56	65	71	79	88	100	100	100	303
TB-8	15	20	GP	NV	NP	2.0	4	8	11	15	25	32	33	37	40	44	48	56	63	73	87	93	100	100	304
TB-2	1	2	SM	NV	NP	13	36	78	88	92	96	97	97	98	98	99	99	100	100	100	100	100	100	100	366
TB-2	9	10	GP	NV	NP	3.4	10	20	25	28	37	43	44	50	53	57	60	66	70	76	83	88	96	100	367

AGRA Earth & Environmental

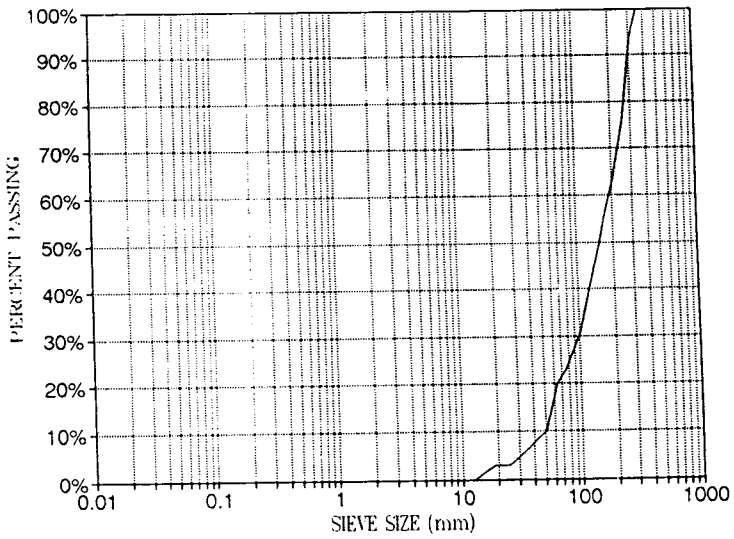
AGRA EARTH & ENVIRONMENTAL, INC.

PROJECT: SALT RIVER CROSSING @ MCKELLIPS
SOURCE: TRAVERSE #1

JOB NO. E94-124
W.O. NO.
LAB NO.
DATE 06-02-95

SIEVE ANALYSIS ASTM D-422

SIEVE SIZE	PERCENT PASSING
20"	
18"	
16"	
14"	100%
12"	94%
10"	76%
8"	63%
7"	57%
6"	49%
5"	41%
4"	31%
3"	23%
2 1/2"	20%
2"	10%
1 1/2"	7%
1"	3%
3/4"	3%
1/2"	0%
3/8"	
1/4"	
#4	
#8	
#10	
#16	
#30	
#40	
#50	
#100	
#200	



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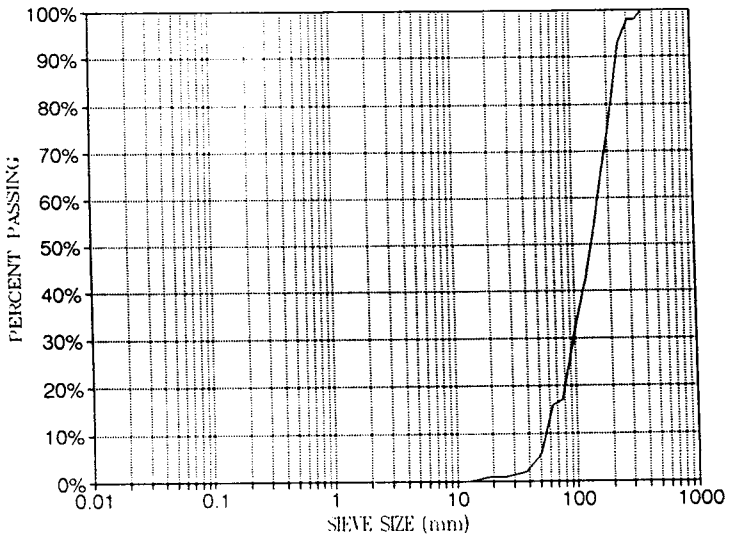
AGRA EARTH & ENVIRONMENTAL, INC.

PROJECT: SALT RIVER CROSSING @ ALMA SCHOOL
SOURCE: TRAVERSE #2

JOB NO. E94-124
W.O. NO.
LAB NO.
DATE 06-02-95

SIEVE ANALYSIS ASTM D-422

SIEVE SIZE	PERCENT PASSING
20"	
18"	
16"	100%
14"	98%
12"	98%
10"	93%
8"	75%
7"	66%
6"	54%
5"	43%
4"	33%
3"	17%
2 1/2"	16%
2"	6%
1 1/2"	2%
1"	1%
3/4"	1%
1/2"	0%
3/8"	
1/4"	
#4	
#8	
#10	
#16	
#30	
#40	
#50	
#100	
#200	



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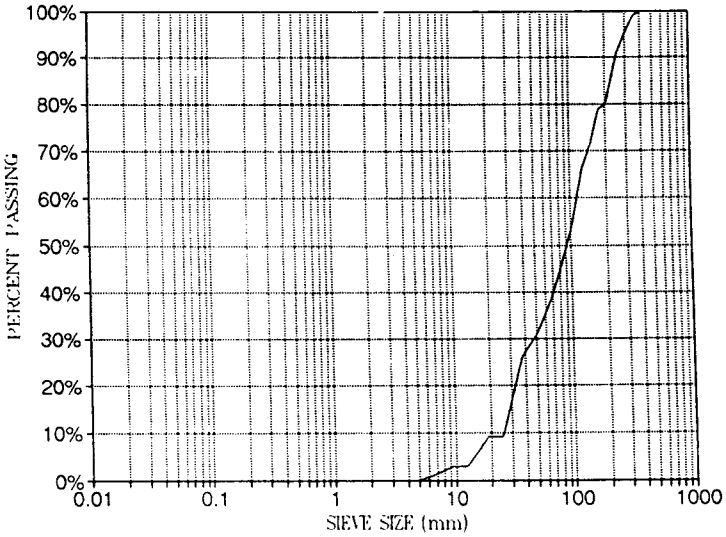
AGRA EARTH & ENVIRONMENTAL, INC.

PROJECT: SALT RIVER CROSSING @ ALMA SCHOOL
SOURCE: TRAVERSE #3

JOB NO. E94-124
W.O. NO.
LAB NO.
DATE 06-02-95

SIEVE ANALYSIS ASTM D-422

SIEVE SIZE	PERCENT PASSING
20"	
18"	
16"	100%
14"	99%
12"	96%
10"	91%
8"	80%
7"	79%
6"	72%
5"	66%
4"	54%
3"	43%
2 1/2"	37%
2"	31%
1 1/2"	26%
1"	9%
3/4"	9%
1/2"	3%
3/8"	3%
1/4"	1%
#4	0%
#8	
#10	
#16	
#30	
#40	
#50	
#100	
#200	



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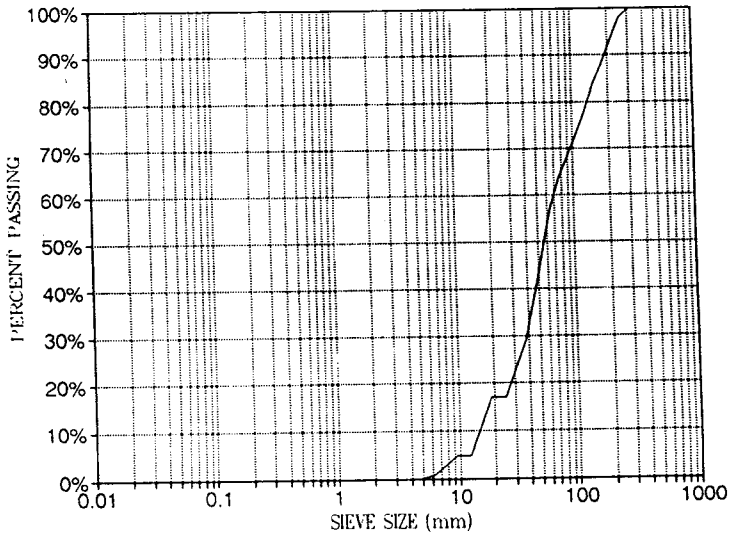
AGRA EARTH & ENVIRONMENTAL, INC.

PROJECT: SALT RIVER CROSSING @ DOBSON
SOURCE: TRAVERSE #4

JOB NO. E94-124
W.O. NO.
LAB NO.
DATE 06-02-95

SIEVE ANALYSIS ASTM D-422

SIEVE SIZE	PERCENT PASSING
20"	
18"	
16"	
14"	
12"	100%
10"	98%
8"	92%
7"	88%
6"	84%
5"	78%
4"	72%
3"	64%
2 1/2"	57%
2"	44%
1 1/2"	29%
1"	17%
3/4"	17%
1/2"	5%
3/8"	5%
1/4"	1%
#4	0%
#8	
#10	
#16	
#30	
#40	
#50	
#100	
#200	



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APPENDIX C

Stability Analysis Diagrams

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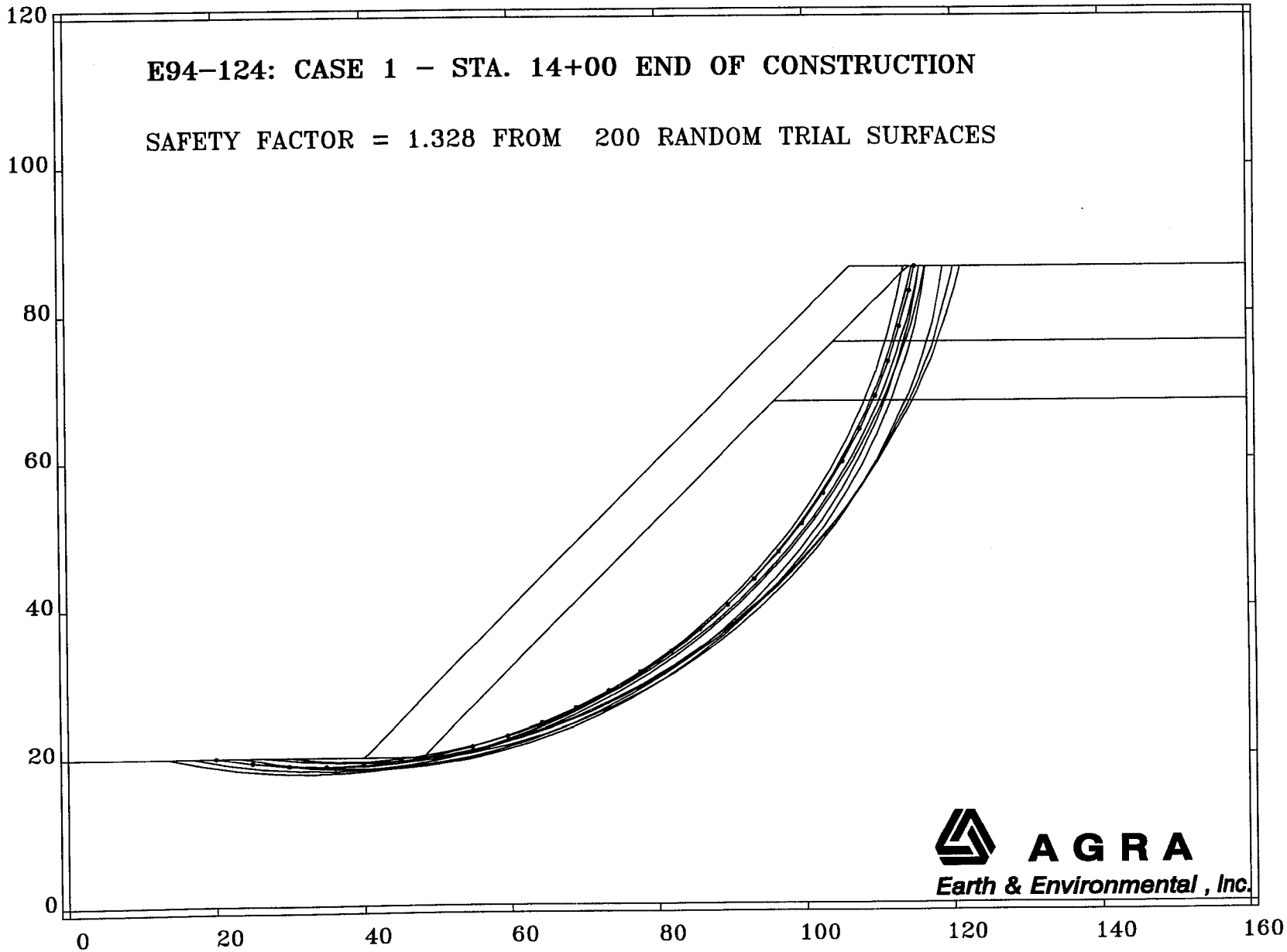
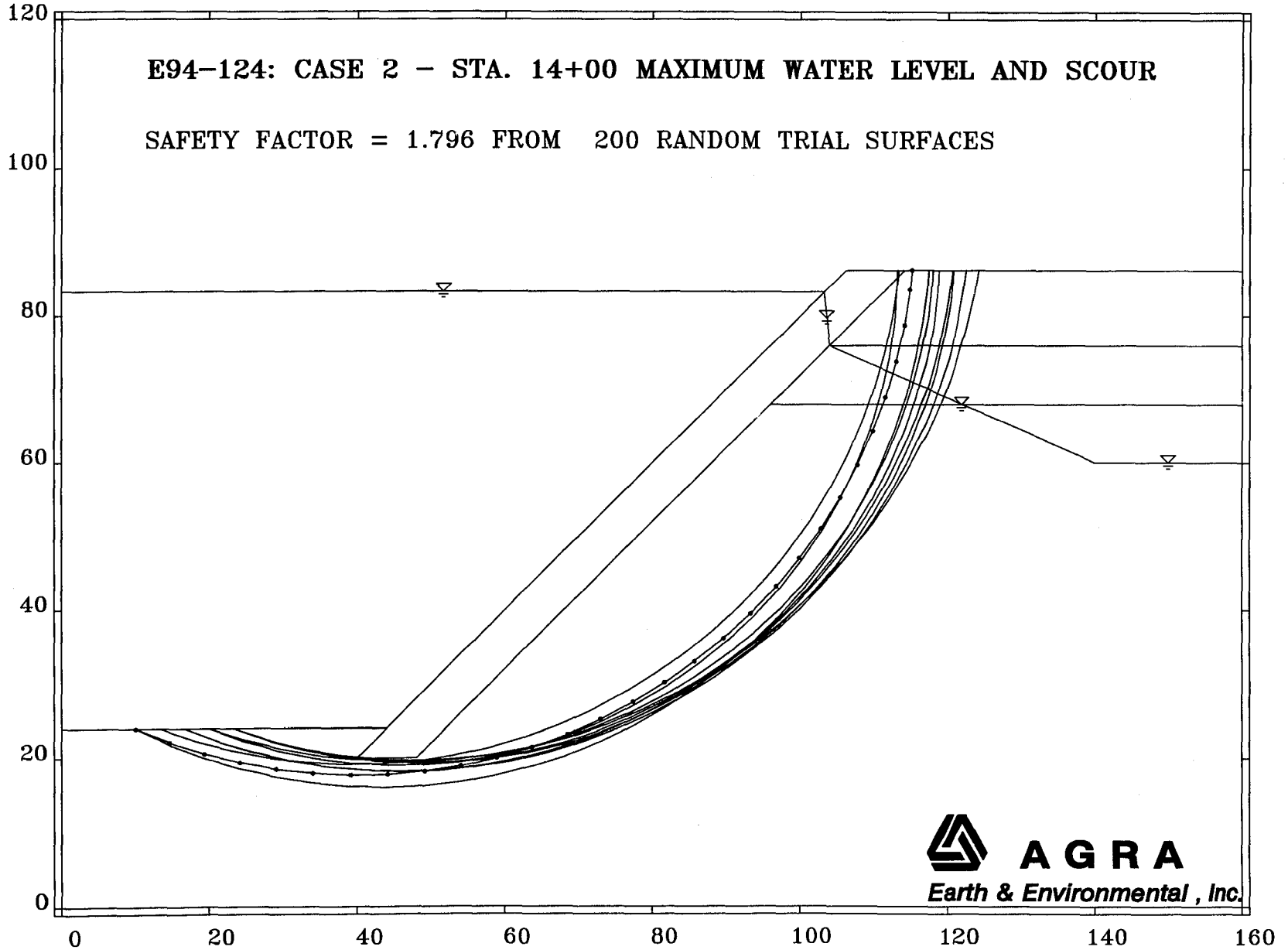
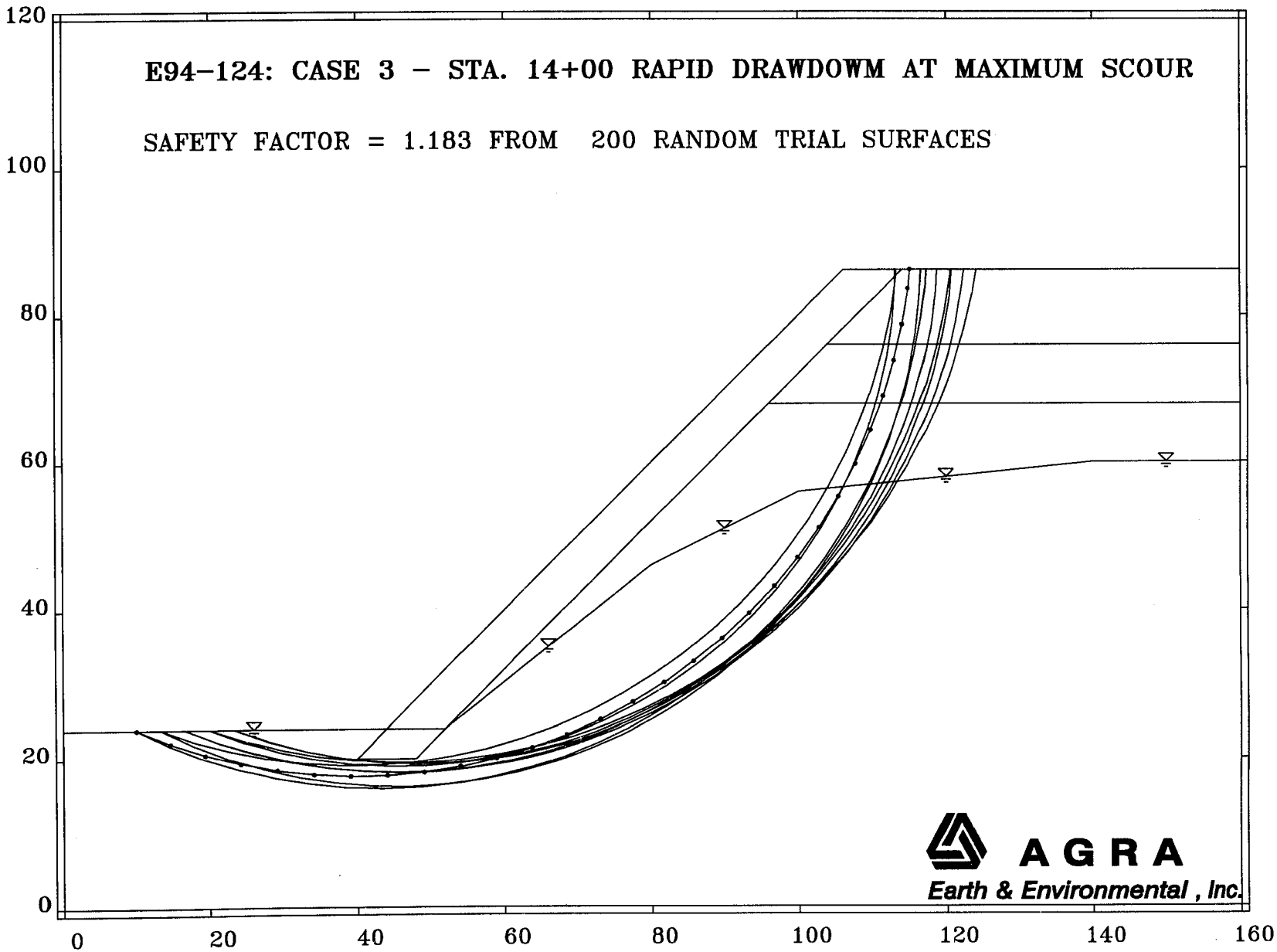
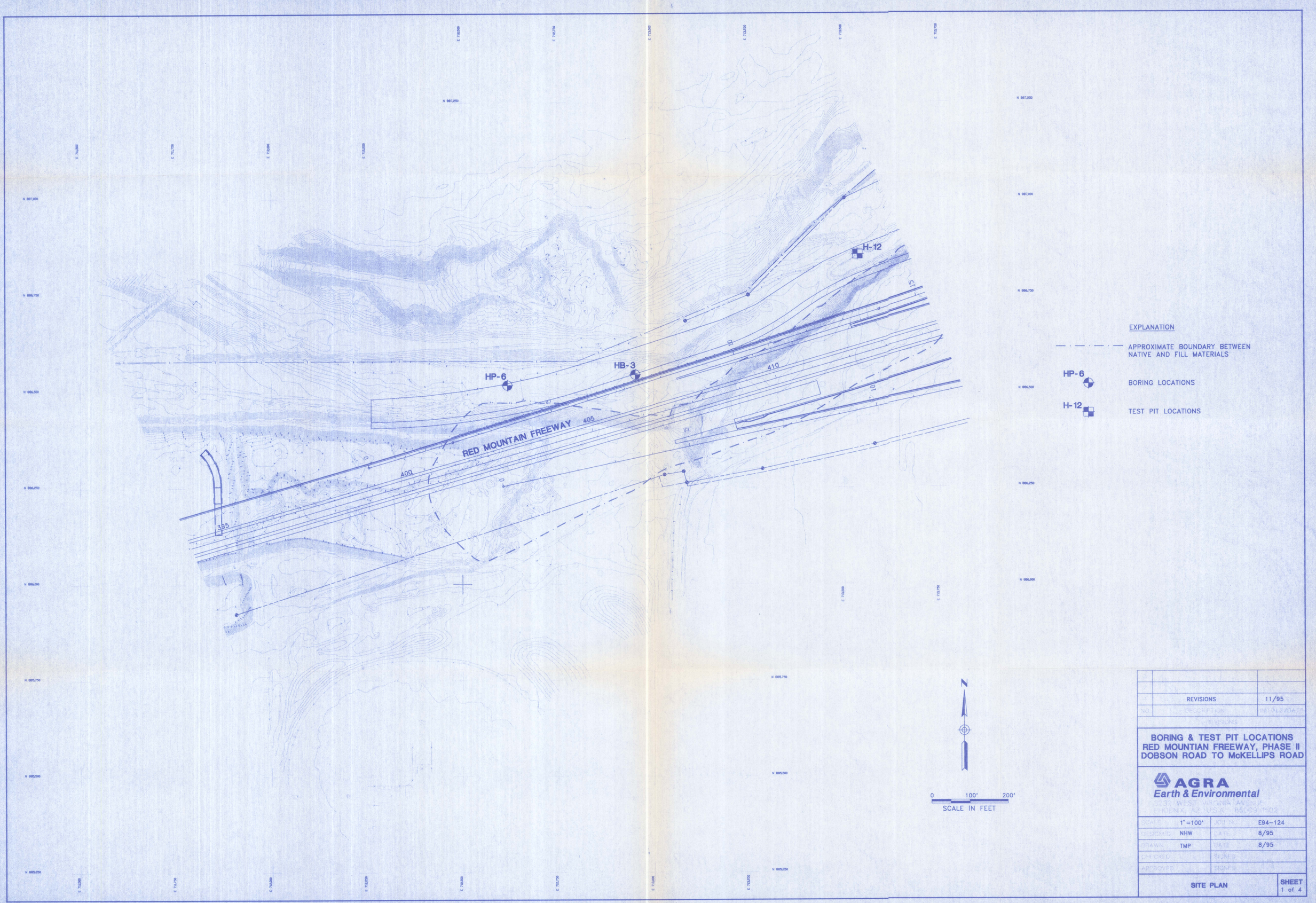
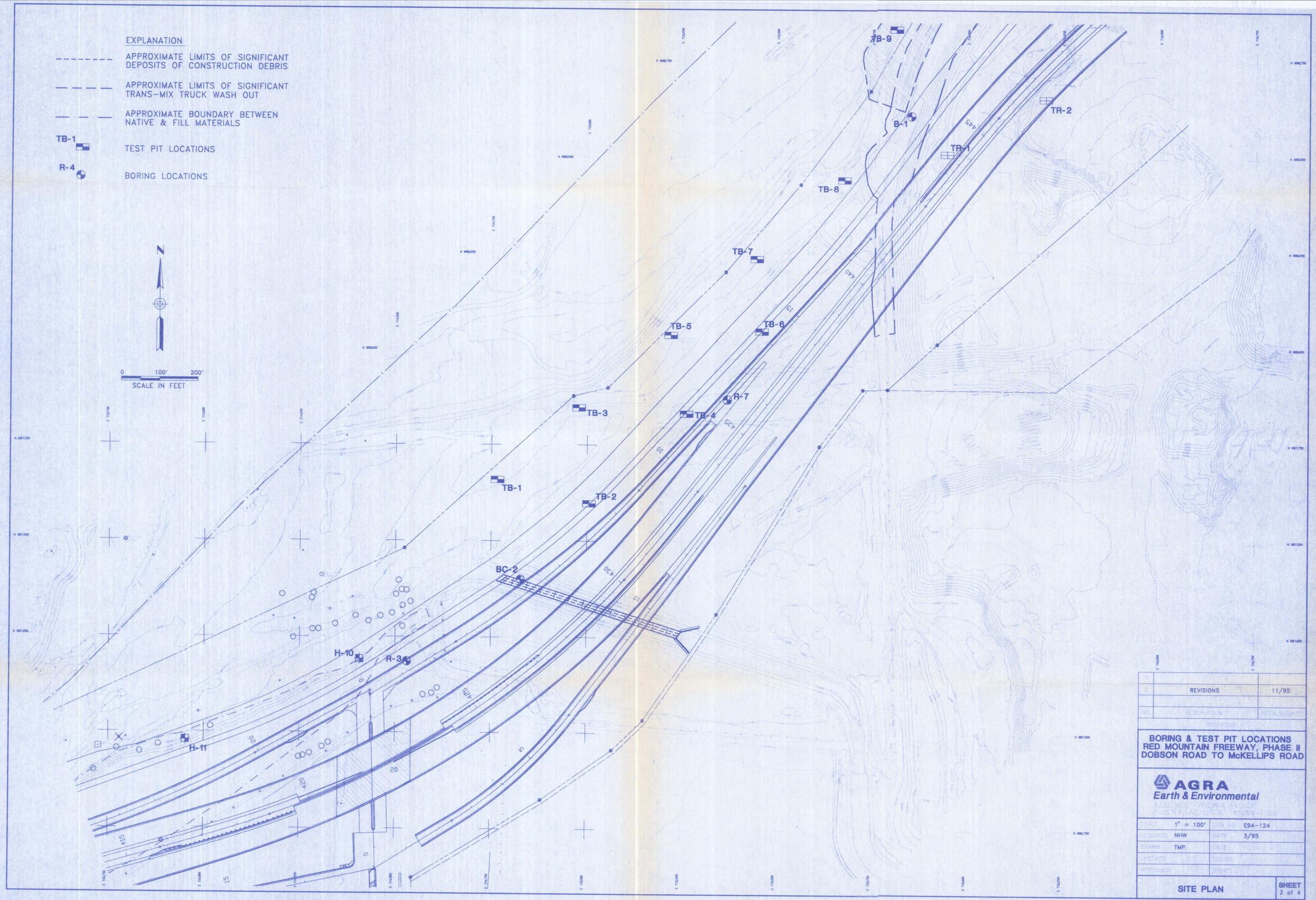

E94-124: CASE 1 - STA. 14+00 END OF CONSTRUCTION
SAFETY FACTOR = 1.328 FROM 200 RANDOM TRIAL SURFACES
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
AGRA
Earth & Environmental , Inc.


E94-124: CASE 2 - STA. 14+00 MAXIMUM WATER LEVEL AND SCOUR
SAFETY FACTOR = 1.796 FROM 200 RANDOM TRIAL SURFACES
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
AGRA
Earth & Environmental, Inc.


E94-124: CASE 3 - STA. 14+00 RAPID DRAWDOWM AT MAXIMUM SCOUR
SAFETY FACTOR = 1.183 FROM 200 RANDOM TRIAL SURFACES
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
AGRA
Earth & Environmental , Inc.


RED MOUNTAIN FREEWAY
HP-6
HB-3
H-12
395
400
405
410
EXPLANATION
APPROXIMATE BOUNDARY BETWEEN NATIVE AND FILL MATERIALS
HP-6
BORING LOCATIONS
H-12
TEST PIT LOCATIONS
N
0 100' 200'
SCALE IN FEET
REVISIONS 11/95
NO. DESCRIPTION INITIALS/DATE
REVISIONS
BORING & TEST PIT LOCATIONS
RED MOUNTIAN FREEWAY, PHASE II
DOBSON ROAD TO McKELLIPS ROAD
AGRA
Earth & Environmental
3232 WEST VIRGINIA AVENUE
PHOENIX, AZ USA 85009-1502
SCALE 1"=100'
JOB NO. E94-124
DESIGNED NHW
DATE 8/95
DRAWN TMP
DATE 8/95
CHECKED
SIGNED
APPROVED
SIGNED
SITE PLAN
SHEET 1 of 4



NO.	DESCRIPTION	INITIALS/DATE
3		
2	REVISIONS	11/95
1		

REVISIONS

BORING & TEST PIT LOCATIONS
RED MOUNTAIN FREEWAY, PHASE II
DOBSON ROAD TO McKELLIPS ROAD

AGRA
Earth & Environmental
3232 WEST VIRGINIA AVENUE
PHOENIX, AZ, U.S.A. 85009-1502

SCALE	1" = 100'	JOB NO.	E94-124
DESIGNED	NHW	DATE	3/95
DRAWN	TMP	DATE	
CHECKED		SIGNED	
APPROVED		SIGNED	

SITE PLAN

SHEET 2 of 4

AGRA EARTH & ENVIRONMENTAL, INC. DWG No. 124ALL-2

EXPLANATION

APPROXIMATE BOUNDARY BETWEEN NATIVE & FILL MATERIALS

APPROXIMATE LIMITS OF SIGNIFICANT TRNSIT-MIX TRUCK WASH OUT

APPROXIMATE LIMITS OF SIGNIFICANT DEPOSITS OF CONSTRUCTION DEBRIS

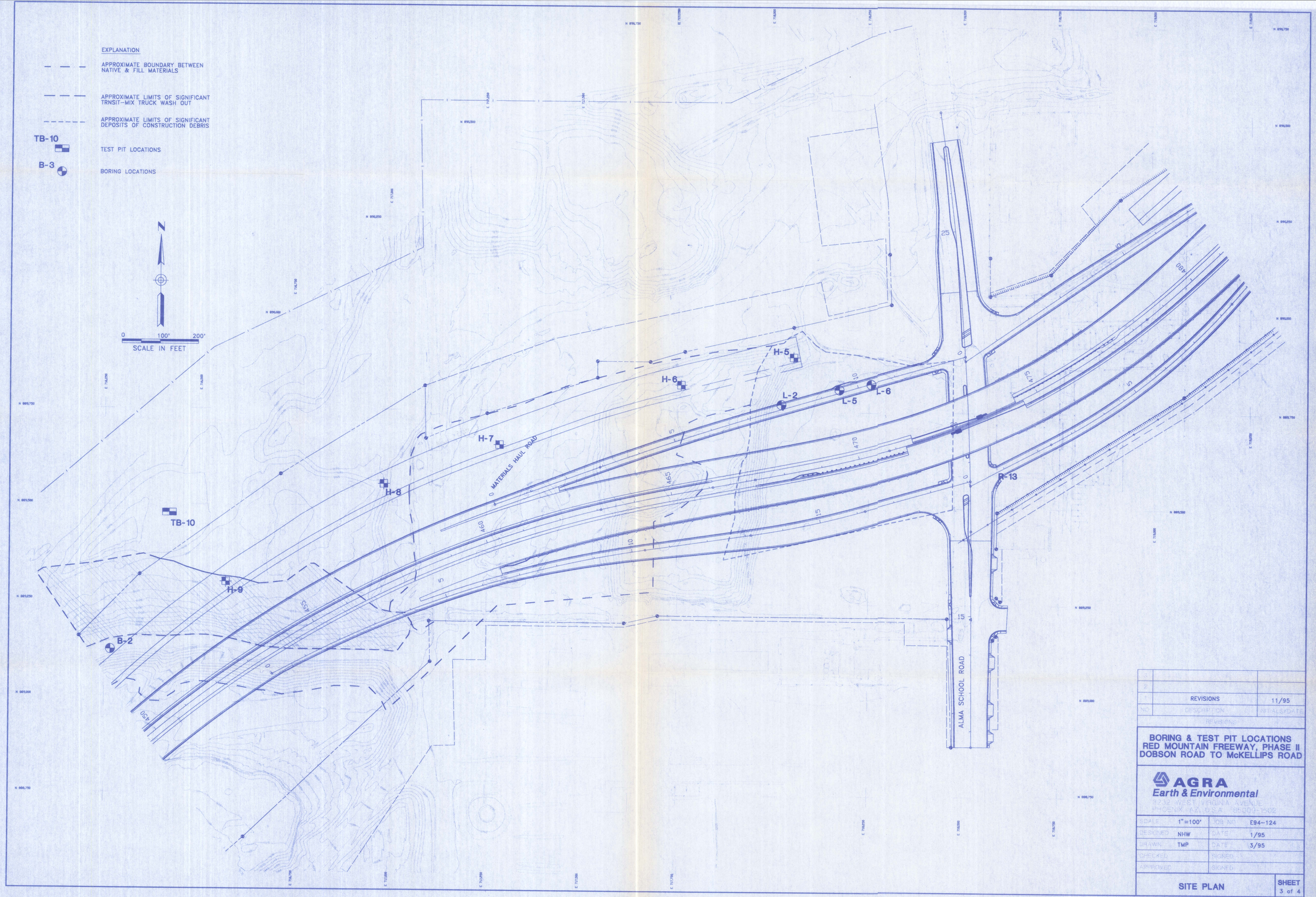
TB-10 TEST PIT LOCATIONS

B-3 BORING LOCATIONS

N

0 100' 200'

SCALE IN FEET



NO	DESCRIPTION	INITIALS & DATE
3		
2		
1	REVISIONS	11/95

REVISIONS

BORING & TEST PIT LOCATIONS
RED MOUNTAIN FREEWAY, PHASE II
DOBSON ROAD TO McKELLIPS ROAD

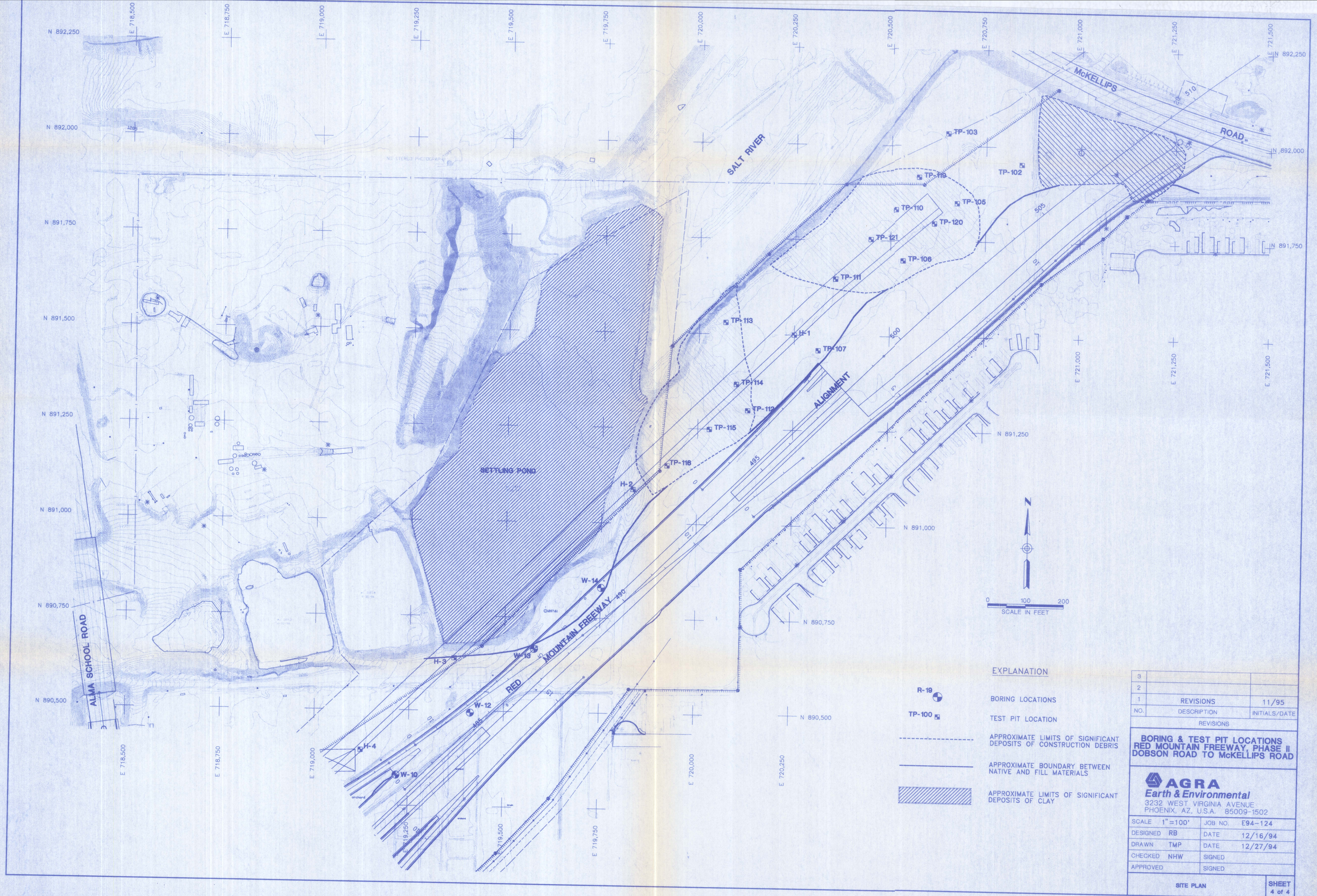
AGRA
Earth & Environmental
3232 WEST VIRGINIA AVENUE
PHOENIX, AZ, U.S.A. 85009-1502

SCALE	1"=100'	JOB NO	E94-124
DESIGNED	NHW	DATE	1/95
DRAWN	TMP	DATE	3/95
CHECKED		SIGNED	
APPROVED		SIGNED	

SITE PLAN

SHEET 3 of 4

AGRA EARTH & ENVIRONMENTAL, INC. DWG No. 124ALL-3



NO.	DESCRIPTION	INITIALS/DATE
3		
2		
1	REVISIONS	11/95

REVISIONS

BORING & TEST PIT LOCATIONS
RED MOUNTAIN FREEWAY, PHASE II
DOBSON ROAD TO McKELLIPS ROAD

AGRA
Earth & Environmental
3232 WEST VIRGINIA AVENUE
PHOENIX, AZ, U.S.A. 85009-1502

SCALE	1"=100'	JOB NO.	E94-124
DESIGNED	RB	DATE	12/16/94
DRAWN	TMP	DATE	12/27/94
CHECKED	NHW	SIGNED	
APPROVED		SIGNED	

SITE PLAN — **SHEET 4 of 4**

AGRA EARTH & ENVIRONMENTAL, INC. DWG No. 124ALL-4