RECONSTRUCTION OF I-95 OVER WEST RIVER
WEST HAVEN AND NEW HAVEN, CONNECTICUT

STATE PROJECT NO. 92-522

REVISED FINAL
STRUCTURE SOIL AND ROCK REPORT
BRIDGE NO. 00164
(I-95 OVER ELLA T. GRASSO BOULEVARD)

March 2005

STATE OF CONNECTICUT
RALPH W. BORJESON
No. 8419
REGISTERED
PROFESSIONAL ENGINEER

Prepared by

PARSONS BRINCKERHOFF

Submitted to

CONNECTICUT DEPARTMENT OF TRANSPORTATION

RECORD COPY
DATE: Nov-14-2007

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1.0 PROPOSED CONSTRUCTION

Bridge No. 00164, constructed in 1956-57 is a three simple span structure carrying I-95 over Ella T. Grasso Boulevard (Route 10) in New Haven, Connecticut. (See Figure 1). The bridge is to be reconstructed to accommodate the realigned and widened I-95. The new bridge will consist of a 32.1 meter (105.5 foot) single span, with two full height abutments and U-type wingwalls. The abutments and wingwalls will be supported on precast prestressed concrete pile foundations.

2.0 EXISTING CONDITIONS

Available design drawings indicate that the existing bridge is founded on steel H-pile supported foundations. The bridge is a three span structure with two piers; column supported abutments and flared wingwalls. All piles are 310 BP 79's (12 BP 53's) that have been designed for negative friction, presumably caused by settlement of underlying organic silt due to fill placed over it during construction. Table 1, below, indicates the pile loadings and estimated lengths from the design drawings. Memorandums contained within the existing bridge files indicate the approximate order length of the piles determined during construction. The abutments and pier footings all used both vertical and batter piles with a pile cutoff of El[1] 0.5 m (2.75 ft) and a bottom of footing of El 0.2 m (1.75 ft).

The existing drawings also indicate that at the West Abutment a pile load test was to be performed on a 28.5 m (93 ft) long pile in a 600 mm (24in) pipe sleeve extending to El –10.7 m (–34 ft). Similarly, at the East Abutment a pile load test on a 30 m (85 ft) long pile in 600 mm (24in) pipe sleeve to El –8.25 m (–26 ft) was called for. The load test results are not available, however the increase in

[1] The existing design elevations are in feet, based on the 1929 NGV Datum, while the reconstruction project is in meters, based on the 1988 NAV Datum. The new datum is 0.326 meters (1.07 ft) higher than the old datum. All elevations shown for the existing bridge in feet are based on the old datum.

pile order length over the estimated pile lengths on the drawings appears to stem from the load tests.

Table 1

Location	Pile Type	Estimated Pile Length	Pile / Order Length)	Dead and Live Load)	Negative Friction	Total Pile Design Load
West Abutment	310BP79 (12BP53)	27.5 – 30.5 m (90 – 100 ft)	> 42.5 m (> 140 ft)	311 kN (35 tons)	178 kN (20 tons)	489 kN (55 tons)
Pier 1 & 2	310BP79 (12BP53)	24.5 – 27.5 m (80 – 90 ft)	NA	178 kN (20 tons)	213 kN (24 tons)	391 kN (44 tons)
East Abutment	310BP79 (12BP53)	24.5 – 27.5 m (80 – 90 ft)	> 42.5 m (> 140 ft)	311 kN (35 tons)	178 kN (20 tons)	489 kN (55 tons)

Existing design drawings also provide boring logs for eight test borings, located near the ends of the abutments and piers. A copy of the drawing showing the boring locations and the boring logs is included in Appendix C. The ground surface at the time of the borings varied from El 6.91 to 5.52 m (23.75 to 19.2 ft). The borings were not performed with a standard sampler or hammer, so SPT N-values are not available. The borings varied in depth from 30.5 to 38 m (100 to 125 ft) in depth. They indicated 8 to 12 m (26 to 39 ft) of brown sand fill overlying 3 to 9 m (10 to 30 ft) of organic silt, overlying fine red silty sand to the bottom of the borings.

3.0 PRELIMINARY DESIGN

3.1 Type Study

The Bridge Type Study Report for Bridge No. 00164 recommended replacement of the bridge with a new single span bridge with full height abutments and U-type wingwalls supported on 355 mm (14 in) square precast prestressed concrete piles.

3.2 Present Design

The proposed design for Bridge No. 00164 utilizes 406 mm (16 in) square precast prestressed concrete pile supported foundations for the abutments and wingwalls. The bottoms of the abutment footings are at El 0.0 m (0.0 ft), and the wingwalls are at El 4.0 m (13 ft).

4.0 SUBSURFACE EXPLORATION

Six final design borings were drilled at the approximate outside corners and center of the proposed new Bridge No. 00164 abutments. The locations of the new test borings are shown on Figure 2. Subsurface profiles with the new borings and the abutments are shown on Figures 3 and 4. Boring logs and laboratory data for these borings are provided in Appendix A and Appendix B, respectively. The ground surface at the new borings varied from El 5.05 to 7.58 m (16.6 to 24.9 ft).

These new borings indicated approximately 8.7 to 10.2 m (28.5 to 33.5 ft) of fill, a loose to very dense, generally medium dense, brown to red-brown fine sand to silty fine sand with occasional pockets of silt. The majority of this material was placed as embankment fill for the original construction of I-95. The bottom of the fill was located between El –2.3 to –3.8 m (-7.5 to –12.5 ft). Underlying the fill was 4.6 to 9.1 m (15 to 30 ft) of soft to stiff, generally medium stiff, gray organic silt. The organic silt was thicker to the west, being approximately 8.5 m (28 ft) thick at Abutment 1 (East) and 5.5 m (18 ft) at Abutment 2 (West). Underlying the organic silt was very loose to very dense, generally medium dense, red-brown fine sand, silty fine sand, fine sand and silt, to sandy silt.

Groundwater was noted between El 3.5 to -0.6 m (11.5 to -2 ft).

5.0 RECOMMENDATIONS

5.1 General

The underlying organic silt does not provide adequate foundation support for the proposed bridge abutments and wingwalls. It is recommended that the new bridge abutments and wingwalls be supported on 406 mm (16 in) square precast prestressed concrete piles.

The medium dense sand and silt underlying the organic silt will provide frictional and end-bearing support for piles. At the present time, precast prestressed concrete piles are the most cost effective piles available. They provide the highest load per unit length and have the least installed cost per unit length for various pile types.

Cost data obtained by Parsons Brinckerhoff for the New Haven Harbor Corridor Improvement Program indicated that 355 mm (14 in) square precast prestressed concrete pile cost $100 per meter ($64 for furnishing and $36 for driving) while 406 mm (16 in) square precast prestressed concrete pile cost $115 per meter, ($75 for furnishing and $40 for driving piles). Based on this data, 355 mm (14 in) piles are 15% cheaper then 406 mm (16 in) piles. A 355 mm (14 in) pile has approximately 15% less surface area then a 406 mm (16 in) pile, which means that a 355 mm (14 in) pile would be 15% longer for the same capacity as a 406 mm (16 in) pile. Thus, for the same capacity 355 and 406 mm (14 and 16 in) precast prestressed concrete piles cost approximately the same. The larger piles should have less breakage and be better able to handle driving stresses. Therefore, 406 mm (16 in) precast prestressed piles are recommended for this bridge.

5.2 Pile Compression Capacity

Historic (I-95 and I-91 Pile Load Test Reports in ConnDOT Soils Group Files) and recent (I-95 New Haven Harbor Crossing Corridor Improvement Program,

Pile Load Test Program Data Report, July, 2002) pile load test data in the area indicates that pile capacity calculated by standard SPT or CPT methods significantly overestimate the capacity of friction piles. Interpretation of recent load test data in two areas (Pile Load Test data Program Evaluation Report, I-95 New Haven Harbor Crossing Improvements, Contract B, State Project No. 92-532, September 2002 by GeoDesign) indicated that precast prestressed concrete piles had an average ultimate skin friction value of 1070 ksf, and an average ultimate end bearing value of about 65 to 70 ksf. Interpretation of data from two other areas (Report on Pile Load Test Program Areas C and D, I-95/I-91/SR34 Interchange State project No. 92-531, September 2002 by Haley and Aldrich) resulted in a recommendation that for 16 inch prestressed precast piles the ultimate skin friction should be based on a range of from 0.8 to 1.0 ksf and ultimate end bearing capacity should be based on 50 ksf.

Review of the subsurface conditions at the four load test pile sites, indicates that the conditions at the West River Project are very similar to Area B discussed in the GeoDesign report. After evaluating the above data, the ultimate capacity of precast prestressed concrete piles for the West River Project were determined based on 65 ksf end bearing and 1000 psf skin friction for embedment in the sands and silty sands underlying the organic silts. No frictional capacity was assumed for the organic silt and overlying fill.

An embedment of approximately 13 m (42.5 ft) into the medium dense sand and silt provides an ultimate pile bearing resistance of approximately 1512 kN (170 tons). This corresponds to pile tips at approximately El –24.5 m (-80.5 ft) for Abutment 1 and El –21.5 m (-70.5 ft) for Abutment 2. With the bottom of abutment footings at El 0.0, pile lengths are 24.5 m (80.5 ft) for Abutment 1 and 21.5 m (70.5 ft) for Abutment 2. With the bottom of the shorter wingwall footings at El 4.0, 4 m (13 ft) longer piles are required then for the abutments.

The ultimate pile bearing resistance is 1512 kN (170 tons). In accordance with the AASHTO LRFD Bridge Design Specifications, a resistance factor of 1.0

should be taken for the service limit state and a resistance factor of 0.80 for the strength limit state. The strength limit resistance factor is based on performing pile load tests and pile driving analyzer testing of production piles.

5.3 Pile Downdrag

Abutment 1 and Abutment 2 are underlain by an average of approximately 8.5 m (27.5 ft) and 5.3 m (17.5 ft) of organic silt, respectively. The grade of I-95 is being raised approximately 1.5 m (5 ft) at Bridge No. 00164. The placement of fill to raise the grade is estimated to cause approximately 8.5 mm (0.33 in) of consolidation settlement of the organic silt at Abutment 1 and 6 mm (0.24 in) at Abutment 2. These settlements are estimated to cause approximately 222 kN (25 tons) of downdrag load on the piles at Abutment 1 and 151kN (17 tons) at Abutment 2. The downdrag was calculated using a value of 0.024 MPa (500 psf) skin friction for the fill and organic silt overlying the neutral point. The 0.024 MPa (500 psf) value was obtained from the GeoDesign (Pile Load Test data Program Evaluation Report, I-95 New Haven Harbor Crossing Improvements, Contract B, State Project No. 92-532, September 2002 by GeoDesign) interpretation of the load test data for precast concrete piles, which stated that "Average ultimate skin friction developed in the fill and organics is about 500 psf." It should be noted that Section 10.7.1.4 of the AASHTO LRFD Bridge Design Specifications states that downdrag is a load, and the commentary for this section states that when designing for downdrag, drag loads should not be combined with transient loads. Only permanent loads need to be included with the downdrag loads.

5.4 Pile Uplift Capacity

The ultimate pile uplift resistance is based on the assumption that 80% of the ultimate downward skin friction (sand and silty sand beneath the organics) is available to resist uplift, or 996 kN (112 tons). A resistance factor of 1.0 should be taken for the service limit state and a resistance factor of 0.80 is recommended for the strength limit state. If uplift controls pile design it is recommended that an uplift load test be performed and the same resistance

factors recommended above be used against the ultimate uplift capacity determined from the load test.

5.5 Lateral Pile Capacity

Lateral foundation loads may be resisted by a combination of shear and bending at the tops of the piles and the horizontal component of axial load in batter piles. The abutments and wingwalls were analyzed for combined vertical and horizontal load using the program GROUP. The maximum factored lateral load on an individual abutment pile was 85 kN (19 kips), which resulted in a calculated deflection of 5.5 mm (0.22 in).

5.6 Pile Testing

It is recommended that both static pile load tests and pile driving analyzer testing of production piles be performed. Two static pile load test are recommended, one in each of the abutments. The tested piles should be located in the southern initially constructed portion of the abutments. The load test piles should be driven within a minimum 660 mm (26 in) diameter steel pipe sleeve or casing that extends through the upper fill and organic silts, approximately El –12.0 m (-39.5 ft) at Abutment 1 and –9.0 m (-29.5 ft) at Abutment 2. The casing should be cleaned to the bottom depth prior to driving the pile within the casing and cut off flush with the ground surface prior to installing the pile.

It is recommended that the piles be load tested in accordance with the Quick Load Test Method as specified in ASTM D-1143 with equipment capable of loading the pile to 1.5 times the 1,512 kN (170 ton) ultimate capacity. A Special Provision revising Section 7.02.03-10 "Determination of bearing Value of Piles" of Form 816 will be provided.

The static load test piles should be dynamically tested utilizing a Pile Driving Analyzer (PDA). It is also recommended that PDA testing be performed on four

other vertical test piles evenly spaced across each of the abutment stage sections.

5.7 Lateral Loads

The abutments and wingwalls should be designed for a static lateral earth force of 2.75 H^2 kN/m (0.0175 H^2 k/ft) with the resultant force acting at H/3 from the base. A surcharge force of 3.63 H kN/m (0.0076 H k/ft) acting at H/2 from the base should be included to account for live loading adjacent to the abutment and wingwalls.

5.8 Seismic Loads

Bridge No. 00164 is a single span structure and ConnDOT's Bridge Design Manual states that abutments and wingwalls of single span bridges do not have to be designed for earthquake loading. The abutment seat width and restraint forces should be calculated in accordance with the AASHTO LRFD Bridge Design Specifications using an Acceleration Coefficient of 0.16 and a Site Coefficient of 1.5, based on Soil Profile Type III.

5.9 Structure Backfill and Drainage

Pervious structural backfill is recommended behind the abutments and wingwalls, above a slope line starting at the top of the heel and extending upward at a slope of 1V:1½H. Pervious structural backfill should be in accordance with the requirements of Section 2.16 of Form 816 for "Pervious Structural Backfill". Where existing embankment material that will not be excavated falls within the area of pervious structural backfill, it may remain in place. The abutments and wingwalls should have underdrains consisting of 150 mm (6 in) CCM pipe. Structure Underdrains should be in accordance with the requirements of Section 7.51 of Form 816 "Underdrains and Outlets".

6.0 CONSTRUCTION CONSIDERATIONS

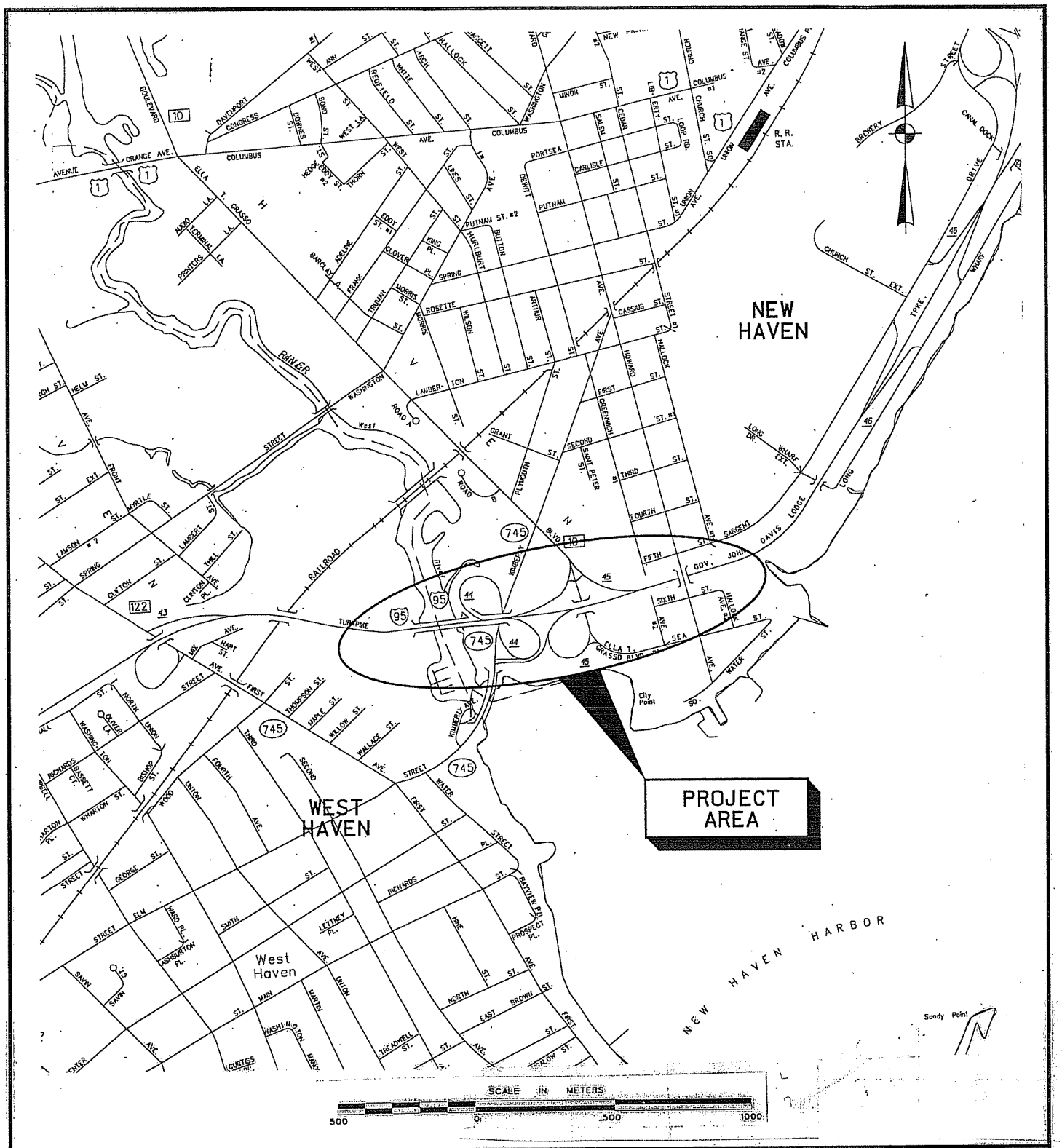
Traffic considerations require that the bridge be constructed in thirds. The southern third will be constructed initially, the central third next and the northern third of the bridge last. Temporary excavation support will be required, both along the existing Ella Grasso Boulevard as well as longitudinally, along I-95. Additionally, the existing bridge will have to be demolished as the new bridge is being constructed.

The abutment piles for the new bridge will be in conflict with some of the H-piles of the existing bridge abutments and piers. Therefore, existing steel H-piles will require pulling, in stages. Any voids should be filled with sand. Existing abutment piles that are not pulled and within the new abutment footprint should be cutoff 600 mm (2 ft) below the bottom of the new footing. Existing pier piles not in conflict with the new piles should be cutoff 1200 mm (4 ft) below the final roadway grade.

Settlement monitoring of the portions of the existing bridge that remain in place and functional during stage construction should be performed during pile driving and pile pulling to assure that detrimental settlements are not occurring.

The bottoms of the excavations for the abutment footings are anticipated to be below the groundwater table. Sump pumping from the corners of the excavations should be sufficient to control groundwater. It is recommended that 150 mm (6 in) of "Granular Fill" in accordance with the requirements of Section 2.14 of Form 816, consisting of crusher-run stone in accordance with the requirements of Section M.02 of Form 816 be shown on the drawings below the bottom of the abutment footings to facilitate groundwater control.

FIGURES



REVISED FINAL STRUCTURE SOILS AND ROCK REPORT

RECONSTRUCTION OF I-95 OVER WEST RIVER
NEW HAVEN / WEST HAVEN, CONNECTICUT

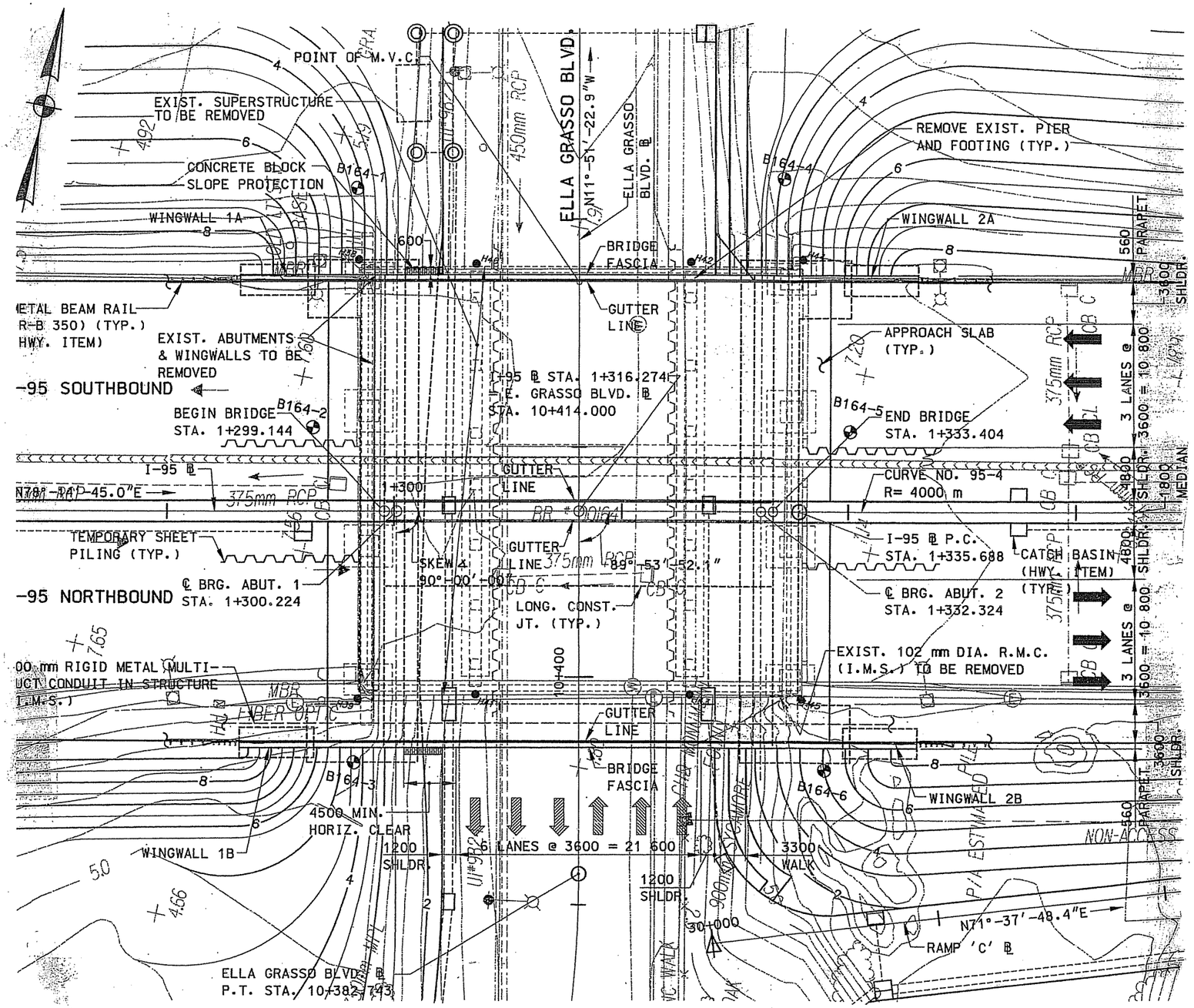
BRIDGE NO. 00164

SITE LOCATION PLAN

March 2005

FIGURE 1

PB 100 YEARS



BORING LEGEND

- ⊕ – 2002 BORING
- ● – EXISTING BORING

SCALE IN METERS

0 10 20 30

PB 100 YEARS

REVISED FINAL STRUCTURE SOILS AND ROCK REPORT

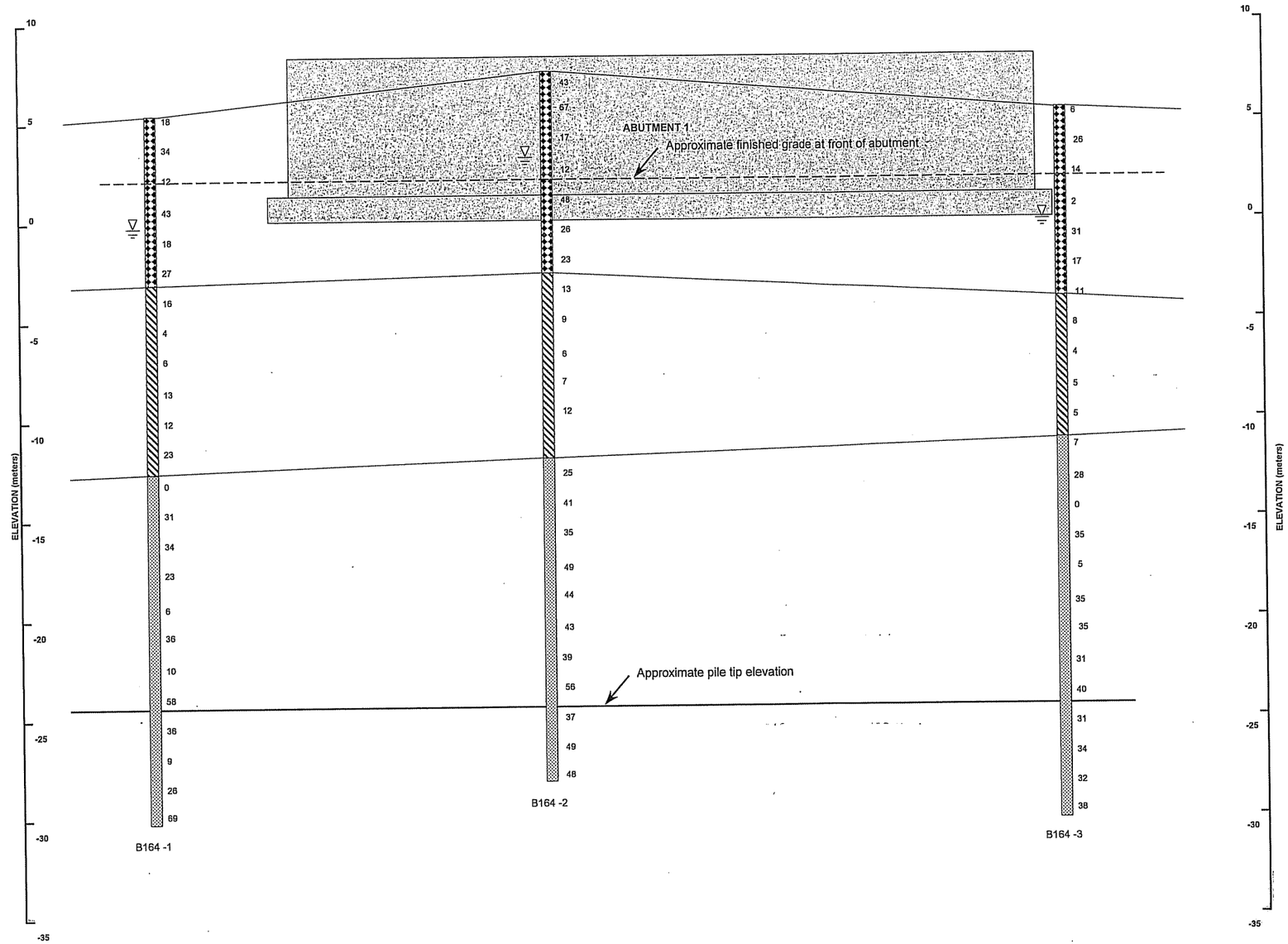
RECONSTRUCTION OF I-95 OVER WEST RIVER NEW HAVEN / WEST HAVEN, CONNECTICUT

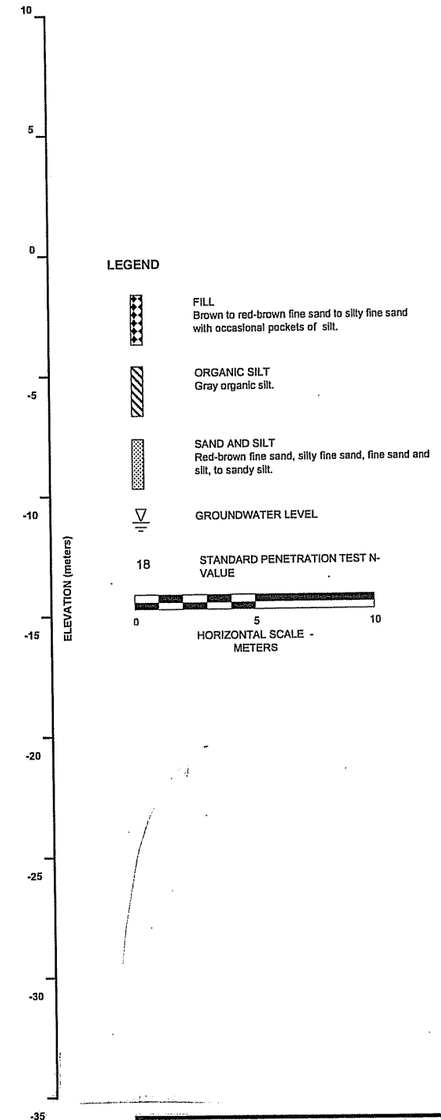
BRIDGE NO. 00164

BORING LOCATION PLAN

March 2005

FIGURE 2





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RECONSTRUCTION OF I-95 OVER WEST RIVER NEW HAVEN / WEST HAVEN, CONNECTICUT

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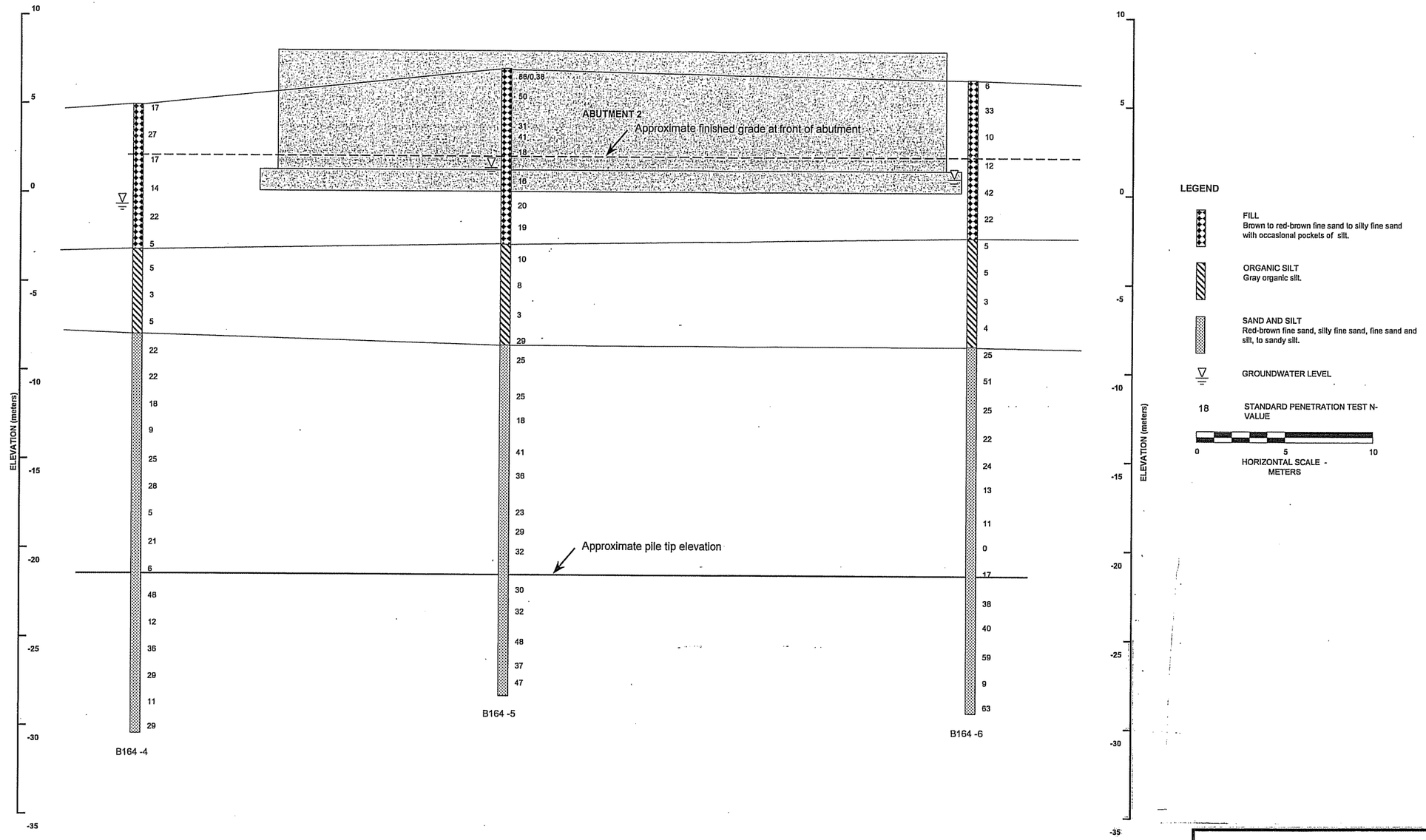
SUBSURFACE PROFILE ABUTMENT 1

March 2005

FIGURE 3



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RECONSTRUCTION OF I-95 OVER WEST RIVER NEW HAVEN / WEST HAVEN, CONNECTICUT

BRIDGE NO. 00164

SUBSURFACE ABUTMENT 2

March 2005

FIGURE 4

APPENDIX A

TEST BORING LOGS

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-1
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+296.7
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	28.2 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202485.1
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289316.8
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

Surface Elevation: 5.52		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: 07/23/02	Utilized			X			X	X	X					
Date Finished: 07/23/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
@ ~5.64 m after hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after hours	Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00 - 0.60	1	0.60	0.15	D	8	8	10	13		Brown SILT, some f sand, little c sand, trace f-c gravel, trace grass, dry.
		1.52 - 2.12	2	0.60	0.36	D	19	17	17	15	1.83	Light brown f SAND, trace c sand, trace silt, moist.
											3.69	
		3.05 - 3.65	3	0.60	0.38	D	9	6	6	18		Light brown f SAND, little (gray) silt, moist.
5		4.57 - 5.17	4	0.60	0.20	D	11	20	23	22		Top 0.13m: Brown f SAND, moist. Bottom 0.08m: Gray silt, trace f sand, moist.
		6.10 - 6.70	5	0.60	0.20	D	7	8	10	14		Gray f-m SAND, trace silt, wet.
		7.62 - 8.22	6	0.60	0.25	D	8	16	11	10		Black CINDERS, trace silt. 7.92m - 8.23m: Wood, creosote soaked.
											8.69	
		9.14 - 9.74	7	0.60	0.15	D	8	8	8	8	-3.17	Gray organic SILT, trace f sand, trace shells.
10												
		10.67 - 11.27	8	0.60	0.46	D	3	2	2	3		Gray organic SILT, trace f sand, trace shells.
		12.19 - 1 2.79	9	0.60	0.48	D	2	3	3	2		Gray organic SILT, trace f sand, trace clay, trace shells.
		13.72 - 14.32	10	0.60	0.36	D	7	7	6	4		Gray organic SILT, trace f sand, little clay, trace shells. pp= 1.25, 1.25, 1.0 tons / ft^2
15												

Casing Size	From	To	Meters of Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-1

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-1
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+296.7
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	28.2 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202485.1
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289316.8
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

			Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: 5.52		Utilized			X			X	X	X					
Date Started: 07/23/02		Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Date Finished: 07/23/02		Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
Groundwater Observations		Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
@ ~5.64 m after hours		Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	
@ m after hours															

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		15-24 - 15.84	11	0.60	0.60	D	4	5	7	7		Gray organic SILT, some clay, trace f sand, trace shells.
		16.76 - 17.36	12	0.60	0.60	D	7	9	14	17		Gray organic SILT, little clay, trace shells, trace f sand.
											17.83	
		18.29 - 18.89	13	0.60	0.03	D	WOR	WOR	WOR	6	-12.31	Red brown f SAND, little silt.
20		19.81 - 20.41	14	0.60	0.30	D	13	14	17	19		Red brown f SAND, some silt, saturated, rapid dilatancy.
		21.34 - 21.94	15	0.60	0.60	D	8	15	19	20		Red brown f SAND, little silt, wet.
		22.86 - 23.46	16	0.60	0.03	D	11	17	6	7		Red brown f SAND, some silt, saturated.
		24.38 - 24.98	17	0.60	0.05	D	3	2	4	2		Red brown f SAND and SILT.
25												
		25.91 - 26.51	18	0.60	0.41	D	18	15	21	21		Red brown f SAND and SILT.
		27.43 - 28.03	19	0.60	0.36	D	WOR	WOR	10	18		Red brown f SAND and SILT.
		28.96 - 29.56	20	0.60	0.36	D	22	28	30	34		Red brown f SAND, some silt, wet.
30												

Casing Size	From	To	Meters of Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-1
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+296.7
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	28.2 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202485.1
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289316.8
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

Surface Elevation: 5.52		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: 07/23/02	Utilized			X			X	X	X					
Date Finished: 07/23/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
@ ~5.64 m after ____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after hours	Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		30.48 - 31.08	21	0.60	0.15	D	15	16	20	23		Red brown SILT and f SAND.
		32.00 - 32.60	22	0.60	0.23	D	4	3	6	5		Red brown SILT and f SAND.
		33.53 - 34.13	23	0.60	0.51	D	6	10	16	19		Red brown f SAND, some silt.
35												
		35.05 - 35.65	24	0.60	0.51	D	21	32	37	45		Red brown f SAND and SILT.
											35.65	
											-30.13	Bottom of Boring 35.65 m.
40												
45												

Casing Size	From	To	Meters of Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-1

Sheet 3 of 3

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-2
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+292.8
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	7.3 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202463.8
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289317.3
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

			Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: 7.58		Utilized			X			X	X	X	X				
Date Started: 08/07/02		Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Date Finished: 08/08/02		Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
Groundwater Observations		Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ ~4.11 m after ____ hours		Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	
@ ____ m after ____ hours															

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.30 - 0.90	1	0.60	0.36	D	8	16	27	30		Brown f-c SAND, mostly f, little silt, trace f-c gravel.
		1.52 - 2.12	2	0.60	0.20	D	22	34	33	34		Light brown f SAND, trace to little silt, trace f gravel.
		3.05 - 3.65	3	0.60	0.51	D	10	8	9	19		Red brown / brown f SAND, trace to little silt.
5		4.57 - 5.17	4	0.60	0.20	D	4	5	7	37		Top 0.13m: Brown SILT, some f sand, wet. Bottom 0.08m: Red brown / brown f SAND, little silt. (Piece of gravel wedged in tip.)
		6.10 - 6.70	5	0.60	0.25	D	12	20	28	34		Brown f SAND, trace silt, trace c sand, wet.
		7.62 - 8.22	6	0.60	0.20	D	12	14	12	12		Brown gray f SAND, trace silt, trace c sand, wet.
		9.14 - 9.74	7	0.60	0.36	D	5	10	13	17		Top 0.20m: Gray SILT, some f sand, little clayey silt seams (very thin).
10											10.21	Bottom 0.15m: Red brown f SAND, little silt, wet.
		10.67 - 11.27	8	0.60	0.46	D	9	6	7	6	-2.63	Black organic SILT and f SAND, little shells, trace fibers. (Sample soaked in black creosote.)
		12.19 - 1 2.79	9	0.60	0.46	D	3	4	5	5		Gray organic SILT, little to some clay, trace f sand, trace shells, stiff. pp= 1.25, 1.25, 1.25 tons / ft^2
		13.72 - 14.32	10	0.38	0.60	D	4	3	3	5		Gray organic SILT, trace to little clay, trace f sand, trace shells. pp= 0.25, 0.25, 0.25 tons / ft^2
15		14.63 - 15.23	1	0.60	0.00	UP						Piston - no recovery.

Casing Size	From	To	Meters of Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			23D/2UP	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-2
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+292.8
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	7.3 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202463.8
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289317.3
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

			Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: 7.58		Utilized			X			X	X	X	X				
Date Started: 08/07/02		Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Date Finished: 08/08/02		Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
Groundwater Observations		Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
@ ~4.11 m after ____ hours		Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	
@ ____ m after ____ hours															

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		15.24 - 15.84	11	0.60	0.60	D	4	3	4	7		Gray organic SILT, trace f sand, stiff.
		16.76 - 17.36	2	0.60	0.00	UP						Piston - No recovery.
		17.37 - 17.97	12	0.60	0.60	D	4	5	7	9		Gray organic SILT, little f sand, trace clay, trace shells, stiff. pp = 1.5, 1.5, 1.25 tons / ft^2 (Driller drilled past 18.28m-18.89m, noted change at 19.20m.)
											19.20	
20		19.81 - 20.41	13	0.60	0.30	D	7	12	13	17	-11.62	Top 0.13m: Red brown f SAND and SILT, saturated. Bottom 0.18m: Red brown f SAND, some silt, saturated, rapid dilatancy.
		21.34 - 21.94	14	0.60	0.51	D	12	20	21	20		Red brown f SAND and SILT, saturated, rapid dilatancy.
		22.86 - 23.46	15	0.60	0.46	D	10	16	19	23		Red brown f SAND, some silt, saturated, rapid dilatancy.
		24.38 - 24.98	16	0.60	0.30	D	15	24	25	27		Red brown f SAND and SILT.
25												
		25.91 - 26.51	17	0.60	0.51	D	14	20	24	25		Red brown f SAND and SILT, saturated, rapid dilatancy.
		27.43 - 28.03	18	0.60	0.36	D	16	20	23	22		Red brown SILT and f SAND.
		28.96 - 29.56	19	0.60	0.43	D	17	19	20	24		Red brown f SAND and SILT.
30												

Casing Size	From	To	Meters of Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			23D/2UP	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-2
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+292.8
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	7.3 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202463.8
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289317.3
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

			Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: 7.58		Utilized			X			X	X	X	X				
Date Started: 08/07/02		Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Date Finished: 08/08/02		Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
Groundwater Observations		Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ ~4.11 m after ____ hours		Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	
@ ____ m after ____ hours															

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		30.48 - 31.08	20	0.60	0.41	D	22	26	30	27		Top 0.10m: Red brown f SAND, little to some silt. Bottom 0.30m: Red brown f SAND and SILT, trace clayey silt seams (very thin).
		32.00 - 32.60	21	0.60	0.36	D	8	14	23	21		Red brown SILT, some f sand, saturated, rapid dilatancy.
		33.53 - 34.13	22	0.60	0.46	D	15	22	27	34		Red brown SILT, some f sand, trace clayey silt seams (very thin).
35		35.05 - 35.65	23	0.60	0.51	D	17	23	25	29		Red brown SILT, some f sand, trace clayey silt seams (very thin).
											35.65 -28.07	Bottom of Boring 35.65 6m.
40												
45												

Casing Size	From	To	Meters of Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			23D/2UP	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-2

Sheet 3 of 3

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-3
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+296.4
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	22.0 RT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202435.9
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289326.8
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

Surface Elevation: 5.49		Casing				Auger		Mud	Sampler		Core Barrel				
Date Started: 07/29/02	Utilized			X			X	X	X					
Date Finished: 07/30/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
@ ~5.64 m after hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after hours	Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00 - 0.60	1	0.60	0.36	D	2	3	3	3		Top 0.10m: Topsoil
												Bottom 0.25m: Brown / red brown f SAND, little f-c sand, little silt, dry.
		1.52 - 2.12	2	0.60	0.46	D	11	12	14	10		Red brown f SAND, little silt, dry.
		3.05 - 3.65	3	0.60	0.36	D	6	6	8	5		Top 0.10m: Red brown f SAND, little silt, moist.
												Bottom 0.25m: Light brown F SAND, trace silt, wet.
5		4.57 - 5.17	4	0.60	0.23	D	2	1	1	4		Top 0.05m: Brown f-c SAND, wet.
												Middle 0.15m: Gray SILT, little clay, trace f sand, wet.
												Bottom 0.03m: Gray f SAND, trace silt, wet.
		6.10 - 6.70	5	0.60	0.25	D	9	15	16	17		Brown gray f-c SAND, trace silt, wet.
		7.62 - 8.22	6	0.60	0.51	D	7	8	9	11		Red brown f SAND, little silt, trace c sand, few f-c gravel, wet.
		9.14 - 9.74	7	0.60	0.30	D	7	7	4	3	9.30	Top 0.15m: Same as above.
10											-3.81	Bottom 0.15m: Gray organic SILT, trace shells, trace f sand, little clay.
		10.67 - 11.27	8	0.60	0.36	D	2	3	5	7		Gray organic SILT, trace shells, trace clay, trace f sand.
		12.19 - 1 2.79	9	0.60	0.60	D	2	2	2	3		Gray organic SILT, trace shells, little clay, trace f sand, stiff. pp = 1.0, 1.25, 1.0 tons / ft^2
		13.72 - 14.32	10	0.60	0.60	D	2	2	3	4		Gray organic SILT, trace shells, trace f sand, little to some clay, very stiff. pp = 1.25, 1.25, 1.25 tons / ft^2
15												

Casing Size	From	To	Meters of Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-3

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-3
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+296.4
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	22.0 RT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202435.9
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289326.8
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

Surface Elevation: 5.49		Casing			Auger		Mud	Sampler		Core Barrel			
Date Started:	Utilized			X		X	X	X					
Date Finished: 07/29/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
@ ~5.64 m after ____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ ____ m after ____ hours	Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		15.24 - 15.84	11	0.60	0.60	D	2	2	3	4		Gray organic SILT, little f sand, little clay, trace shells.
											16.31	pp = 0.75, 0.75, 0.75 tons / ft^2
											-10.82	
		16.76 - 17.36	12	0.60	0.46	D	WOR	WOR	7	11		Brown gray f-c SAND, trace silt.
		18.29 - 18.89	13	0.60	0.36	D	11	13	15	16		Red brown f SAND, little silt, saturated, medium dilatancy.
20		19.81 - 20.41	14	0.60	0.51	D	WOR	WOR	WOR	3		Red brown f SAND, little silt, saturated, medium dilatancy.
		21.34 - 21.94	15	0.60	0.41	D	11	17	18	18		Red brown f SAND, some silt, saturated, rapid dilatancy.
		22.86 - 23.46	16	0.60	0.23	D	10	1	4	10		Red brown f SAND, some silt, saturated, rapid dilatancy.
		24.38 - 24.98	17	0.60	0.25	D	10	17	18	23		Red brown f SAND and SILT, trace clayey silt seams (~1.59mm),
25												saturated, rapid dilatancy.
		25.91 - 26.51	18	0.60	0.30	D	11	16	19	20		Red brown f SAND and SILT, saturated, rapid dilatancy.
		27.43 - 28.03	19	0.60	0.30	D	14	15	16	19		Red brown f SAND and SILT, saturated, rapid dilatancy.
		28.96 - 29.56	20	0.60	0.51	D	11	17	23	20		Red brown f SAND, some silt, wet.
30												

Casing			Meters of	
Size	From	To	Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-3
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+296.4
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	22.0 RT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202435.9
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289326.8
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

Surface Elevation: 5.49		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started:	Utilized			X			X	X	X					
Date Finished: 07/29/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
@ ~5.64 m after ____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ ____ m after ____ hours	Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		30.48 - 31.08	21	0.60	0.36	D	10	15	16	21		Red brown f SAND, some silt, wet.
		32.00 - 32.60	22	0.60	0.25	D	10	14	20	22		Red brown SILT, little to some f sand, little clayey silt seams (~0.79-1.59mm).
		33.53 - 34.13	23	0.60	0.51	D	17	15	17	16		Red brown f SAND and SILT.
35												
		35.05 - 35.65	24	0.60	0.36	D	16	19	19	23		Red brown SILT, some f sand.
											35.65 -30.16	Bottom of Boring 35.65.
40												
45												

Casing Size	From	To	Meters of Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-3

Sheet 3 of 3

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-4
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+334.3
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	29.1 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202493.6
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289353.5
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

Surface Elevation: 5.05		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: 07/25/02	Utilized			X			X	X	X					
Date Finished: 07/26/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
@ ~5.64 m after ____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
@ ____ m after ____ hours	Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00 - 0.60	1	0.60	0.25	D	6	7	10	12		Top 0.15m: Topsoil. Bottom 0.10m: Brown f SAND, trace c sand, trace f gravel, little silt, dry.
		1.52 - 2.12	2	0.60	0.18	D	7	11	16	19		Light brown f SAND, trace silt, trace c sand, dry.
		3.05 - 3.65	3	0.60	0.30	D	7	8	9	12		Top 0.25m: Light brown f SAND, trace silt, trace c sand, dry. Bottom 0.05m: Gray SILT, little f sand, moist.
5		4.57 - 5.17	4	0.60	0.43	D	7	7	7	6		Light brown f-c SAND, trace silt, moist.
		6.10 - 6.70	5	0.60	0.56	D	9	11	11	13		Gray brown f SAND, trace c sand, trace f gravel, trace silt, wet.
		7.62 - 8.22	6	0.60	0.03	D	2	2	3	5		Dark gray c GRAVEL, one piece.
											8.69	
		9.14 - 9.74	7	0.60	0.51	D	2	2	3	3	-3.64	Gray organic SILT, trace clay, trace shells, soft.
10												
		10.67 - 11.27	8	0.60	0.60	D	2	1	2	2		Gray organic SILT, trace clay, trace shells, trace f sand.
		12.19 - 1 2.79	9	0.60	0.60	D	3	2	3	3		Gray organic SILT, trace clay, trace shells, trace f sand, few f sand lenses (~0.79mm).
											13.26	
		13.72 - 14.32	10	0.60	0.36	D	10	10	12	14	-8.21	Gray f SAND, little silt.
15												

Casing			Meters of	
Size	From	To	Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-4

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-4
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+334.3
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	29.1 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202493.6
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289353.5
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

			Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation:	5.05	Utilized			X			X	X	X					
Date Started:	07/25/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Date Finished:	07/26/02	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
Groundwater Observations		Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ ~5.64 m after ____ hours		Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	
@ ____ m after ____ hours															

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		15.24 - 15.84	11	0.60	0.46	D	4	7	15	22		Top 0.36m: Red brown f SAND, little silt. Bottom 0.10m: Orange brown f SAND, trace silt.
		16.76 - 17.36	12	0.60	0.08	D	5	8	10	10		Red brown f SAND, little to some silt.
		18.29 - 18.89	13	0.60	0.23	D	5	4	5	7		Red brown f SAND, some silt.
20		19.81 - 20.41	14	0.60	0.30	D	10	11	14	14		Light brown f-c SAND, trace silt, moist.
		21.34 - 21.94	15	0.60	0.41	D	13	15	13	15		Gray brown f SAND, trace c sand, trace f gravel, trace silt, wet.
		22.86 - 23.46	16	0.60	0.30	D	5	2	3	10		Red brown f SAND and SILT, saturated, rapid dilatancy.
		24.38 - 24.98	17	0.60	0.30	D	11	14	7	13		Red brown f SAND, little to some silt, wet.
25												
		25.91 - 26.51	18	0.60	0.46	D	3	2	4	4		Red brown f SAND, little to some silt, wet.
		27.43 - 28.03	19	0.60	0.15	D	10	21	27	24		Red brown f SAND, little to some silt, wet.
		28.96 - 29.56	20	0.60	0.30	D	7	3	9	16		Red brown f SAND and SILT, rapid dilatancy.
30												

Casing Size	From	To	Meters of Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-4

Sheet 2 of 3

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-4
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+334.3
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	29.1 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202493.6
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289353.5
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

			Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation:	5.05	Utilized			X			X	X	X					
Date Started:	07/25/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Date Finished:	07/26/02	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
Groundwater Observations		Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ ~5.64 m after ____ hours		Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	
@ ____ m after ____ hours															

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		30.48 - 31.08	21	0.60	0.51	D	3	13	23	24		Top 0.41m: Red brown f SAND, some silt. Bottom 0.10m: Red brown f SAND and SILT, few clayey silt seams (~1.59mm).
		32.00 - 32.60	22	0.60	0.41	D	5	8	21	24		Red brown f SAND and SILT.
		33.53 - 34.13	23	0.60	0.30	D	2	3	8	4		Red brown f SAND and SILT.
35												
		35.05 - 35.65	24	0.60	0.46	D	6	7	22	31		Top 0.30m: Red brown f SAND and SILT, wet. Bottom 0.15m: Red brown SILT and f SAND, few clayey silt seams
											35.65 -30.60	Bottom of Boring 35.65 m.
40												
45												

Casing Size	From	To	Meters of Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-4

W. Conroy	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-5
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+340.2
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	6.9 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202473.1
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289363.7
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

Surface Elevation: 7.18		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: 08/07/02	Utilized			X			X	X	X	X				
Date Finished: 08/08/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
@ ~5.64 m after ____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ ____ m after ____ hours	Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
												0-0.30: Asphalt.
		0.30 - 0.68	1	0.38	0.23	D	28	36	50/0.08m			Top 0.08m: Dark brown f-c SAND, mostly f, trace f gravel, trace silt.
												Middle 0.08m: Brown f-c SAND, mostly f, trace f-c gravel, trace silt.
												Bottom 0.08m: Crushed c gravel.
		1.52 - 2.12	2	0.60	0.15	D	28	26	24	24		Brown f-c SAND, mostly f, little silt, trace f-c gravel.
		3.05 - 3.65	3	0.60	0.00	D	15	15	16	17		No Recovery.
		3.66 - 4.26	4	0.60	0.03	D	13	17	24	20		Brown f SAND, little silt, moist.
5		4.57 - 5.17	5	0.60	0.30	D	11	13	5	3		Top 0.08m: Brown f SAND, trace silt, moist.
												Bottom 0.23m: Light brown f SAND, moist.
		6.10 - 6.70	6	0.60	0.20	D	2	6	10	13		Brown gray f SAND, trace c sand, trace silt, wet.
		7.62 - 8.22	7		0.15	D	11	13	7	7		Brown gray f SAND, trace c sand, trace silt, wet.
												(7.92m: Black creosote came out of hole, while rollerbitting.)
		9.14 - 9.74	8	0.60	0.20	D	12	10	9	9		Black f SAND, trace c sand, little silt, little shells.
10											10.06	
											-2.88	
		10.67 - 11.27	9	0.60	0.41	D	3	5	5	5		Gray organic SILT, trace clay, trace f sand, trace shells.
		11.58 - 12.18	1	0.60	0.60	UP						Piston.
		12.19 - 1 2.79	10	0.60	0.51	D	3	3	5	5		Gray organic SILT, some clay, trace f sand, trace shells.
												pp = 1.75, 1.5, 1.5 tons / ft^2
		13.72 - 14.32	11	0.60	0.60	D	1/0.30m		3	4		Gray organic SILT, some clay, little f sand, trace shells.
												pp = 1.0, 1.25, 1.0 tons / ft^2
15		14.63 - 15.23	2	0.60	0.00	UP						Piston - No Recovery.

Casing Size	From	To	Meters of Earth	Rock
100mm	0	20.00	36.55	
			No. of Samples	
			25D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-5

W. Conroy	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-5
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+340.2
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	6.9 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202473.1
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289363.7
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

			Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: 7.18		Utilized			X			X	X	X	X				
Date Started: 08/07/02		Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Date Finished: 08/08/02		Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
Groundwater Observations		Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
@ ~5.64 m after ____ hours		Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	
@ ____ m after ____ hours															

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		15.24 - 15.84	12	0.60	0.60	D	13	14	15	15	15.39	Top 0.15m: Gray organic SILT, little clay, little f sand, trace shells.
											-8.21	Middle 0.15m: Gray f SAND and SILT.
												Bottom 0.30m: Red brown f SAND, little silt.
		16.76 - 17.36	13	0.60	0.25	D	9	12	13	15		Red brown f SAND, little silt.
		18.29 - 18.89	14	0.60	0.51	D	10	11	14	16		Red brown f SAND, some silt.
20		19.81 - 20.41	15	0.60	0.25	D	9	8	10	10		Red brown f SAND, some silt.
		21.34 - 21.94	16	0.60	0.36	D	14	18	23	26		Red brown f SAND, some silt.
		22.86 - 23.46	17	0.60	0.30	D	12	15	21	25		Red brown f SAND and SILT.
		24.38 - 24.98	18	0.60	0.46	D	11	10	13	15		Red brown f SAND and SILT.
25												
		25.91 - 26.51	19	0.60	0.36	D	13	15	14	14		Red brown SILT and f SAND, trace clayey silt seams.
		27.43 - 28.03	20	0.60	0.20	D	15	15	17	19		Red brown SILT and f SAND.
		28.96 - 29.56	21	0.60	0.30	D	15	14	16	18		Red brown f SAND, some silt.
30												

Casing Size	From	To	Meters of Earth	Rock
100mm	0	20.00	36.55	
			No. of Samples	
			25D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

W. Conroy	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-5
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+340.2
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	6.9 LT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202473.1
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289363.7
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

Surface Elevation: 7.18		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: 08/07/02	Utilized			X			X	X	X	X				
Date Finished: 08/08/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
@ ~5.64 m after ____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ ____ m after ____ hours	Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		30.48 - 31.08	22	0.60	0.25	D	14	16	16	19		Red brown f SAND, some silt.
		32.00 - 32.60	23	0.60	0.20	D	18	24	24	24		Red brown SILT and f SAND.
		33.53 - 34.13	24	0.60	0.30	D	22	18	19	22		Red brown SILT and f SAND.
35												
		35.05 - 35.65	25	0.60	0.25	D	28	23	24	26	35.65	Red brown SILT and f SAND.
											-28.47	Bottom of Boring 35.65 m.
40												
45												

Casing			Meters of	
Size	From	To	Earth	Rock
100mm	0	20.00	36.55	
			No. of Samples	
			25D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-5

Sheet 3 of 3

M Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-6
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+337.9
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	22.6 RT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202443.8
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289367.6
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

Surface Elevation: 6.38		Casing				Auger		Mud	Sampler		Core Barrel				
Date Started: 07/30/02	Utilized			X			X	X	X						
Date Finished: 08/02/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)	
Groundwater Observations	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55	
@ ~5.64 m after hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond		
@ m after hours	Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide		

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00 - 0.60	1	0.60	0.51	A	2	3	3	3		Brown f SAND, little silt.
		1.52 - 2.12	2	0.60	0.15	A	10	14	19	29		Red brown f SAND, tr c sand, trace silt, moist.
		3.05 - 3.65	3	0.60	0.36	A	4	5	5	6		Light brown f SAND, trace silt, moist.
5		4.57 - 5.17	4	0.60	0.41	A	3	2	10	16		Top 0.25m: Gray SILT, some f sand, moist. Bottom 0.15m: Light brown f SAND, trace c sand, trace silt, moist.
		6.10 - 6.70	5	0.60	0.20	D	23	22	20	17		Brown gray c SAND, little f sand, trace c gravel, trace silt, wet.
		7.62 - 8.22	6	0.60	0.20	D	12	12	10	8		Gray f SAND, trace silt.
											8.69	
											-2.31	
		9.14 - 9.74	7	0.60	0.51	D	3	2	3	3		Gray organic SILT, some clay, trace f sand, trace shells, stiff.
10												
		10.67 - 11.27	8	0.60	0.60	D	2	2	3	3		Gray organic SILT, some clay, trace f sand, trace shells, stiff.
		12.19 - 1 2.79	9	0.60	0.51	D	1	1	2	3		Gray organic SILT, trace clay, trace shells.
		13.72 - 14.32	10	0.60	0.60	D	2	2	2	2		Gray organic SILT, trace clay, trace f sand, trace shells.
											14.78	
15											-8.40	

Casing			Meters of	
Size	From	To	Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-6

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-6
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+337.9
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	22.6 RT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202443.8
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289367.6
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

Surface Elevation: 6.38		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: 07/30/02	Utilized			X			X	X	X					
Date Finished: 08/02/02	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
@ ~5.64 m after ____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
@ ____ m after ____ hours	Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		15.24 - 15.84	11	0.60	0.56	D	10	12	13	15		Brown f SAND, trace silt, trace c sand, few f gravel.
		16.76 - 17.36	12	0.60	0.46	D	12	23	28	32		Top 0.41m: Red brown f SAND, some silt. Bottom 0.05m: Red brown f SAND, little silt.
		18.29 - 18.89	13	0.60	0.36	D	8	10	15	15		Red brown f SAND, some silt, saturated, rapid dilatancy.
20		19.81 - 20.41	14	0.60	0.56	D	8	7	15	20		Red brown f SAND, some silt, saturated, rapid dilatancy.
		21.34 - 21.94	15	0.60	0.46	D	12	12	12	16		Red brown f SAND, some silt, saturated.
		22.86 - 23.46	16	0.60	0.51	D	8	5	8	16		Red brown SILT and f SAND, wet.
		24.38 - 24.98	17	0.60	0.51	D	WOR	WOR	11	11		Red brown SILT and f SAND, wet.
25												
		25.91 - 26.51	18	0.60	0.10	D	WOR	WOR	WOR	WOR		Red brown f SAND and SILT, saturated, rapid dilatancy.
		27.43 - 28.03	19	0.60	0.60	D	WOR	3	14	29		Red brown f SAND and SILT, trace clayey silt seams (very thin).
		28.96 - 29.56	20	0.60	0.51	D	14	17	21	27		Red brown f SAND and SILT, trace clayey silt seams (very thin).
30												

Casing			Meters of	
Size	From	To	Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

M. Jennett	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B164-6
DRILLER	STATE OF CONNECTICUT	Line & Station	I-95 1+337.9
E. Fulton	DEPARTMENT OF TRANSPORTATION	Offset	22.6 RT
INSPECTOR	TOWN: New Haven / West Haven, CT	N. Coordinate	202443.8
Parsons Brinckerhoff Quade & Douglas, Inc.	PROJECT NAME: Reconstruction I-95 Over West River	E. Coordinate	289367.6
SOILS ENGINEER	PROJECT NUMBER 92-533	Parsons Brinckerhoff Quade & Douglas, Inc.	
	BORING CONTRACTOR: General Borings, Inc.	PRIME DESIGNER	

			Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: 6.38		Utilized			X			X	X	X					
Date Started: 07/30/02		Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	Piston	B (st)	B (dt)	NX (st)	NV II (dt)
Date Finished: 08/02/02		Size I.D. (mm)	60	76	100	64		150	X	36	76	35	35	55	55
Groundwater Observations		Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ ~5.64 m after ____ hours		Fall (m)	0.6	0.6	0.6	0.6			80 mm	0.76		of Bit		Carbide	
@ ____ m after ____ hours															

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60	STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		30.48 - 31.08	21	0.60	0.51	D	14	18	22	29		Red brown f SAND and SILT.
		32.00 - 32.60	22	0.60	0.46	D	18	27	32	38		Red brown f SAND and SILT, few clayey silt seams (very thin), few f sand lenses (very thin).
		33.53 - 34.13	23	0.60	0.30	D	2	4	5	7		Red brown f SAND and SILT, saturated, rapid dilatancy.
35												
		35.05 - 35.65	24	0.60	0.41	D	18	26	37	43		Red brown f SAND and SILT, saturated, rapid dilatancy.
											35.65	
											-29.27	Bottom of Boring 35.65 m.
40												
45												

Casing Size	From	To	Meters of Earth	Rock
100 mm	0	15.00	35.66	
			No. of Samples	
			24D	

NOTES: Raising and dropping of the 140-lb (63.5kg) safety hammer was accomplished using a wire winch.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test

PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Hole No. B164-6

Sheet 3 of 3

APPENDIX B

LABORATORY DATA

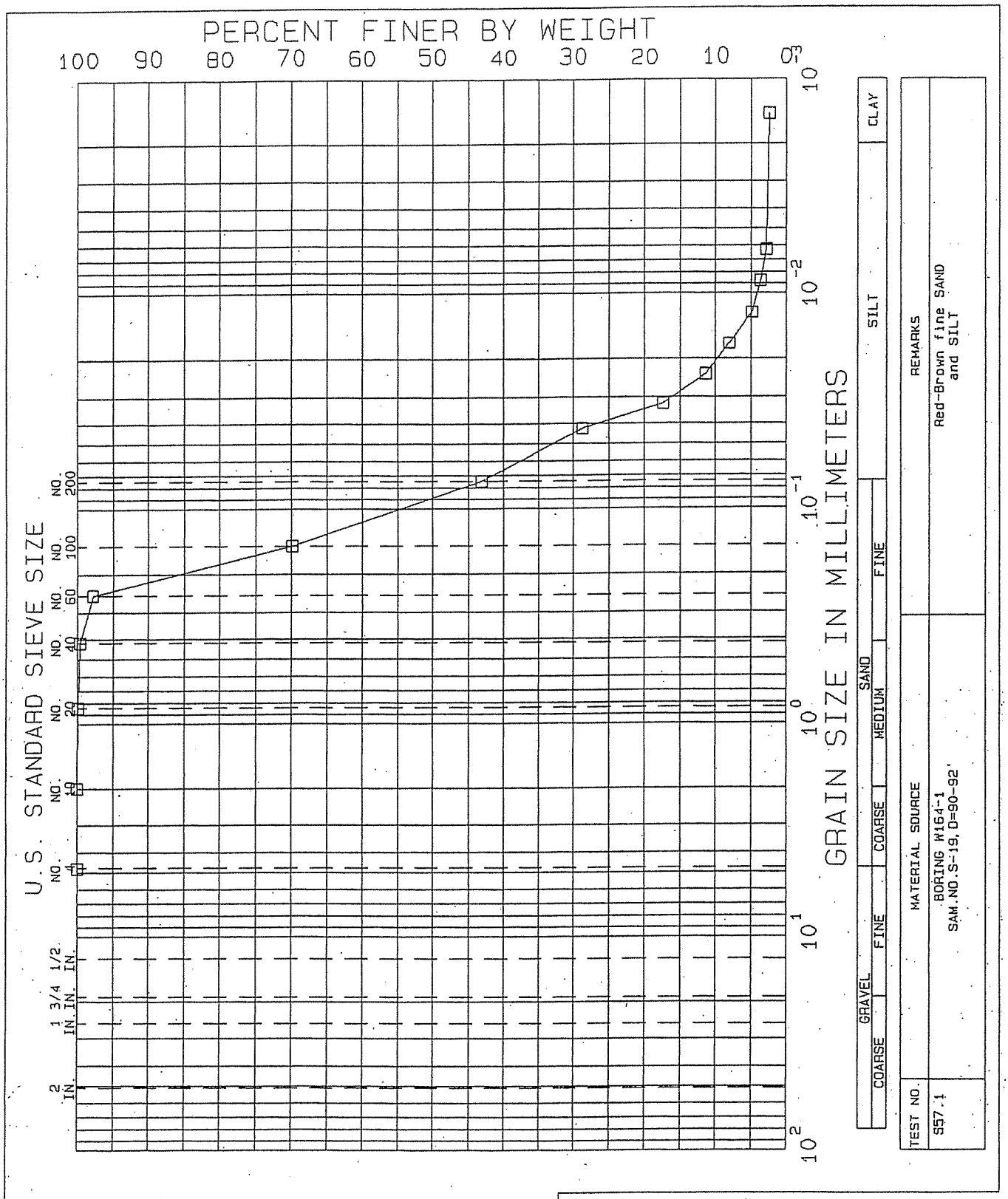
LABORATORY TESTING DATA SHEET

ject Name: RECONSTRUTION OF I-95 OVER WEST RIVER

oject No: L17371 | Assigned By: R. BORJESON | Reviewed By:

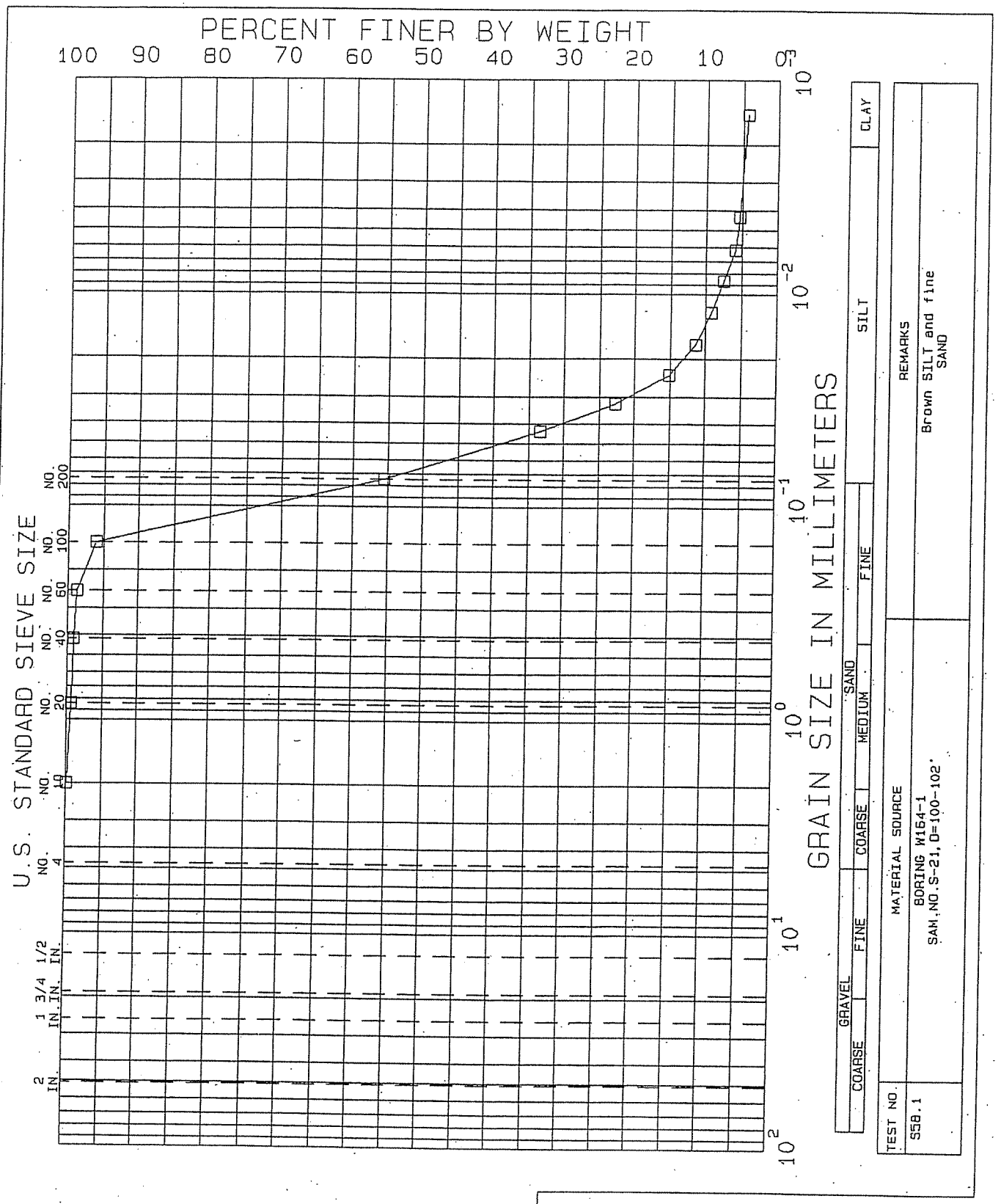
oject Engineer: D. SCHULZE | Date: AUG.02 | Date Reviewed:

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Density: γ_d MAX (pcf) / W_{opt} (%)	Perme-ability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol.: $\frac{C_c}{1+e_0}$	Laboratory Log and Soil Description
R-9	S-13	60-62	53				73	4												Red-Brown SILT, some fine Sand
W101-1	S-12	55-57	54				12	2												Red-Brown f-m SAND, little (-) Silt
	S-17	80-82	55				53	3												Red-Brown SILT and fine SAND
W101-2	S-13	60-62	56				39	2												Red-Brown fine SAND and SILT
B164-1	S-19	90-92	57				43	3												Red-Brown fine SAND and SILT
	S-21	100-102	58				55	5												Brown SILT and fine SAND
B164-3	S-18	85-87	59				49	3												Red-Brown fine SAND and SILT
	S-22	105-107	60				80	5												Red-Brown SILT, little (+) fine Sand
B164-4	S-16	75-77	61				38	3												Red-Brown fine SAND and SILT
	S-20	95-97	62				27	2												Red-Brown fine SAND and SILT



RECONSTRUCTION OF I-95
OVER WEST RIVER
GRADATION TESTS

BORING NO.	W164-1	TEST SERIES	
SAMPLE	S-19	NO.	57
DEPTH	90-92'	DATE	Aug.02
TECH.	MST		
REVIEWER	DAS	FILE	L17371



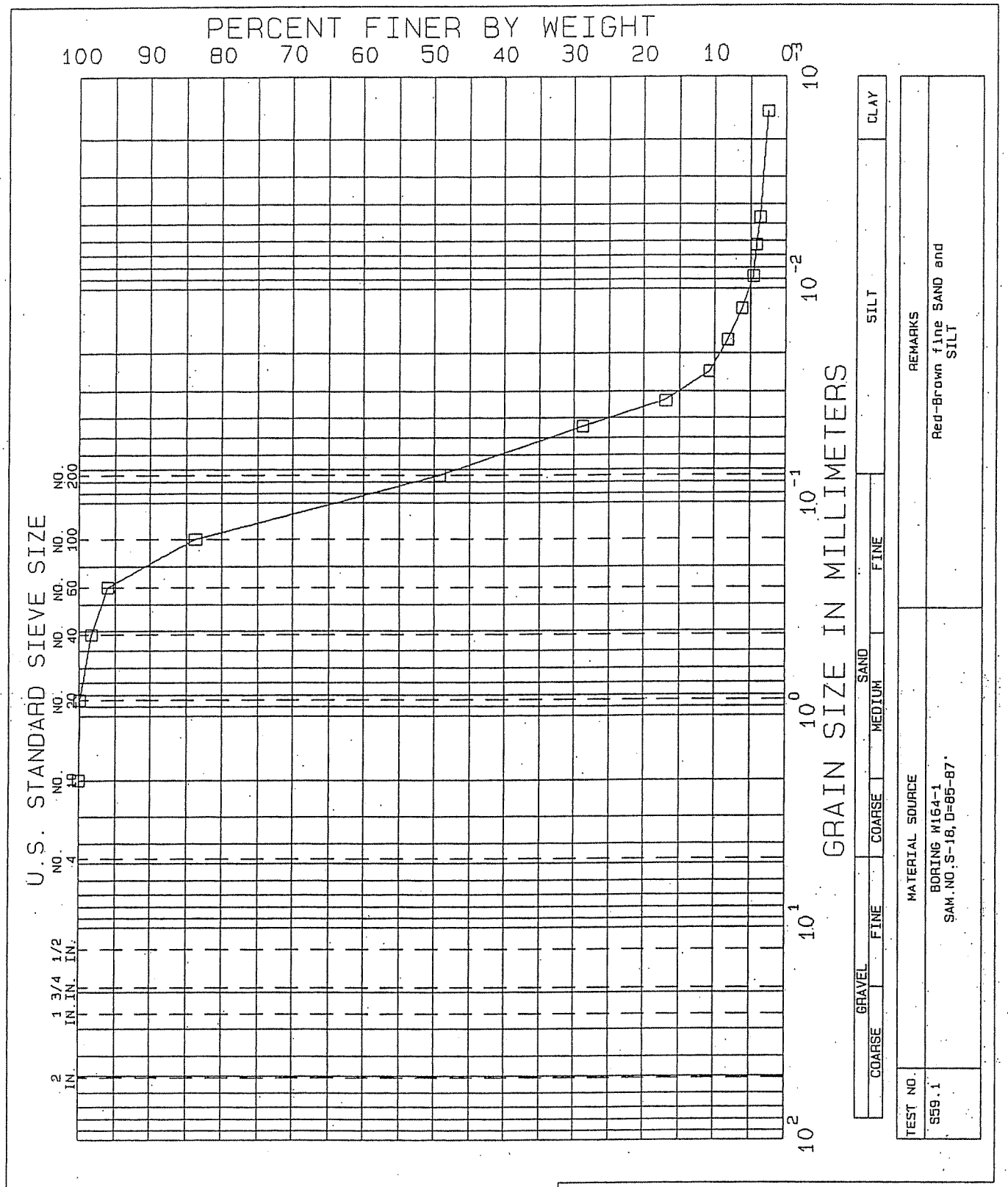
RECONSTRUCTION OF I-95
OVER WEST RIVER
GRADATION TESTS

BORING NO. W164-1
SAMPLE S-21
DEPTH 100-102'
TECH MST
REVIEWER DAS

TEST SERIES
NO. 58
DATE Aug.02

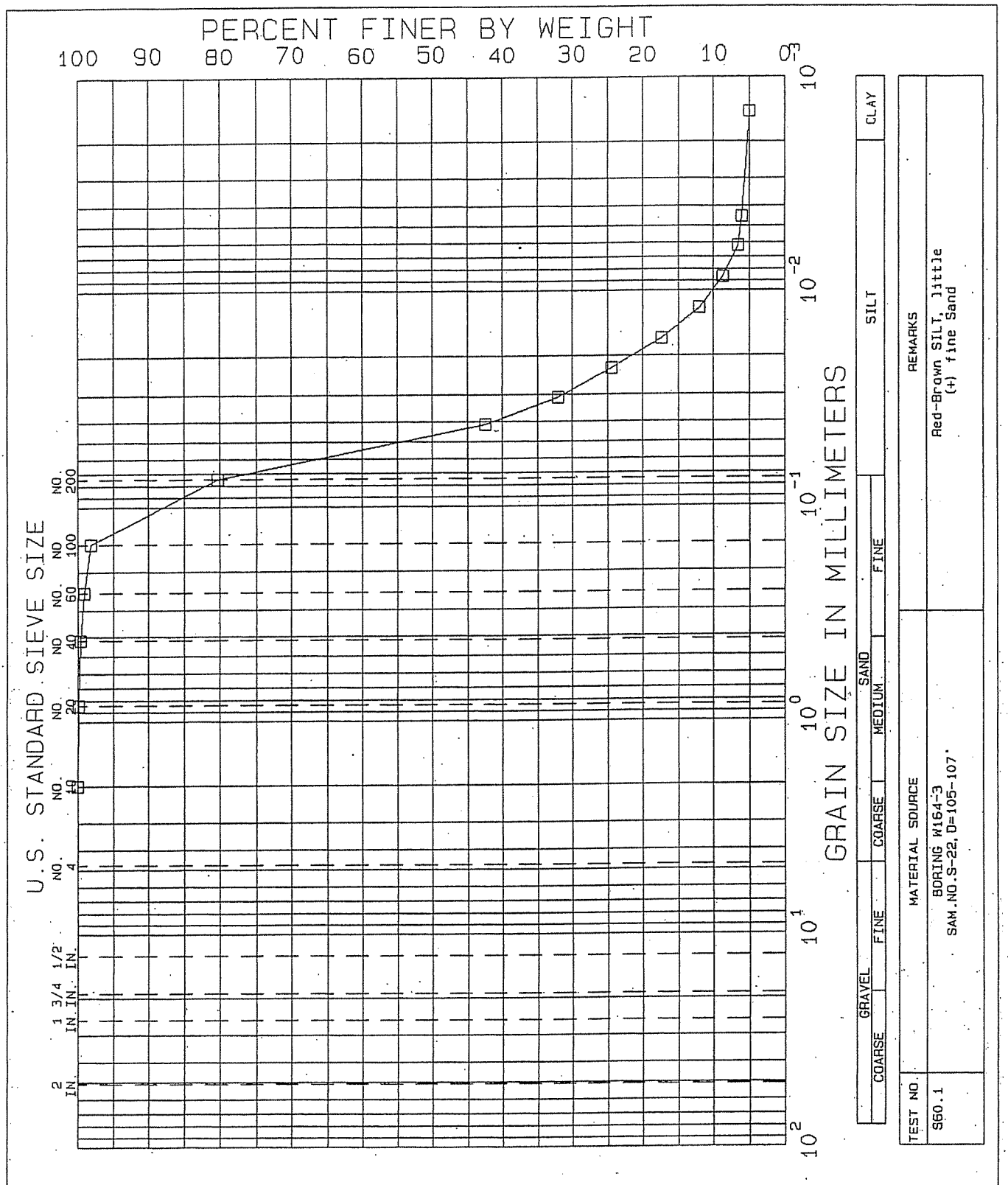
FILE L17371

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS



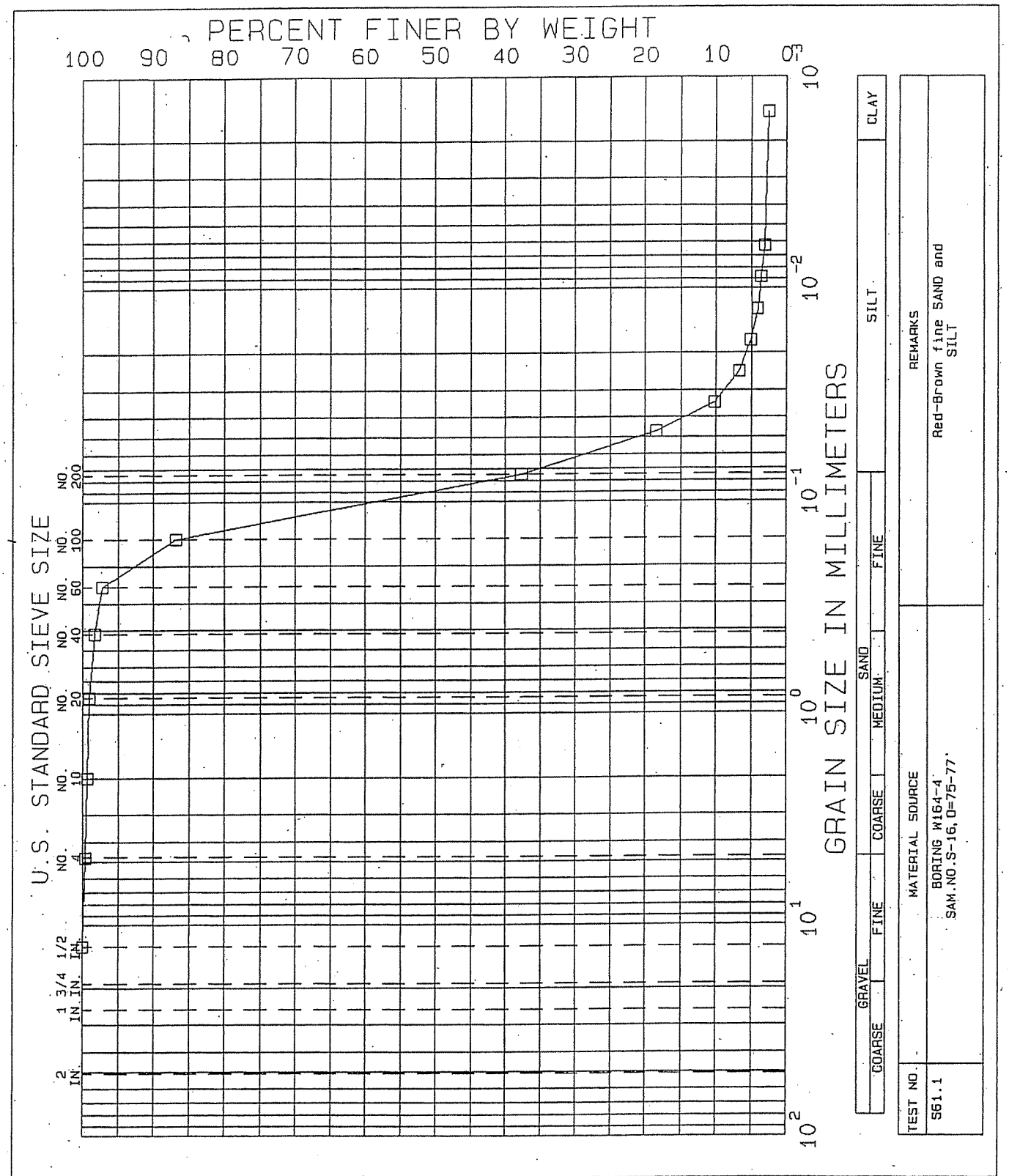
RECONSTRUCTION OF I-95
OVER WEST RIVER
GRADATION TESTS

BORING NO.	W164-1	TEST SERIES	
SAMPLE	S-18	NO.	59
DEPTH	85-87'	DATE	Aug.02
TECH.	MST		
REVIEWER	DAS	FILE	L17371



RECONSTRUCTION OF I-95
OVER WEST RIVER
GRADATION TESTS

BORING NO.	W164-3	TEST SERIES	
SAMPLE	S-22	NO.	60
DEPTH	105-107'	DATE	Aug.02
TECH.	MST		
REVIEWER	DAS	FILE	L17371



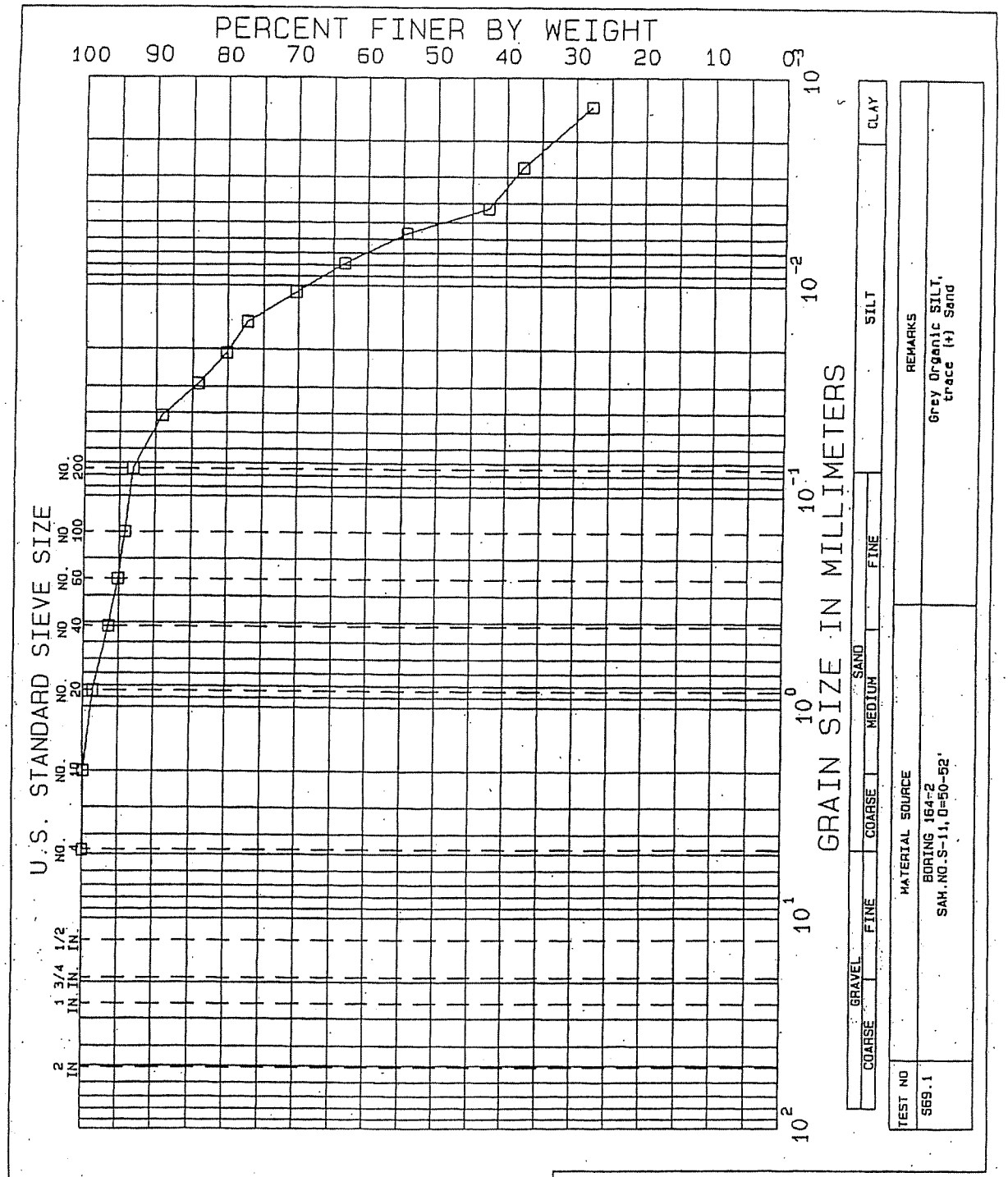
RECONSTRUCTION OF I-95
OVER WEST RIVER
GRADATION TESTS

BORING NO.	W164-4	TEST SERIES	
SAMPLE	S-16	NO.	61
DEPTH	75-77'	DATE	Aug.02
TECH.	MST		
REVIEWER	DAS	FILE	L17371

LABORATORY TESTING DATA SHEET

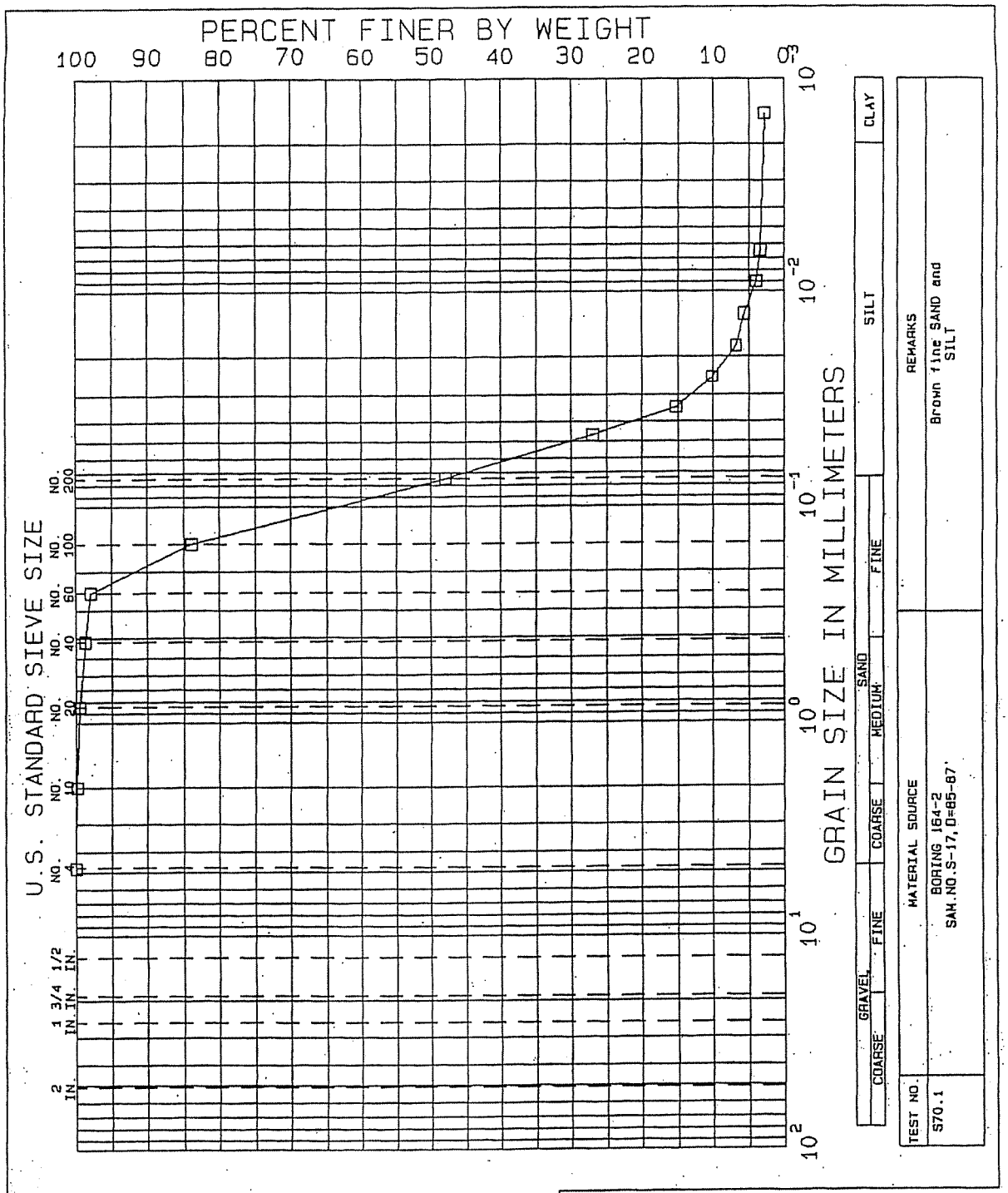
Project Name: RECONSTRUTION OF I-95 OVER WEST RIVER
Project No.: L17371
Project Engineer: D. SCHULZE
Assigned By: R. BORJESON
Date: AUG.02
Reviewed By:
Date Reviewed:

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Density: γ_d MAX (pcf) W_{opt} (%)	Permeability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol.: $\frac{C_c}{1+e_0}$	Laboratory Log and Soil Description
B164-2	S-11	50-52	69				93	33												Grey Organic SILT, trace (+) Sand
	S-17	85-87	70				48	3												Brown fine SAND and SILT
B164-5	S-19	85-87	71				51	3												Brown SILT and fine SAND
	S-25	115-117	72				58	4												Brown SILT and fine Sand
B164-6	S-16	75-77	73				60	3												Brown SILT and fine SAND
	S-23	110-112	74				63	3												Brown SILT and fine SAND
B165-2	S-14	65-67	75				97	8												Brown Clayey SILT
	S-19	90-92	76				99	8												Brown Clayey SILT
B165-5	S-12	55-57	77				99	7.												Brown Clayey SILT
	S-20	95-97	78				98	12												Brown Clayey SILT
P1-2	S-9	40-42	79				48	8												Grey f-m SAND and Organic SILT, little Gravel-sized Shells
P2-3	S-17	90-92	80				71	6												Brown SILT, some fine Sand
	S-25	130-132	81				99	14												Grey Clayey SILT



RECONSTRUCTION OF I-95
OVER WEST RIVER
GRADATION TESTS

BORING NO.	B164-2	TEST SERIES	
SAMPLE	S-11	NO.	69
DEPTH	50-52'	DATE	Aug.02
TECH.	MST		
REVIEWER	DAS	FILE	L17371

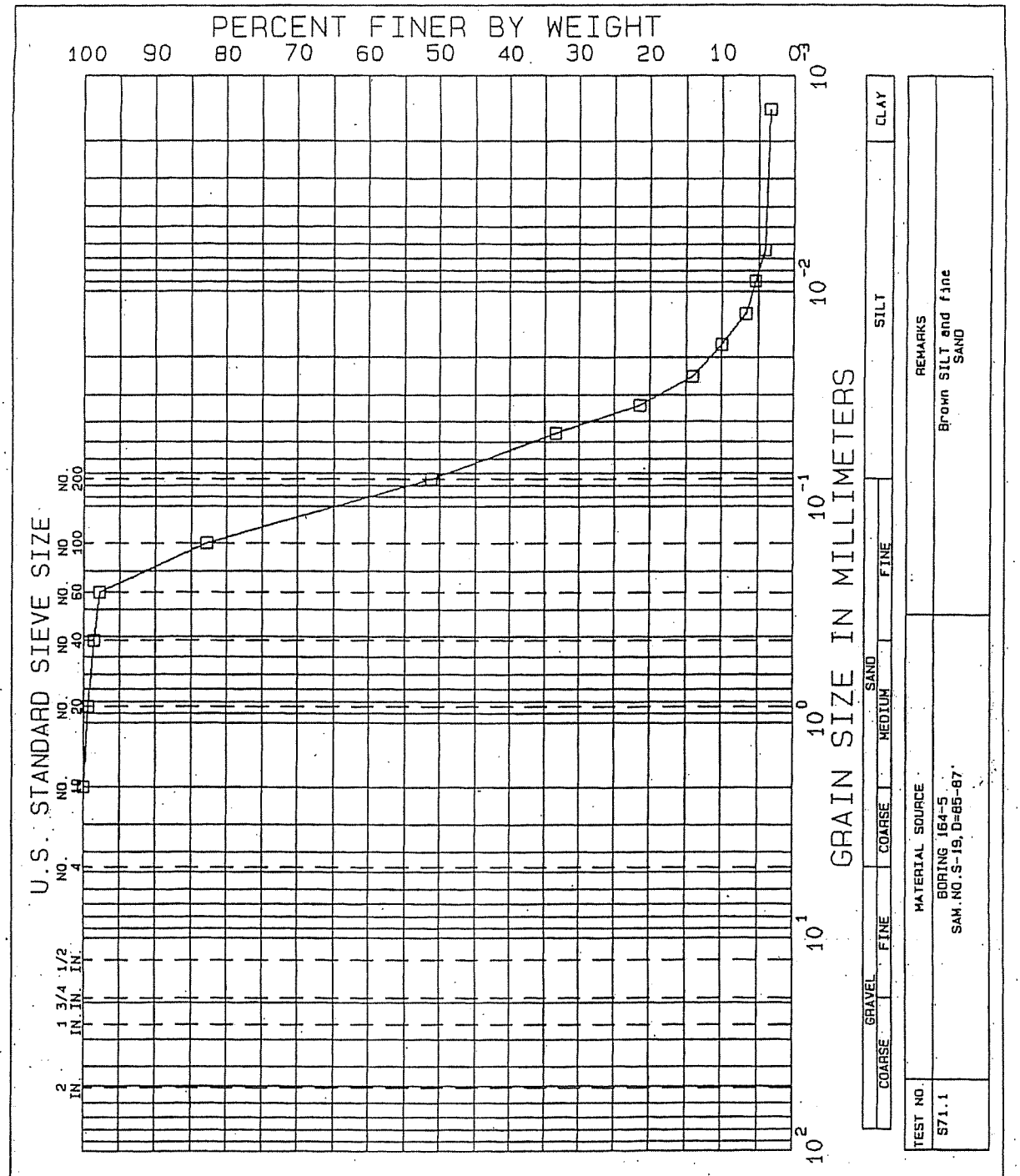


RECONSTRUCTION OF I-95
OVER WEST RIVER
GRADATION TESTS

BORING NO. B164-2
SAMPLE S-17
DEPTH 85-87'
TECH. MST
REVIEWER DAS

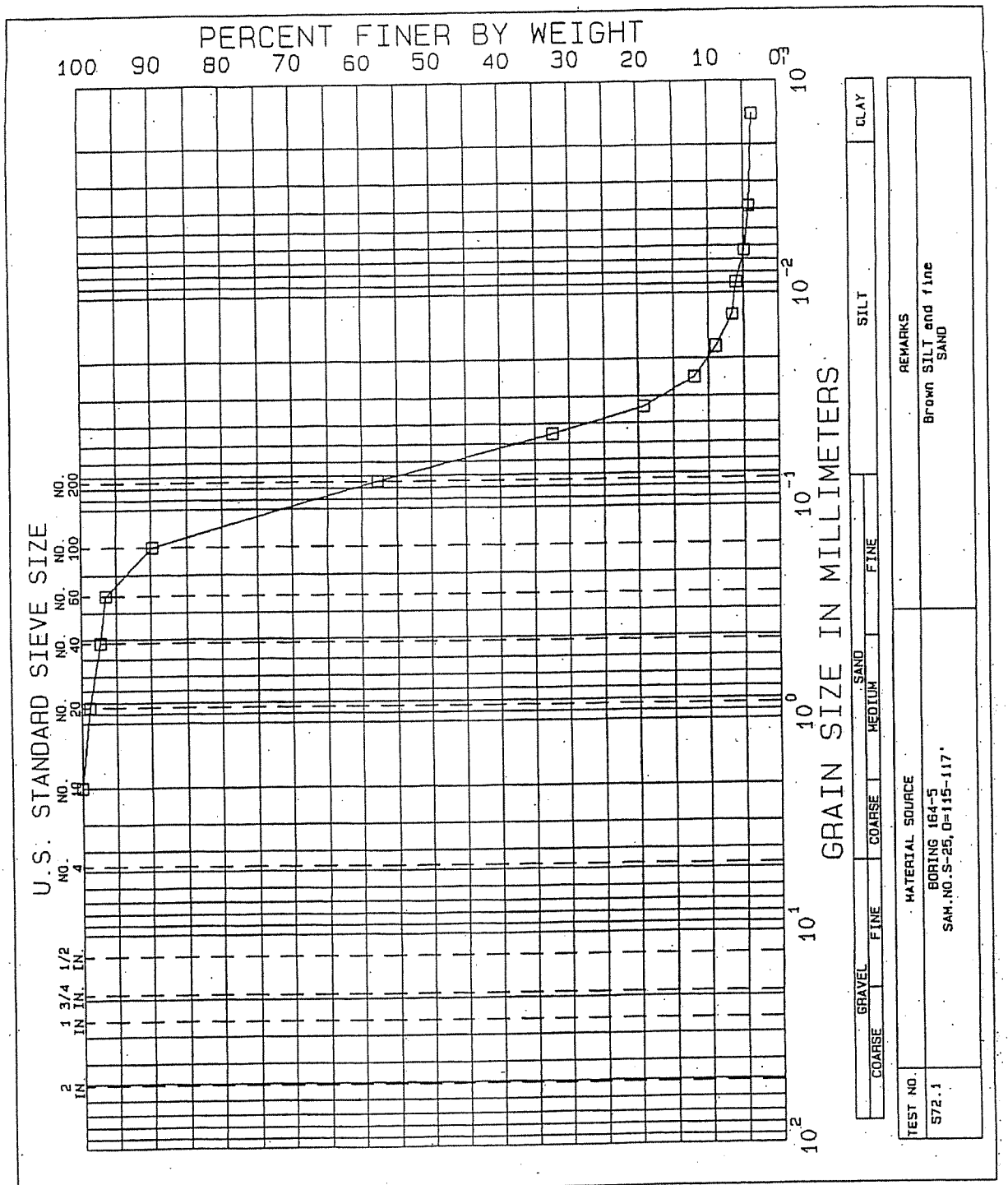
TEST SERIES
NO. 70
DATE Aug.02

FILE L17371



RECONSTRUCTION OF I-95
OVER WEST RIVER
GRADATION TESTS

BORING NO.	B164-5	TEST SERIES	
SAMPLE	S-19	NO.	71
DEPTH	85-87'	DATE	Aug.02
TECH.	MST		
REVIEWER	DAS	FILE	L17371

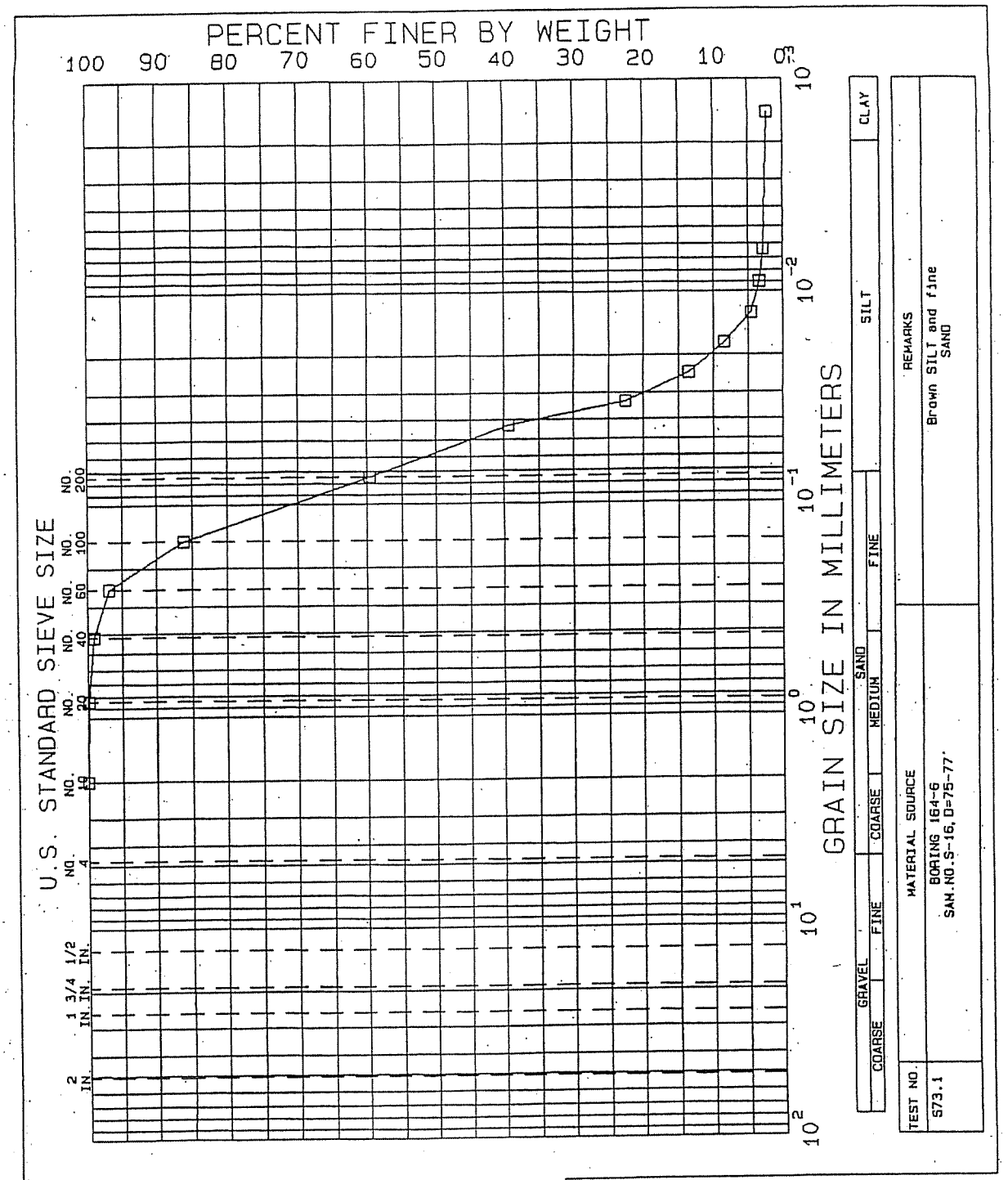


RECONSTRUCTION OF I-95
OVER WEST RIVER
GRADATION TESTS

BORING NO. B164-5
SAMPLE S-25
DEPTH 115-117'
TECH. MST
REVIEWER DAS

TEST SERIES
NO. 72
DATE Aug.02

FILE L17371

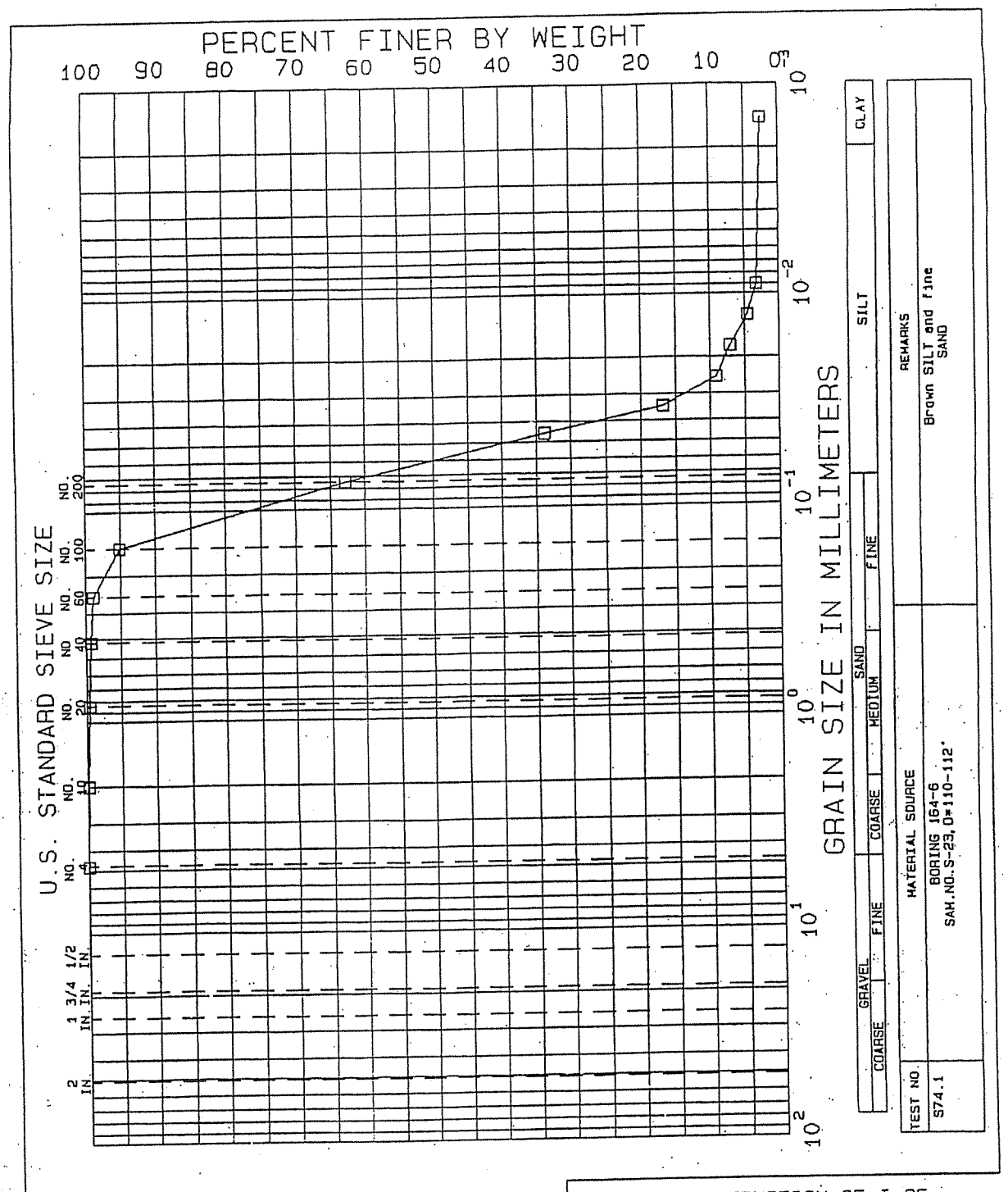


RECONSTRUCTION OF I-95
OVER WEST RIVER
GRADATION TESTS

BORING NO. B164-6
SAMPLE S-16
DEPTH 75-77'
TECH. MST
REVIEWER DAS

TEST SERIES
NO. 73
DATE Aug.02

FILE L17371



RECONSTRUCTION OF I-95
OVER WEST RIVER
GRADATION TESTS

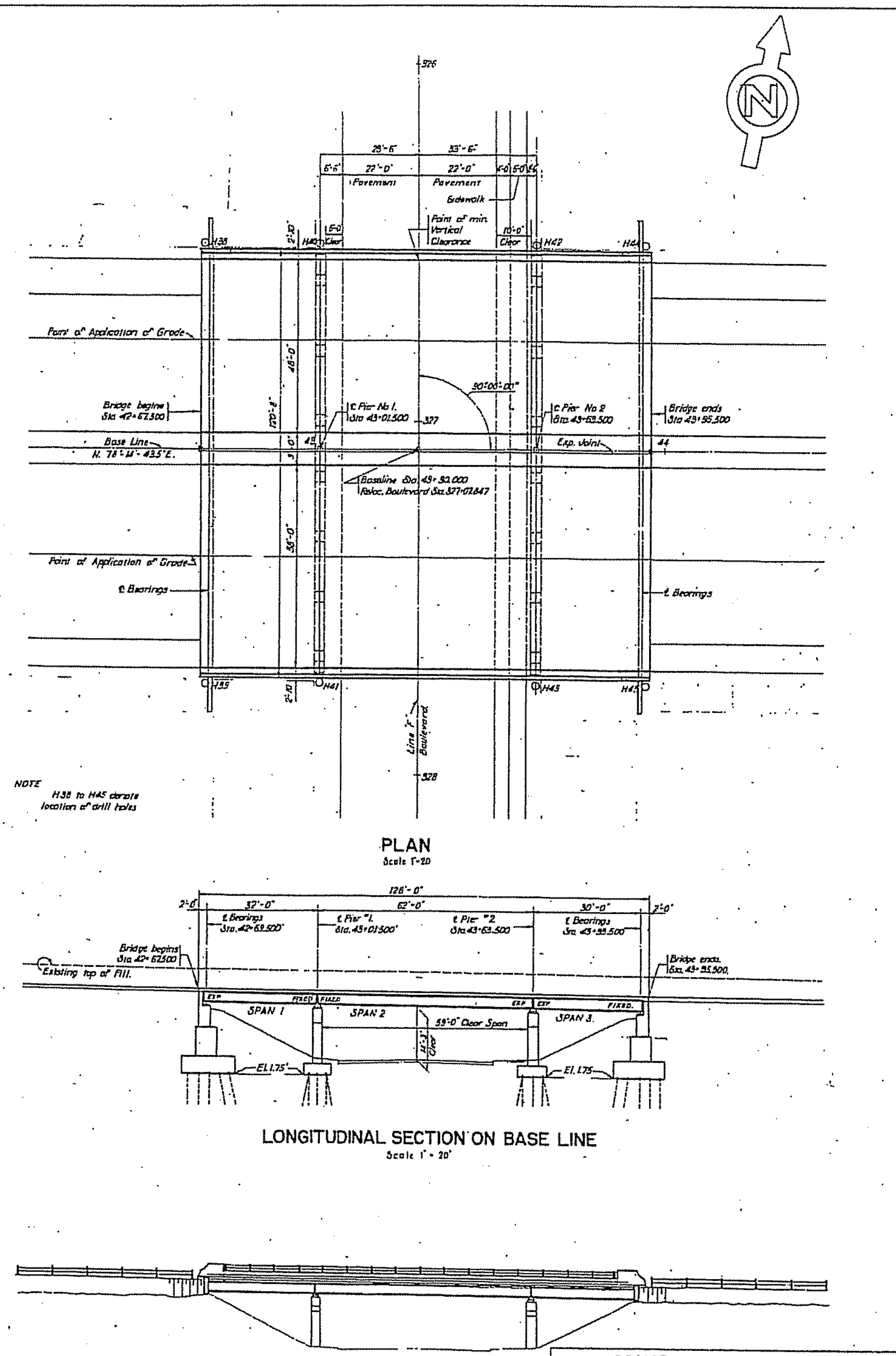
BORING NO B164-6
SAMPLE S-23
DEPTH 110-112'
TECH. MST
REVIEWER DAS

TEST SERIES
NO. 74
DATE Aug.02

FILE L17371

APPENDIX C

BRIDGE NO. 00164
EXISTING TEST BORING LOCATION AND LOG DRAWING



PLAN
Scale 1" = 20'

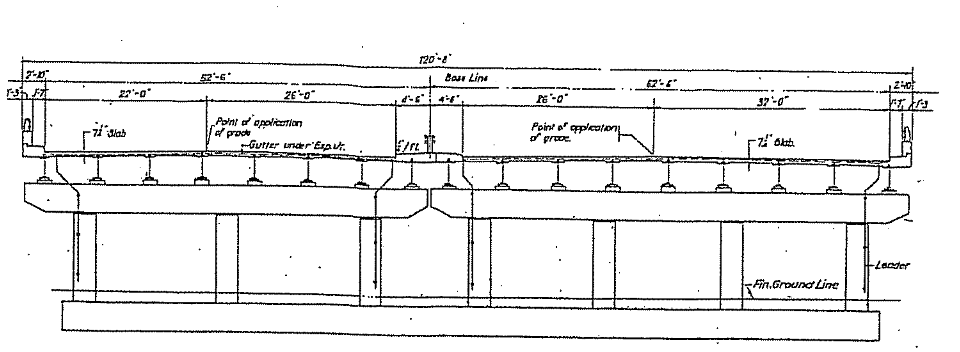
NOTE
H38 to H45 denote location of drill holes

LONGITUDINAL SECTION ON BASE LINE
Scale 1" = 20'

ELEVATION
Scale 1" = 20'

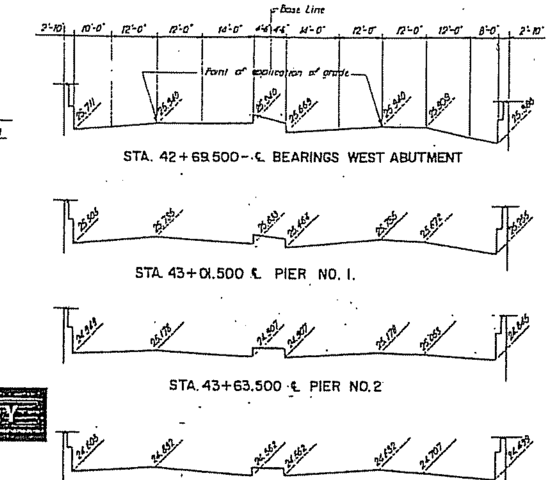
Date Started: 6-15-56
Date Completed: 10-7-57
Final Length: 126.00'
Total Cost $420,614.37

CONCRETE DISTRIBUTION	
Footings	504 c.y.
Substructure	492 c.y.
Superstructure	439 c.y.
Total	1435 c.y.



TRANSVERSE SECTION
Scale 1" = 10'-0"

FOR INFORMATION ONLY



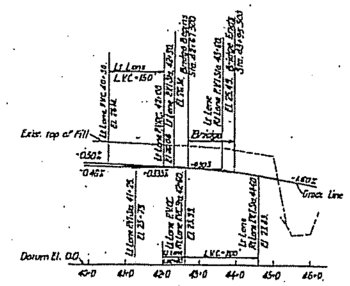
STA. 42+69.500 - ℄ BEARINGS WEST ABUTMENT

STA. 43+01.500 ℄ PIER NO. 1.

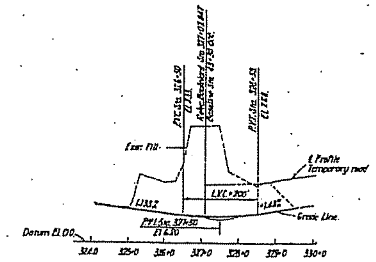
STA. 43+63.500 ℄ PIER NO. 2

STA. 43+93.500 - ℄ BEARINGS EAST ABUTMENT

DECK CROSS SECTIONS
Scales Hor 1" = 20' Vert 1" = 2.5'

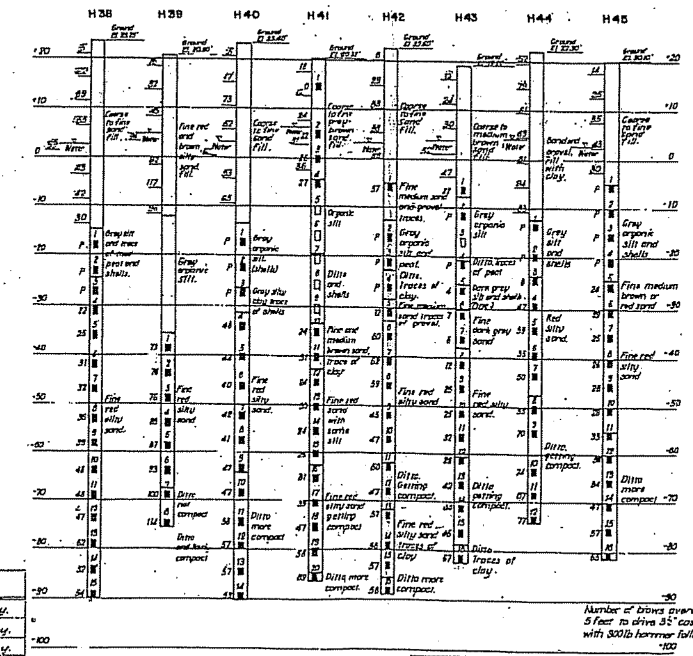


EXPRESSWAY PROFILE
Scales: Hor. 1" = 200' Vert. 1" = 20'



RELOCATED BOULEVARD PROFILE
Scales: Hor. 1" = 200' Vert 1" = 20'

GENERAL NOTES (cont'd).
The elevations shown on the plans are to bottom of steel masonry plates. Pedestals should be finished sufficiently lower to accomodate 3 layers of duck swabbed with red-lead paint.



BORINGS

LEGEND

REDUCED DRAWING NOT TO SCALE

QUANTITIES		
ITEM	UNIT	QUANTITY
Structure Excavation (Complete)	c.y.	1407
Structure Excavation Complete for Abutment Columns	c.y.	1140
6" Perf. A.C.C.M. Pipe	l.f.	288
Pipe Pile Sleeves 24" Diam.	l.f.	66
12 BP 53 Control Pile (95')	ea.	3
Special 12 BP 53 Test Pile (85')	ea.	1
Special 12 BP 53 Test Pile (83')	ea.	1
Pile Loading Test (110 Ton)	ea.	2
Class "A" Concrete.	c.y.	1438
1" Premoulded Bituminous Joint Filler for Bridges	s.f.	22
3/4" Premoulded Bituminous Joint Filler for Bridges	s.f.	162
1/2" Premoulded Bituminous Joint Filler for Bridges	s.f.	149
1/4" Premoulded Bituminous Joint Filler for Bridges	s.f.	50
Furnishing Steel Piles	lbs.	1405545
Deformed Steel Bars	lbs.	229654
Structural Steel	lbs.	398430
Spiral Shear Connectors & Bars	lbs.	2928
Copper Gutters and Leaders (20 oz)	lbs.	210
Dampproofing	s.y.	282
Metal Bridge Rail	l.f.	216
Pervious Structure Backfill	c.y.	751
Portland Cement	bbl.	3025
Natural Cement	bbl.	534
Driving Steel Piles	l.f.	26482
Splicing Steel Piles	ea.	15
Junction Box (18"x18"x10")	ea.	6
2" Rigid Steel Conduit	l.f.	20
2 1/2" Rigid Steel Conduit	l.f.	336
6" A.C.C.M. Pipe	l.f.	84

REVISIONS		
NO.	DATE	DESCRIPTION

GENERAL NOTES

Specifications: Connecticut State Highway Department Specification form 803
Design Specifications: A.A.S.H.O. 1955 as modified by Connecticut State Highway Department Specifications.
Live Loading: H20-S16-44.
Composite Design: Superstructure designed for composite action for live load and superimposed dead load. For live load n = 10 and for superimposed dead load including future wearing surface of 25 p.s.f. n = 30.
Construction of deck to be done without the use of temporary supports under the steel stringers.
Concrete: shall have a minimum compressive strength of 3000 p.s.i. after 28 days and shall be classified as follows.
Class "A" concrete to be used in footings and substructures.
Class "A" air-entrained concrete to be used in bridge deck, safety walk and parapet.
Class "C" concrete to be used in cast-in-place concrete piles.
Cost of furnishing and placing joint seal and 3-ply tarpaper shall be paid for under concrete item.
All corners or exposed edges of concrete shall be chamfered 1" unless otherwise dimensioned.
Reinforcing bars under bearing surfaces shall be placed to clear anchor bolts.
Unless otherwise shown on the plans lengths of splices of reinforcing bars shall be as follows:
20 diameters for bars in slabs, longitudinal bars in pier shafts and longitudinal bars in abutments and wingwalls except in beams and under bridge seats where they shall be 35 diameters.
35 diameters for all others.
Unless otherwise shown on the plans, the minimum cover of reinforcing bars shall be as follows:
3" in abutment and wingwall footings and in piers.
2" in walls of abutments and wingwalls.
1 1/2" in top of slabs
1" in bottom of slabs.
Structural Steel: Structural steel for plated rolled beams shall conform to A.S.T.M.-A373. All other structural steel shall conform to A.S.T.M.-A7 unless otherwise noted.
Paint: All exposed surfaces of structural steel and metal bridge rail shall be painted with one shop coat and one field coat of red-lead and linseed oil and two field coats of color as directed by the engineer. Surfaces not in contact but inaccessible after assembly or erection shall be painted with three coats of shop paint.
Quantities: Quantities are approximate and shall be checked by the contractor in preparing his bid.
Pedestals are to be poured slightly higher than shown on contract plans and monolithically with pier caps and abutment stems and are to be brought down to proper elevation by bushhammering or grinding (GENERAL NOTES contd. above).

CONNECTICUT
STATE HIGHWAY DEPARTMENT
TOWN OF NEW HAVEN
GREENWICH KILLINGLY EXPRESSWAY
OVER
RELOCATED BOULEVARD

GENERAL PLAN AND ELEVATIONS

DESIGNED BY KING AND GAVARIS
SCALES As noted
MADE BY R.L.A., L.H. DATE 7-17-55
CHECKED BY M.A.S. DATE 8-10-55
APPROVED DATE 8-26-55
PROJECT NO. 316A-01
BRIDGE SHEET NO. 1 of 6

316A 01

320 05

44

NOTE
THE "GENERAL PLAN AND ELEVATIONS" DRAWING SHOWN ON THIS SHEET HAS BEEN REPRODUCED FROM THE ORIGINAL DESIGN DRAWINGS OF STATE PROJECT NO. 316A-01, DATED 1955.

REV.	DATE	DESCRIPTION	SHEET NO.
		REVISIONS	

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OR ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

DESIGNER: R. BORJESON
DRAFTER: T. LAUBERTE
CHECKED BY: T. LAUBERTE
DATE CHECKED: 10-11-02

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

ENGINEER: PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.
APPROVED BY: DATE:

PROJECT TITLE:
RECONSTRUCTION OF I-95 OVER ELLA T. GRASSO BOULEVARD (BRIDGE NO. 00164)
CADD FILE: EXBORING.DGN
PLOTTED 10/17/02

TOWN: NEW HAVEN / WEST HAVEN
DRAWING TITLE: EXISTING BORINGS
PROJECT NO.: 92-522
DRAWING NO.: SLD-5
SHEET NO.:

STRUCTURE LAYOUT FOR DESIGN SUBMISSION