LOP 6704

SOIL CONTAMINATION ASSESSMENT
12th STREET AND MARTIN LUTHER KING JR. WAY
OAKLAND, CALIFORNIA
SCI 272.021

Prepared for:

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June 17, 1991

I INTRODUCTION

This report presents the results of the soil contamination assessment conducted by Subsurface Consultants, Inc. (SCI) at the southwest corner of 12th Street and Martin Luther King Jr. Way in Oakland, California. The property is situated as shown on the Site Plan, Plate 1. SCI previously conducted a preliminary environmental assessment of the property, the results of which are summarized in our report dated April 24, 1991. We understand that in the near future, the property will be developed with a 3-story building having a basement extending 5 to 6 feet below the existing groundsurface.

As outlined in our letter dated April 5, 1991, our assessment was conducted to evaluate the lateral and vertical extent of (1) lead, and oil and grease contamination in surface soils and (2) gasoline contamination near the previous service station. The scope of our services included drilling test borings, performing analytical tests on selected soil samples, and preparing this report. This report presents our conclusions regarding:

1. Soil and groundwater conditions;
2. The lateral and vertical limits of hydrocarbon and lead contamination;
3. The significance of contaminant levels with respect to local and state criteria, and
4. Remediation recommendations.

II BACKGROUND

As discussed in our April 24, 1991 report, a gasoline service station previously occupied portions of the property at 1125 Grove Street (now named Martin Luther King Jr. Way). The service station had at least 5 underground fuel tanks (500-gallon capacity), two dispenser islands and an automobile lift hoist. The service station was demolished in 1971; the tanks were removed at that time.

Gasoline contamination exists at the site near the previous fuel tanks. We have concluded that these tanks are the most likely source of contamination. Lead and oil and grease contamination was also identified in the surface soils at various locations on site.

III FIELD INVESTIGATION

To evaluate the lateral and vertical limits of soil contamination, twelve additional test borings were drilled (Borings 6 through 17). Borings 1 through 5 were drilled during our previous investigation. Logs of all borings are presented in Appendix A. The boring locations are shown on the Site Plan, Plate 1.

Standardized protocols were followed during our field investigation. A detailed discussion of our field procedures is provided in Appendix A.

IV SITE CONDITIONS

A. Site Geology

The site is situated within the Northern California Coast Ranges Geomorphic Province. Locally, the site is mapped[1] as being underlain by the Merritt Sand formation. This Quaternary age deposit consists primarily of fine-grained silty and clayey sand deposited by wind and water as beach and near shore deposits. The Merritt Sand overlies the Alameda formation, also deposited in Quaternary time. The Alameda Formation consists of continental and marine sediments deposited in the valley occupied by San Francisco Bay.

B. Site Conditions

The site encompasses a rectangular lot with plan dimensions of about 150 by 200 feet. The property is occupied by construction debris, equipment, and a job trailer. Also present is a boarded up two-story wooden Victorian house (Merriam House) that has been moved to the property and is stored on steel beams and blocking. No permanent structures currently occupy the site. However, concrete basement slabs, foundations and basement walls previously planned for the Herrick and Merriam Houses occupy the northern portion of the lot. The basement for the Herrick House occupies the area of the former automobile service station.

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[1] Radbruch, "Areal and Engineering Geology of the Oakland West Quadrangle, California," 1957, U.S. Geologic Survey Map I-239

C. Soil and Groundwater Conditions

The test borings indicate that the site is blanketed by a layer of fill about 5 feet thick. The fill consists predominantly of loose silty sands. The fill is not present in the borings drilled inside the existing basements. The fill is underlain by dense sands, and silty and clayey sands of the Merritt sand formation. These soils extended to the depths explored, 32 feet.

Groundwater levels were measured at depths of about 24 to 29 feet below the groundsurface immediately following drilling. These levels may not represent fully stabilized groundwater levels. Review of available data indicates that groundwater flow in the area is toward the northwest. It is estimated that groundwater exists about 27 feet below sidewalk grades.

V ANALYTICAL TESTING

Selected soil samples were analyzed by Curtis & Tompkins, Ltd. a laboratory certified by the DHS for hazardous waste and water testing, for the contaminants previously detected. The analyses included:

1. Total volatile hydrocarbons (TVH), EPA 8015/5030
2. Total extractable hydrocarbons (TEH), EPA 8015/3550
3. Hydrocarbon oil and grease (O&G), SMWW 5520 E&F
4. Purgeable halocarbons by EPA method 8010, and
5. Total and soluble lead.

Summaries of the analytical test results (including previous analyses) are presented in Tables 1, 2 and 3. Descriptions of the sample preparation and analytical test methods, analytical test reports and chain-of-custody records are presented in Appendix B.

Table 1
Petroleum Hydrocarbon Concentrations in Soil

Boring	Depth (feet)	TVH[1] (mg/kg)[4]	TEH[2] (mg/kg)	O&G[3] (mg/kg)
S-1	1	ND[5]	7.6	ND
S-4	0.5	--[6]	ND	ND
S-6	0.5	--	ND	ND
S-8	0.5	--	ND	52
S-10	0.5	--	ND	ND
S-13	0.5	--	ND	82
1	1.5	--	--	ND
2	7	ND	ND	ND
3[7]	3	2300	--	--
3[7]	6.5	51	--	--
3[7]	15.5	4000	--	--
3[7]	20.5	980	ND	ND
4	24	ND	--	--
6	26	ND	ND	--
6	27.5	ND	ND	--
7	21	190	240	--
7	26	ND	ND	--
8	2	--	ND	58
10	3	--	ND	ND
11[7]	16	54	620	--
11[7]	20.5	--	--	ND
11[7]	21	2000	1800	--
12[7]	20.5	--	--	ND
12[7]	21	650	1300	--
12[7]	22.5	ND	ND	--
12[7]	26	ND	ND	--
13	21	ND	ND	--
13	26	ND	ND	--
14	24	ND	ND	--
14	26	ND	ND	--
15[7]	19.5	--	--	ND
15[7]	20	ND	ND	--
16	21	ND	ND	--
16	26	ND	ND	--
17	25	ND	ND	--
17	30	ND	ND	--

1 TVH = Total Volatile Hydrocarbons reported as gasoline
2 TEH = Total Extractable Hydrocarbons reported as gasoline
3 O&G = Oil and Grease
4 mg/kg = milligrams per kilogram
5 ND = None detected, chemicals not present at concentrations above the detection limits
6 -- = Test not performed
7 Borings 3, 11, 12 and 15 were drilled within the existing basement; the surface is about 5 to 6 ft below sidewalk grades

Table 2
Concentrations of Total and Soluble Lead In Soils

Sample	Depth	Total Lead (mg/kg)[1]	Soluble Lead (ug/kg)[2]
S2	0.5	118	--
1	1.5	31.0	--
1	4	ND[4]	ND
1	5.5	ND	--
2	1	102	--
2	3	ND	--
2	5	ND	--
2	7	ND	--
5	1	63	--
5	3.5	ND	--
7	3	ND	--
7	5.5	ND	--
8	2	363	8350
8	4	ND	--
8	5.5	ND	--
9	1.5	ND	--
9	7	ND	--
10	1	598	--
10	3	ND	ND
10	5.5	ND	--

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1 mg/kg = milligrams per kilogram
2 ug/kg = micrograms per kilogram
3 -- = Test not requested
4 ND = None detected, chemicals not present at concentrations above detection limits

Table 3
Concentrations of Volatile Organic Chemicals in Soils

Boring	Depth (feet)	Chloro-benzene (ug/kg)[1]	1,2-Dichloro-ethane (ug/kg)	Other EPA 8010 Chemicals
3[3]	20.5	ND[2]	330	ND
12[3]	21	280	ND	ND
15[3]	20	ND	52	ND

[1] ug/kg = micrograms per kilogram
[2] ND = None detected, chemicals not present at concentrations above detection limits
[3] Borings 3, 11, 12 and 15 were drilled within the existing basement; the surface is about 5 to 6 ft below sidewalk grades

VI CONCLUSIONS

A. General

Our investigation indicates that gasoline, oil and grease, 1,2-dichloroethane (DCA), chlorobenzene and lead are present in soil at the site. The hydrocarbon and organic chemical contamination appears to be related to releases from the former gasoline station which occupied the northeast corner of the site. The lead contamination appears limited to the surface soils blanketing most of the property. The source of lead contamination is uncertain, but is likely unrelated to service station activities. Low levels of oil and grease were also detected in surface soils within a limited area of the property. In our

opinion, the source of oil and grease is likely surface spillage on the service station site. Our findings and conclusions are discussed in more detail below.

B. Gasoline Contamination

Gasoline is present in soil beneath the former fuel tanks. Gasoline is present at concentrations varying up to 4000 mg/kg. The contamination was detected to depths of approximately 27 feet below sidewalk levels, the depth at which groundwater likely exists. The approximate lateral extent of gasoline contamination in soil is presented on Plate 2.

C. Chlorinated Hydrocarbons

Two chlorinated hydrocarbons, chlorobenzene and 1,2-dichloroethane (DCA), were detected in soil samples below the former fuel tanks. As indicated in Table 3, chlorobenzene was detected in one soil sample at a concentration of 280 ug/kg. DCA was detected in two samples at concentrations of 52 and 330 ug/kg.

The source of the DCA and chlorobenzene is currently uncertain. DCA is a minor constituent of some gasolines and hence, may be associated with the gasoline contamination. However, DCA and chlorobenzene are also relatively common solvents and could be associated with leakage from a waste oil tank.

D. Oil and Grease Contamination

Oil and grease were detected at concentrations ranging from 52 to 82 mg/kg within surface soils near the central portion of the property, in the area indicated on Plate 3. The soils containing oil and grease represent fill that appears to be derived from the

adjacent basement excavation which is within the area of the former gasoline station. The contamination source is likely surface spills that occurred on the property as a result of auto repair activities.

At the concentrations detected, these soils do not appear to pose a significant health or environmental concern. However, oil and grease contaminated soils will likely require special consideration with regard to disposal of the materials off-site. They will likely have to be placed in an appropriate landfill.

E. Lead Contamination

Lead exists in the shallow surface soils over most of the property. The contamination appears limited to the upper 1 to 2 feet of soil. The lead concentrations varied up to 598 mg/kg, but averaged about 200 mg/kg. The results of the lead analyses are presented on Plate 4. Soluble lead was detected at a concentration of 8.35 mg/l from a sample from Boring 8 which contained comparatively high concentrations of total lead. This concentration of soluble lead exceeds the soluble threshold limit concentration (STLC) for lead (5 mg/l) which is one criteria used to classify materials as a hazardous waste. We suspect that the high soluble lead concentration encountered at Boring 8 represents a localized condition.

The source of lead contamination is uncertain at this time. However, given that the contaminated material appears widespread but limited to soils within about 2 feet or so of the groundsurface, there is a high likelihood that the source is

associated with air emissions from industrial activities and automobile use in the vicinity.

F. Groundwater Contamination

The gasoline and chlorinated hydrocarbon contamination appears to extend to groundwater. Consequently, we conclude that it is probable that groundwater quality has been impacted. The lateral extent and concentrations of groundwater contamination are currently unknown and should be investigated by installing groundwater monitoring wells. Groundwater impacts should be evaluated in the next phase of investigation.

G. Remediation

1. Gasoline Contamination

The gasoline concentrations that exist in the soil near the previous service station are sufficiently high that we judge the Alameda County Health Care Services Agency (ACHCSA) will require remediation. In our opinion, the most appropriate and economical remediation alternative will involve removal of the contaminated soil, soil aeration on-site, and placement of the aerated soil back into the excavation. The soils contaminated with low concentrations of chlorobenzene and DCA will also be excavated when the gasoline contaminated soils are removed. Remediation of gasoline contamination by aeration will also be effective in reducing the concentrations of these chlorinated hydrocarbons.

Cleanup criteria will have to be negotiated with the regulatory agencies. However, based on our experience, we judge that soil excavation should proceed until soils containing petroleum hydrocarbons in excess of 100 mg/kg are removed. Excavations extending to depths up to about 30 feet below sidewalk

grades may be required to remove contaminated soils. The approximate area of excavation, based upon the analytical data, is shown on Plate 2.

Upon completion of excavation, soil samples obtained from the bottom and side walls of the excavation should be analyzed to check the adequacy of clean-up activities. The number and location of these confirmation samples and analyses should be negotiated with the ACHCSA.

Analytical testing should be performed by a California Department of Health Services certified laboratory. The confirmation samples should be analyzed for total volatile hydrocarbons (EPA 8015/5030), total extractable hydrocarbons (EPA 8015/3550), and benzene, toluene, ethylbenzene and toluene (EPA 8020).

Once remediation is complete, the excavation should be backfilled with clean and aerated soil. The fill should be compacted in thin lifts to at least 90 percent relative compaction (ASTM D1557).

2. **Oil and Grease Contamination**

We recommend that the oil and grease contaminated soils be excavated to a depth of 2.5 feet within the limits of the area illustrated on Plate 3. These soils should be stockpiled, analyzed and disposed of at an appropriate landfill. Samples of the stockpiled materials should be obtained and analyzed in accordance with criteria set by local landfills. The most appropriate disposal alternative/location should be identified when the analytical results are obtained.

3. Lead Contamination

Lead contaminated soils exist within approximately the upper 1 to 2 feet of the existing groundsurface. We recommend that these soils be excavated to a depth of about 2 feet below sidewalk grades in areas of proposed basement excavation. These soils should be stockpiled, analyzed and disposed of off-site at an appropriate landfill. The most appropriate disposal alternative/location should be identified once the analytical results are obtained.

VII LIMITATIONS

The conclusions drawn from this investigation are an expression of our professional opinion, and do not constitute a warranty or guaranty, either expressed or implied. It should be understood that additional investigative work on the property may modify the conclusions presented herein, as additional information becomes available.

List of Attached Plates:

Plate 1	Site Plan
Plate 2	Gasoline Concentrations in Soil
Plate 3	Oil and Grease Concentrations in Soil
Plate 4	Total Lead Concentrations in Soil

Appendix A: Investigation Protocol

Plates A-1 through A-16 - Logs of Borings 1 thru 17

Plate A-17 - Unified Soil Classification System

Appendix B: Analytical Testing

Analytical Laboratory Test Reports

Chain-of-Custody Documents

Distribution:

6 copies: Ms. Henri Turney
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JVB:TEC:JPB:sld

APPENDIX A
INVESTIGATION PROTOCOL

A. Test Borings

The test borings were drilled using a truck-mounted drill rig equipped with 8-inch diameter hollow stem augers. Our field engineer observed drilling operations, prepared detailed logs of the test borings and obtained undisturbed samples of the materials encountered. Test boring logs are presented on Plates A-1 through A-16. Soils are classified in accordance with the Unified Soil Classification System described on Plate A-17.

A California Drive Sampler having an outside diameter of 2.5 inches and an inside diameter of 2.0 inches was used to obtain soil samples. The number of blows required to drive the sampler the final 12 inches of each 18-inch penetration was recorded and is presented on the test boring logs. Drilling and sampling equipment was thoroughly steam-cleaned prior to each use to reduce the likelihood of cross-contamination between samples and/or borings.

Soil samples were retained in 2.0-inch-diameter brass liners. Teflon sheeting was placed over the ends of the soil liners; the liners were subsequently capped and sealed with duct tape. The shoe sample from each drive was retained in a plastic bag and screened for volatile organics using an Organic Vapor Meter (OVM). OVM measurements are recorded on the logs of the test borings. The sealed liners were placed in ice-filled coolers and remained iced until delivery to the analytical laboratory. Chain-of-Custody records accompanied the samples. Copies of the Chain-of-Custody documents are presented in Appendix B.

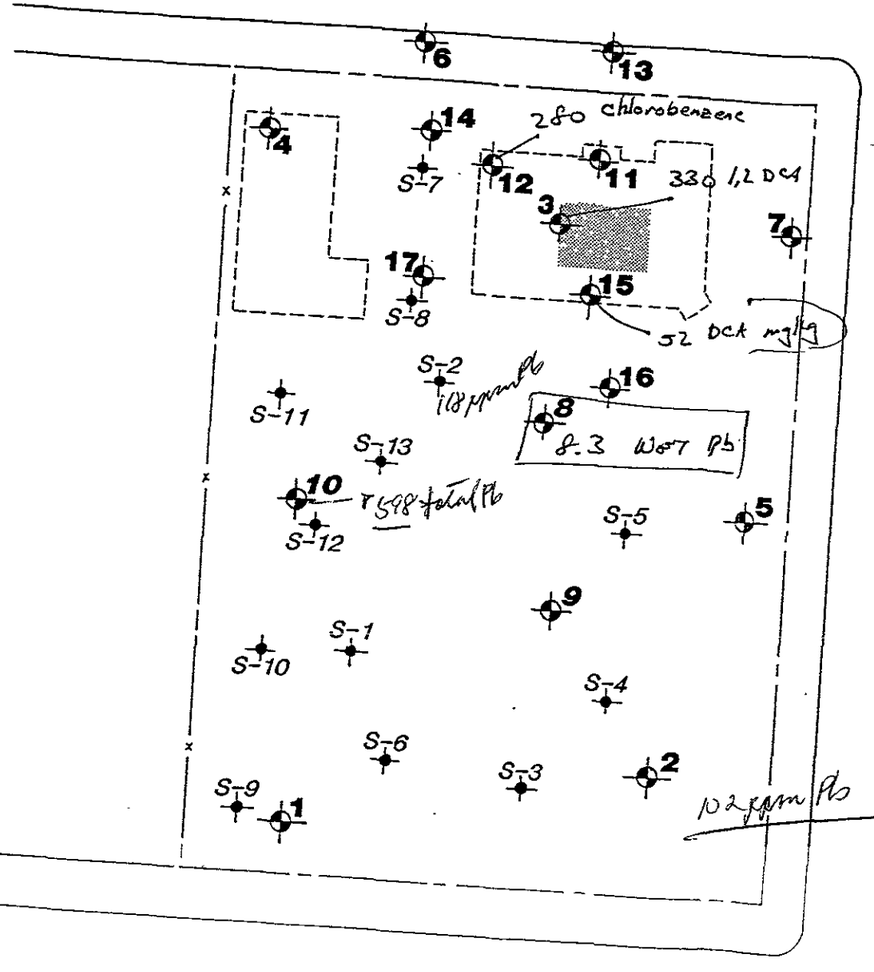
APPENDIX B
ANALYTICAL TESTING

Analytical testing of soil was provided by Curtis and Tompkins, Ltd., a State of California Department of Health Services (DHS) certified laboratory. The analytical tests were performed on individual samples. A summary of sample preparation and test methods are presented below.

Test Analysis	Sample Preparation Method	Analytical Method
Total Volatile Hydrocarbons	EPA 5030	EPA 8015 Mod.
Total Extractable Hydrocarbons	EPA 3550	EPA 8015 Mod.
Total Oil and Grease	EPA 3550	SMWW17:5520F
Purgeable Halocarbons	EPA 5030	EPA 8010
Total Lead		EPA 7420
Soluble Lead	WET Extraction	EPA 7420

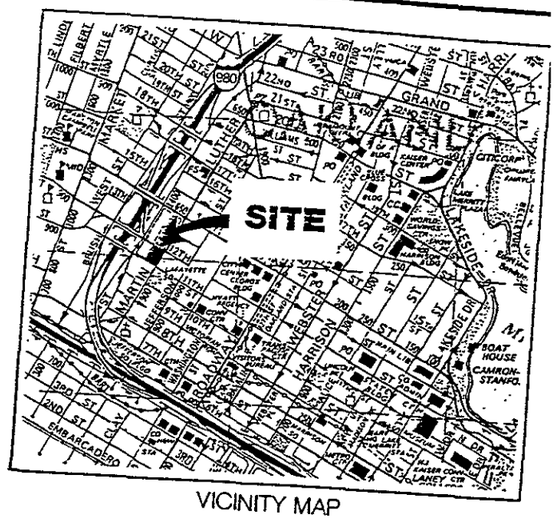
A summary of the analytical results is presented in Tables 1 thru 3 in the report text. Analytical test reports and Chain-of-Custody records are presented in the following pages.

12TH STREET



11TH STREET

MARTIN LUTHER KING JR. WAY



VICINITY MAP

- TEST BORING
- SURFACE SOIL SAMPLES
- —x— FENCE
- - - - EXISTING BASEMENTS
- APPROXIMATE LOCATION OF FORMER TANKS

TRUE NORTH

REFERENCE NORTH

APPROXIMATE SCALE (feet)

0 40 80

SITE PLAN

12TH ST. & MARTIN LUTHER KING JR. WAY

PLATE

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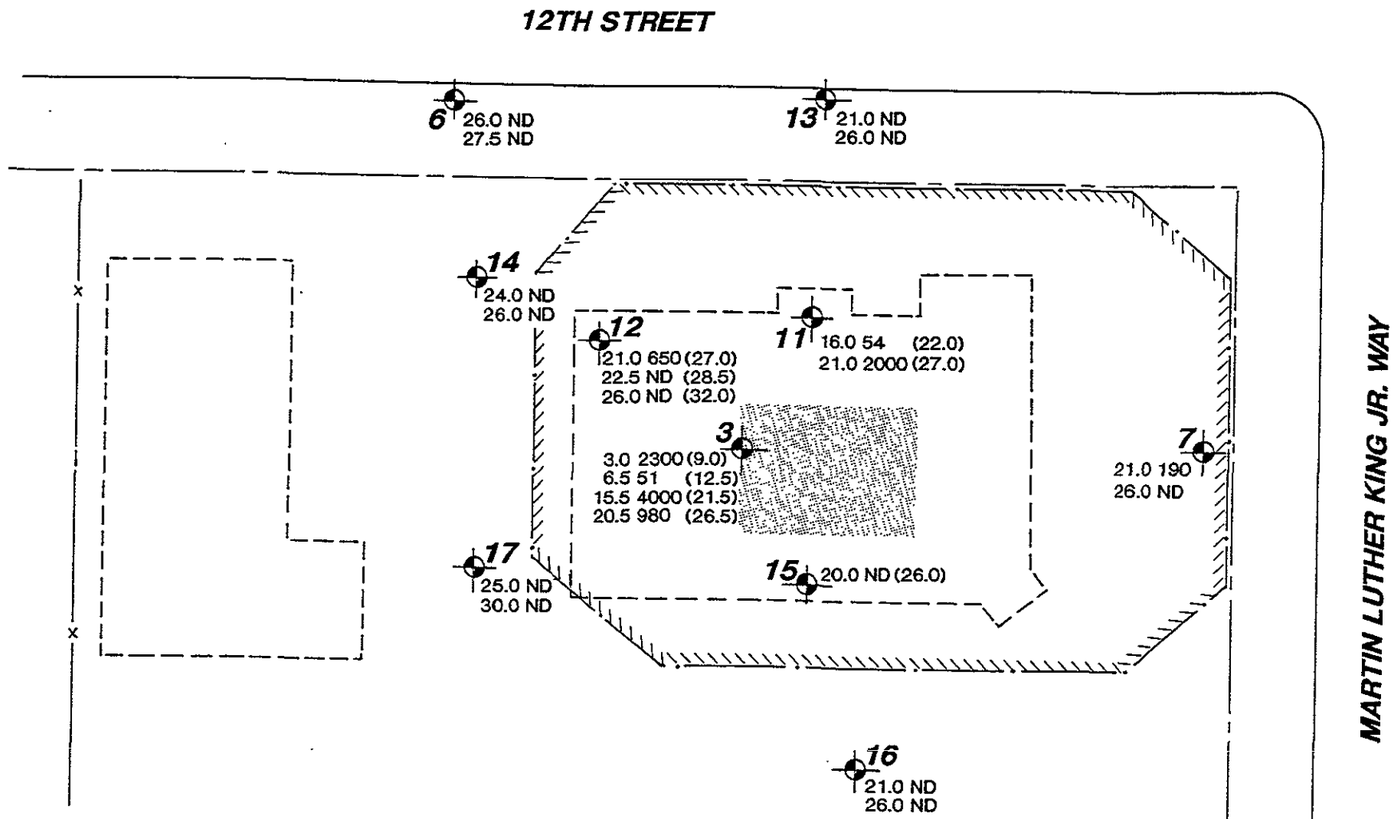

TEST BORING

21.0 1500 (27.0)

- ADJUSTED DEPTH (feet) TO ACCOUNT FOR 6 FOOT DEEP BASEMENT
- GASOLINE CONCENTRATION, mg/kg
- DEPTH, FEET

APPROXIMATE AREA OF GASOLINE CONTAMINATION

N

APPROXIMATE SCALE (feet)

0 20 40

GASOLINE CONCENTRATIONS IN SOIL

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12TH ST & MARTIN LUTHER KING JR. WAY

JOB NUMBER	DATE	APPROVED
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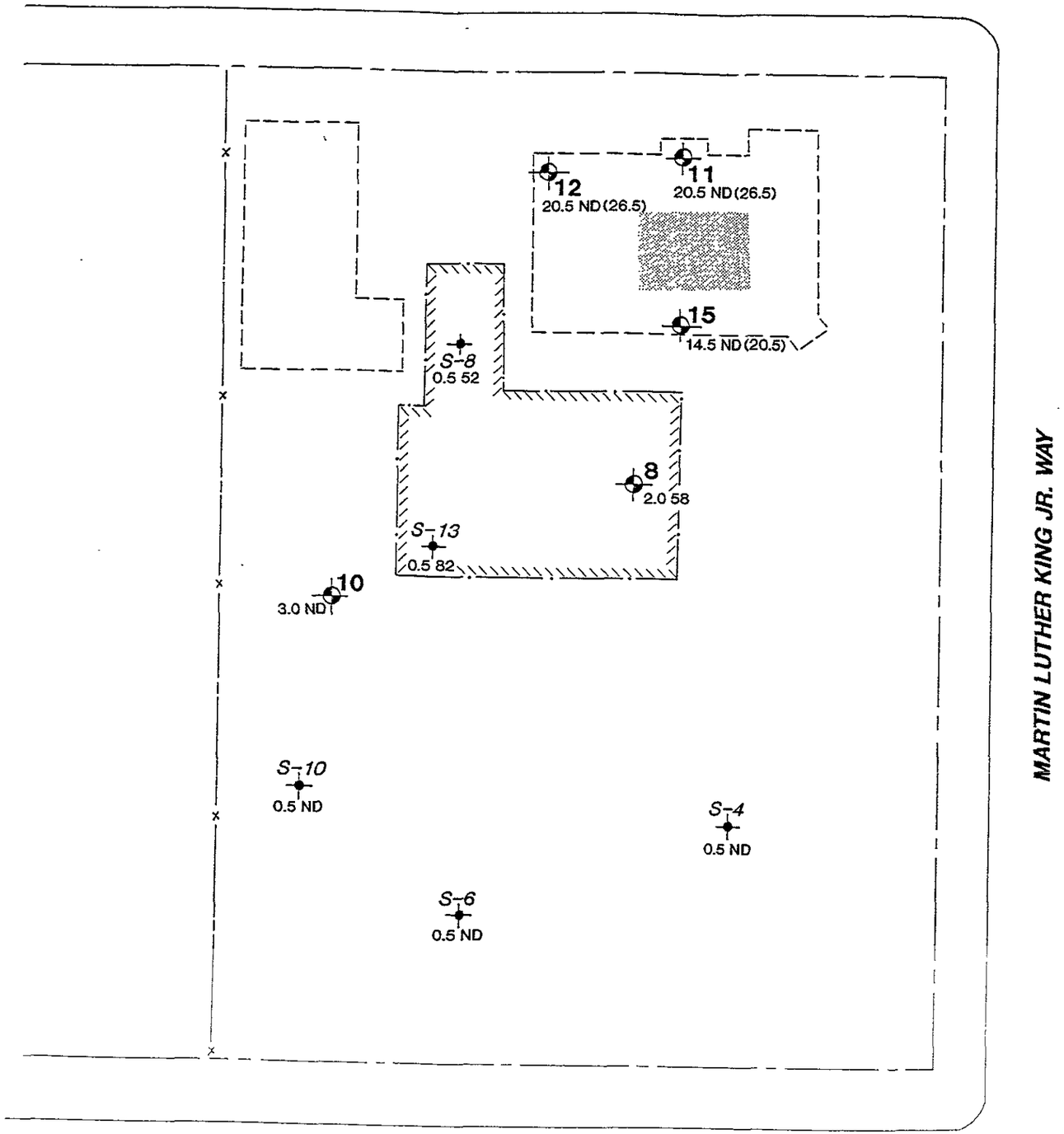
PLATE 2

12TH STREET



MARTIN LUTHER KING JR. WAY

11TH STREET

TEST BORING

SURFACE SOIL SAMPLE, 0.5 TO 1.0 FEET

10.0 63(16.5)
- ADJUSTED DEPTH (feet) TO ACCOUNT FOR 6 FOOT DEEP BASEMENT
- OIL AND GREASE CONCENTRATION, mg/kg OR ppm
- DEPTH, FEET

APPROXIMATE AREA OF OIL AND GREASE CONTAMINATION

APPROXIMATE SCALE (feet)

0 25 50

OIL & GREASE CONCENTRATIONS IN SOIL

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PLATE 3

12TH STREET

MARTIN LUTHER KING JR. WAY

11TH STREET

S-2
0.5 118

7
3.0 ND
5.5 ND

8
2.0 363
4.0 ND
5.5 ND

10
1.0 598
3.0 ND
5.5 ND

5
1.0 63
3.5 ND

9
1.5 ND
7.0 ND

2
1.0 102
3.0 ND
7.0 ND

1
1.5 31.9
4.0 ND
5.5 ND

TEST BORING

SURFACE SOIL SAMPLE

0.5 120
- 120 — LEAD CONCENTRATION, mg/kg OR ppm
- 0.5 — DEPTH, FEET

APPROXIMATE SCALE (feet)

0 25 50

TOTAL LEAD CONCENTRATIONS IN SOIL

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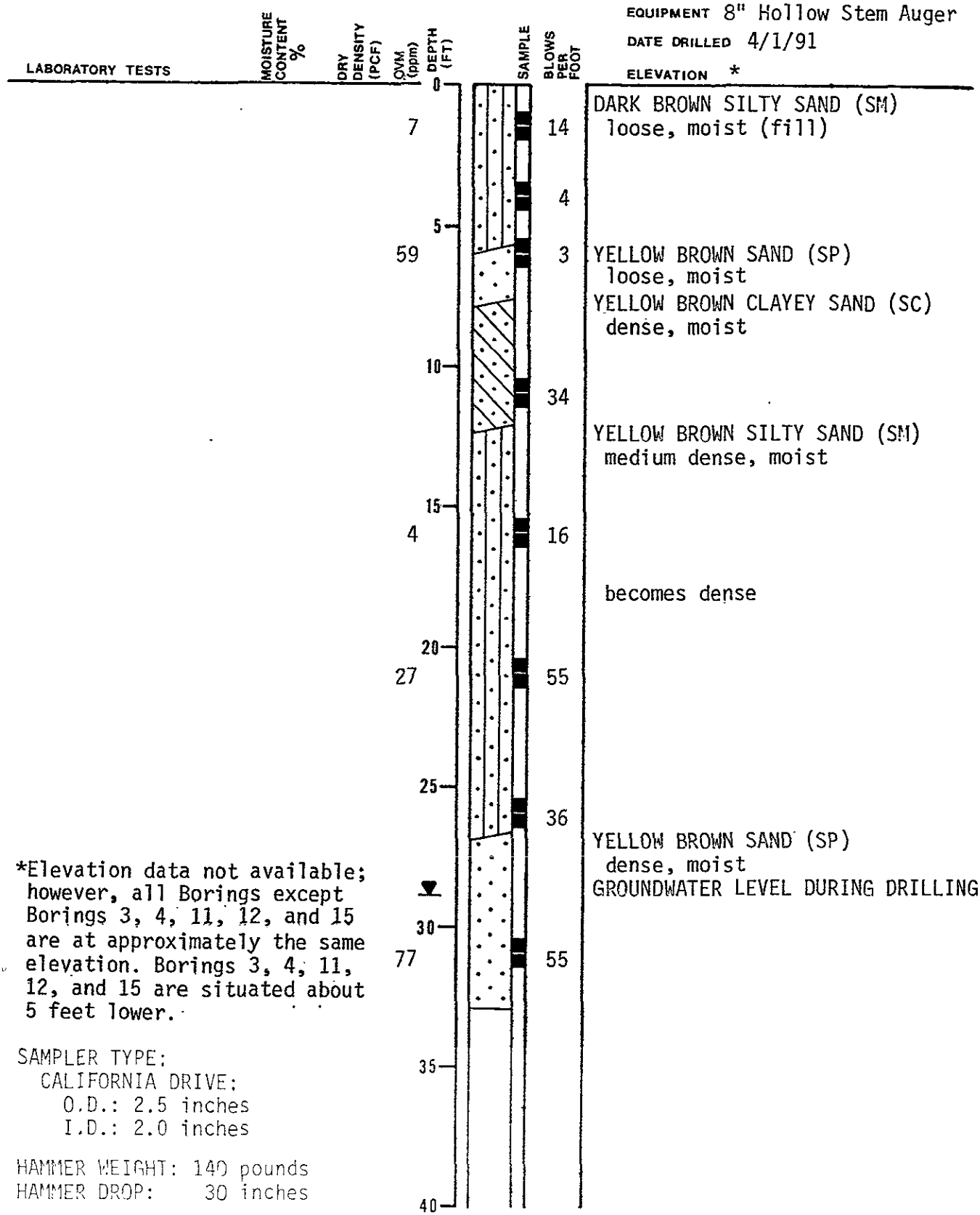
PLATE 4

LOG OF TEST BORING 1

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 4/1/91
ELEVATION *



*Elevation data not available; however, all Borings except Borings 3, 4, 11, 12, and 15 are at approximately the same elevation. Borings 3, 4, 11, 12, and 15 are situated about 5 feet lower.

SAMPLER TYPE:
CALIFORNIA DRIVE:
O.D.: 2.5 inches
I.D.: 2.0 inches

HAMMER WEIGHT: 140 pounds
HAMMER DROP: 30 inches

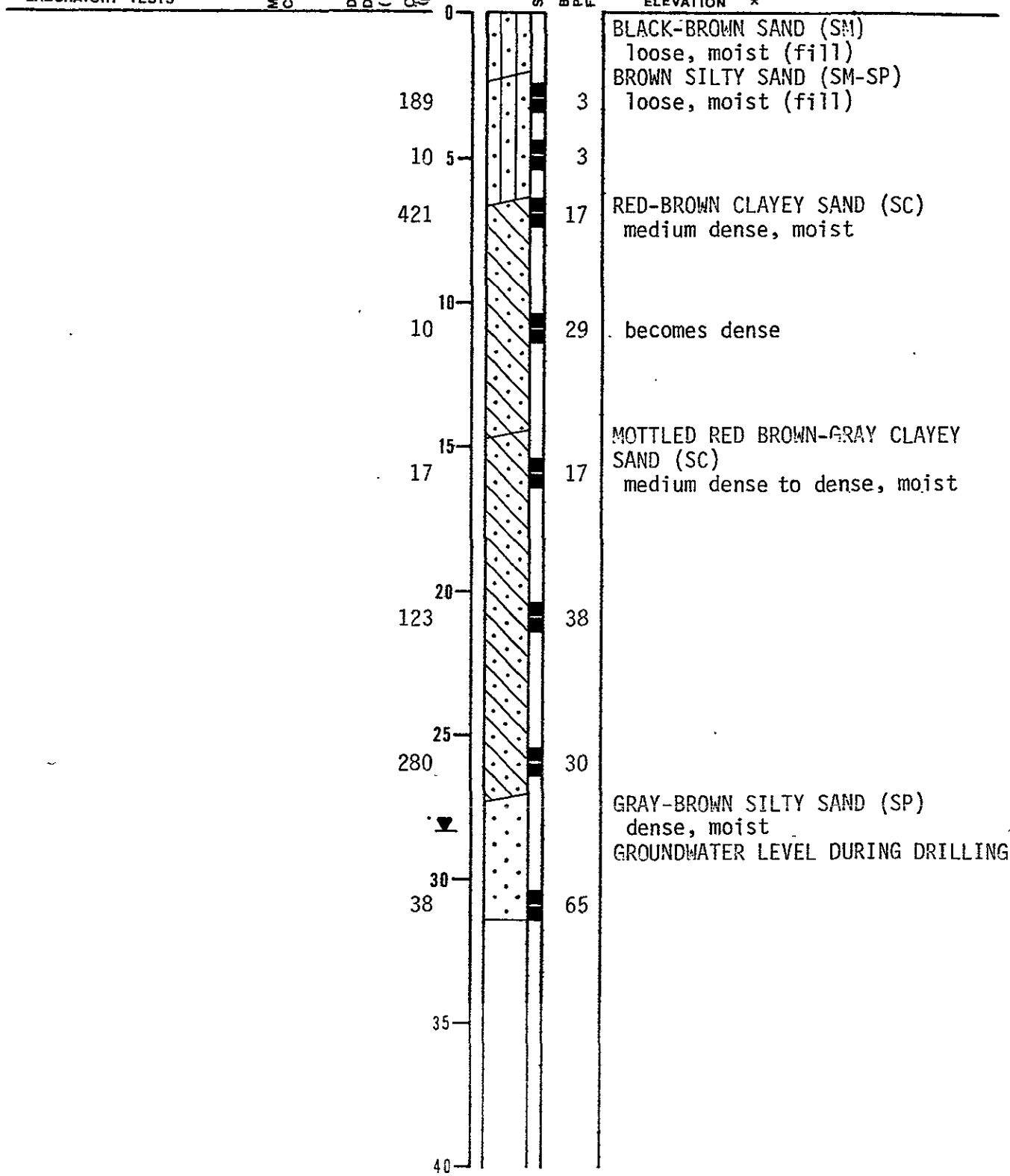
Subsurface Consultants	12TH ST. & MARTIN LUTHER KING JR. WAY			PLATE A-1
	JOB NUMBER 272.021	DATE 4/5/91	APPROVED JUB	

LOG OF TEST BORING 2

EQUIPMENT 8" Hollow Stem Auger

DATE DRILLED 4/1/91

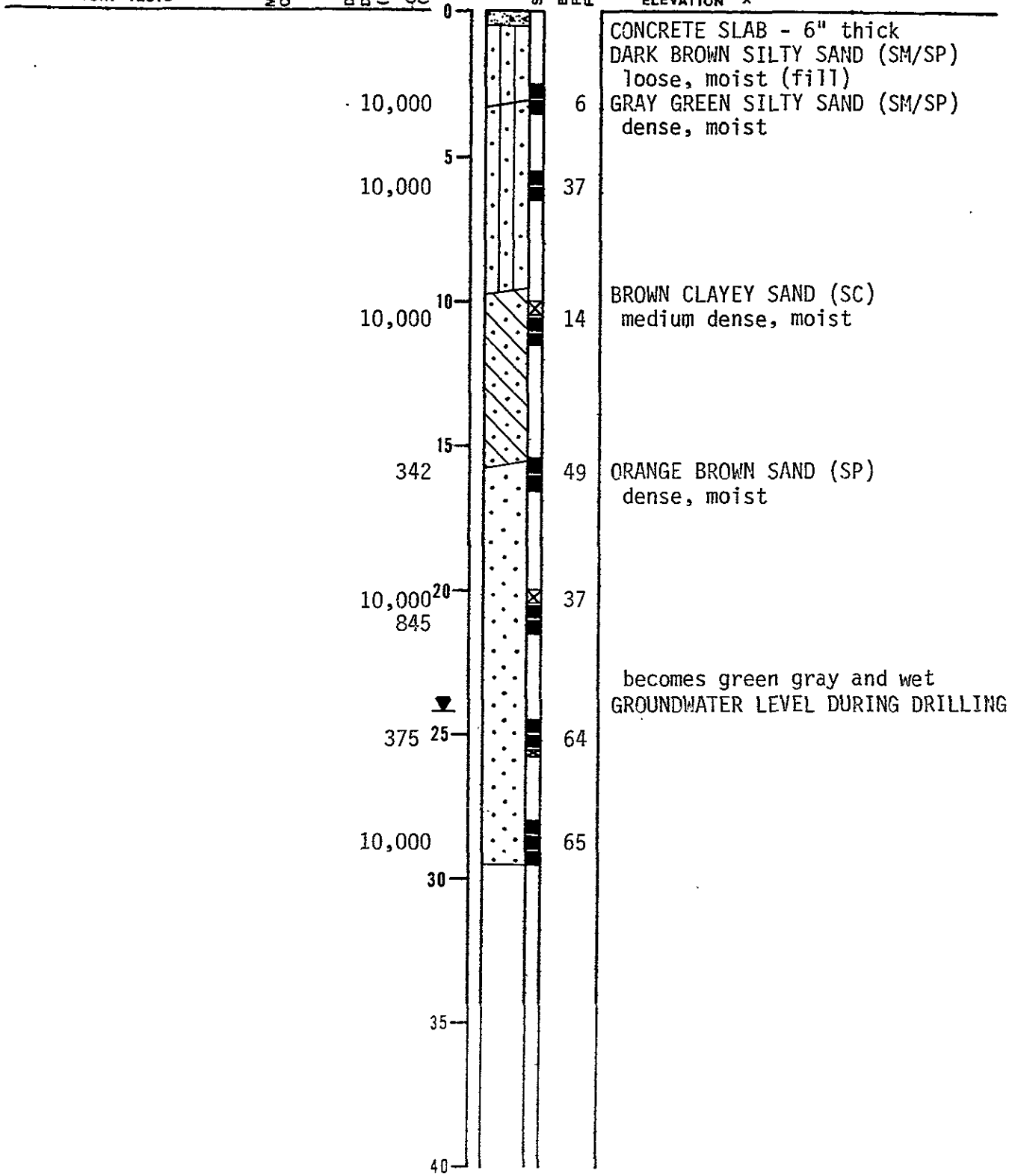
ELEVATION *



Subsurface Consultants	12TH ST. & MARTIN LUTHER KING JR. WAY			PLATE
	JOB NUMBER	DATE	APPROVED	A-2
	272.021	4/5/91	JVB	

LOG OF TEST BORING 3

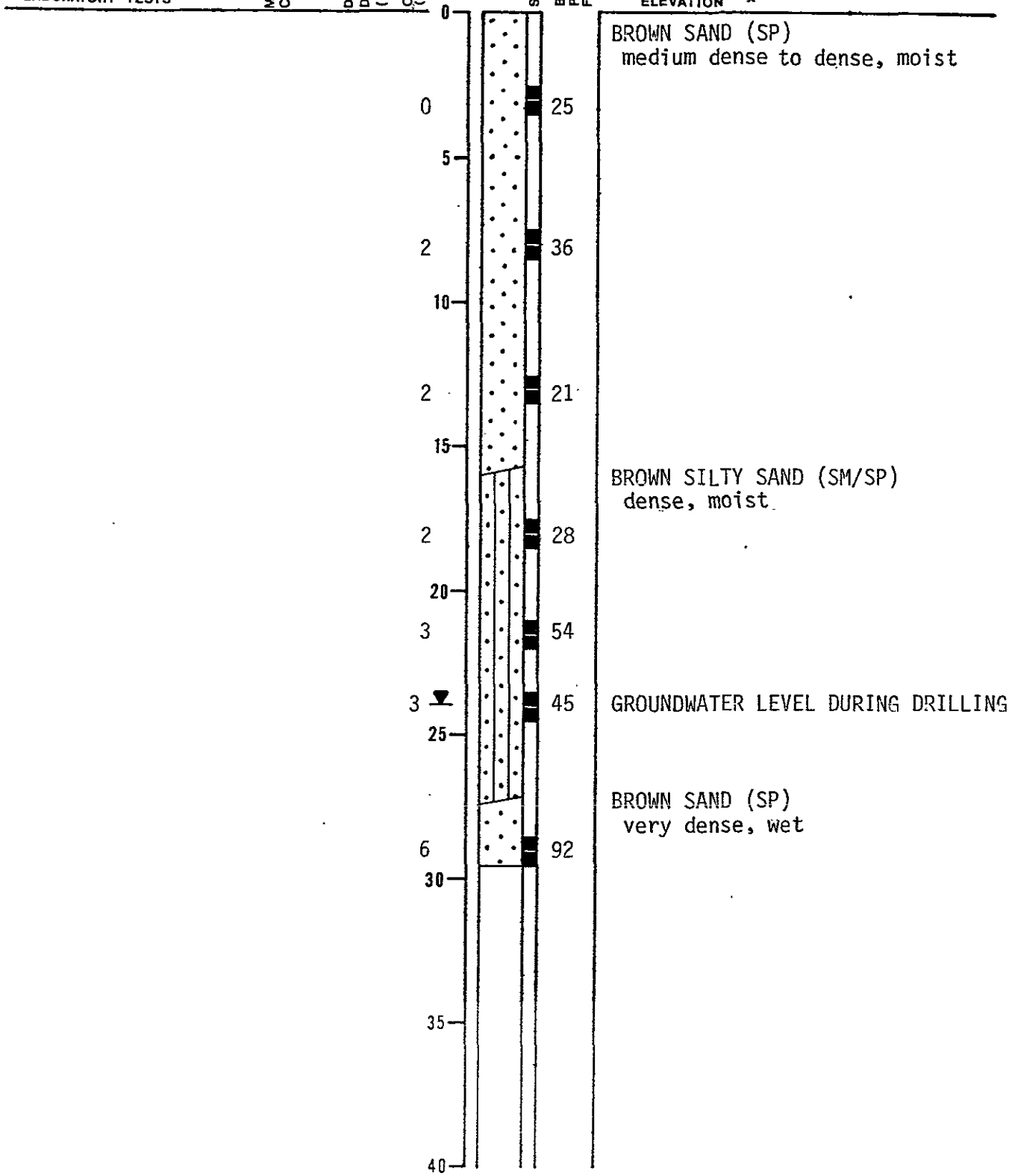
EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 4/2/91
ELEVATION *



Subsurface Consultants	12TH ST. & MARTIN LUTHER KING JR. WAY			PLATE
	JOB NUMBER	DATE	APPROVED	A-3
	272.021	4/5/91	JVB	

LOG OF TEST BORING 4

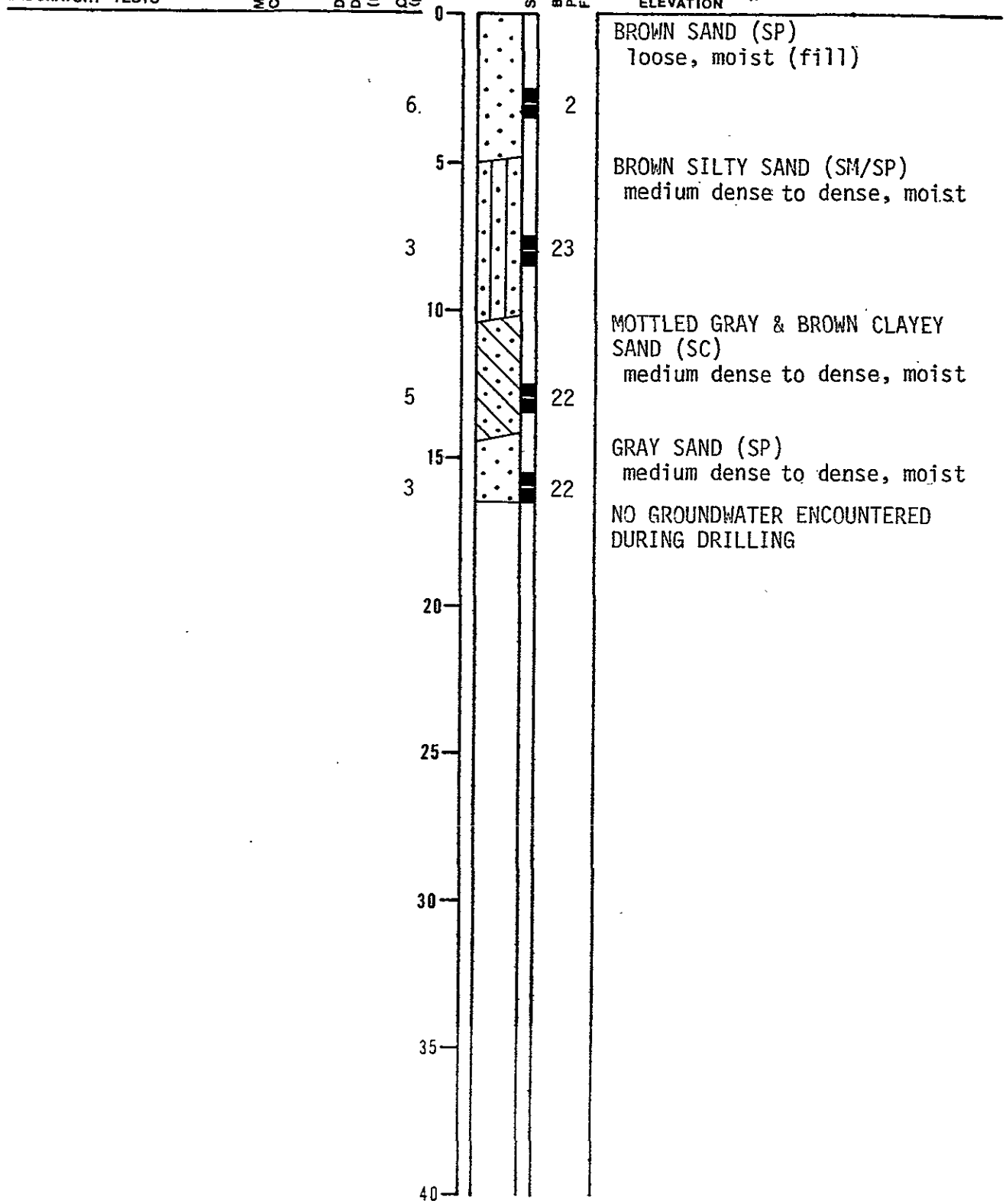
EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 4/2/91
ELEVATION *



Subsurface Consultants	12TH ST. & MARTIN LUTHER KING JR. WAY			PLATE A-4
	JOB NUMBER 272.021	DATE 4/5/91	APPROVED JVB	

LOG OF TEST BORING 5

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 4/2/91
ELEVATION *



Subsurface Consultants	12TH ST. & MARTIN LUTHER KING JR. WAY			PLATE A-5
	JOB NUMBER 272.021	DATE 4/5/91	APPROVED JVB	

LOG OF TEST BORING 6

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 5/13/91
ELEVATION *

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	OVM (ppm)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT	
				0			DARK BROWN SILTY SAND (SM) loose to medium dense (fill)
			0	5		19	RED BROWN CLAYEY SAND (SC) medium dense to dense, moist
				10		38	BROWN SILTY SAND (SM) dense, moist
				15		17	
			100	20		45	
				25		56	
			13			79	GROUNDWATER LEVEL DURING DRILLING BROWN SILTY SAND (SM/SP) dense to very dense, wet Boring backfilled with cement grout
				30			
				35			
				40			

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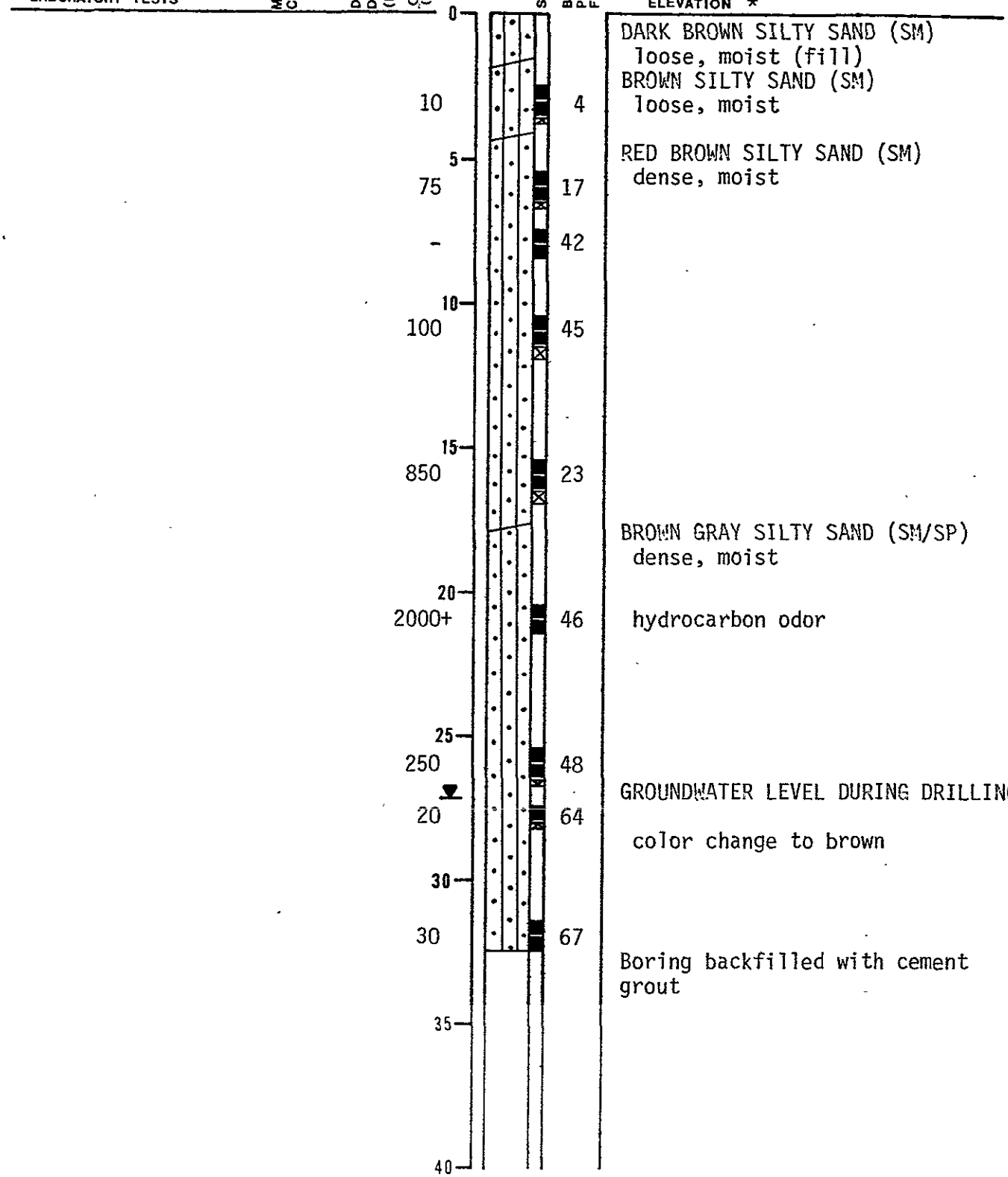
PLATE A-6

LOG OF TEST BORING 7

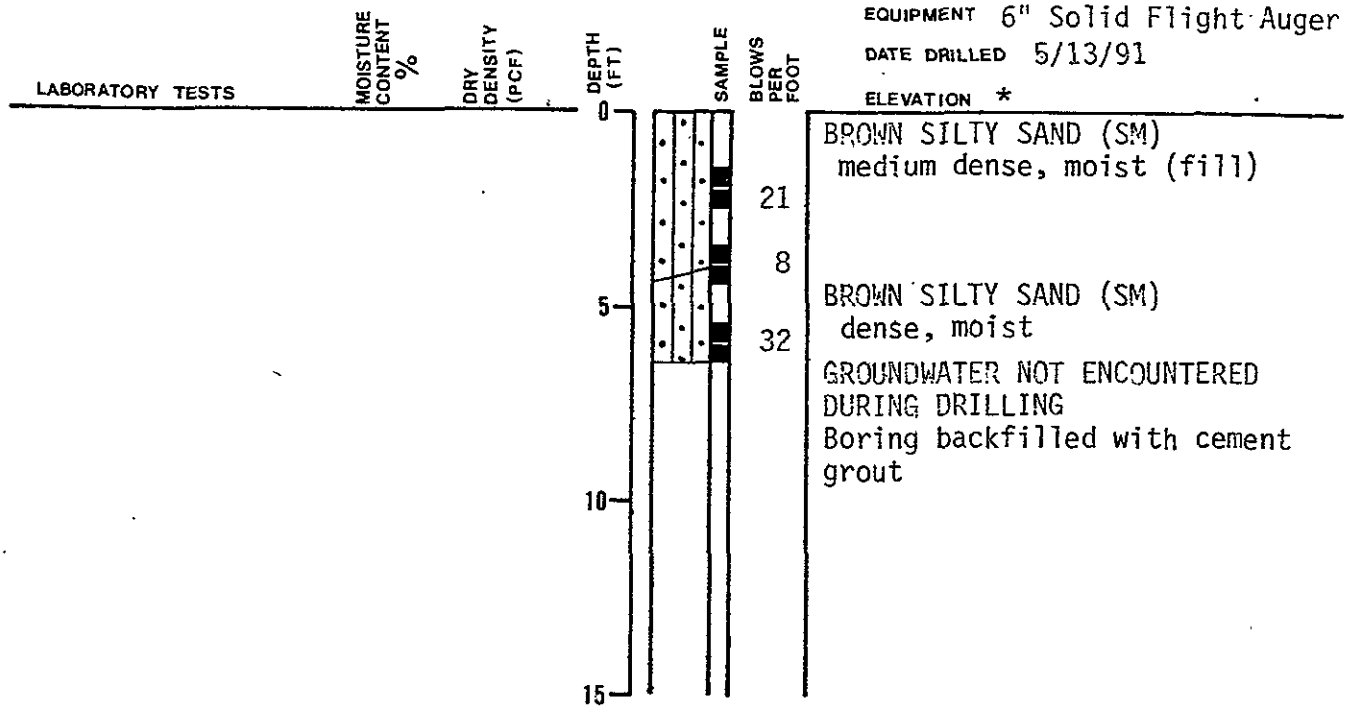
EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 5/13/91
ELEVATION *



Subsurface Consultants	12TH ST. & MARTIN LUTHER KING JR. WAY			PLATE
	JOB NUMBER	DATE	APPROVED	A-7
	272.021	5/23/91	JVB	

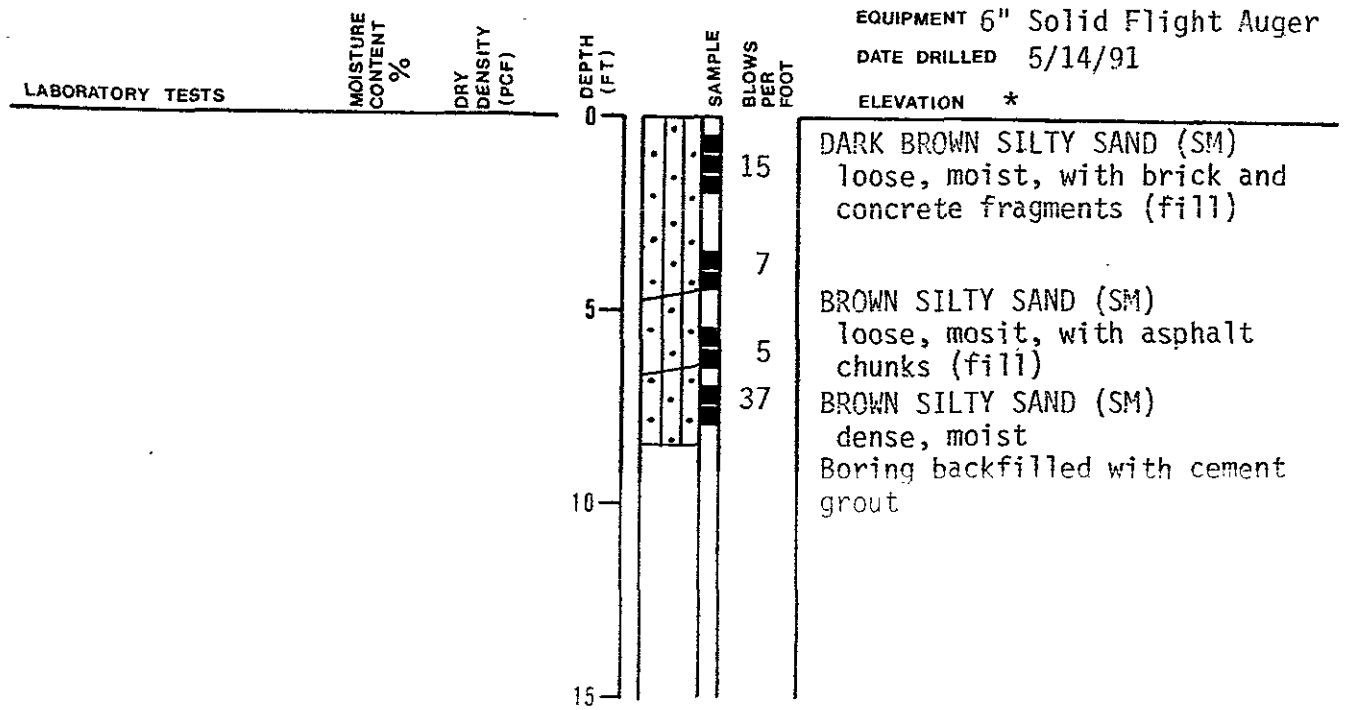
LOG OF TEST BORING 8

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 5/13/91
ELEVATION *



LOG OF TEST BORING 9

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 5/14/91
ELEVATION *



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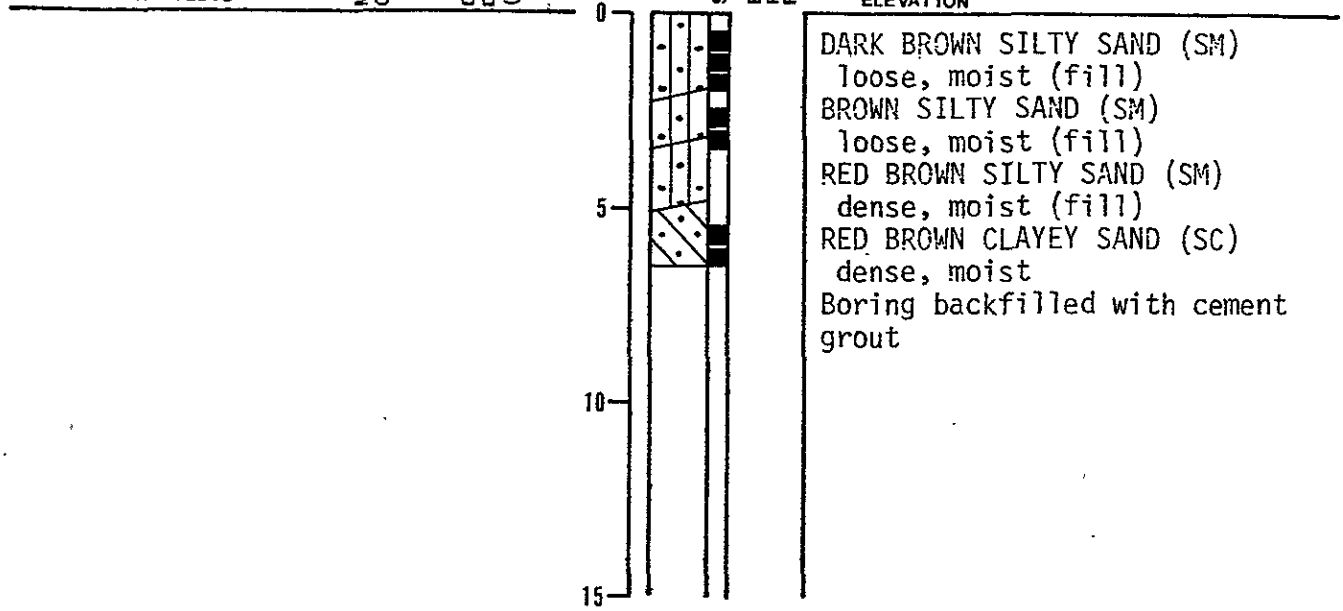
	JOB NUMBER 272.021	DATE 5/23/91	APPROVED JVB	

LOG OF TEST BORING 10

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 5/14/91
ELEVATION *



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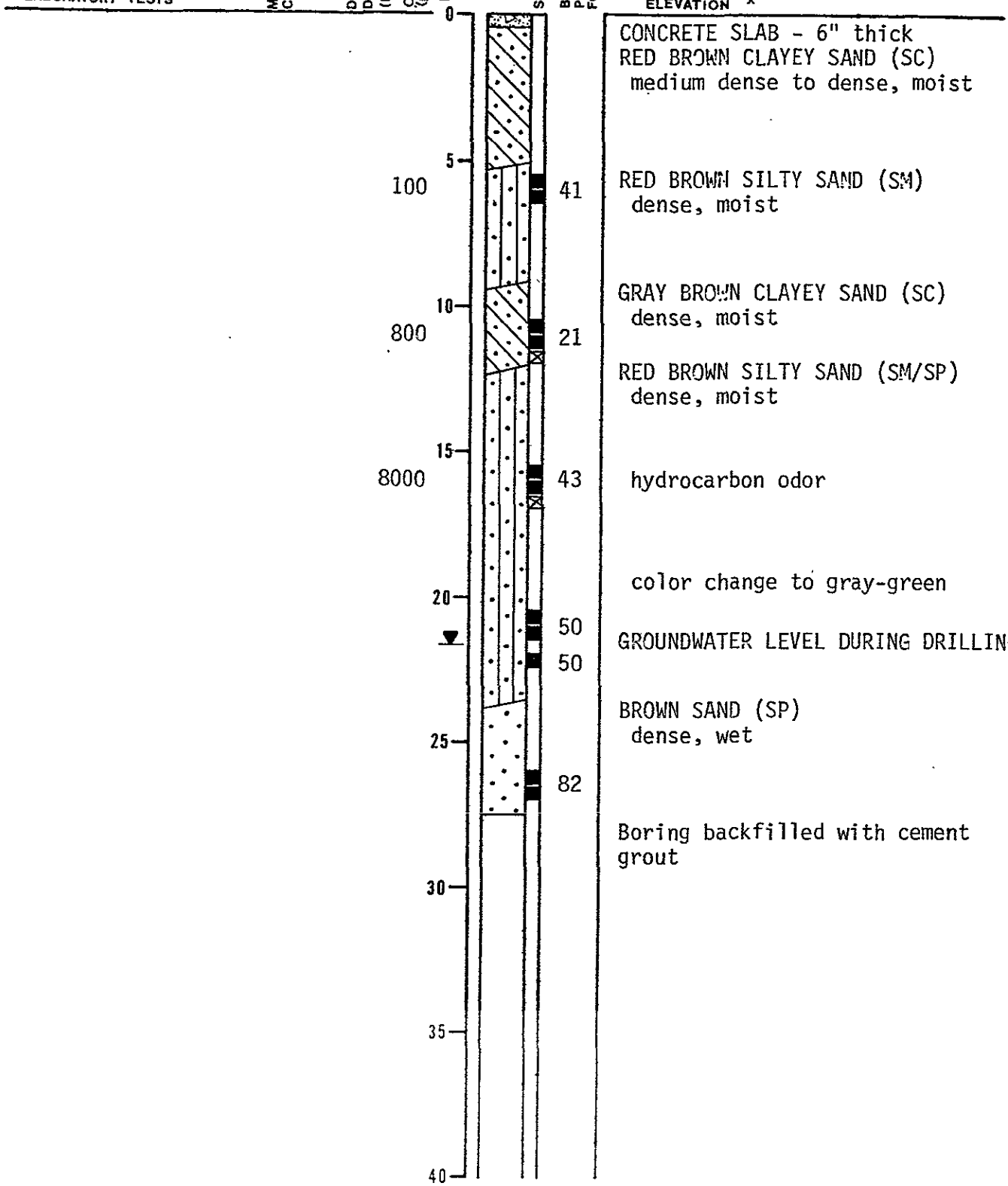
	JOB NUMBER 272.021	DATE 5/23/91	APPROVED JVB	

LOG OF TEST BORING 11

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 5/13/91
ELEVATION *



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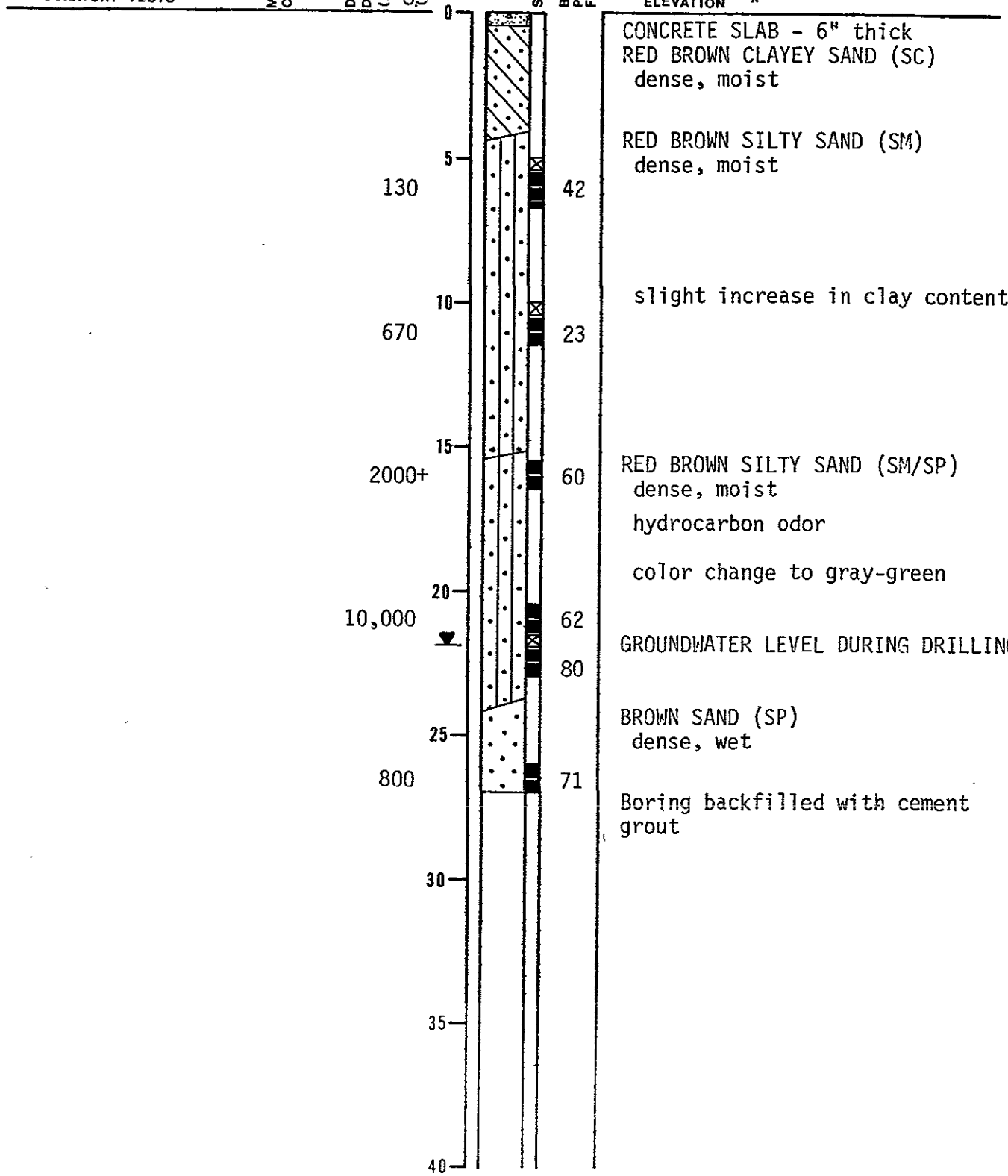
272.021	5/23/91	JVB

PLATE A-10

LOG OF TEST BORING 12

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 5/13/91
ELEVATION *



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	JOB NUMBER	DATE	APPROVED	A-11
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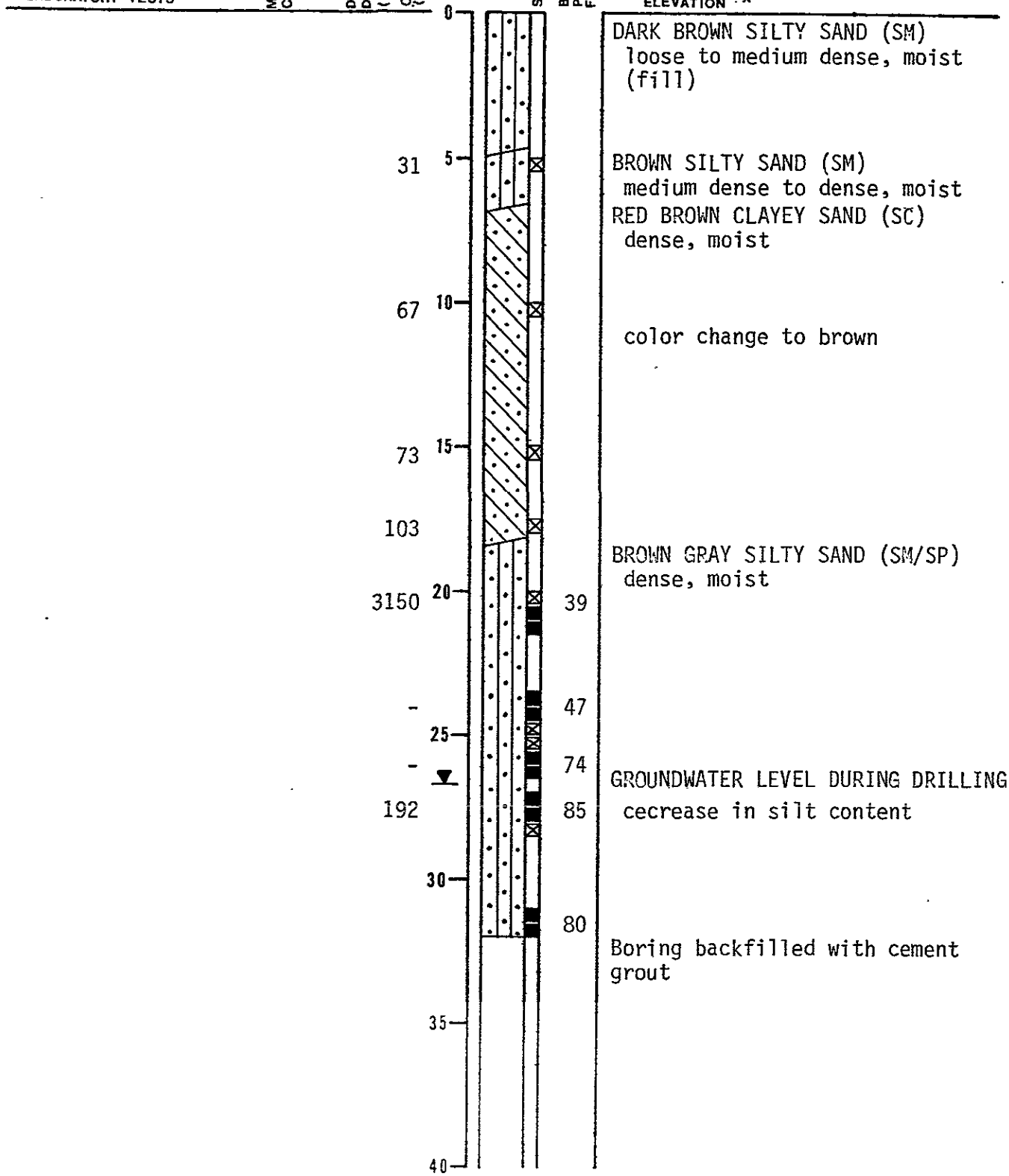
LOG OF TEST BORING 13

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 5/14/91
ELEVATION *



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	JOB NUMBER 272.021	DATE 5/23/91	APPROVED JVB	

LOG OF TEST BORING 14

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 5/14/91
ELEVATION *

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	OVM (ppm)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT	
				0			DARK BROWN SILTY SAND (SM) loose, moist (fill)
				5			BROWN SILTY SAND (SM) medium dense, moist
							RED BROWN CLAYEY SAND (SC) dense, moist
			47	10			decrease in clay content
			51				
			56	15			
				20			BROWN SILTY SAND (SM/SP) dense, moist
			300			48	hydrocarbon odor color change to gray-brown
			2000			44	
				25			
						64	
			500	▼			GROUNDWATER LEVEL DURING DRILLING
			200			61	
				30			decrease in silt content
			120			73	
							Boring backfilled with cement grout
				35			
				40			

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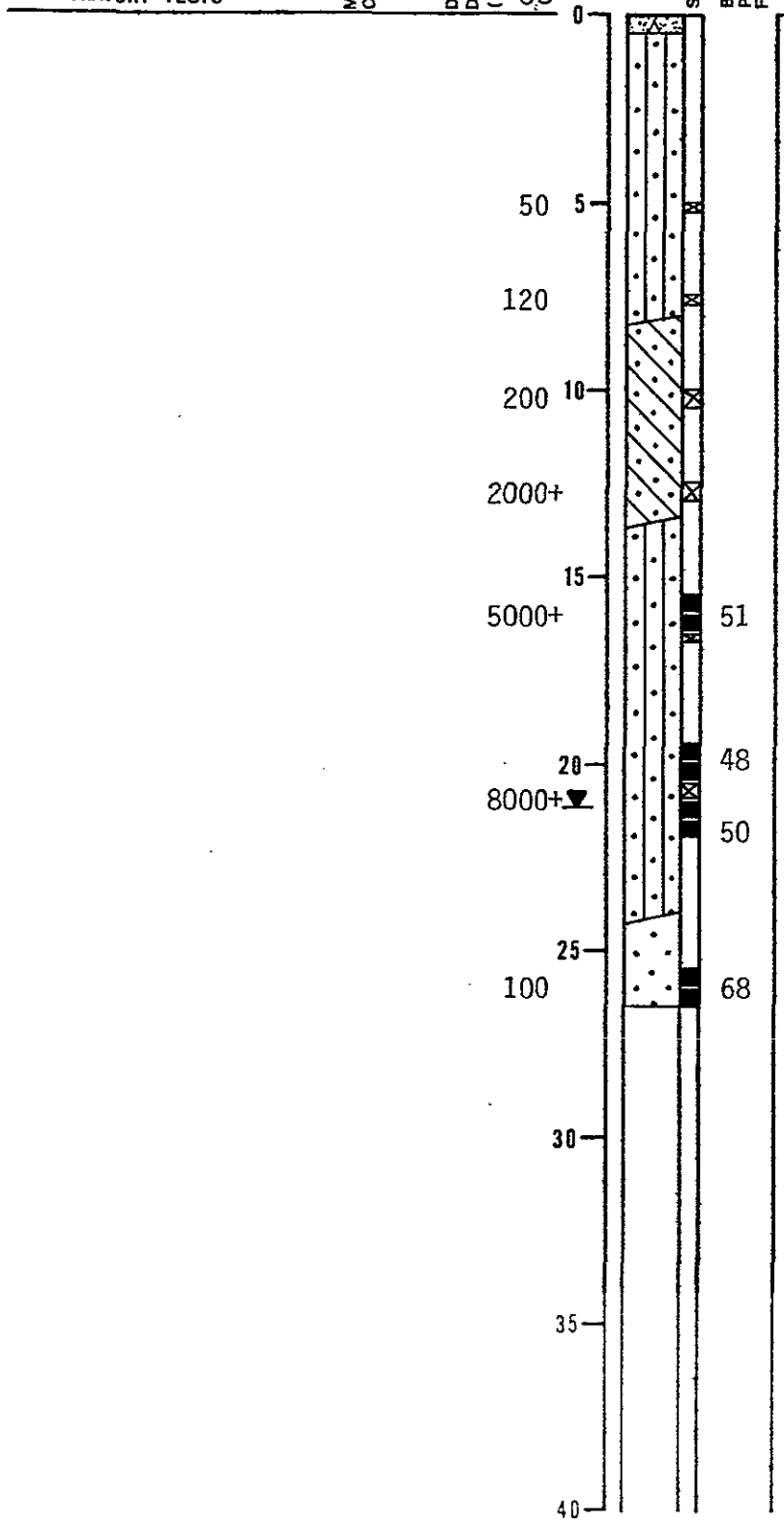
PLATE A-13

LOG OF TEST BORING 15

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 5/14/91
ELEVATION *



CONCRETE SLAB - 6" thick
RED BROWN SILTY SAND (SM)
dense, moist

BROWN CLAYEY SAND (SC)
dense, moist

RED BROWN SILTY SAND (SM/SP)
dense, moist

color change to gray-green
GROUNDWATER LEVEL DURING DRILLING

BROWN SAND (SP)
dense, wet

Boring backfilled with cement grout

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PLATE A-14

LOG OF TEST BORING 16

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 5/14/91
ELEVATION *

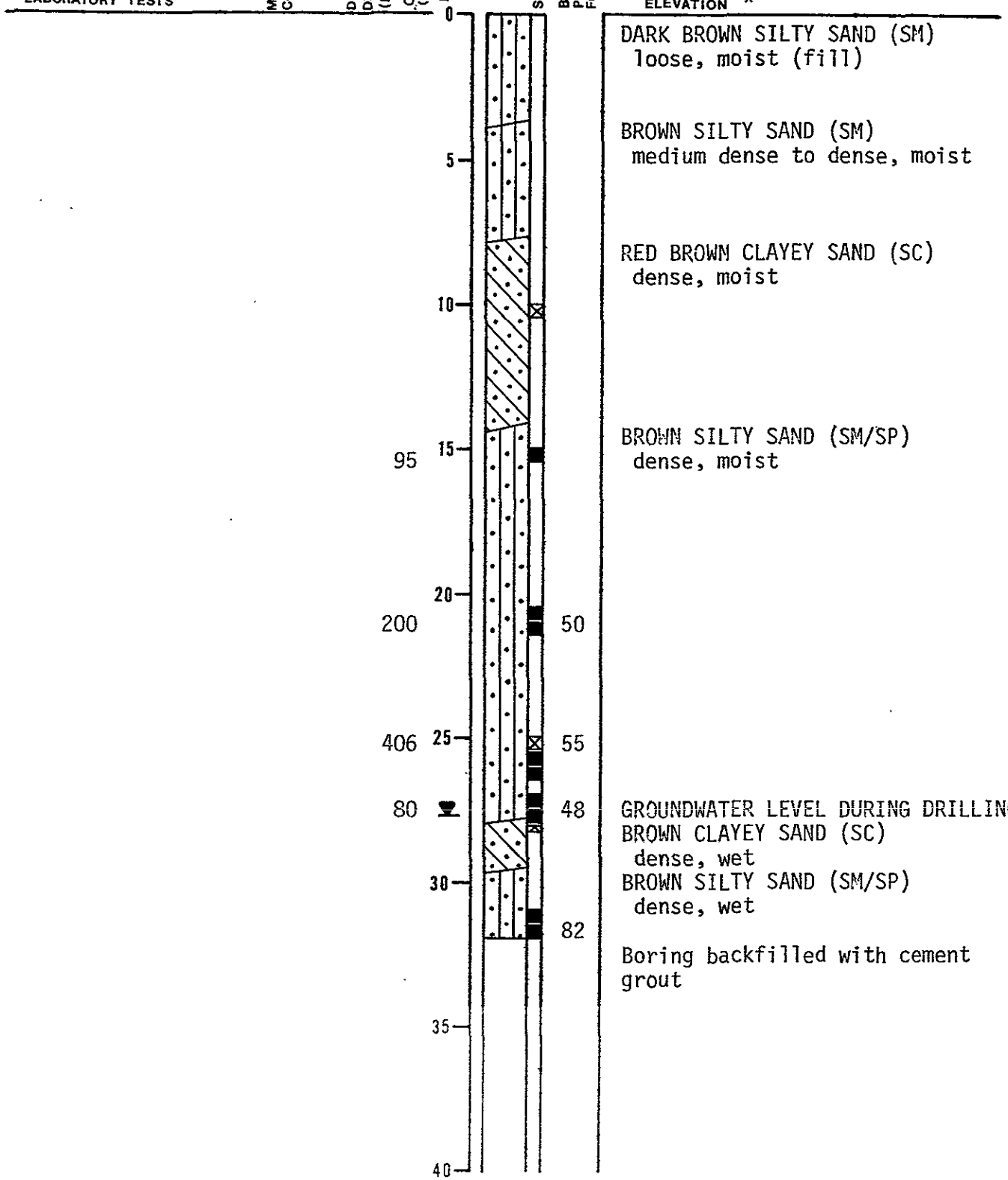

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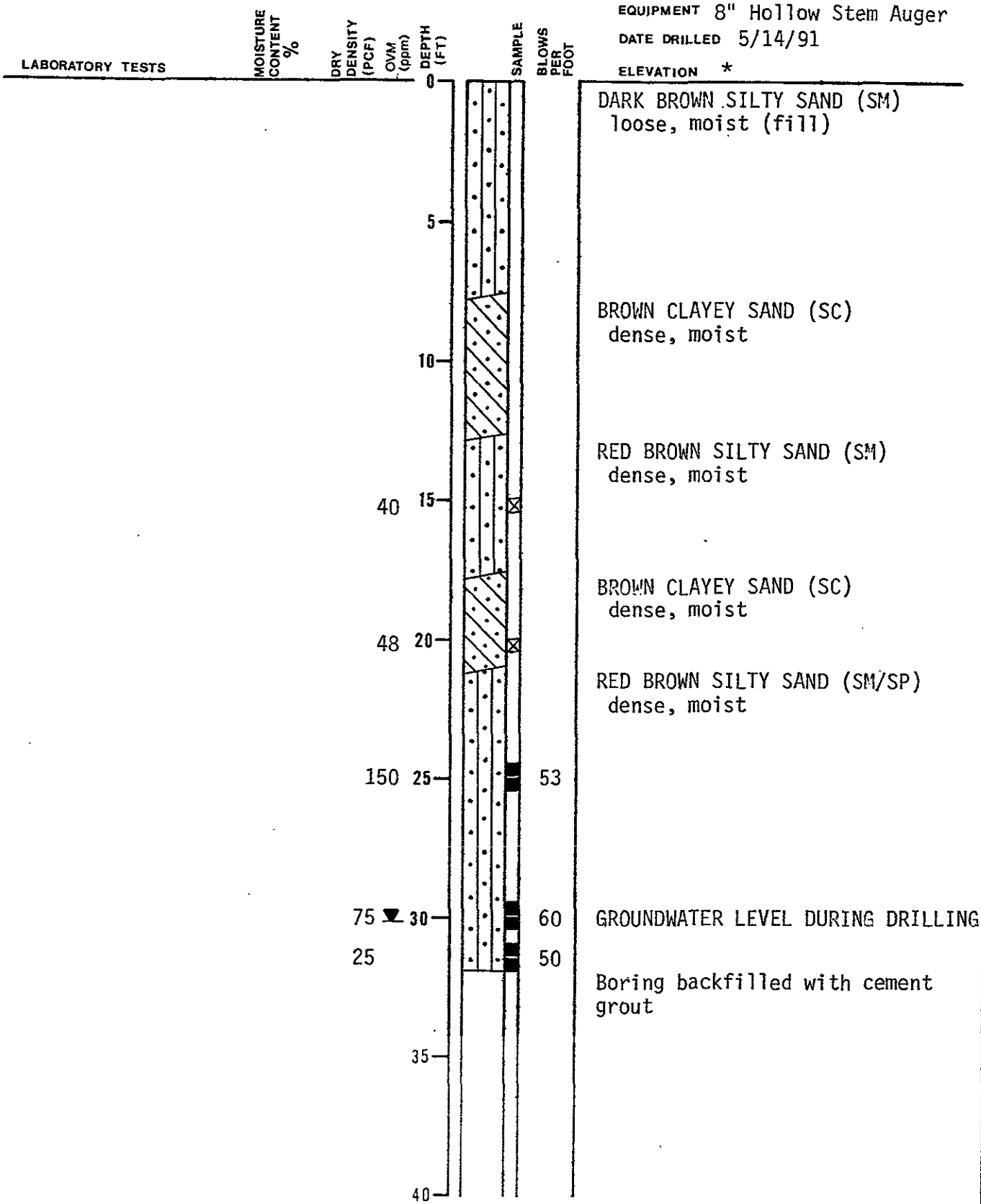
PLATE A-15

LOG OF TEST BORING 17

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 5/14/91
ELEVATION *



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	JOB NUMBER 272.021	DATE 5/23/91	APPROVED JVB	A-16

GENERAL SOIL CATEGORIES			SYMBOLS		TYPICAL SOIL TYPES
COARSE GRAINED SOILS *More than half is larger than No. 200 sieve*	**GRAVEL** More than half coarse fraction is larger than No. 4 sieve size	Clean Gravel with little or no fines	GW		Well Graded Gravel, Gravel-Sand Mixtures
			GP		Poorly Graded Gravel, Gravel-Sand Mixtures
		Gravel with more than 12% fines	GM		Silty Gravel, Poorly Graded Gravel-Sand-Silt Mixtures
			GC		Clayey Gravel, Poorly Graded Gravel-Sand-Clay Mixtures
	SAND *More than half* coarse fraction is smaller than No. 4 sieve size	Clean sand with little or no fines	SW		Well Graded Sand, Gravelly Sand
			SP		Poorly Graded Sand, Gravelly Sand
		Sand with more *than 12% fines*	SM		Silty Sand, Poorly Graded Sand-Silt Mixtures
			SC		Clayey Sand, Poorly Graded Sand-Clay Mixtures
FINE GRAINED SOILS *More than half is smaller than No. 200 sieve*	**SILT AND CLAY** Liquid Limit Less than 50%		ML		Inorganic Silt and Very Fine Sand, Rock Flour, Silty or Clayey Fine Sand, or Clayey Silt with Slight Plasticity
			CL		Inorganic Clay of Low to Medium Plasticity, Gravelly Clay, Sandy Clay, Silty Clay, Lean Clay
			OL		Organic Clay and Organic Silty Clay of Low Plasticity
	SILT AND CLAY Liquid Limit Greater than 50%		MH		Inorganic Silt, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silt
			CH		Inorganic Clay of High Plasticity, Fat Clay
			OH		*Organic Clay of Medium to High Plasticity, Organic Silt*
HIGHLY ORGANIC SOILS			PT		Peat and Other Highly Organic Soils

UNIFIED SOIL CLASSIFICATION SYSTEM

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PLATE **A-17**