SPEEDIE AND ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS
11029 N. 24th AVE. • SUITE 805 • PHOENIX, ARIZONA • 85029 • (602) 997-6391

DRAFT

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

REPORT ON SOIL INVESTIGATION

DESIGNATION: M.C.F.C.D. Roadway Bridge
Arizona Canal Diversion Channel

LOCATION: 25th Avenue @ Arizona Canal
Phoenix, Arizona

CLIENT: Sverdrup & Parcel and Associates

PROJECT NO: 88916SS

DATE: July 20, 1984

Registered Professional Engineer (Civil)
CERTIFICATE NO.
11431
JAMES ALAN
SPEEDIE
DATE SIGNED 7-20-84
Arizona U. S. A.

A118.958

SPEEDIE AND ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029 • (602) 997-6391

JAMES A. SPEEDIE, P.E.
GREGG A. CREASER, P.E.
GARY E. STOCKER, P.E.
STEVEN A. GRIESS, P.E.

REPORT ON SOIL INVESTIGATION

Registered Professional Engineer (Civil)
CERTIFICATE NO.
11431
JAMES ALAN
SPEEDIE
DATE SIGNED 7-20-84
Arizona U. S. A.

DESIGNATION: M.C.F.C.D. Roadway Bridge
Arizona Canal Diversion Channel

LOCATION: 25th Avenue @ Arizona Canal
Phoenix, Arizona

CLIENT: Sverdrup & Parcel and Associates

PROJECT NO: 88916SS

DATE: July 20, 1984

TABLE OF CONTENTS

	PAGE
INTRODUCTION	1
GENERAL SITE AND SOIL CONDITIONS	1
Site Conditions	1
General Subsurface Conditions	1
ANALYSIS AND RECOMMENDATIONS	2
Analysis	2
Foundation Design	3
Lateral Pressures	4
Pavement Design	4
Utilities Installation	5
GENERAL	5
APPENDIX	

SPEEDIE
AND ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029

INTRODUCTION

This report presents the results of a subsoil exploration carried out at the site of the proposed bridge for 25th Avenue as it passes over the Arizona Canal Diversion Channel adjacent to the Arizona Canal. The bridge will begin approximately 15 feet north of the Arizona Canal right-of-way and extend approximately 125 feet to the north.

Present plans call for the construction of a 110-foot long single-span bridge over the Diversion Channel at 90 degrees. The nearly-rectangular concrete-lined channel will have a flow line elevation of 1211± with near vertical side slopes. The bridge deck elevation will be at 1236± feet.

In order to maintain traffic flow during bridge construction, a temporary bridge over the canal will be built to the west of the existing bridge. Since this structure will function as a major traffic facility for a significant period, its design will be approached in the same manner as the permanent bridge. Furthermore, soil conditions at the recommended bearing depth are sufficiently similar that the recommendations presented herein are applicable to both bridges.

As noted on the Soil Boring Location Plan, Plate 1, Borings B-1 and B-2 were drilled at each end of the proposed permanent bridge. Boring B-3 was drilled to confirm the consistency of conditions at the temporary bridge site.

GENERAL SITE AND SOIL CONDITIONS

Site Conditions - At the time of this investigation, 25th Avenue was completed to 50 feet wide, curb to curb. There are no sidewalks. There are storm drains and water and sewer lines located within the right-of-way. Electrical service apparently terminates to the north of the proposed channel. There is an existing single span bridge over the Arizona Canal; the channel is currently unlined.

General Subsurface Conditions - Subsoil conditions at the site are relatively uniform within the test boring locations. The upper 2.5 to

3.0 feet consists of medium dense to dense brown clayey sand to sandy clay with a trace of gravel. Moisture contents are on the order of 7.0 percent, which is considerably lower then the plastic limit of 18. This material is most likely roadway fill.

Underlying the upper clayey sands in Boring No. 1 and No. 2 the subsoils consist of stiff to hard, sandy to silty clays extending to 13.0 feet. In Boring No. 3 the subsoil consists of medium to very dense light brown sand to a depth of 15 feet. This material contains varying amounts of silt or clay and a trace of gravel. Moisture contents for these sandy soils are on the order of 6.0 percent. In-place dry densities are on the order of 95.7 PCF. These materials exhibit a Standard Penetration Resistance (SPT) of 15 to 25 bpf.

Boring No. 1 and No. 2 both encountered a stratum of medium dense to dense light brown gravelly sand from 13.0 to 19.0 feet. This material is very clean with only a trace of silt noted. This soil exhibits a SPT on the order of 20 bpf.

Underlying the sandy stratum in all three borings the subsoil consists of hard light brown sandy clay extending to 29.0 to 32.5 feet. Moisture contents are on the order of 10 to 23 percent with plastic limits ranging from 17 to 30. In-place dry densities are on the order of 98 to 114 PCF. This layer exhibits a Standard Penetration Resistance (SPT) of 30 to 100 blows per foot.

Below the sandy clays the subsoil consists of dense to very dense brown gravelly sand to depths of approximately 55 feet. This stratum contains varying amounts of fines and numerous cobbles. Auger refusal was met on cobbles in Boring No. 2. Standard Penetration Resistance ranges from 40 to better than 100 bpf.

Although the bore holes were sampled full of water, all borings were dry upon completion. Apparently perched groundwater should not be encountered at the depths investigated.

ANALYSIS AND RECOMMENDATIONS

Analysis - Analysis of the field and laboratory data indicate that the subsoils at the site are favorable for the support of the proposed main bridge on shallow foundations founded on the very dense gravelly sand. Founding on the sand will minimize any effects of future saturation.

All borings were dry upon completion. Accordingly groundwater should not be a factor during construction. However, due to sand lenses and the proximity of the Canal, seepage could be a nuisance. Details of the temporary bridge are not known at this time. However, it appears reasonable to support this bridge on shallow foundations as discussed below.

Foundation Design - Project documents provided by Sverdrup & Parcel indicate the proposed bottom of the Diversion Channel will be at Elevation 1211. It is our opinion that the proposed structures can be properly supported at Elevation 1202 on the dense gravelly sand encountered at depths of 29 to 32 feet (Elevation 1207 to 1204) utilizing conventional spread footings or drilled belled caissons. Net allowable bearing capacity values for design have been determined for these and other levels and are presented, together with settlement estimates, as follows:

Footing Elevation (Ft.)	Design Bearing Capacity (psf)	Estimated Settlements (In.) Total	Differential
1202	8000	1.0	0.5
	10000	1.2	0.6
	12000	1.4	0.7
1197*	12000	0.7	0.1
	15000	0.8	0.1

* Caissons only

These values apply to both spread footings and hand-cleaned belled caissons. Cementation, particularly at Elevation 1210 is light and variable, which may cause sloughing problems for belled caissons. Accordingly, if caissons are selected, we recommend that a full-size test hole be drilled to confirm that bells will stay open, or even if straight shafts are practical.

Lateral Pressures - Native soils are quite stable and would exert relatively small active pressures; accordingly active lateral pressures for retaining wall design will be governed by compaction of backfill. For compaction in thin lifts using light equipment, an equivalent fluid pressure of 35 pcf may be utilized for unrestrained walls; for rigid or restrained walls, use 60 pcf.

For resistance of lateral loads, passive pressures for shallow footings (Elevation 1202) may be simulated by an equivalent fluid pressure of 350 pcf for continuous footings and 400 pcf for spread footings, together with a sliding friction coefficient of 0.4. For caissons (to Elevation 1197) a value of 600 pcf may be used.

All backfill must be compacted to not less than 95 percent of maximum dry density (ASTM D-698) to mobilize these passive values at low strain. We recommend selectively stockpiling excavated material to use for backfill and entirely preclude the use of plastic clays for this purpose.

Pavement Design - Grading operations should be conducted so that the upper 3.0 feet of the roadway approach embankments be constructed of the more granular subsoils to take advantage of their structural stability. This pavement design is based on the City of Phoenix Standard Detail P-1104, Depth of Base Course for Major Streets; a supplement to the M.A.G. Uniform Standard Details. For design purposes, a value of 50 percent passing the 200 sieve and a plasticity index of 14 percent results in the following minimum design:

Asphaltic Concrete	ABC	Select
4 inches	4 inches	8 inches

All materials should meet the applicable requirements of M.A.G. Uniform Standard Specifications. The asphalt mix design should meet the requirements of M.A.G. designated C-3/4 mix.

All embankment subgrade materials, abutment and wing wall backfill should be compacted to 95 percent maximum dry density as determined by ASTM D-698 (Standard Proctor). Pavement base course materials should be compacted to 100 percent.

Utilities Installation - Trench excavations for utilities may be accomplished by conventional trenching equipment. Excavations deeper than approximately 13 feet below existing grade will encounter sands and gravels subject to minor sloughing. It is believed, however, that this material may contain enough fines to enable trench walls to stand near-vertically for the short periods of time required to install utilities. If trenches are greater than shoulder-height, precaution must be taken to protect workmen.

Backfill of trenches may be carried out with native excavated material. This material should be moisture conditioned, placed in 8-inch lifts and mechanically compacted. Water settling is not recommended. Compaction should meet the requirements of M.A.G. Uniform Standard Specifications.

GENERAL

The scope of this investigation and report does not include regional considerations such as seismic activity and ground fissures resulting from subsidence due to groundwater withdrawal.

Our analysis of data and the recommendations presented herein are based on the assumption that soil conditions do not vary significantly from those found at specific sample locations. Our work has been performed in accordance with generally accepted engineering principles and practice; this warranty is in lieu of all other warranties expressed or implied.

We recommend that a Soils Engineer monitor the earthwork and foundation portions of this project to ensure compliance to project specifications and the recommendations presented in this report. If any significant changes are made in the scope of work or type of construction that was assumed in this report, we must review such revised conditions to confirm our findings if the conclusions and recommendations presented herein are to apply.

Respectfully submitted,

Registered Professional Engineer (Civil)
CERTIFICATE NO.
14383
GREGG ALAN
CREASER
Date Signed 7-20-94
ARIZONA, U.S.A.

Gregg A. Creaser

Gregg A. Creaser, P.E.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
11431
JAMES ALAN
SPEEDIE
DATE SIGNED 7-20-94
Arizona U.S.A.

James A. Speedie

James A. Speedie, P.E.

SPEEDIE
AND ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029

APPENDIX

FIELD AND LABORATORY INVESTIGATION . . . . . Page 1 of 1

SOIL BORING LOCATION PLAN . . . . . Plate 1

SOIL LOG LEGEND . . . . . Plate 2

LOG OF SOIL BORINGS: Soil Boring No. B-1 . . . . . Figure No. 1A and 1B

Soil Boring No. B-2 . . . . . Figure No. 2A and 2B

Soil Boring No. B-3 . . . . . Figure No. 3

TABULATION OF TEST DATA . . . . . Figure No. 4

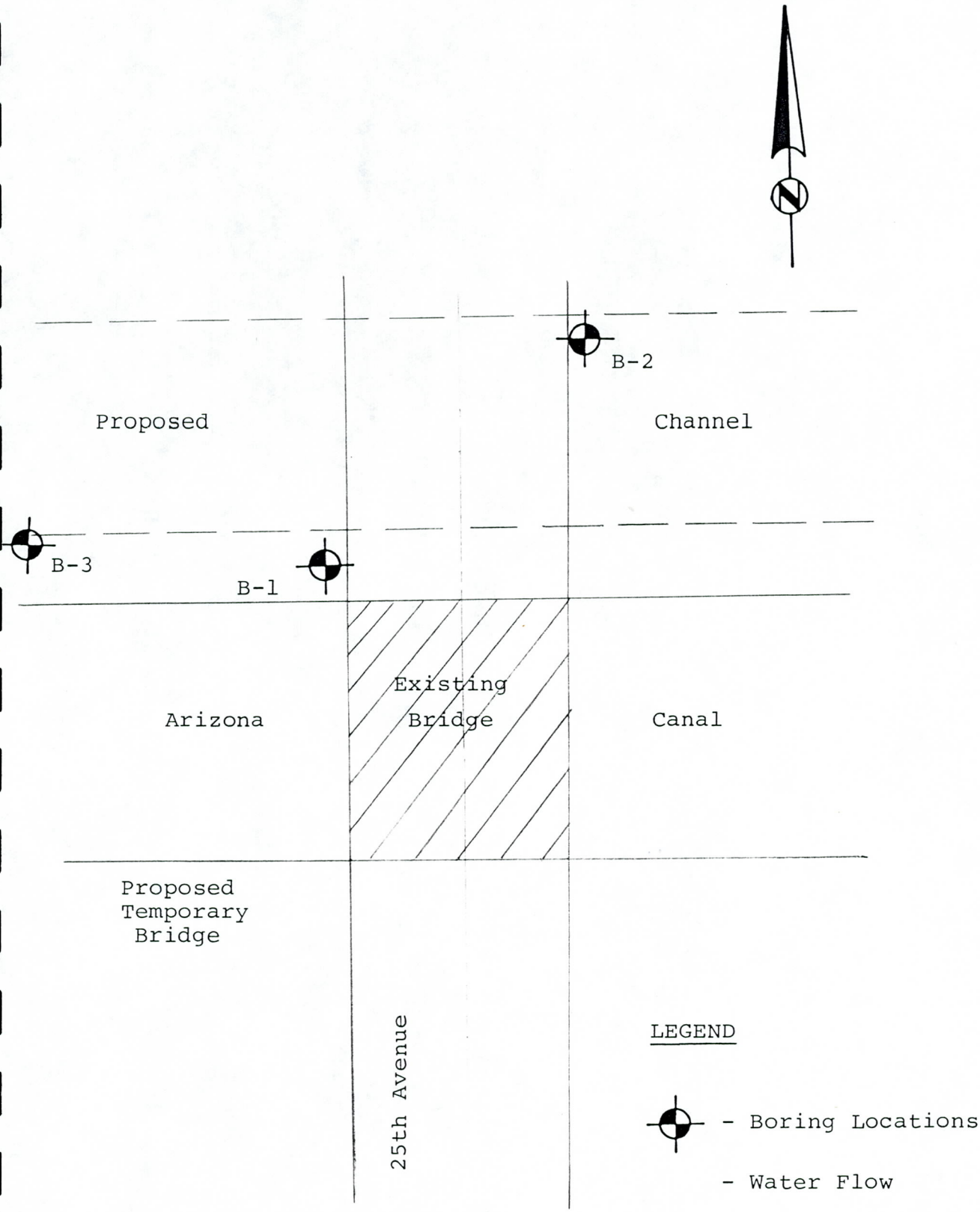
CONSOLIDATION TEST . . . . . Figure No. 5

TRIXIAL SHEAR TEST DATA . . . . . Figure No. 6

FIELD AND LABORATORY INVESTIGATION

On June 6, 1984, three soil test borings were drilled at the approximate locations shown on the attached Soil Boring Location Plan, Plate 1. All exploration work was carried out under the full-time supervision of our engineer, who recorded subsurface conditions and obtained samples for laboratory testing. The soil borings were advanced with a truck-mounted CME 55 drill rig utilizing 6.5-inch diameter hollow-flight augers. Detailed information regarding the borings and samples obtained can be found on an individual Log of Test Boring prepared for each drilling location. It is noted that, in our effort to simulate moisture from future seepage, water was added to each hole prior to taking any driven sample.

Laboratory testing consisted of moisture content, dry density, grain-size distribution and plasticity (Atterberg Limits) tests for classification and pavement design parameters. Consolidation tests were performed on a selected ring sample in order to estimate settlements and determine effects of inundation. Triaxial shear tests were performed on selected liner samples to determine the in-place shear strength of the subsoils. All field and laboratory data is presented in this Appendix as Figures No. 1 through 5.



SPEEDIE & ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS
Project No. 88916SC

SOIL BORING LOCATION PLAN
MCFCD ROADWAY BRIDGE
25TH AVE. & A.C.D.C.
PHOENIX, ARIZONA

NOTE: Drawing Not To Scale

SOILS CLASSIFICATION CHART

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVEL WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

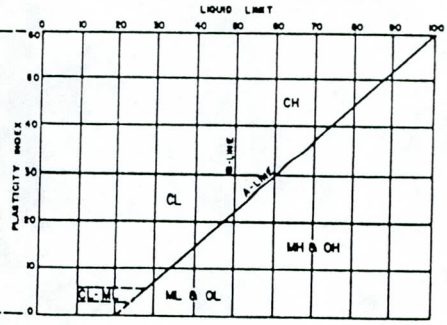
FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOILS

GRADATION CHART

MATERIAL SIZE		PARTICLE SIZE			
		LOWER LIMIT		UPPER LIMIT	
		MILLIMETERS	SIEVE SIZE*	MILLIMETERS	SIEVE SIZE *
SAND	FINE	.074	#200*	0.42	#40*
	MEDIUM	0.42	#40*	2.00	#10*
	COARSE	2.00	#10*	4.76	#4*
GRAVEL	FINE	4.76	#4*	191	3/4"*
	COARSE	191	3/4"*	76.2	3"*
COBBLES		762	3"*	304.8	12"
BOULDERS		304.8	12"*	914.4	36"

*U.S. Standard *Clear Square Openings

PLASTICITY CHART



CONSISTENCY			RELATIVE DENSITY	
CLAYS & SILTS	BLOWS/FOOT*	STRENGTH ‡	SANDS & GRAVELS	BLOWS/FOOT*
VERY SOFT	0-2	0-½	VERY LOOSE	0-4
SOFT	2-4	½-½	LOOSE	4-10
FIRM	4-8	½-1	MEDIUM DENSE	10-30
STIFF	8-16	1-2	DENSE	30-50
VERY STIFF	16-32	2-4	VERY DENSE	OVER 50
HARD	OVER 32	OVER 4		

* Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).

‡ Unconfined compressive strength in tons/sq ft. Read from a pocket penetrometer.

SAMPLE DESIGNATION	PENETRATION RESISTANCE SYMBOL	DESCRIPTION
Bag	-	Large Bulk Sample
BS	-	Misc. Grab Sample - Bottle or Bag
AS	-	Auger Sample - A grab sample taken directly from auger flights
S	●	Spoon Sample - Standard Penetration Test (ASTM D-1586)-Driving a 2.0-inch outside diameter, 1 3/8-inch inside diameter, split spoon sampler into undisturbed soil for three sucessive 6-inch increments of penetration by means of a 140-pound weight falling freely through a distance of 30 inches. The cumulative number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).
LS	●	Liner Sample - Standard Penetration Test-Driving a 2.0-inch outside diameter split spoon, equipped with two, 3-inch long by 1 3/8-inch inside diameter brass liners, seperated by a 1-inch long spacer, into undisturbed soil as above.
RS	○	Ring Sample - Driving a 3.0-inch outside diameter spoon, equipped with a series of 2.42-inch inside diameter, 1-inch long brass rings, into undisturbed soil for one 12-inch increment by means of a 140-pound weight falling freely through a distance of 30 inches. The blows required for the 12 inches of penetration are recorded.
ST	-	Shelby Tube - A 3.0-inch outside diameter thin-walled tube continuously pushed into undisturbed soil by a rapid motion, without impact or twisting. (ASTM D-1587)
-	■	Continuous Penetration Resistance (Bullnose) - Driving a 2.0-inch outside diameter "Bullnose penetrometer" continuously into undisturbed soil by means of a 140-pound weight falling freely through a distance of 30 inches. The blows for each successive 12-inch increment are recorded.

NOTE: The stratification lines shown on the Logs of Test Borings and/or Test Pit represent the approximate boundary between soil types, and the transition may be gradual.

SOIL LOG LEGEND

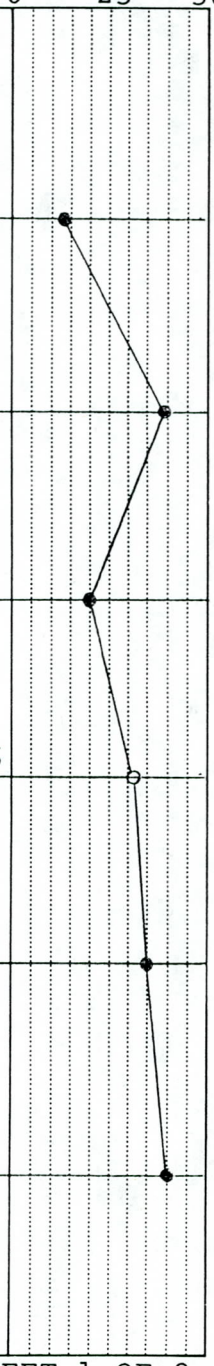
SPEEDIE & ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS
1109 NORTH 24TH AVENUE, SUITE 8[illegible]
INDIANIE, ARIZONA 85[illegible]

GROUND SURFACE ELEVATION: 1236+

SOIL DESCRIPTION		SAMPLE NUMBER	ELEVATION OF SAMPLE TIP *	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)
Medium Dense Brown CLAYEY SAND (SC - Dry). Trace Of Gravel.	2.5'				
Stiff Brown SANDY CLAY (CL - Dry). Trace Of Gravel. Moderately Cemented.	9.0'	S-1	5.5	-	-
Hard Light Brown SILTY CLAY (CL - Dry).	13.0'	S-2	10.5	-	-
Medium Dense Light Brown GRAVELLY SAND (SM - Wet). Trace Of Silt.	18.0'	S-3	15.5	-	-
Hard Light Brown SANDY CLAY (CL - Dry). Slightly Cemented.	22.5'	RS-4	20.0	10.5	98.6
Hard Brown And White Mottled SANDY CLAY (CL - Moist).	29.0'	LS-5	25.0	16.5	114.0
	30.5'	S-6	30.5	-	-

ELEVATION (FEET)

STANDARD PENETRATION NUMBER (N) BLOWS PER FOOT



CONTINUED ON NEXT SHEET

* Sample Depth

SHEET 1 OF 2

BORING STARTED: 06-12-84
BORING COMPLETED: 06-12-84
FIELD ENGINEER/TECHNICIAN: R. Schooler
DRILLER: K. Heinrich
CONTRACTOR: Heber Mining

WATER LEVEL IN HOLE AT Dry

NUMBERS OF HOURS AFTER COMPLETION:

SPEEDIE & ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS

LOG OF TEST BORING NUMBER B-1

MCFCD ROADWAY BRIDGE
25TH AVENUE &
ARIZONA CANAL DIVERSION CHANNEL
PHOENIX, ARIZONA

APPROVED: JAS | DATE: 07-13-84
PROJECT NO: 88916SC | FIGURE NO: 1A

GROUND SURFACE ELEVATION: 1236±

SOIL DESCRIPTION	SAMPLE NUMBER	ELEVATION OF SAMPLE TIP *	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	STANDARD PENETRATION NUMBER (N) BLOWS PER FOOT (0 – 25 – 50)
Dense To Very Dense Brown GRAVELLY SAND (SP - Wet). Variable Amounts of Clay And Cobbles.	S-7	35.5	-	-	
	S-8	40.5	-	-	89/12" →
	S-9	44.5	-	-	50/4" →
	S-10	50.5	-	-	94/10" →
54.5'	S-11	55.5	-	-	90/11" →
Hard Brown And White Mottled SANDY CLAY (CL - Dry). Cobbles Noted At 59 Feet. 60.0'					
END OF BORING					

ELEVATION (FEET)

* Sample Depth

SHEET 2 OF 2

BORING STARTED: 06-12-84
BORING COMPLETED: 06-12-84
FIELD ENGINEER/TECHNICIAN: R. Schooler
DRILLER: K. Heinrich
CONTRACTOR: Heber Mining

▽ WATER LEVEL IN HOLE AT Dry

NUMBERS OF HOURS AFTER COMPLETION:

SPEEDIE & ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS

LOG OF TEST BORING NUMBER B-1

MCFCD ROADWAY BRIDGE
25TH AVENUE &
ARIZONA CANAL DIVERSION CHANNEL
PHOENIX, ARIZONA

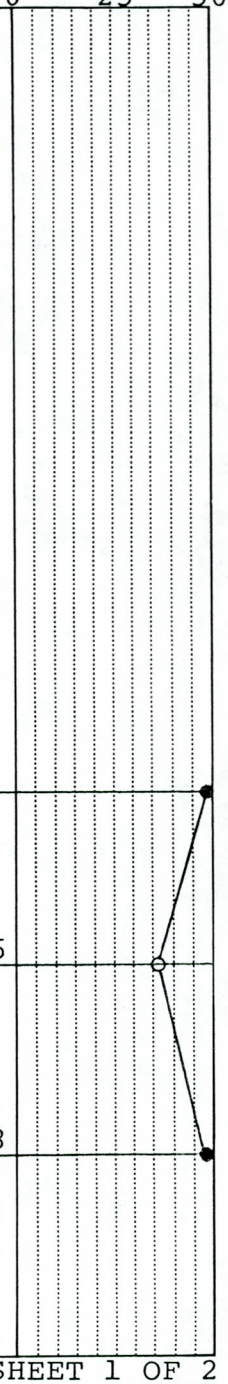
APPROVED: JAS	DATE: 07-13-84
PROJECT NO: 88916SC	FIGURE NO: 1B

GROUND SURFACE ELEVATION: 1235±

SOIL DESCRIPTION		SAMPLE NUMBER	ELEVATION OF SAMPLE TIP *	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)
Medium Dense Brown CLAYEY SAND (SC - Dry). Some Gravel.	3.0'				
Very Stiff Brown SANDY CLAY (CL - Dry). Moderately Cemented.	13.5'				
Dense Light Brown GRAVELLY SAND (SM - Dry). Trace Of Silt.	19.0'				
Hard Light Brown SANDY CLAY (CL - Moist).	22.5'	S-1	20.5	-	-
Dense Light Brown CLAYEY SAND (SC - Moist). Trace Of Gravel.	27.5'	RS-2	25.0	14.2	111.6
Hard Light Brown SANDY CLAY (CL - Wet). Trace Of Gravel.	30.0'	LS-3	30.0	23.3	102.8
CONTINUED ON NEXT SHEET					

ELEVATION (FEET)

STANDARD PENETRATION NUMBER (N) BLOWS PER FOOT



* Sample Depth

SHEET 1 OF 2

BORING STARTED: 06-12-84
BORING COMPLETED: 06-12-84
FIELD ENGINEER/TECHNICIAN: R. Schooler
DRILLER: K. Heinrich
CONTRACTOR: Heber Mining

WATER LEVEL IN HOLE AT Dry

NUMBERS OF HOURS AFTER COMPLETION:

SPEEDIE & ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS

LOG OF TEST BORING NUMBER B-2

MCFCD ROADWAY BRIDGE
25TH AVENUE &
ARIZONA CANAL DIVERSION CHANNEL
PHOENIX, ARIZONA

APPROVED: DS DATE: 07-13-84

PROJECT NO: 88916SC FIGURE NO: 2A

GROUND SURFACE ELEVATION: 1235±

SOIL DESCRIPTION	SAMPLE NUMBER	ELEVATION OF SAMPLE TIP *	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	STANDARD PENETRATION NUMBER (N) BLOWS PER FOOT (0 – 25 – 50)
32.5'					
	S-4	35.5	-	-	94/10" →
Very Dense Brown GRAVELLY SAND (SP - Moist). Trace Of Silt. Cobbles.	S-5	39.3	-	-	50/3" →
	S-6	44.5	-	-	50/5" →
48.0'					
END OF BORING - Auger Refusal On Cobbles					

ELEVATION (FEET)

* Sample Depth

SHEET 2 OF 2

BORING STARTED: 06-12-84
BORING COMPLETED: 06-12-84
FIELD ENGINEER/TECHNICIAN: R. Schooler
DRILLER: K. Heinrich
CONTRACTOR: Heber Mining

WATER LEVEL IN HOLE AT Dry

NUMBERS OF HOURS AFTER COMPLETION:

SPEEDIE & ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS

LOG OF TEST BORING NUMBER B-2

MCFCD ROADWAY BRIDGE
25TH AVENUE &
ARIZONA CANAL DIVERSION CHANNEL
PHOENIX, ARIZONA

APPROVED: JAS	DATE: 07-13-84
PROJECT NO: 88916SC	FIGURE NO: 2B

GROUND SURFACE ELEVATION: 1233±

SOIL DESCRIPTION		SAMPLE NUMBER	ELEVATION OF SAMPLE TIP *	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	STANDARD PENETRATION NUMBER (N) BLOWS PER FOOT (0 – 25 – 50)
Very Stiff Light Brown SANDY CLAY (CL - Dry). Trace Of Gravel. Moderately Cemented.	3.0'	S-1	2.5	7.0	-	
Very Dense Light Brown SAND (SC - Dry). Some Clay. Trace Of Gravel. Some Voids.	8.0'	RS-2	5.0	6.0	95.7	54/12" →
Medium Dense Light Brown SAND (SM - Dry). Trace Of Silt. Cobbles.	15.0'	S-3	10.5	-	-	
		S-4	15.5	-	-	
Very Stiff Light Brown SANDY CLAY (CL - Dry). Trace Of Gravel. Moderately Cemented.	20.5'	S-5	20.5	-	-	
END OF BORING						

ELEVATION (FEET)

* Sample Depth

BORING STARTED: 06-12-84
BORING COMPLETED: 06-12-84
FIELD ENGINEER/TECHNICIAN: R. Schooler
DRILLER: K. Heinrich
CONTRACTOR: Heber Mining

WATER LEVEL IN HOLE AT Dry

NUMBERS OF HOURS AFTER COMPLETION:

SPEEDIE & ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS

LOG OF TEST BORING NUMBER B-3

MCFCD ROADWAY BRIDGE
25TH AVENUE &
ARIZONA CANAL DIVERSION CHANNEL
PHOENIX, ARIZONA

APPROVED: JAS	DATE: 07-13-84
PROJECT NO: 88916SC	FIGURE NO: 3

TABULATION OF TEST DATA

Test Boring or Test Pit Number	Sample Number	Depth of Sample Tip	Elevation of Sample Tip	Natural Water Content (percent of dry weight)	In-Place Dry Density (pounds per cubic foot)	Particle Size Distribution							Atterberg Limits			Unified Soil Classification	Cohesion – one-half of Unconfined Compressive Strength (psf)
						Colloids (percent)	Clay (percent)	Silt (percent)	Fine Sand (percent)	Medium Sand (percent)	Coarse Sand (percent)	Gravel (percent)	Liquid Limit (percent)	Plastic Limit (percent)	Plasticity Index (percent)		
B-1	RS-4	20.0	-	10.5	98.6	←	52	→	43	5	0	0	30	17	13	CL	-
B-1	LS-5	25.0	-	16.5	114.0	←	58	→	19	8	6	9	50	30	20	CL	-
B-2	RS-2	25.0	-	14.2	111.6	←	43	→	19	18	16	5	50	29	21	SC	-
B-2	LS-3	30.0	-	23.3	102.8	-	-	-	-	-	-	-	-	-	-	CL	-
B-3	S-1	2.5	-	7.0	-	←	82	→	16	1	0	1	29	18	11	CL	-
B-3	RS-2	5.0	-	6.0	95.7	←	20	→	30	24	17	8	35	21	14	SC	-

PROJECT NO. 88916SC

SPEEDIE & ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS

SHEET 1 OF 1

FIGURE NO. 4

SPEEDIE & ASSOCIATES

GEOTECHNICAL AND SITE ENGINEERS
11029 NORTH 24TH AVENUE, SUITE 805 • PHOENIX, ARIZONA 85029 • (602) 997-6391

CONSOLIDATION TEST

PROJECT: Arizona Canal Bridge PROJECT NO.: 88916SC DATE:
LOCATION: 25th Avenue & Arizona Canal - Phoenix, Arizona
CLIENT: Sverdrup & Parcel and Assoc. LAB. SAMPLE NO.: 3606
BORING NO.: B-1 FIELD SAMPLE NO.: RS-4 SAMPLE DEPTH: 20.0 SAMPLE ELEV. (TIP): -
TESTED BY: RAS DATE: 6-15-84 CHECKED BY: DATE:
REMARKS: Sample inundated at end of test at 8,000 PSF.

———— - In-situ
— — — - Inundated

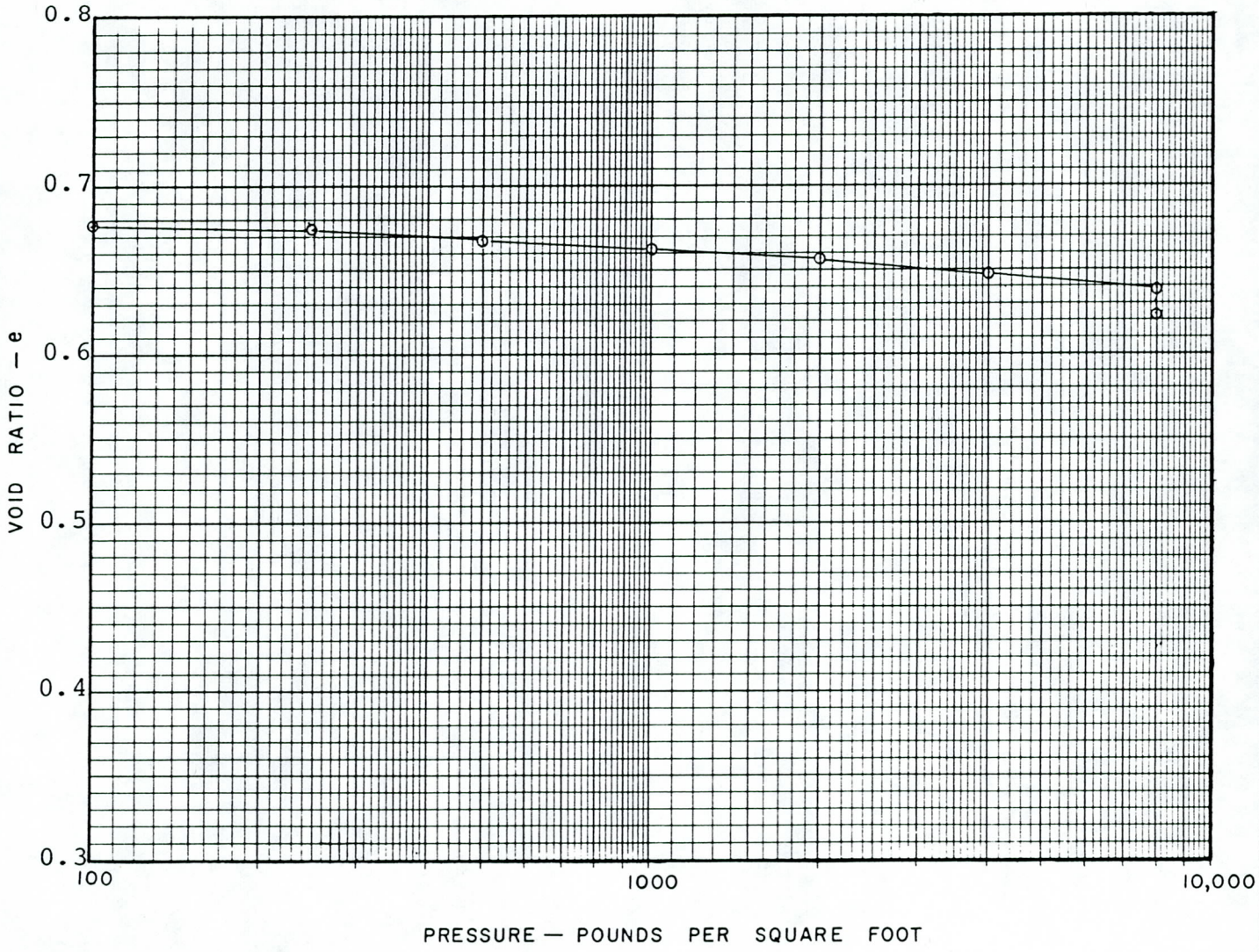
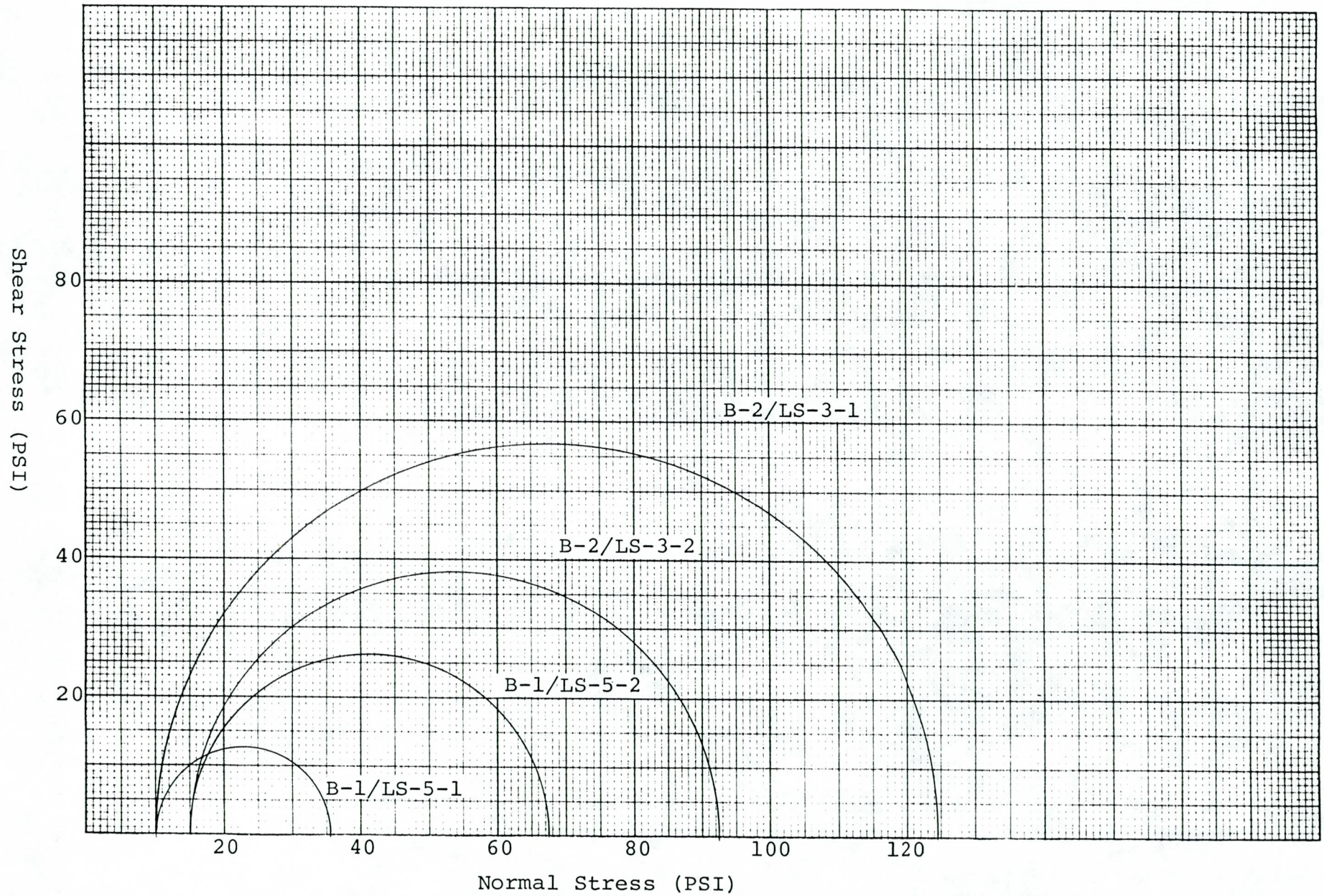


FIGURE NO. 5



TRIAXIAL SHEAR TEST DATA
MCFCD ROADWAY BRIDGE
25TH AVE. & ARIZONA CANAL
PHOENIX, ARIZONA

SPEEDIE & ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS
Project No. 88916SC

FIGURE NO. 6