8232

ATL
TESTING LABORATORIES

SOSSAMAN BOX CULVERT
SOSSAMAN ROAD AND GUADALUPE ROAD
MCFCD 91-06

Registered Professional Engineer
CERTIFICATE NO.
23677

ATL JOB NO. 192004

March 11, 1992

REPORT OF

GEOTECHNICAL INVESTIGATION

FOR

WELLS ENGINEERS, INC.

SOSSAMAN BOX CULVERT
SOSSAMAN ROAD AND GUADALUPE ROAD
MCFCD 91-06

REVIEWED BY:

David P. Hayes, P.E.
Executive Vice President

Registered Professional Engineer (Civil)
CERTIFICATE NO.
23677
JAMES D. ROSE
Date Signed 3-13-92
ARIZONA U.S.A.

ATL TESTING LABORATORIES
GEOTECHNICAL AND MATERIALS CONSULTANTS

March 11, 1992

Wells Engineers, Inc.
3737 North 7th Street, Suite 201
Phoenix, Arizona 85014-5005

Attn: Mr. Mike Lopez

Re: **Geotechnical Investigation**
Sossaman Box Culvert
Sossaman Road and
Guadalupe Road
Maricopa County
MCFCD 91-06
ATL Job No. 192004

Gentlemen:

This report presents the results of the geotechnical investigation of the subject site. The accompanying report presents the results of the field exploration, laboratory tests, and engineering analysis. The existing box culvert will be modified to include a fifth barrel, east and west extensions, a new approach apron and spillway plus downstream channel connections.

The geotechnical work was performed in accordance with ATL Testing Laboratories (ATL) Proposal No. 91047 dated March 20, 1991.

ATL has appreciated the opportunity to be of service to you on this project and looks forward to a continued association on future projects. Should any questions arise, please do not hesitate to contact us at your earliest convenience.

Registered Professional Engineer Certificate No. 22718 David P. Hayes Date Signed 3/11/92 Arizona U.S.A.

Reviewed By:

David P. Hayes, P.E.
Executive Vice President

Very truly yours,

Registered Professional Engineer Certificate No. 23677 James D. Rose Date Signed 3-11-92 Arizona U.S.A.

James D. Rose, P.E.
Vice President, Geotechnical

JDR/dn

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REVIEWED BY:

David P. Hayes, P.E.
Executive Vice President

REPORT OF

GEOTECHNICAL INVESTIGATION

FOR

WELLS ENGINEERS, INC.

PROJECT

SOSSAMAN BOX CULVERT
SOSSAMAN ROAD AND GUADALUPE ROAD
MCFCD 91-06
ATL JOB NO. 192004

1.0 PROJECT DESCRIPTION

The project consists of modifying an existing box culvert at Sossaman Road and Guadalupe Road in Maricopa County Arizona. The box culvert conveys storm water from the channel on the east side of Sossaman Road to the downstream channel on the north side of Guadalupe Road. The box culvert will be widened by adding a fifth barrel and extended length wise to the west and east. The approach apron and concrete spillway will also be reconstructed. The inflow channel approach and outflow are concrete lined. The modified box culvert will connect to the concrete channel lining.

2.0 SCOPE OF WORK

The purpose of this geotechnical investigation is to provide engineering data and recommendations for:

- Allowable soil bearing capacity for the box culvert
- Lateral earth pressures

The allowable soil bearing capacity and lateral earth pressures are to be determined in accordance with NAVFAC DM 7.2.

3.0 LOCATION AND SITE DESCRIPTION

The site is located at Sossaman Road just north of Guadalupe Road in eastern Maricopa County. The existing box culvert connects an inflow channel on the east side of Sossaman Road to an outflow channel on the west side of Sossaman Road and the north side of Guadalupe Road. The general location is shown on Plate No. 2.

4.0 SUBSURFACE INVESTIGATION

Two (2) borings were drilled and sampled to a depth of 16.5 feet below existing grades at each end of the existing box culvert. All borings were drilled with a Mobile B-50 truck mounted drill using four-inch diameter continuous flight auger and eight-inch diameter hollow stem auger. Water was added to the hole before conducting standard penetration tests (SPTs) in accordance with MCFCD requirements. Driven ring samples were obtained at in-situ moisture conditions.

ATL's field representative logged the borings and took samples of the different subsurface soils encountered. Plate No. 3 shows the boring locations. The boring logs are presented in Appendix A.

5.0 LABORATORY TESTING

Representative soil samples were returned to ATL's laboratory for further analyses. The specific type and number of laboratory tests performed for the project are as follows:

Sieve Analysis	4
Atterberg Limits	4
Moisture Contents	4
Standard Proctor	1
Consolidation	2
Swell	1
Direct Shear	1

Results of the laboratory tests are summarized in Appendix B, "Laboratory Test Results".

6.0 SUMMARY OF SUBSURFACE CONDITIONS

The upper 6 feet of soil consisted of medium dense clayey sand and silty sand. Below 6 feet of depth to the bottom of the borings at 16.5 feet of depth, the soil consisted of moist very stiff to hard sandy clay and dense to medium dense clayey sand. Groundwater was not encountered in the borings to the depths explored.

7.0 DISCUSSIONS AND RECOMMENDATIONS

7.1 Allowable Bearing Capacity

The bearing capacity for the box culvert was established using the procedures of Chapter 4, "Shallow Foundations" in NAVFAC DM 7.2, dated September 1, 1986. The proposed addition to the box culvert may bear on compacted native clayey sand having an allowable bearing capacity of 4000 psf. The top 12 inches of clayey sand should be compacted to a minimum of 95 percent of the ASTM D698 dry density with the moisture content within 2 percent of optimum. Compaction should be done in 6 inch maximum lifts. Anticipated total settlement is less than 0.5 inch.

7.2 Lateral Earth Pressures

To facilitate design of retaining structures, the following lateral earth pressures expressed as equivalent fluid pressures should be used. The following equivalent fluid pressures are based upon using on-site compacted clayey silty sand with a unit weight of 120 PCF and an internal friction angle of 33 degrees.

- Active - 35 pounds per cubic foot
- At Rest - 55 pounds per cubic foot
- Passive - 407 pounds per cubic foot

The same equivalent fluid pressures may be used for an imported compacted silty sand with a unit weight of 120 PCF and an internal friction angle of 33 degrees. Refer to Section 7.3.4.

7.3 General Construction Recommendations

7.3.1 Subgrade Preparation

The roadway subgrade should be prepared in accordance with Section 301 of the "Uniform Standard Specification for Public Works Construction" sponsored by the Maricopa Association of Governments (MAG).

7.3.2 Asphaltic Concrete

The asphaltic concrete pavement should be placed in accordance with Section 321 of MAG. The asphaltic concrete should be in accordance with Section 710 of MAG specifications. The asphaltic concrete should be in accordance with Type C-3/4.

7.3.3 Aggregate Base

The aggregate base for the roadway should be placed in accordance with Section 310 of MAG. The aggregate base should meet the requirements of Section 702 of MAG.

7.3.4 Imported Fill

The imported granular soil shall conform to these specifications:

Sieve Size	Percent Passing
3"	100
#4	40 - 100
#200	0 - 25

The plasticity index shall not exceed 10.

8.0 ADDITIONAL SERVICES

It is recommended that ATL be retained to provide materials testing services during construction. This is to observe compliance with design concepts, specifications, recommendations, and to allow design changes should the subsurface conditions differ from those anticipated prior to the start of construction.

PLATES

Guidelines in the Use and Interpretation of This Geotechnical Report

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The geotechnical report was prepared for the use of the Owner in the design of the subject facility and should be made available to potential contractors and/or the Contractor for information on factual data only. This report should not be used for contractual purposes as a warranty of interpreted subsurface conditions such as those indicated by the interpretive boring and test pit logs, cross sections, or discussion of subsurface conditions contained herein.

The analyses, conclusions and recommendations contained in the report are based on site conditions as they presently exist and assume that the exploratory borings, test pits, and/or probes are representative of the subsurface conditions of the site. If, during construction, subsurface conditions are found which are significantly different from those observed in the exploratory borings and test pits, or assumed to exist in the excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

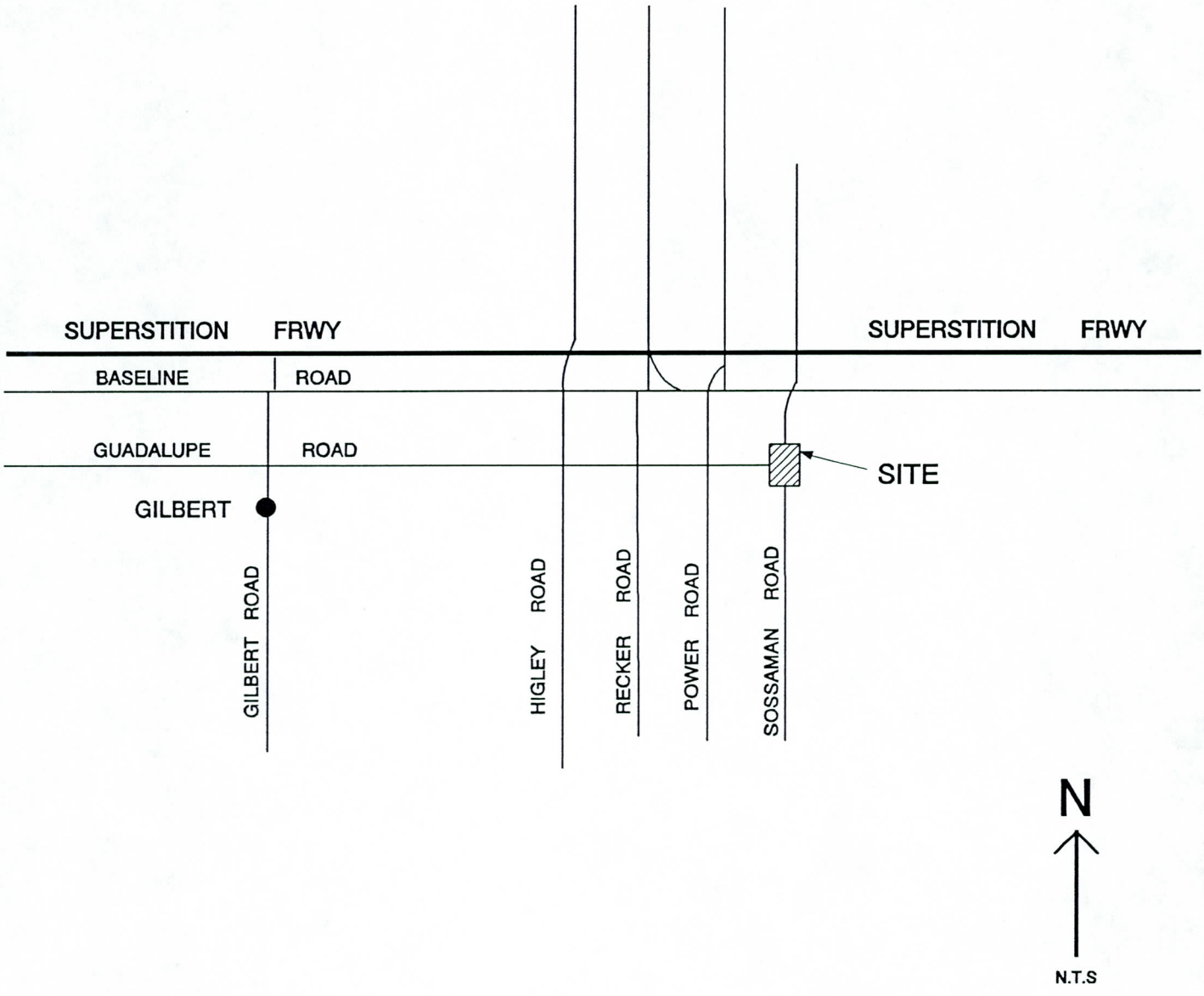
The Summary Boring Logs are our opinion of the subsurface conditions revealed by periodic sampling of the ground as the borings progressed. The soil descriptions and interfaces between strata are interpretive and actual changes may be gradual.

The boring logs and related information depict subsurface conditions only at these specific locations and at the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the soil conditions at these boring locations.

Groundwater levels often vary seasonally. Groundwater levels reported on the boring logs or in the body of the report are factual data only for the dates shown.

Unanticipated soil conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking soil samples, borings or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. It is recommended that the Owner consider providing a contingency fund to accommodate such potential extra costs.

This firm cannot be responsible for any deviation from the intent of this report including, but not restricted to, any changes to the scheduled time of construction, the nature of the project or the specific construction methods or means indicated in this report; nor can our firm be responsible for any construction activity on sites other than the specific site referred to in this report.



VICINITY MAP

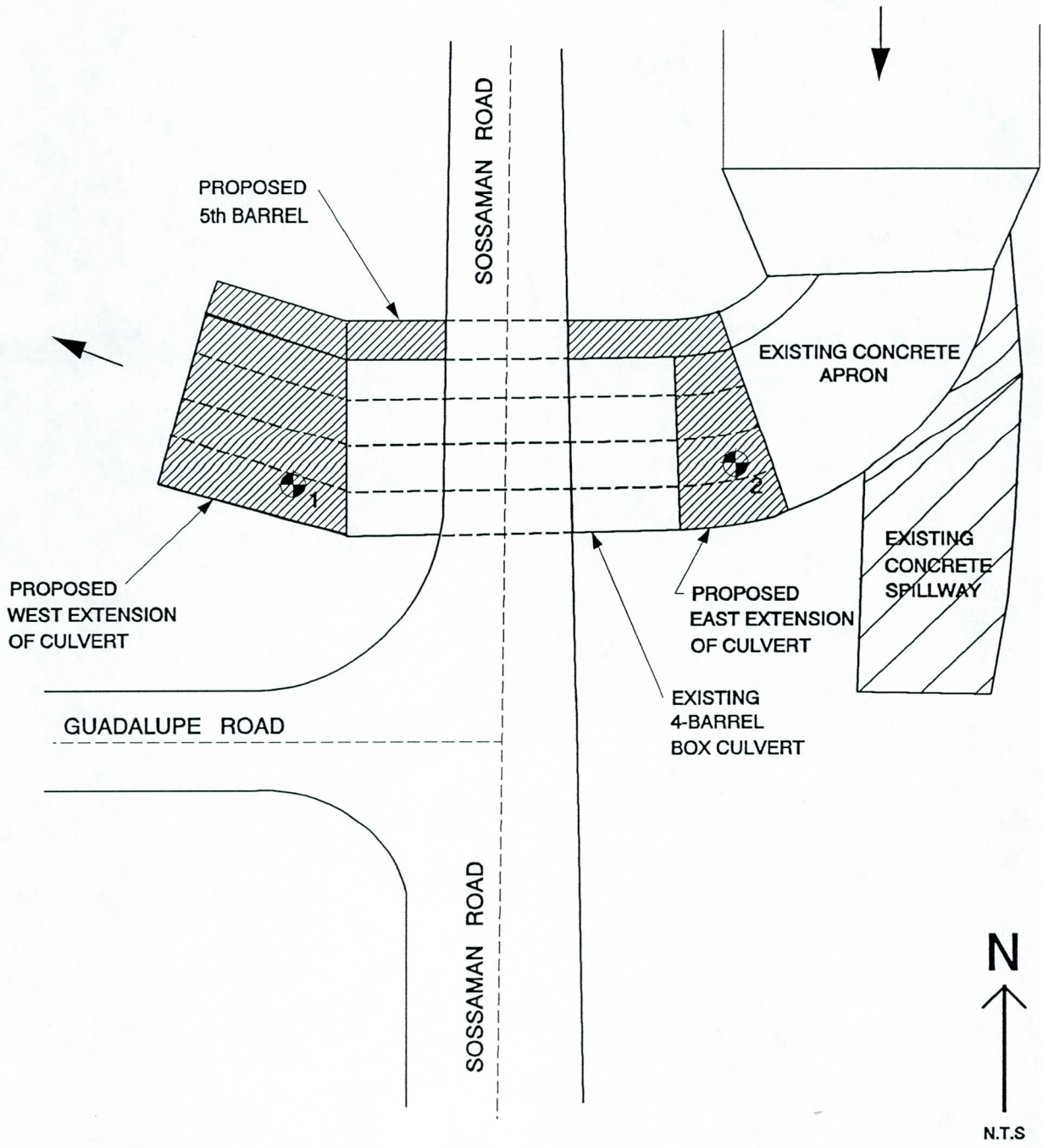
SOSSAMAN BOX CULVERT

SOSSAMAN AND GUADALUPE ROADS

FCD 91-06

ATL JOB NO. 192004

PLATE 2



LEGEND

1 BORING LOCATIONS

ATL Testing Laboratories

BORING LOCATIONS

SOSSAMAN BOX CULVERT

SOSSAMAN AND GUADALUPE ROADS

FCD 91-06

ATL JOB NO. 192004

PLATE 3

APPENDIX A

BORING LOGS

SOSSAMAN BOX CULVERT
SOSSAMAN AND GUADALUPE ROADS

ATL Testing Laboratories

ATL Job No. 192004

Boring Number: *01*
Boring Location: *65 Feet North of Guadalupe Road and 55 Feet North of Sossaman Road.*
Date of Boring: *1-22-92*
Elevation of Boring: *Existing Grade*

Drilling Equipment: *Mobile B50 With 8-inch Diameter Hollow Stem Auger.*
Driller: *G. Skaggs*
Logger: *J. Cowell*
Reviewed By: *J. Rose*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		BROWN CLAYEY SAND (SC), MOIST, WEAKLY CEMENTED.				
		LIGHT BROWN CLAYEY SAND WITH GRAVEL (SC), SLIGHTLY MOIST, MEDIUM DENSE.			*6.1*	
				38	*14.0*	*113.9*
		BROWN SILTY SAND WITH TRACE OF CLAY (SM), MOIST, MEDIUM DENSE.				
	5				*16.6*	
		BROWN SANDY CLAY (CL), MOIST, VERY STIFF TO HARD, WEAKLY CEMENTED.		*66*	*19.1*	*109.1*
				65		
	10	*(5 GALLONS WATER ADDED BEFORE DRIVING SAMPLER).*	*28*			
		BROWN CLAYEY SAND (SC), MOIST, MEDIUM DENSE.				
	15	*(5 GALLONS WATER ADDED BEFORE DRIVING SAMPLER)*	*18*			
		BOTTOM OF BORING.				
	20					
	25					

Boring Stopped at *16.5* Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

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SOSSAMAN BOX CULVERT
SOSSAMAN AND GUADALUPE ROADS

ATL Testing Laboratories

ATL Job No. 192004

Boring Number: *02*
Boring Location: *70 Feet North of Guadalupe Road and 60 Feet East of Sossaman Road.*
Date of Boring: *1-22-92*
Elevation of Boring: *Existing Grade*

Drilling Equipment: *Mobile B50 With 4-inch Diameter Solid Stem Auger.*
Driller: *G. Skaggs*
Logger: *J. Cowell*
Reviewed By: *J. Rose*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		3 1/2 INCHES PORTLAND CEMENT CONCRETE.				
		BROWN CLAYEY SAND (SC), MOIST.				
		LIGHT BROWN CLAYEY SILTY SAND (SC-SM), SLIGHTLY MOIST, MEDIUM DENSE.		*44*	*4.6*	*106.8*
	5			*39*		
		LIGHT BROWN SANDY CLAY (CL), MOIST, VERY STIFF TO HARD, WEAK CEMENTATION.		*72*	*10.4*	*116.5*
	10	*BROWN CLAYEY SAND (SC), MOIST, VERY STIFF TO HARD, WEAK CEMENTATION.*	*38*			
	15	*(3 GALLONS OF WATER ADDED BEFORE DRIVING SAMPLER)*	*22*			
		BOTTOM OF BORING.				
	20					
	25					

Boring Stopped at *16.5* Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

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APPENDIX B

LABORATORY TEST RESULTS

SUMMARY OF LABORATORY ANALYSIS

PROJECT: Sossaman Box Culvert DATE: 2-22-92

LOCATION: Sossaman and Guadalupe Roads, Maricopa County

MATERIAL: Borehole Samples SAMPLING DATE: 1-22-92

REQUESTED BY: J. Rose ATL JOB NO: 192004

LOG NO.	DEPTH (FT)	MOIST (%)	USCS	LL	PI	SIEVE ANALYSIS – PERCENT PASSING											
						200	100	50	40	30	16	10	4	3/8	3/4	1.5	3
1	1.5 – 3	6.1	SC	31	8	10	14	18	22	26	35	43	60	74	88	100	
1	3 – 6	16.6	SM	23	2	42	64	77	81	85	91	95	98	100			
2	2 – 6	3.8	SC – SM	26	5	8	11	17	22	29	48	66	90	99	100		
2	6 – 10	615.6	CL	49	20	67	73	78	81	84	91	96	100				

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STANDARD PROCTOR TESTS (ASTM D698A)

Boring No.	Sample Depth, (Ft)	USCS	Maximum Dry Density (pcf)	Optimum Moisture (%)
1	3 - 6	SM	115.5	13.4

SOSSAMAN BOX CULVERT
SOSSAMAN ROAD AND GUADALUPE ROAD
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WELLS ENGINEERS, INC.
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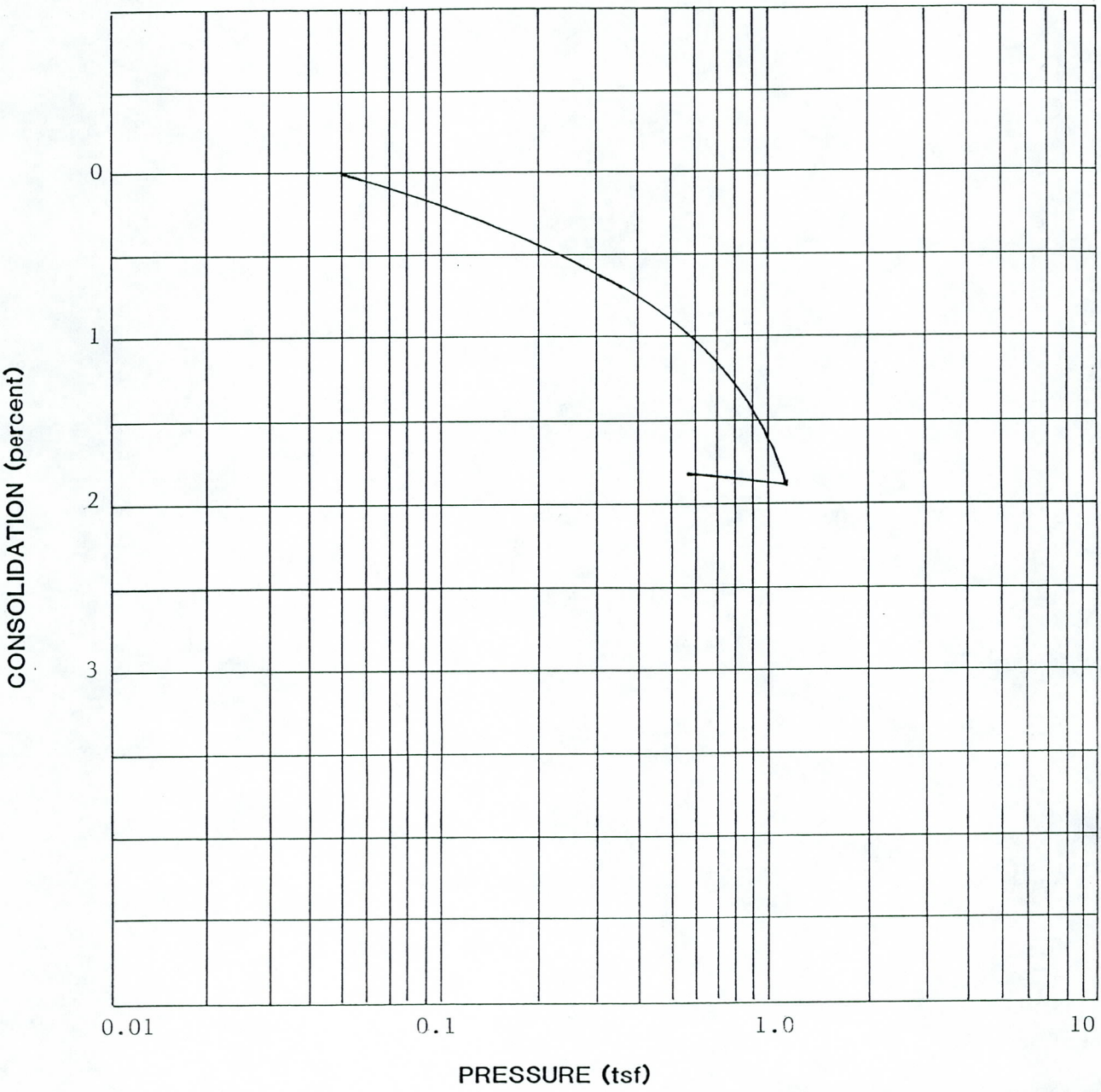
CONTROLLED SWELL TESTS

Boring No.	Depth (Ft)	Load to Control Swell (psf)	Dry Density (psf)	Moisture (%)
1	5 - 6.5	680	109.1	19.1

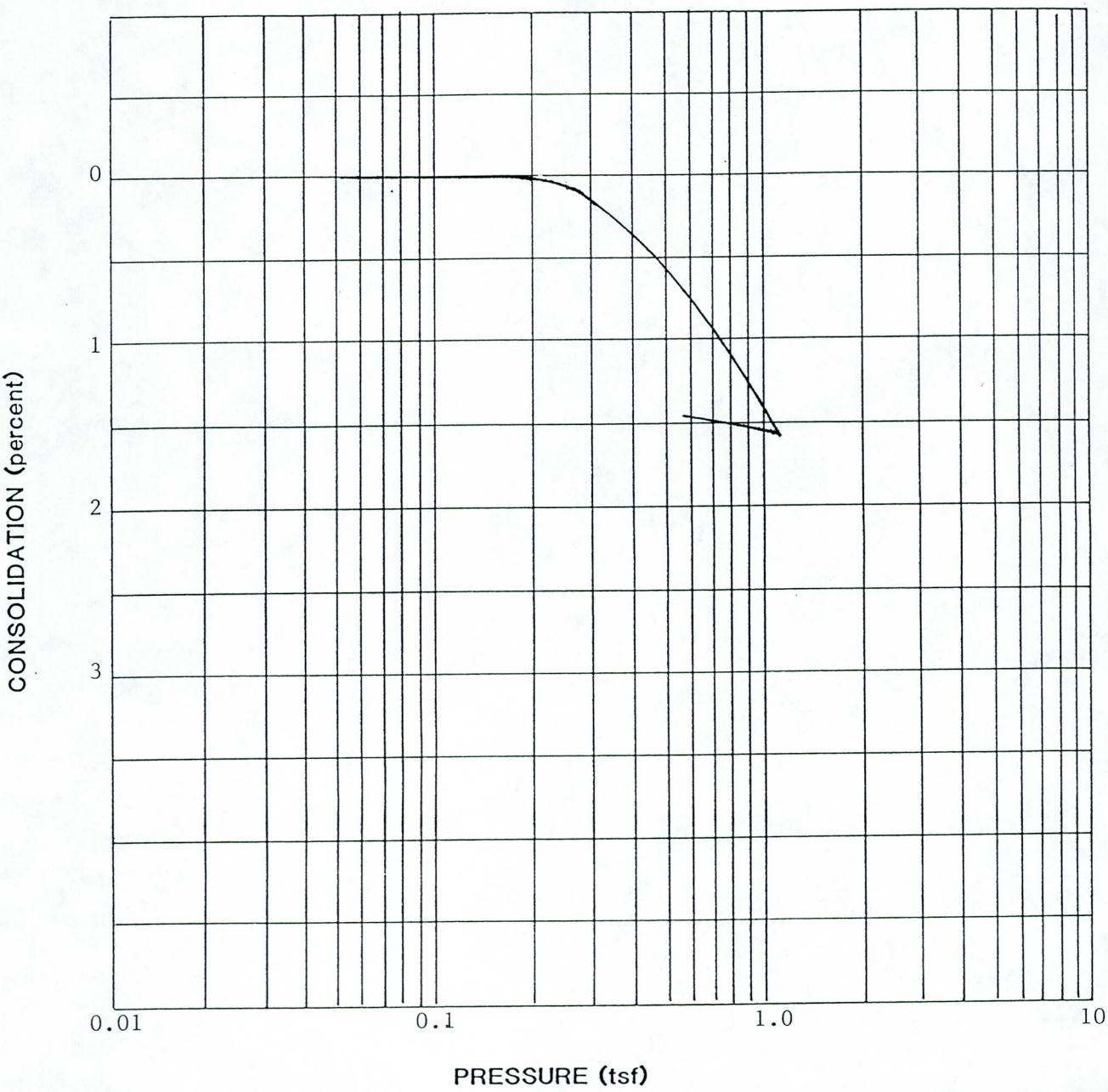


Key	Boring No.	Depth (ft.)	USCS	Soil Description	Liquid Limit (%)	Plastic Limit (%)	Moisture Content (%)		Dry Density (pcf)
							Before	After	
	1	2.5-4	SC	Brown clayey sand with gravel (SC)	23	21	14.0	16.4	113.9

SOSSAMAN BOX CULVERT

CONSOLIDATION TEST DATA

Proj. No. 192004 | Date 3-11-92 | 54

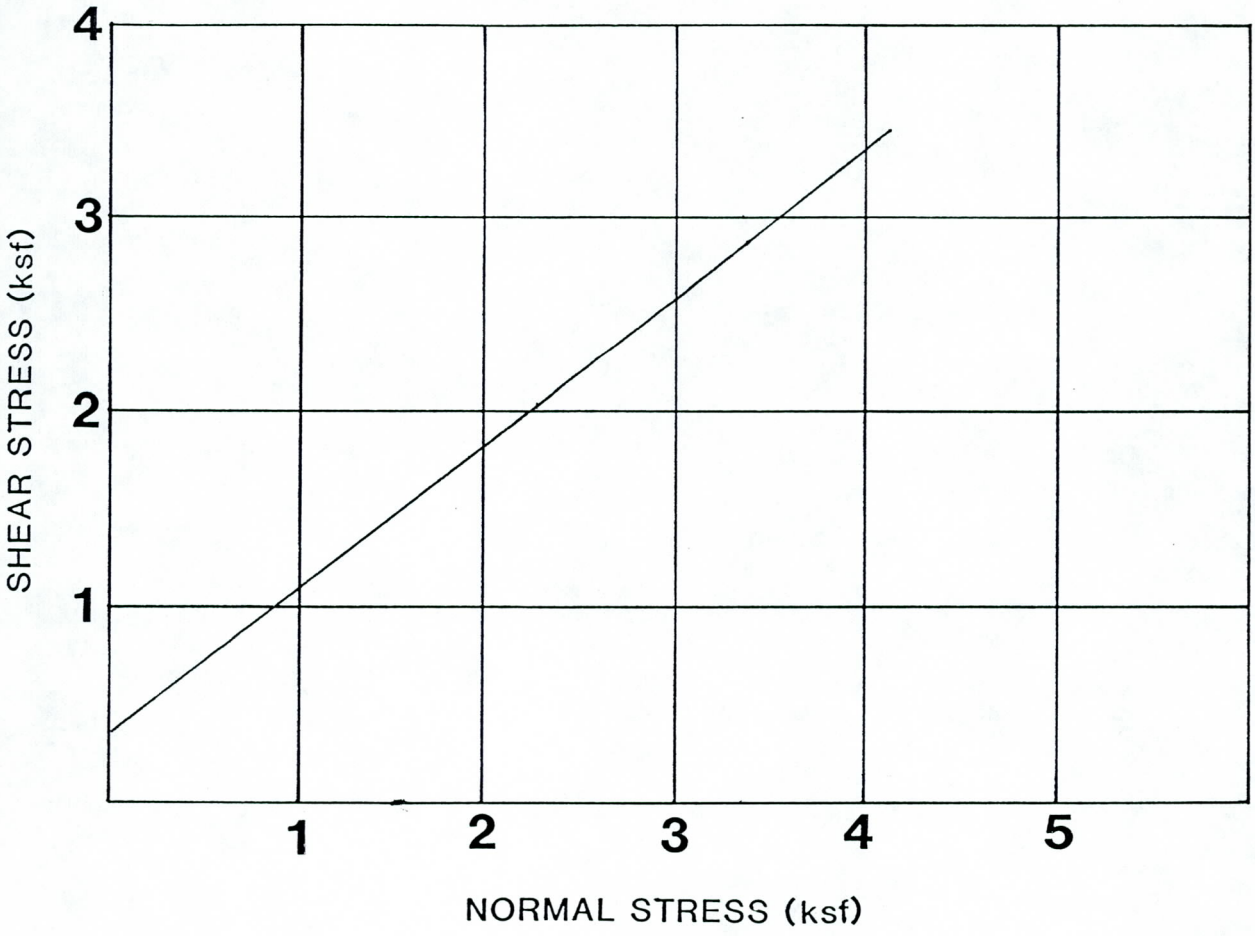


Key	Boring No.	Depth (ft.)	USCS	Soil Description	Liquid Limit (%)	Plastic Limit (%)	Moisture Content (%)		Dry Density (pcf)
							Before	After	
	2	7.5-9	CL	Brown sandy clay (CL)	49	20	10.4	15.7	116.5

SOSSAMAN BOX CULVERT

CONSOLIDATION TEST DATA

Proj. No. 192004 | Date 3-11-92 | B5



Boring or Test Pit No.	Depth (ft.)	USCS	Soil Description	Cohesive Strength (ksf)	Internal Friction Angle	Moisture Content (%)	Dry Density (pcf)
1	2.5-4	SC-SM	Light brown clayey silty sand	0.37	37.2	4.6	106.8

DIRECT SHEAR TEST DATA

In-Situ Moisture Content

SOSSAMAN BOX CULVERT

B6

JOB NO. 192004