

**HENLEY
JOHNSTON
& ASSOCIATES, INC.**
engineering geoscience consultants



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& ASSOCIATES, INC.
engineering geoscience consultants

24 December 1991

The PB/MK Team
7220 So. Westmoreland Road
Suite 200
Dallas, Texas 75237

Attention: Mr. Hugh Kelly

Aubrey D. Henley, R.G., C.E.G.
president

John W. Johnston, P.E.
executive vice-president

William D. Flannigan, R.G.
senior vice-president

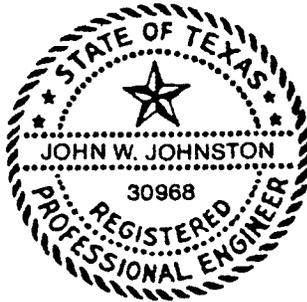
Herbert C. Crowder, R.G.
senior vice-president

Re: Geotechnical Investigation
Arrowhead Road Extension
SSC Project
Ellis County, Texas
PB/MK Job No. I-040
Subcontract No. SC-A00-1088

Gentlemen:

We are pleased to submit our data report on the subject investigation for the Arrowhead Road Extension.

Please call us if you have any questions.



JWJ:kdh
Attachments

Very truly yours,

John W. Johnston, P.E.
Henley-Johnston & Associates, Inc.

I. INTRODUCTION

General

This report presents the results of a subsurface investigation for the Arrowhead Road Extension, conducted under Subcontract No. SC-A00-1088, Task No. I-346. The project site is located in Ellis County, Texas on the East side of the West Campus between FM66 and approximately Boz Road as shown on Plate 1.

Scope

The project, as authorized, included the drilling and sampling of six (6) exploratory soil borings to depths of ten feet or two feet into the Austin Chalk limestone, whichever is less. This information is intended to provide soil data for the extension of Arrowhead Road in the West Campus area. A few laboratory soil tests assigned by Mr. Hugh Kelly of The PB/MK Team were performed for soil identification. No recommendations were requested; consequently, this data report consists of boring logs and field investigation contained in Appendix A, laboratory soil test descriptions in Appendix B, and a brief description of site geology.

II. SITE GEOLOGY

General

The project site is located on the inland edge of the Gulf Coastal Plain. Specifically, the site is located East of the West Campus extending from FM66 to approximately Boz Road and about 450

feet East of Bakers Branch Road. The site is underlain by clay soils and weathered limestone of the Austin Chalk Formation.

The clay soils encountered in the borings ranged in thickness from about 0.5 feet to about nine (9) feet and consisted of an upper dark brown clay (ranging in thickness from about 0.5 to about 6 feet) and a lower brown and tan clay with limestone fragments (extending below about 6 foot depth in Boring AH-10). Details of materials encountered in these borings are shown on the attached "Log of Boring" illustrations following Appendix A.

Due to recent rainfall, the moisture content of the near surface soils probably were higher than may have been observed in the previous studies for Arrowhead Road. The results of all laboratory tests for this investigation are presented on Plate 2.

All of the borings encountered weathered limestone materials of the Austin Chalk Formation at depths shallower than the termination depth of the borings. The Austin Chalk Formation was encountered at depths of 2 to 3 feet in Boring Nos. AH-7 through AH-9, 9 feet in Boring No. AH-10, and 0.5 to 1 foot in Boring Nos. AH-11 and AH-12. The limestone materials encountered were highly to moderately weathered and ranged in hardness from soft to moderately hard.

III. ENGINEERING PROPERTIES

Not a part of this task.

IV. CONSTRUCTION

Not a part of this task.

APPENDIX A

FIELD INVESTIGATION

A.1 General

The subsurface exploration program consisted of drilling and sampling borings. The drilling was performed by Henley-Johnston & Associates drill crews under the direct supervision of an Engineering Geologist. A total of six (6) borings were drilled for the project. Boring locations are shown on the illustration entitled "Location of Borings" presented on Plate 1.

The borings were staked in the field by others prior to our mobilization. Because of wet site conditions, the borings were relocated to the locations shown on Plate 1; coordinates and elevations will be provided at a later date by The PB/MK Team.

The borings were drilled with truck-mounted drilling equipment using rotary techniques.

The sampling and testing procedures are discussed in detail in the following paragraphs. Boring logs are presented in Appendix A, along with a key to classification symbols, abbreviations, consistencies and hardness descriptions. The stratification lines shown on the boring logs represent approximate boundaries between subsurface material types.

A.2 Sampling and Lithologic Logging

The sampling techniques used were dependent on the material encountered. Samples of cohesive soils were obtained by

hydraulically pushing a 3-inch diameter thin-walled tube (Shelby Tube) into the deposits. This technique generally conforms with ASTM D-1587.

Soil samples recovered by the thin-walled tube were removed from the sampler in the field, packaged for shipment to the laboratory, and visually classified in general accordance with the Unified Soil Classification System by an Engineering Geologist. The unconfined compressive strength of each cohesive sample was estimated with a hand-operated pocket penetrometer. These values are noted on the individual boring logs.

After drilling and sampling through the overburden soils the weathered limestone was augered and disturbed samples of the limestone were obtained from the auger cuttings.

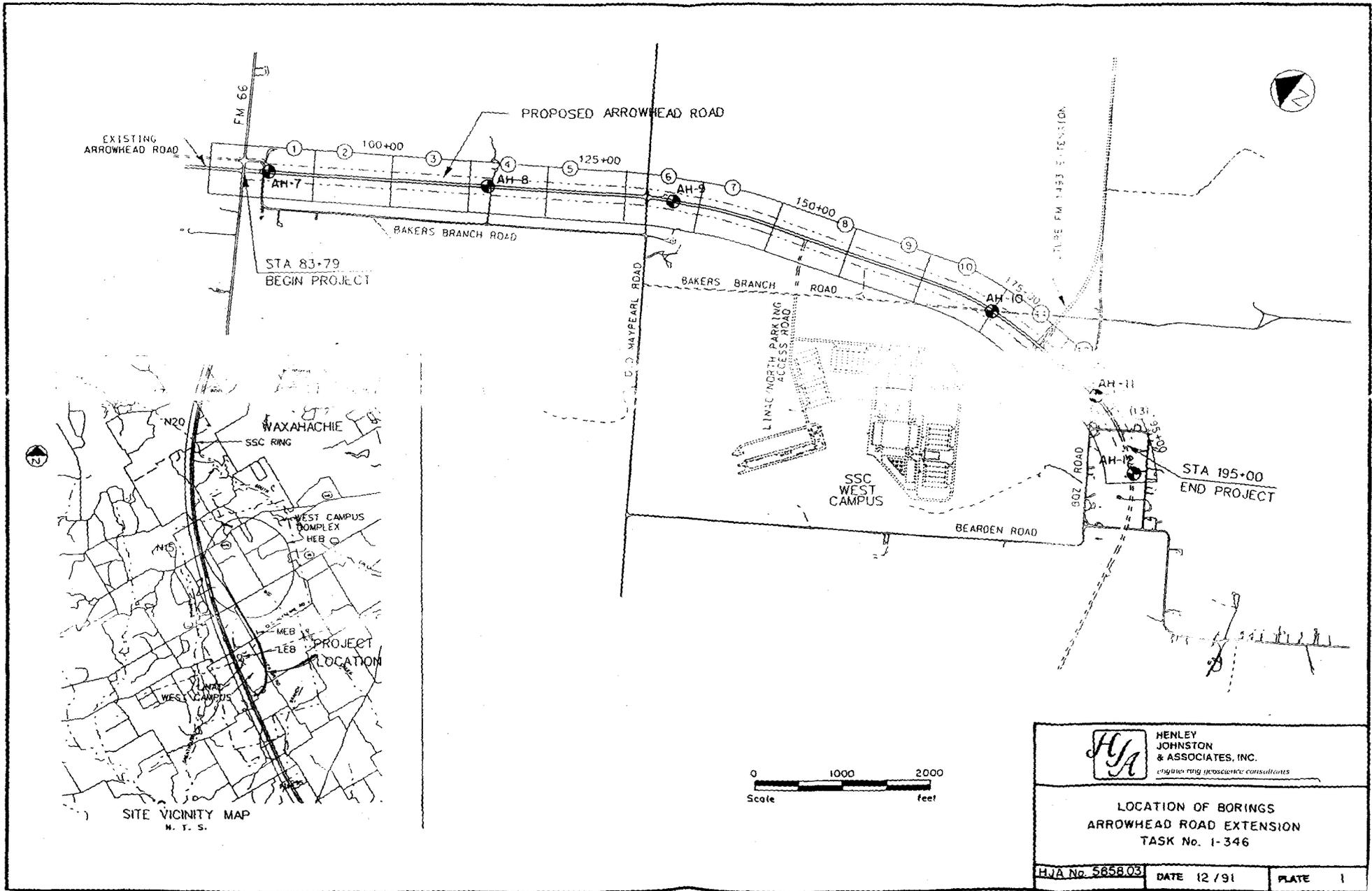
APPENDIX B

LABORATORY TESTING

A.1 General

Laboratory soil tests were assigned on selected soil samples by Mr. Hugh Kelly of The PB/MK Team. These tests were to provide index properties of the soils encountered at the site.

Moisture content determinations were made for 14 soil samples from the six (6) borings. For two of these samples, Atterberg Limits, Dry Unit Weight, and Percent Material Passing the No. 200 Sieve were also determined. All test results are summarized on Plate 2.



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LOCATION OF BORINGS ARROWHEAD ROAD EXTENSION TASK No. 1-346		
HJA No. 585B03	DATE 12 / 91	PLATE 1

**ARROWHEAD ROAD EXTENSION
TASK No. I-346**

SUMMARY OF LABORATORY TESTS

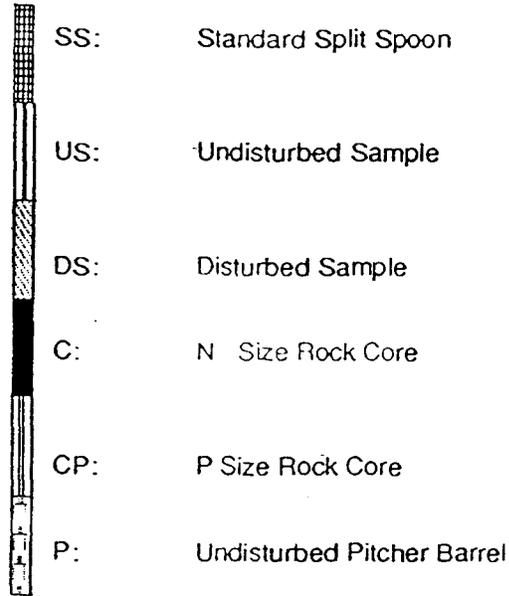
SUMMARY OF INDEX PROPERTIES

BORING NUMBER	DEPTH (ft.)	LL (%)	PI	MC (%)	DUW (pcf)	-200 (%)	UNIFIED SOIL CLASSIFICATION
AH-7	0.0-1.5			15.5			
AH-7	1.5-2.7	50	20	30.2	85.1	85.2	ML or OL
AH-8	0.0-1.5			29.1			
AH-8	1.5-3.0			27.3			
AH-9	0.0-1.5			25.8			
AH-9	1.5-1.8			23.0			
AH-10	0.0-1.5			37.6			
AH-10	1.5-3.0			37.2			
AH-10	3.0-4.5	68	32	39.0	79.3	94.0	MH or OH
AH-10	4.5-6.0			41.1			
AH-10	6.0-7.5			20.5			
AH-10	7.5-9.0			18.0			
AH-11	0.0-0.5			36.4			
AH-12	0.0-1.0			43.4			

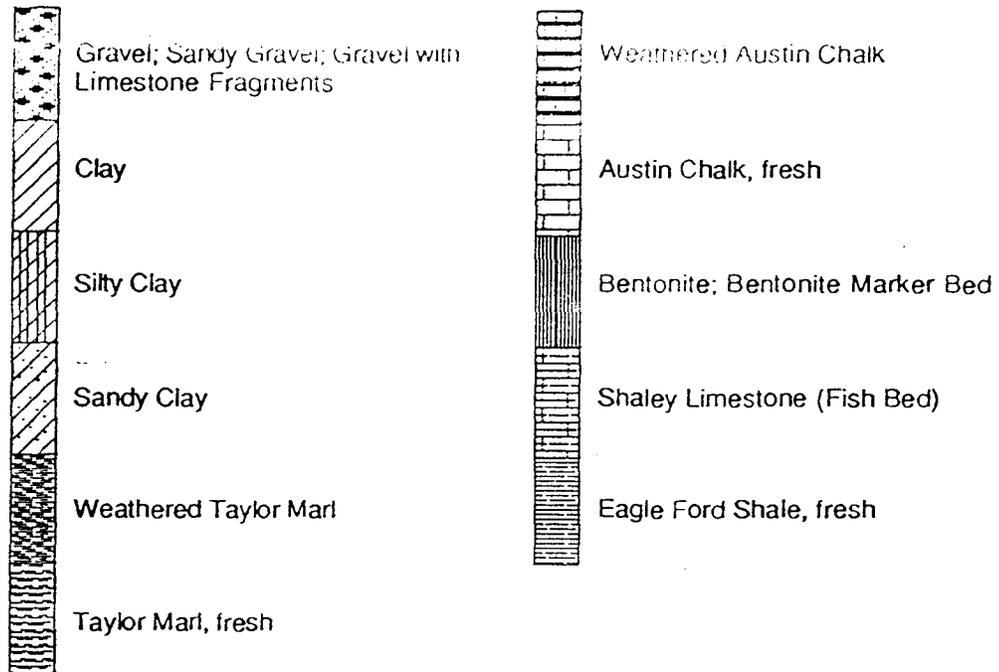
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BORING LOG GRAPHICS LEGEND

SAMPLE GRAPHICS



MATERIAL GRAPHICS



**HENLEY-JOHNSTON
& ASSOCIATES, INC.**

BORING LOG

Boring No.: AH-7
Contract:
Sheet: 1 of 1

Project: SUPERCONDUCTING SUPER COLLIDER

Logged by: M. Thomas

Client: THE PB/MK TEAM

Date Start: 12/16/91

Client Representative: H. Kelly

Date Finish: 12/16/91

Coordinates: N: ft. E: ft.

Ground Elevation: ft.

Trend: -----

Plunge: -90.0

Total Depth Drilled: 5.0 ft.

Drill Contractor: HENLEY-JOHNSTON

Driller: B. Cromeans

Rig Type: Mobile B 80

Methods:

Drilling Without Sampling:

Sampling Soil: Undisturbed Shelby Tube

Drilling Rock: 4" auger with carbide teeth

Sampling Rock: Bag sample from auger flights

Comments: Continuous sampling to top of rock. Auger 2 ft. into rock (bag sample).

ELEV. (ft.)	DEPTH (ft.)	SAMPLE		BLOWS (r) or SCS (depth)	REC (%)	RQD (%)	SAMPLE DESCRIPTION
		TYPE	No.				
	0	US	1	8.5			CLAY, dark brown, moderately plastic, firm to stiff, moist to v. moist, with trace of silt and some weathered limestone fragments. US-1, p.p.=1.0
		US	2	11			
							LIMESTONE (Austin Chalk), moderately to highly weathered, tan.
		DS	1				
	5						End of Boring @ 5.0 ft

LEGEND/NOTES:

Datum is NGVD 1929.

Coordinates are Texas State Plane
Coordinates, NAD 1983.

BLOWS = number of blows required to drive
sample spoon 6" or distance shown.

r = inches of soil sample recovery.

REC = rock core recovery, in %.

RQD = Rock Quality Designation, in %.

SAMPLE TYPE

SS = Standard Split Spoon

US = Undisturbed Sample

DS = Disturbed Sample

C = N-Size Rock Core

CP = P-Size Rock Core

P = Undisturbed Pitcher Barrel

SCS = Special Core Sample

Approved/Date

Last Edited

12/18/91

**HENLEY-JOHNSTON
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BORING LOG

Boring No.: AH-8
Contract:
Sheet: 1 of 1

Project: SUPERCONDUCTING SUPER COLLIDER

Client: THE PB/MK TEAM

Client Representative: H. Kelly

Coordinates: N: ft. E: ft.

Trend: -----

Plunge: -90.0

Drill Contractor: HENLEY-JOHNSTON

Driller: B. Cromeans

Logged by: M. Thomas

Date Start: 12/16/91

Date Finish: 12/16/91

Ground Elevation: ft.

Total Depth Drilled: 5.5 ft.

Rig Type: Mobile B 80

Methods:

Drilling Without Sampling:

Sampling Soil: Undisturbed Shelby Tube

Drilling Rock: 4" auger with carbide teeth

Sampling Rock: Bag sample from auger flights

Comments: Continuous sampling to top of rock. Auger 2 ft. into rock (bag sample).

ELEV. (ft.)	DEPTH (ft.)	SAMPLE		BLOWS (r) or SCS (depth)	REC (%)	RQD (%)	SAMPLE DESCRIPTION
		TYPE	No.				
	0	US	1	7			<p>CLAY, dark brown, moderately plastic, stiff to very stiff, slighty moist, with trace of silt and trace of weathered limestone fragments increasing to some weathered limestone fragments with depth. US-1, p.p. = 1.5</p> <p>US-2, p.p. = 3.25</p>
		US	2	9			
		US	3	6			
							LIMESTONE (Austin Chalk), moderately to highly weathered, tan.
	5	DS	1				
							End of Boring @ 5.5 ft.

LEGEND/NOTES:

Datum is NGVD 1929.

Coordinates are Texas State Plane
Coordinates, NAD 1983.

BLOWS = number of blows required to drive
sample spoon 6" or distance shown.

r = inches of soil sample recovery.

REC = rock core recovery, in %.

RQD = Rock Quality Designation, in %.

SAMPLE TYPE

SS = Standard Split Spoon

US = Undisturbed Sample

DS = Disturbed Sample

C = N-Size Rock Core

CP = P-Size Rock Core

P = Undisturbed Pitcher Barrel

SCS = Special Core Sample

Approved/Date

Last Edited

12/18/91

**HENLEY-JOHNSTON
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BORING LOG

Boring No.: AH-9
Contract:
Sheet: 1 of 1

Project: SUPERCONDUCTING SUPER COLLIDER

Client: THE PB/MK TEAM

Client Representative: H. Kelly

Coordinates: N: ft. E: ft.

Trend: -----

Plunge: -90.0

Drill Contractor: HENLEY-JOHNSTON

Driller: B. Cromeans

Logged by: M. Thomas

Date Start: 12/16/91

Date Finish: 12/16/91

Ground Elevation: ft.

Total Depth Drilled: 3.7 ft.

Rig Type: Mobile B 80

Methods:

Drilling Without Sampling:

Sampling Soil: Undisturbed Shelby Tube

Drilling Rock: 4" auger with carbide teeth

Sampling Rock: Bag sample from auger flights

Comments: Continuous sampling to top of rock. Auger 2 ft. into rock (bag sample).

ELEV. (ft.)	DEPTH (ft.)	SAMPLE		BLOWS (r) or SCS (depth)	REC (%)	RQD (%)	SAMPLE DESCRIPTION
		TYPE	No.				
	0	US	1	9			CLAY, dark brown, moderately plastic, stiff, moist, with some organics. US-1, p.p.=2.0
		US	2	3.5			
		DS	1				LIMESTONE (Austin Chalk), moderately to highly weathered, tan.
							End of Boring @ 3.7 ft.

LEGEND/NOTES:

Datum is NGVD 1929.

Coordinates are Texas State Plane
Coordinates, NAD 1983.

BLOWS = number of blows required to drive
sample spoon 6" or distance shown.

r = inches of soil sample recovery.

REC = rock core recovery, in %.

RQD = Rock Quality Designation, in %.

SAMPLE TYPE

SS = Standard Split Spoon

US = Undisturbed Sample

DS = Disturbed Sample

C = N-Size Rock Core

CP = P-Size Rock Core

P = Undisturbed Pitcher Barrel

SCS = Special Core Sample

Approved/Date

Last Edited

12/18/91

**HENLEY-JOHNSTON
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BORING LOG

Boring No.: **AH-10**
Contract:
Sheet: **1 of 1**

Project: **SUPERCONDUCTING SUPER COLLIDER**
Client: **THE PB/MK TEAM**
Client Representative: **H. Kelly**
Coordinates: **N: ft. E: ft.**
Trend: **---**
Drill Contractor: **HENLEY-JOHNSTON**

Logged by: **M. Thomas**
Date Start: **12/16/91**
Date Finish: **12/16/91**
Ground Elevation: **ft.**
Total Depth Drilled: **10.0 ft.**
Rig Type: **Mobile B 80**

Methods:
Drilling Without Sampling:
Sampling Soil: **Undisturbed Shelby Tube**
Drilling Rock: **4" auger with carbide teeth**
Sampling Rock: **Bag sample from auger flights**

Comments: **Continous sampling to top of rock. Auger 2 ft. into rock or 10.0 ft., whichever comes first (bag sample)**

ELEV. (ft.)	DEPTH (ft.)	SAMPLE		BLOWS (r) or SCS (depth)	REC (%)	RQD (%)	SAMPLE DESCRIPTION	
		TYPE	No.					
	0	US	1	7			CLAY , dark brown, moderately to highly plastic, firm to stiff, moist to very moist with trace weathered limestone fragments. US-1, p.p.=1.0	
		US	2	9				US-2, p.p.=1.0
		US	3	15				US-3, p.p.=0.75
	5	US	4	12				US-4, p.p.=2.0
		US	5	13			CLAY , brown and tan, moderately plastic, very stiff, moist to very moist, with trace of silt and some weathered limestone fragments. US-5, p.p.=2.25	
		US	6	9			US-6, p.p.=2.5	
	10	DS	1				LIMESTONE (Austin Chalk), highly weathered, tan.	
End of Boring @ 10.0 ft.								

LEGEND/NOTES:

Datum is NGVD 1929.
Coordinates are Texas State Plane
Coordinates, NAD 1983.
BLOWS = number of blows required to drive
sample spoon 6" or distance shown.
r = inches of soil sample recovery.
REC = rock core recovery, in %.
RQD = Rock Quality Designation, in %.

SAMPLE TYPE

SS = Standard Split Spoon
US = Undisturbed Sample
DS = Disturbed Sample
C = N-Size Rock Core
CP = P-Size Rock Core
P = Undisturbed Pitcher Barrel
SCS = Special Core Sample

Approved/Date

Last Edited

12/18/91

**HENLEY-JOHNSTON
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BORING LOG

Boring No.: AH-11
Contract:
Sheet: 1 of 1

Project: **SUPERCONDUCTING SUPER COLLIDER**
Client: **THE PB/MK TEAM**
Client Representative: **H. Kelly**
Coordinates: **N: ft. E: ft.**
Trend: **----**
Drill Contractor: **HENLEY-JOHNSTON**

Logged by: **M. Thomas**
Date Start: **12/16/91**
Date Finish: **12/16/91**
Ground Elevation: **ft.**
Total Depth Drilled: **2.5 ft.**
Rig Type: **Mobile B 80**

Plunge: **-90.0**
Driller: **B. Cromeans**

Methods:
Drilling Without Sampling:
Sampling Soil: **Undisturbed Shelby Tube**
Drilling Rock: **4" auger with carbide teeth**
Sampling Rock: **Bag sample from auger flights**

Comments: continuous sampling to top of rock. Auger 2 ft. into rock (bag sample).

ELEV. (ft.)	DEPTH (ft.)	SAMPLE		BLOWS (r) or SCS (depth)	REC (%)	RQD (%)	SAMPLE DESCRIPTION
		TYPE	No.				
	0	US	1	5			CLAY , dark brown, moderately plastic, stiff, moist with trace of silt and some weathered limestone fragments. LIMESTONE (Austin Chalk), moderately to highly weathered, tan.
		DS	1				
							End of Boring @ 2.5 ft.

LEGEND/NOTES:

Datum is NGVD 1929.
Coordinates are Texas State Plane
Coordinates, NAD 1983.
BLOWS = number of blows required to drive
sample spoon 6" or distance shown.
r = inches of soil sample recovery.
REC = rock core recovery, in %.
RQD = Rock Quality Designation, in %.

SAMPLE TYPE

SS = Standard Split Spoon
US = Undisturbed Sample
DS = Disturbed Sample
C = N-Size Rock Core
CP = P-Size Rock Core
P = Undisturbed Pitcher Barrel
SCS = Special Core Sample

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**HENLEY-JOHNSTON
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BORING LOG

Boring No.: AH-12
Contract:
Sheet: 1 of 1

Project: **SUPERCONDUCTING SUPER COLLIDER**
Client: **THE PB/MK TEAM**
Client Representative: **H. Kelly**
Coordinates: **N: ft. E: ft.**
Trend: **---**
Drill Contractor: **HENLEY-JOHNSTON**

Logged by: **M. Thomas**
Date Start: **12/16/91**
Date Finish: **12/16/91**
Ground Elevation: **ft.**
Total Depth Drilled: **3.0 ft.**
Rig Type: **Mobile B 80**

Methods:
Drilling Without Sampling:
Sampling Soil: **Undisturbed Shelby Tube**
Drilling Rock: **4" auger with carbide teeth**
Sampling Rock: **Bag sample from auger flights**

Comments: **Continuous sampling to top of rock. Auger 2 ft. into rock (bag sample).**

ELEV. (ft.)	DEPTH (ft.)	SAMPLE		BLOWS (r) or SCS (depth)	REC (%)	RQD (%)	SAMPLE DESCRIPTION
		TYPE	No.				
	0	US	1	6.5			CLAY , dark brown, moderately plastic, firm, moist to very moist, with trace of silt and with some weathered limestone fragments @ bottom. US-1, p.p.=0.75 LIMESTONE (Austin Chalk), moderately to highly weathered, tan.
		DS	1				
							End of Boring @ 3.0 ft.

LEGEND/NOTES:

Datum is NGVD 1929.
Coordinates are Texas State Plane
Coordinates, NAD 1983.
BLOWS = number of blows required to drive
sample spoon 6" or distance shown.
r = inches of soil sample recovery.
REC = rock core recovery, in %.
RQD = Rock Quality Designation, in %.

SAMPLE TYPE

SS = Standard Split Spoon
US = Undisturbed Sample
DS = Disturbed Sample
C = N-Size Rock Core
CP = P-Size Rock Core
P = Undisturbed Pitcher Barrel
SCS = Special Core Sample

Approved/Date

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