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July 24, 2018

Development HUB
NYC Department of Buildings
80 Centre Street
New York, NY 10013

Attn: Scott Pavan, RA, Borough Commissioner

Re: Request for Approval of Variance in Number of Borings
270 Park Avenue
New York, New York
MRCE File No. 13183

Dear Commissioner Pavan,

Mueser Rutledge Consulting Engineers (MRCE) has reviewed available geotechnical information provided and in our files for 270 Park Avenue and on behalf of our client, J.P. Morgan Chase & Co. is requesting approval from the New York City Department of Buildings (DOB) for a variance to reduce the number of test borings for compliance with the New York City Building Code (Code). We summarize herein the project description, site geology, previous and proposed boring investigations, subsurface conditions, and proposed foundation design.

EXHIBITS

The following exhibits are attached to illustrate our report:

<u>Exhibit</u>	<u>Description</u>
Figure No. 1	Site Location Plan
Figure No. 2	Rock Contour Map
Drawing No. BLP-1	Proposed Boring Location Plan
Appendix A	MRCE Assessment of Previous Rock Data
Appendix B	Borings from Construction Contract CM008 MTA/LIRR East Side Access
Appendix C	Borings from Construction Contract CM009 MTA/LIRR East Side Access

SITE AND PROJECT DESCRIPTION

The project site is in the Borough of Manhattan, New York, on the block bounded by East 48th Street and East 47th Street to the north and south, and Madison Avenue and Park Avenue to the west and east, as shown on Figure No. 1.

The site is currently occupied by a 52-story building with two underground track levels that connect to Grand Central Terminal. East Side Access (ESA) facilities also cover part of the footprint underneath the building.

The above grade portion of the existing 52-story building is planned to be demolished. A new office tower of approximately 70-stories is planned to be constructed. The new tower will be supported on existing retrofitted foundations and new foundations.

Adjacent sidewalk ground surface elevations range between El. +42 and El. +58 with the grade sloping upwards to the east and south. Elevations refer to the North American Vertical Datum of 1988 (NAVD88).

AVAILABLE INFORMATION

We were provided with the following information:

- Geotechnical Data Report for Construction Contract CM008 MTA/LIRR East Side Access prepared by Mueser Rutledge Consulting Engineers, dated October 4, 2002
- Geotechnical Data Report for Construction Contract CM009 MTA/LIRR East Side Access prepared by PB/STV, dated 2004
- Original 270 Park Avenue Foundation Drawings prepared by Skidmore Owings and Merrill, dated 1957

Permission has been obtained from MTA ESA to use the borings for filings with the DOB. Locations of existing borings within the proposed development are shown in Drawing BLP-1 and relevant information from the above reports are presented in Appendices A, B and C.

In addition, we reviewed our previous work in the vicinity of the site for general understanding of the subsurface conditions.

GEOLOGY

The New York City area lies at the junction of three major physiographic provinces: the New England Upland to the northwest, the Triassic Lowland to the southwest and the Coastal Plain to the southeast. The New England Upland is locally known as the Manhattan Prong, which is a northeast trending deeply eroded sequence of metamorphic rocks. The Manhattan Prong is west of the Coastal Plain. The boundary between the two physiographic provinces is called the "fall line". The project site lies within the Manhattan Prong, west of the fall line.

Bedrock below the project site is the Hartland Formation, which is a durable ridge of metamorphosed and folded bedrock. The Hartland Formation is a deep-water oceanic deposit, which metamorphosed to gneiss and schist. It consists primarily of inter-bedded units of gray schist to gneissic schist with minor garnets, white to pinkish-white fine to medium grained gneissic granite with minor garnet and dark greenish black amphibolite with white or pink granite pegmatite. It is also inter-bedded with marble and contains granitic intrusions.

SUBSURFACE INVESTIGATION

Previous Investigations: Subsurface investigations had previously been performed at this site by MRCE and others.

In 2002, 10 borings were made as part of the East Side Access (ESA) project for the new Long Island Railroad (LIRR) Terminal at Grand Central Station (GCT). Two of the borings were made in close proximity of the footprint of the building. The borings were made with a truck drill rig mounted on high rail equipment by Warren George Inc. under the continuous inspection of MRCE's resident engineers. The investigation extended from existing Track No. 115 to the west wall of the existing train shed, bounded by East 50th Street to the north and East 43rd Street to the south. . Two borings from this investigation that are within the vicinity

of the proposed building are showing on Drawing BLP-1, Proposed Boring Location Plan (attached). Boring logs are included in Appendix B.

Another geotechnical investigation was performed by PB/STV, a joint venture of Parsons Brinkerhoff / STV Inc., for the ESA project. The borings were made with high rail equipment as described above by Warren George Inc. and Jersey Boring & Drilling. Seven borings from this investigation are within the vicinity of the proposed building and are shown on Drawing BLP-1. Boring logs are included in Appendix C.

Proposed Subsurface Investigation: A subsurface investigation is required to confirm the anticipated foundation conditions and satisfy the exploration requirements of the Code. For buildings supported on deep foundations, the Code requires a minimum of one boring per 2,000 square feet of new building footprint for the first 20,000 square feet and one boring per every additional 4,000 square feet (Section 1802.4.1). Where the foundation design relies on rock, the Code requires a sufficient number of rock cores to extend at least 10 feet below the lowest level of bearing to provide assurance of the rock soundness.

The lot area for the new building is approximately 80,000 square feet. Part of the building will be supported on footings bearing on bedrock. There is a possibility part of the building will be bearing on caissons socketed into bedrock. Based on the building footprint and proposed foundation system, 25 borings are needed to meet the Code. There are 9 existing borings from the previous ESA investigations that meet Code requirements for which we obtained permission from ESA to use them. Sixteen additional borings would be required to meet Code requirements. We propose to perform 8 new borings. We anticipate that the new borings will extend between 30 and 90 feet below the existing lower track level, where the ESA Concourse Level is currently under construction. The proposed boring locations are shown on Drawing BLP-1, Proposed Boring Location Plan.

The borings will be made with diesel powered restricted access drill-rigs, rigs mounted to high rail equipment to drill on the existing tracks or a portal electric rig in enclosed areas with no ventilation. The type of rigs used will depend on access to proposed boring locations. All borings will be grouted with cement bentonite. Prior to grouting, all borings will be surveyed with an acoustic televiewer (ATV) to determine the depths and precise orientations of bedrock fractures. Field and laboratory testing of the rock will be performed to the strength and quality of the rock and determine design parameters. No monitoring wells will be installed. Water levels will be observed at the end of drilling.

SUBSURFACE CONDITIONS

MRCE reviewed both geotechnical reports focusing on the borings within the vicinity of the project site. General descriptions of the soil strata encountered in the borings and their classification in accordance with the Code are summarized below in order of their occurrence with depth. A summary of the Rock Quality Designation (RQD), allowable bearing pressures based on recovery and RQDs in accordance with Code, and jointing are tabulated in Appendix A.

Fill (NYC Class 7): The fill consists of a mixture of coarse gravel (track ballast), cobbles, rock fragments, fine to coarse sand and silt ranging in thickness from 0 to 5 feet.

Bedrock (NYC Class 1a to 1b): The bedrock underlying the site is a medium to coarse-grained gneissic schist of the Manhattan Formation. Generally it is hard and sound in its unweathered state. The rock is typically described as a medium-hard to hard, slightly weathered to unweathered, gray gneissic mica schist, closely to moderately jointed with iron stained and slightly weathered joints, with occasional pegmatite zones and garnet. Core recoveries generally ranged from 80 to 100 percent and RQD's were typically in the range of 70 to 100 percent. Rock core sketches of each recovered core are attached to the boring logs in Appendix B and C.

PRELIMINARY DESIGN RECOMMENDATIONS

The proposed building will be supported on the existing foundations where possible. At column locations where the building load exceeds the capacity of the existing foundation, the existing footings will be augmented to support the new loads.

Allowable Bearing Pressure: Based on our review of the original 270 Park Avenue foundation drawings, the allowable bearing pressure of the rock is 40 tsf. We have summarized the rock core recoveries and RQDs from the previous ESA borings attached in Appendix A.

Existing Foundation Augmentation: Based on the preliminary foundation loads provided to us by the structural engineer, Severud Associates, modifications to some of the existing building foundations will be required. In order to support the additional compression and tension loads from the new structure, micropiles and rock anchors will need to be installed adjacent to the existing footings and new grillages or grillage extensions designed to transfer the load from columns and shear walls to the rock.

We have developed these preliminary options for foundation augmentation:

1. Use existing grillage footings by approving a higher rock bearing capacity
2. Expanding the existing grillage footing to increase bearing area
3. Use the existing grillage footings and install tiedown rock anchors through grillage
4. Expand the existing grillage footing and install micropiles
5. Expand the existing grillage footing and install tiedown rock anchors

The proposed boring investigation described above will help in determining if increasing the bearing capacity is feasible.

Based on the preliminary loads provided to us, the tiedown rock anchors may have bond zones in the range of 40 feet. The free length could vary from 10 to 30 feet. The drill hole diameter could vary between 7-inch to 13-inch depending on loads to be transferred. The micropiles / tiedowns could extend up to 70 feet into rock below bottom of existing foundations.

The proposed foundations of the building will consist of spread footings bearing and socketed in bedrock with tiedown anchors for uplift capacity. The core of the building will likely consist of grade beams and caissons socketed into bedrock. The tiedown anchors will be proof tested to 1.33 times the design load. The rock sockets for the caissons will be inspected with a camera to verify rock quality.

IMPACT TO EXISTING ESA FACILITIES

After completion of the proposed subsurface investigation, we will perform analyses to evaluate the effects of increased column loads on the adjacent ESA escalator shafts and caverns.

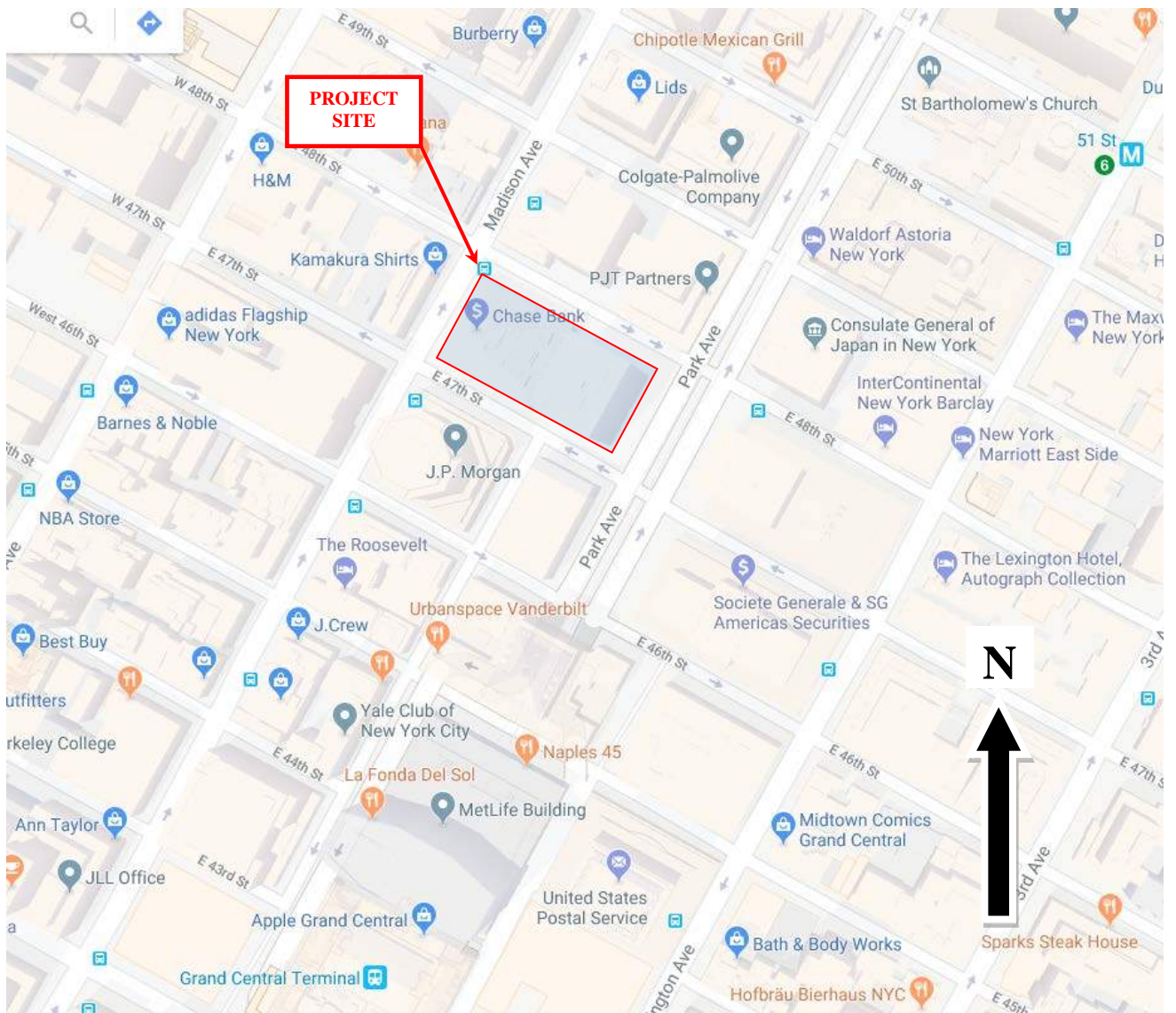
CLOSURE

The proposed building footprint of 80,000 square feet requires 25 borings to be drilled for a building supported on deep foundations per the Code. There are 6 existing borings within the footprint of the building and 3 borings within 25 feet of the building footprint, for a total of 9 borings that meet Code requirements. We propose to perform 8 new borings within the proposed building footprint. There will be total of 17 borings between the existing and proposed borings, which provides a coverage ratio of about 68% of the number of borings required.

Robert A. Ellman

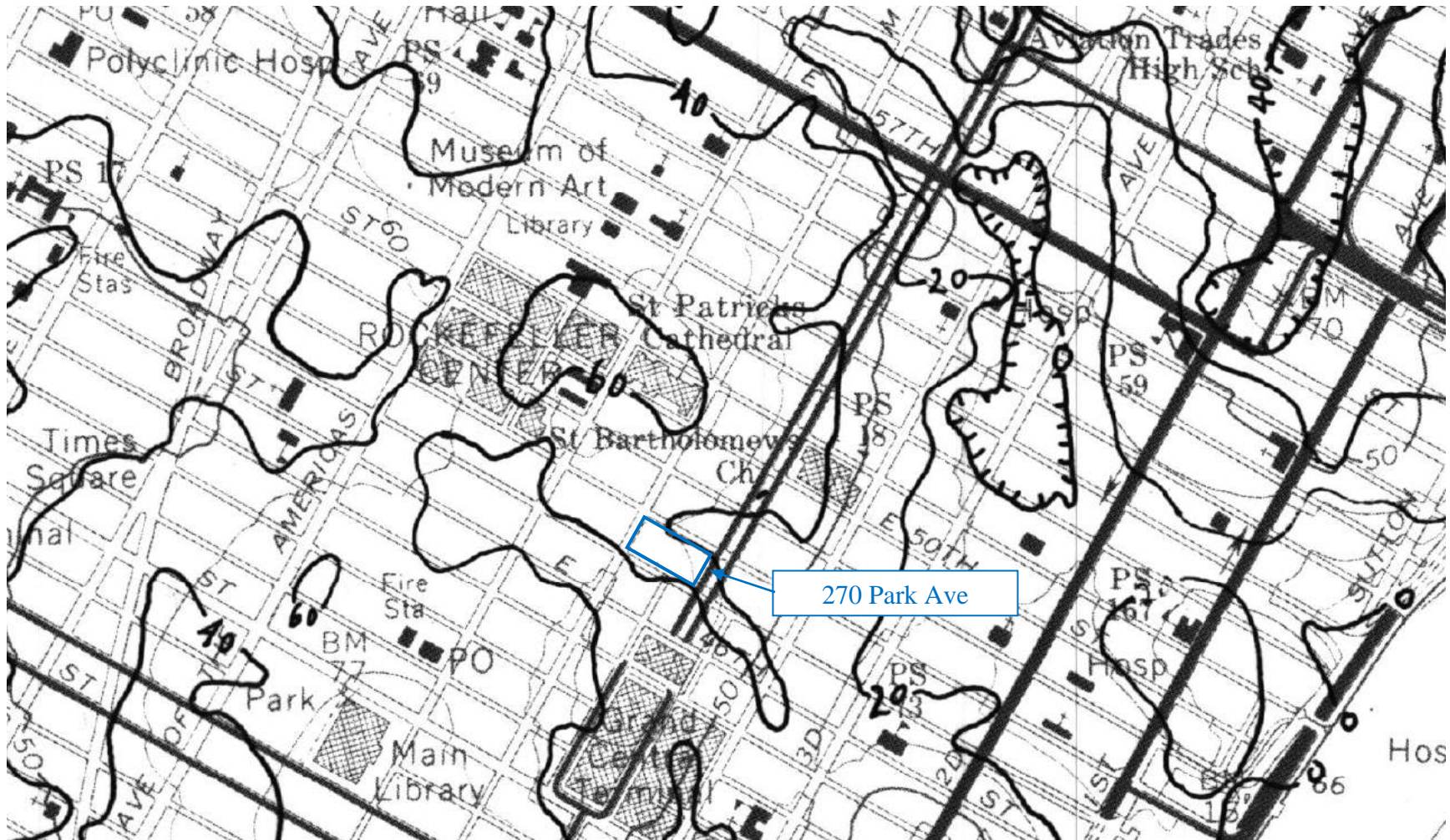


EXHIBITS



Source: <https://www.google.com/maps/>

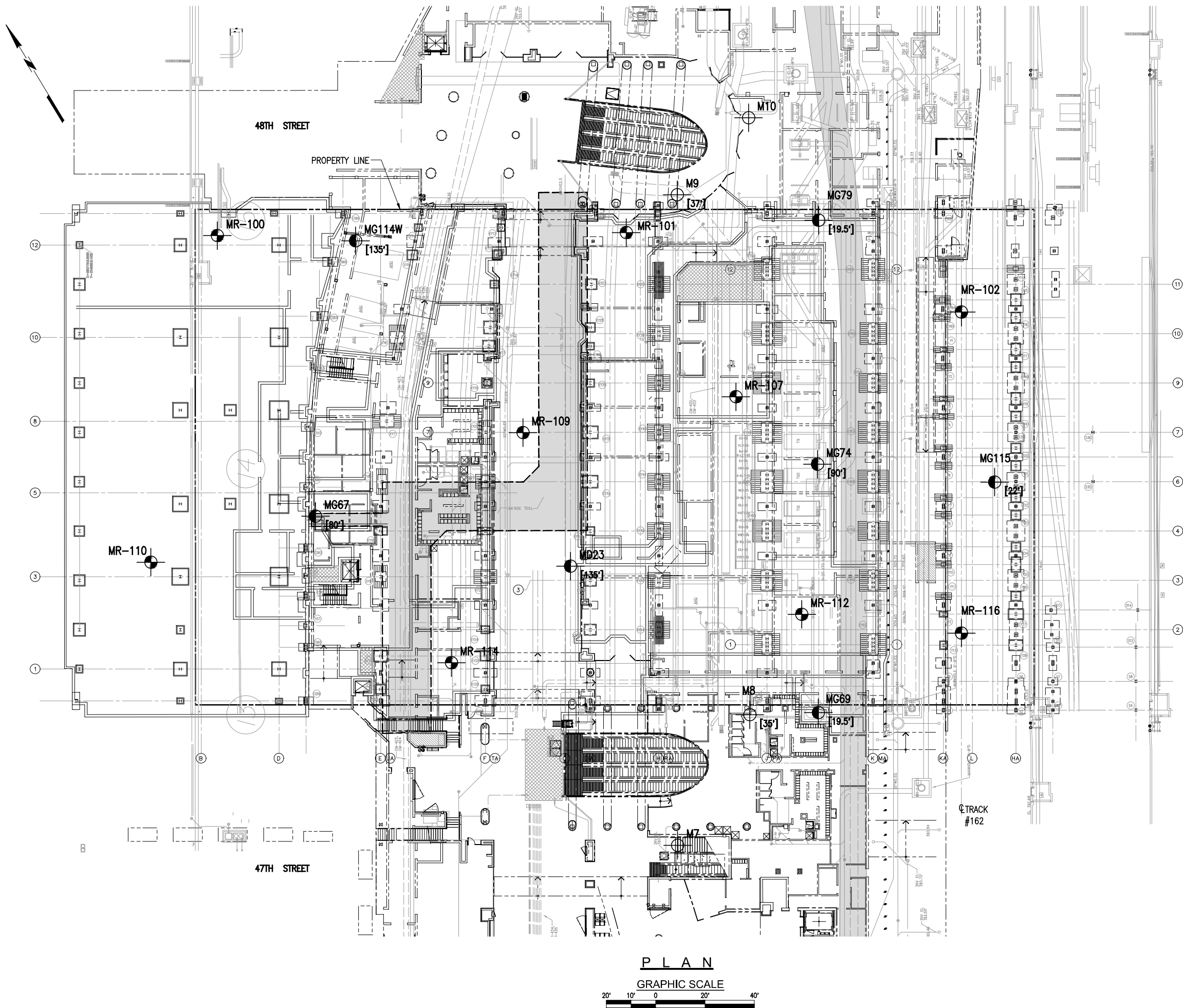
270 PARK AVENUE		
NEW YORK		NEW YORK
JP MORGAN CHASE & CO.		
NEW YORK		NEW YORK
MUESER RUTLEDGE CONSULTING ENGINEERS		
225 WEST 34 TH STREET, NEW YORK, NY 10122		
SCALE -	MADE BY: JSM	DATE: 06-14-18
		FILE NO. 13183
SITE LOCATION PLAN		FIGURE NO. 1



Source: Bedrock and Engineering Geologic Maps of New York County
And Parts of Kings and Queens Counties, New York, and Parts of Bergen and
Hudson Counties, New Jersey, 1990, Charles A. Baskerville

270 PARK AVENUE	
NEW YORK	NEW YORK
Mueser Rutledge Consulting Engineers 225 West 34 th Street • New York, NY 10122	MRCE 13183
Rock Contour Map	FIGURE 2

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NOTES:
1. BASE AND UTILITY PLANS PROVIDED BY SEVERUD AND TISHMAN.

- LEGEND:**
- BORINGS PERFORMED BY OTHERS (EAST SIDE ACCESS)
[XX.X] - BORING DEPTH
 - BORINGS PERFORMED BY MRCE (EAST SIDE ACCESS)
[XX.X] - BORING DEPTH
 - PROPOSED BORINGS

REV.	DATE	BY	DESCRIPTION	
270 PARK AVENUE				
NEW YORK			NEW YORK	
JP MORGAN CHASE & CO.				
NEW YORK			NEW YORK	
MUESER RUTLEDGE CONSULTING ENGINEERS				
14 PENN PLAZA — 225 W. 34TH STREET, NY, NY 10122				
SCALE	MADE BY: A.R.M.		DATE: —	FILE NUMBER
GRAPHIC	CH'KD BY: J.S.M.		DATE: —	13183
PROPOSED BORING LOCATION PLAN				DRAWING NUMBER
				BLP-1

APPENDIX A

MRCE ASSESSMENT OF PREVIOUS ROCK DATA

MRCE Boring #: M-7

Ground Surface Elev. (NAVD88) = +11.7

Depth (ft)	REC/RQD (%)	Rock Type	Jointing	NYCDOB Rock Classification
0 to 1	-	Fill	Dipping 0 to 20 degrees southeast to southwest	-
1 to 6	100/68	Medium hard gray gneissic schist		40 tsf
6 to 16	97/82	Hard gray gneissic schist, trace pegmatite zones, garnet		40 tsf
16 to 26	100/89	Shistose gneiss		60 tsf
26 to 35	99/90	Hard gray gneissic schist, trace pegmatite zones, garnet		60 tsf

MRCE Boring #: M-8

Ground Surface Elev. (NAVD88) = +12.1

Depth (ft)	REC/RQD (%)	Rock Type	Jointing	NYCDOB Rock Classification
0 to 1	-	Fill	Dipping 25 to 45 degrees to the south-southeast to southwest	-
1 to 5	-	Hard gray gneissic schist, trace pegmatite zones, garnet		-
5 to 15	100/87	Hard gray gneissic schist, trace pegmatite zones, garnet		60 tsf
15 to 20	87/75	Medium hard gray gneissic schist, trace pegmatite zones, garnet		40 tsf
20 to 25	100/92	Hard gray gneissic schist, trace pegmatite zones, garnet		60 tsf
25 to 35	100/100	Hard gray gneissic schist, trace pegmatite zones, garnet		60 tsf

MRCE Boring #: M-9

Ground Surface Elev. (NAVD88) = +11.7

Depth (ft)	REC/RQD (%)	Rock Type	Jointing	NYCDOB Rock Classification
0 to 1	-	Fill	Dipping 15 to 30 degrees to the south-southeast to southwest	-
1 to 5	100/30	Hard gray gneissic schist, trace pegmatite zones, garnet		20 tsf
5 to 7	100/85	Hard gray gneissic schist, trace pegmatite zones, garnet		60 tsf
7 to 17	95/86	Hard gray gneissic schist, trace pegmatite zones, garnet		60 tsf
17 to 27	100/87	Hard gray gneissic schist, trace pegmatite zones, garnet		60 tsf
27 to 37	100/85	Hard gray gneissic schist, trace pegmatite zones, garnet		60 tsf

MRCE Boring #: M-10

Ground Surface Elev. (NAVD88) = +11.9

Depth (ft)	REC/RQD (%)	Rock Type	Jointing	NYCDOB Rock Classification
0 to 1	-	Fill	Dipping 15 to 30 degrees to the south and west.	-
1 to 5	-	Medium hard gray gneissic schist, trace pegmatite zones, garnet		-
5 to 15	100/65	Medium hard gray gneissic schist, trace pegmatite zones, garnet		40 tsf
15 to 25	100/72	Hard gray gneissic schist, trace pegmatite zones, garnet		40 tsf
25 to 35	100/86	Hard gray gneissic schist, trace pegmatite zones, garnet		60 tsf

PB/STV Borings

Boring #: MD-23

Ground Surface Elev. (NAVD88) = +11.6

Depth (ft)	REC/RQD (%)	Rock Type	Jointing	NYCDOB Rock Classification
0 to 2	-	Fill	Dipping 0 to 40 degrees	-
5 to 10	77/62	Medium hard gray gneissic schist		40 tsf
10 to 15	97/82	Hard gray gneissic schist, trace pegmatite zones, garnet		40 tsf
15 to 25	100/89			60 tsf
25 to 135	100/100			60 tsf

Boring #: MG-67

Ground Surface Elev. (NAVD88) = +12.7

Depth (ft)	REC/RQD (%)	Rock Type	Jointing	NYCDOB Rock Classification
0 to 2.5	-	Fill	Dipping 10 to 50 degrees	-
2.5 to 5	100/37	Weathered gray schist		20 tsf
5 to 10	100/100	Hard gray gneissic schist, trace pegmatite zones, garnet		60 tsf
10 to 15	98/95			60 tsf
15 to 20	98/98			60 tsf
20 to 80	100/(85 to 100)			60 tsf

Boring #: MG-69**PB/STV Borings**

Ground Surface Elev. (NAVD88) = +11.8

Depth (ft)	REC/RQD (%)	Rock Type	Jointing	NYCDOB Rock Classification
0 to 1	-	Fill	Dipping 15 to 40 degrees	-
1 to 5	57/30	Weathered gray schist		8 tsf
5 to 10	100/100	Hard gray gneissic schist, trace pegmatite zones, garnet		60 tsf
10 to 15	100/100			60 tsf
15 to 20	100/100			60 tsf

Boring #: MG-74

Ground Surface Elev. (NAVD88) = +11.8

Depth (ft)	REC/RQD (%)	Rock Type	Jointing	NYCDOB Rock Classification
0 to 1.3	-	Fill	Dipping 5 to 50 degrees	-
1.3 to 5	66/0	Rock fragments		-
5 to 10	100/96	Hard gray schist, trace pegmatite zones		60 tsf
10 to 15	98/98			60 tsf
10 to 20	100/100			60 tsf
20 to 25	100/93			60 tsf
25 to 90	100/100			60 tsf

Boring #: MG-79**PB/STV Borings**

Ground Surface Elev. (NAVD88) = +11.7

Depth (ft)	REC/RQD (%)	Rock Type	Jointing	NYCDOB Rock Classification
0 to 0.9	-	Fill	Dipping 20 to 60 degrees	-
0.9 to 4.5	53/19	Rock fragments		-
4.5 to 9.5	100/96	Hard gray schist, trace pegmatite zones		60 tsf
9.5 to 14.5	100/100			60 tsf
14.5 to 19.5	100/100			60 tsf

Boring #: MG-114w

Ground Surface Elev. (NAVD88) = +12.2

Depth (ft)	REC/RQD (%)	Rock Type	Jointing	NYCDOB Rock Classification
0 to 4	-	Fill	Dipping 15 to 30 degrees	-
4 to 5	100/92	Rock fragments		-
5 to 10	96/96	Hard gray schist, trace pegmatite zones		60 tsf
10 to 20	96/96			60 tsf
20 to 135	98-100/97-100			60 tsf

Boring #: MG-115

Ground Surface Elev. (NAVD88) = +11.2

Depth (ft)	REC/RQD (%)	Rock Type	Jointing	NYCDOB Rock Classification
0 to 2	-	Fill	Dipping 0 to 30 degrees	-
2 to 7	80/50	Medium hard gray schist		40 tsf
7 to 12	100/67	Hard gray schist, trace pegmatite zones		60 tsf
12 to 17	100/100			60 tsf
17 to 22	100/100			60 tsf

APPENDIX B

BORINGS FROM CONSTRUCTION CONTRACT
CM008 MTA/LIRR EAST SIDE ACCESS

\$REF1\$
\$REF2\$
\$REF3\$
\$REF4\$
\$REF5\$
\$REF6\$

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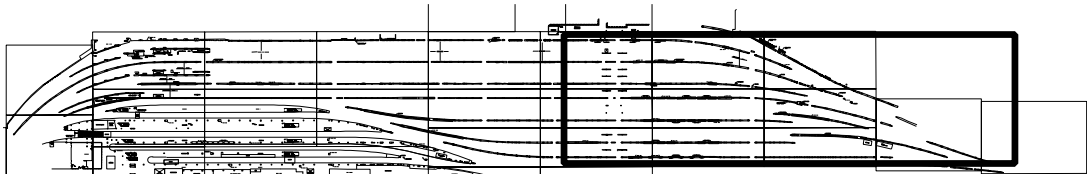
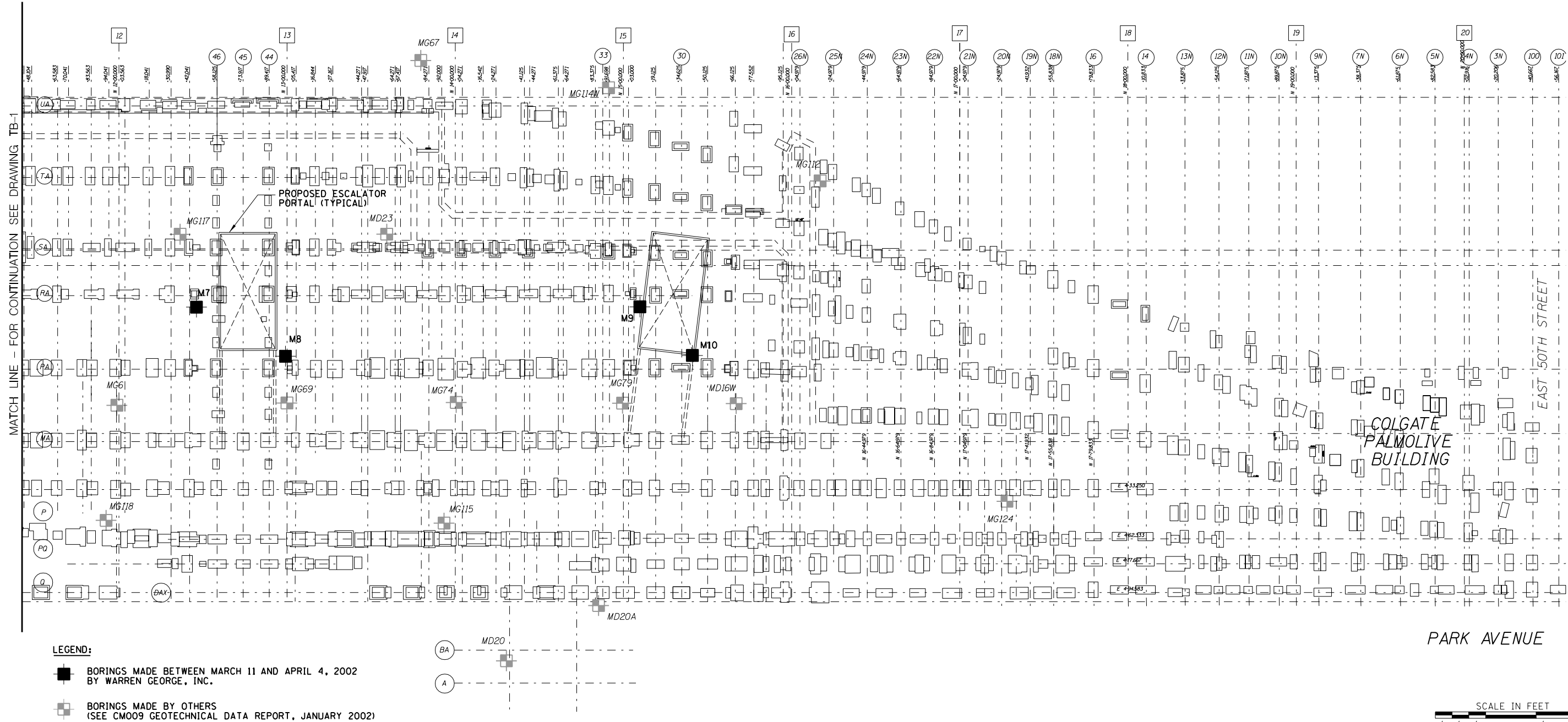
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\$(SCALE)

edelossantos



KEY PLAN



Long Island Rail Road
East Side Access

SYSTEMS ENGINEER
PARSONS TRANSPORTATION GROUP OF NEW YORK, INC.

DATE:	REVISIONS	No.

DESIGNED BY:
I. BEER
DRAWN BY:
M. RINGHEANU
CHECKED BY:
F. ARLAND
COORDINATED BY:
APPROVED BY:

PROFESSIONAL ENGINEER
N.Y. LIC. No.

DATE:

GCT CONCOURSE CIVIL & STRUCTURAL

MADISON CONCOURSE AND ENTRANCES
BORING LOCATION PLAN

SCALE:
1" = 30'-0"
DRAWING NUMBER:
B-2
DATE:
REVISION NUMBER:

CONTRACT No.
CM008
ISSUE
60%
SHEET No.
OF

TABLE R-1 ROCK CORE CLASSIFICATION CRITERIA							
HARDNESS/SOUNDNESS CLASSIFICATION	TYPICAL GEOLOGIC CLASSIFICATION	IDENTIFICATION CHARACTERISTICS	GENERAL MINIMUM CORING CHARACTERISTICS				INTACT SPECIMEN TYPICAL MINIMUM COMPRESSIVE STRENGTH
			NX OR LARGER		BX OR SMALLER		
			REC	RQD	REC	RQD	
HARD ROCK ----- UNWEATHERED MAY BE JOINTED	-CRYSTALLINE IGNEOUS, OR METAMORPHIC ROCKS -HIGHLY SILICEOUS SEDIMENTARY ROCKS	- UNWEATHERED FABRIC - RINGS WHEN STRUCK WITH BAR - SHARP AND HARD FRACTURE SURFACE WHEN BROKEN MECHANICALLY - MAY BE JOINTED, BUT JOINTS ARE GENERALLY TIGHT. JOINTS MAY BE IRON STAINED. - DOES NOT DISINTEGRATE UPON EXPOSURE - DOES NOT SLAKE IN WATER	95 OR MORE	85 OR MORE	85 OR MORE	75 OR MORE	3,000
MEDIUM HARD ROCK ----- SLIGHTLY WEATHERED MAY BE CLOSELY JOINTED	AS FOR HARD ROCKS AND: - MODERATELY SILICEOUS SEDIMENTARY ROCKS - CERTAIN CALCAREOUS ROCKS	AS FOR HARD ROCK, EXCEPT: - FABRIC MAY BE IRON STAINED - MAY BE CLOSELY JOINTED, BUT JOINTS ARE GENERALLY TIGHT. JOINTS HAVE SLIGHT WEATHERING OR MAY BE IRON STAINED.	70	50	50	40	1,500
INTERMEDIATE ROCK ----- MODERATELY WEATHERED MAY BE CLOSELY JOINTED	AS FOR MEDIUM HARD ROCKS AND: - MOST SEDIMENTARY ROCKS OTHER THAN COMPACTION SHALES - MOST CALCAREOUS ROCKS WHICH ARE NOT POROUS	AS FOR MEDIUM HARD ROCK, EXCEPT: - MODERATELY WEATHERED FABRIC - WEATHERED JOINTS - THUDS WHEN STRUCK BY BAR - CAN BE INDENTED WITH A STEEL NAIL - BREAKS READILY WITH HAMMER - PIECES OF WEATHERED SURFACE CAN BE BROKEN OFF BY HAND - DOES NOT DISINTEGRATE UPON EXPOSURE - UNWEATHERED PIECES DO NOT SLAKE	50	35	35	25	500
WEATHERED ROCK ----- HIGHLY WEATHERED MAY BE BROKEN	AS FOR INTERMEDIATE ROCKS AND: - COMPACTION SEDIMENTARIES - CALCAREOUS ROCKS WITH SOIL-FILLED CAVITIES	AS FOR INTERMEDIATE ROCK, EXCEPT: - HIGHLY WEATHERED FABRIC - CAN BE BROKEN EASILY, CRUMBLES WITH DIFFICULTY BY HAND - CAN BE SCRAPED BY KNIFE - MAY SOFTEN UPON EXPOSURE - MAY SLAKE IN WATER - STANDARD PENETRATION RESISTANCE EXCEEDS 50 BLOWS/FOOT	LESS THAN 50	LESS THAN 35	LESS THAN 35	LESS THAN 25	150
DECOMPOSED ROCK ----- (RESIDUAL SOILS)	ALL ROCK TYPES	- ROCK TEXTURE AND STRUCTURE OFTEN PRESERVED - GENERALLY SOIL-LIKE IN CONSISTENCY - CAN BE CRUMPLED BY SLIGHT HAND PRESSURE - CAN BE PEELED WITH A KNIFE - STANDARD PENETRATION RESISTANCE LESS THAN 50 BLOWS/FOOT	WHEN RECOVERED WITH SOIL SAMPLING TECHNIQUES, DESCRIBED AS FOR SOILS INCLUDING USC GROUP SYMBOLS. (WTHD ROCK) ADDED TO DESCRIPTION.				
			GENERALLY RECOVERED WITH SOIL SAMPLING TECHNIQUES AND DESCRIBED AS FOR SOILS INCLUDING USC GROUP SYMBOLS. (DEC ROCK) ADDED TO DESCRIPTION.				

NOTES:

1. ROCK CORE DESCRIPTIONS REPRESENT ONLY THE MATERIAL RECOVERED IN THE CORING OPERATIONS.
2. GENERAL MINIMUM CORING CHARACTERISTICS ASSUME ROCK CORING WITH A DOUBLE TUBE SERIES "M" OR EQUIVALENT CORE BARREL USING GOOD CORING TECHNIQUES AND EQUIPMENT.
3. REC - RECOVERY IS THE LENGTH OF CORE RECOVERED, EXPRESSED AS A PERCENTAGE OF THE LENGTH OF CORE RUN.
4. RQD - ROCK QUALITY DESIGNATION IS THE SUM OF THE LENGTHS OF CORE PIECES FOUR INCHES OR LONGER EXPRESSED AS A PERCENTAGE OF THE TOTAL LENGTH OF CORE RUN. LENGTHS ARE MEASURED BETWEEN IN-SITU SEPARATIONS; MECHANICAL BREAKS RESULTING FROM CORING AND VERTICAL JOINTS ARE IGNORED.

TABLE R-2 WEATHERING AND JOINTING DEFINITIONS

DEGREE OF FABRIC WEATHERING

FABRIC WEATHERING

CHARACTERISTIC

Unweathered	UnW	No decomposition or discoloration rings when struck
Slightly Weathered	SIW	Iron Stained Rings when struck
Moderately Weathered	MdW	Deteriorated fabric Thuds when struck
Highly Weathered	HiW	Friable, easily broken by hand
Decomposed	Dec	Soil-like

DEGREE OF JOINT WEATHERING

JOINT WEATHERING

CHARACTERISTIC

Iron stained joints	FeJtS	Indicates movement of water along joints
Weathered joints	WJts	Joints are not tight and do not match. Joints have friable edges.

DEGREE OF JOINTING

JOINTING

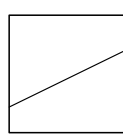
JOINT FREQUENCY

Massive	Mssv	Less than 1 joint in 4 feet
Blocky	Blky	1 joint every 2 to 4 feet
Moderately Jointed	MdJtd	1 joint every foot to 2 feet
Jointed	Jtd	1 to 2 joints per foot
Closely Jointed	ClJtd	2 to 4 joints per foot
Broken	Bkn	More than 4 joints per foot

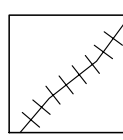
Vertical joints are ignored in RQD and joint frequency evaluations, but are noted in written descriptions and and on core sketches.

TABLE R-4 ROCK CORE SKETCH KEY

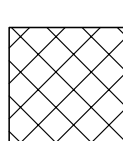
SKETCH SYMBOLS



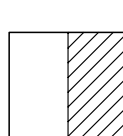
Joint



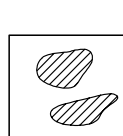
Healed Joint



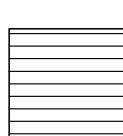
Broken



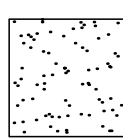
Part of Core Not Recovered



Cavities or Vugs in Core



Clay



Sand

JOINT ORIENTATION AND CONDITION

SURFACE

-

CONDITION

Parallel

-

//

Curved

-

C

Slick

-

1

Crossing

-

X

Irregular

-

I

Smooth

-

2

Foliation

-

F

Straight

-

S

Rough

-

3

Stratification

-

S

Unfoliated or

Unstratified

-

U

Mechanical

Break

-

MB

TABLE R-3 ABBREVIATIONS FOR ROCK CORE CLASSIFICATION

Blocky	Blky	Intermediate	Int
Broken	Bkn	Light	Lt
Brown	brn	Lignite	lign
Calcareous or Calcite	calc	Limestone	lms
Cavities	cvts	Jointed	Jtd
Chlorite	chl	Joints	Jts
Clay, Clayey	cl	Massive	Mssv
Closely Jointed	ClJtd	Medium Hard	MdHd
Coating on joint surface	coat	Mica, Micaceous	Mic
Crushed	crsh	Moderately Jointed	MdJtd
Dark	dk	Moderately Weathered	MdW
Decomposed	Dec	Pockets	pkts
Ditto	do	Quartz	qtz
Dolomite, Dolomitic	Dol	Recovery	Rec
Iron stained Joints	FeJts	Rock Quality Designation	RQD
Iron Stained	FeStn	Sand	sa
Feldspar	feld	Sandstone	ss
Foliation	Fol	Schist, Schistose	sch
Fractured	frct	Shale	sh
Fragments	fgmts	Shear zone	Sz
Gneiss, Gneissic	gns	Siliceous	sil
Gouge	gog	Silt	si
Granite, Granitic	gr	Slickensided	slks
Gray	gry	Slightly Weathered	SIW
Hard	Hd	Unweathered	UnW
Highly Weathered	HiW	Weathered	Wthd
Hornblende	Hbl	Weathered Joints	WJts
Injected	inj	Vein	Vn
Interbedded	Intrbd	Vertical Joints	VJts

REVISED - FEBRUARY 11, 1999

MUESER RUTLEDGE CONSULTING ENGINEERS

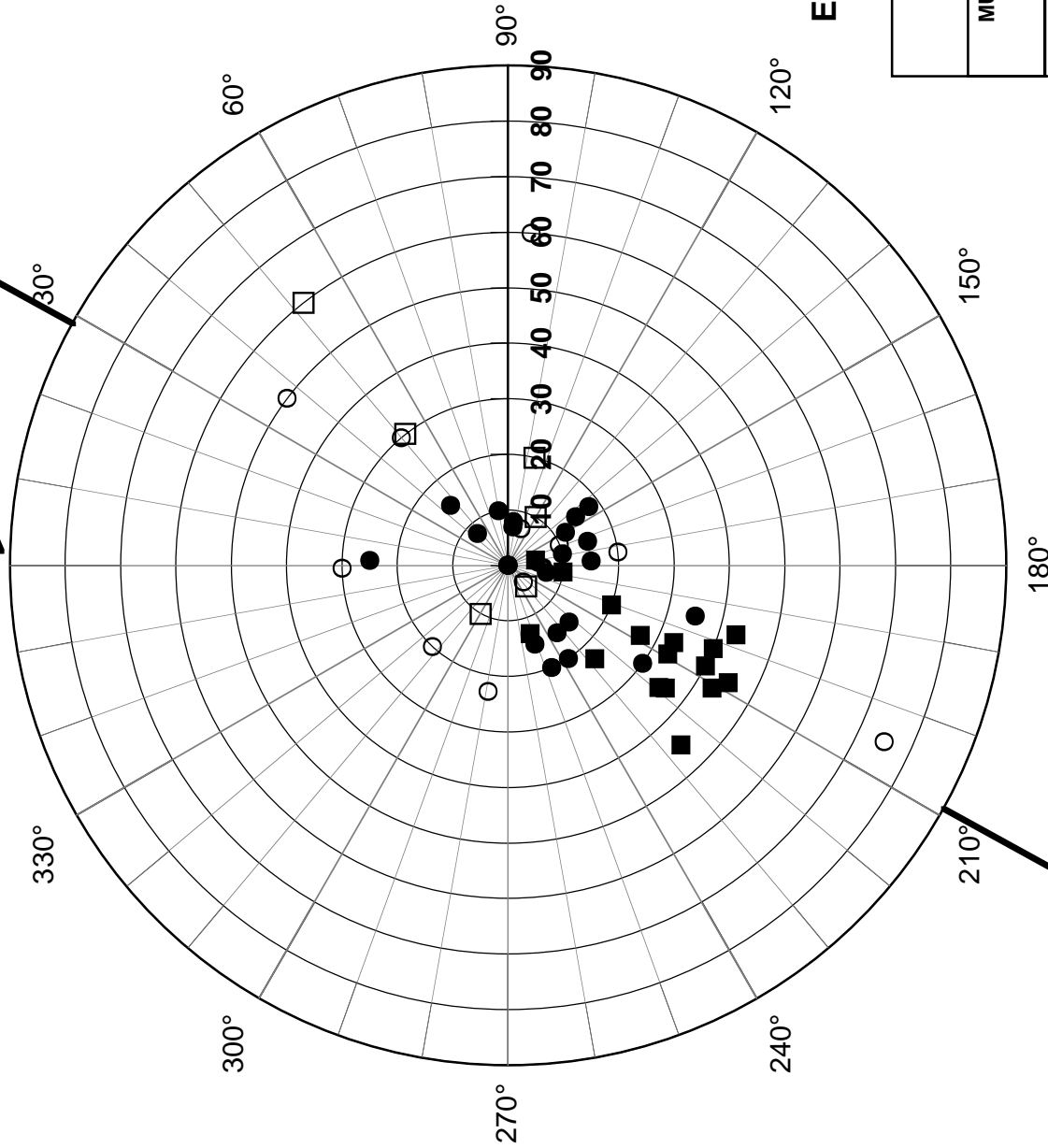
225 WEST 34TH STREET, NEW YORK, NY 10122

ROCK CORE CLASSIFICATION CRITERIA

FIGURE NO.

RC-1

TRUE NORTH
TYPICAL GCT TRACK ORIENTATION



BORING
LEGEND FOR
JOINT ORIENTATION

●	M-7 //	■	M-8 //
○	M-7 X	□	M-8 X

// = JOINT PLANES
PARALLEL TO FOLIATION

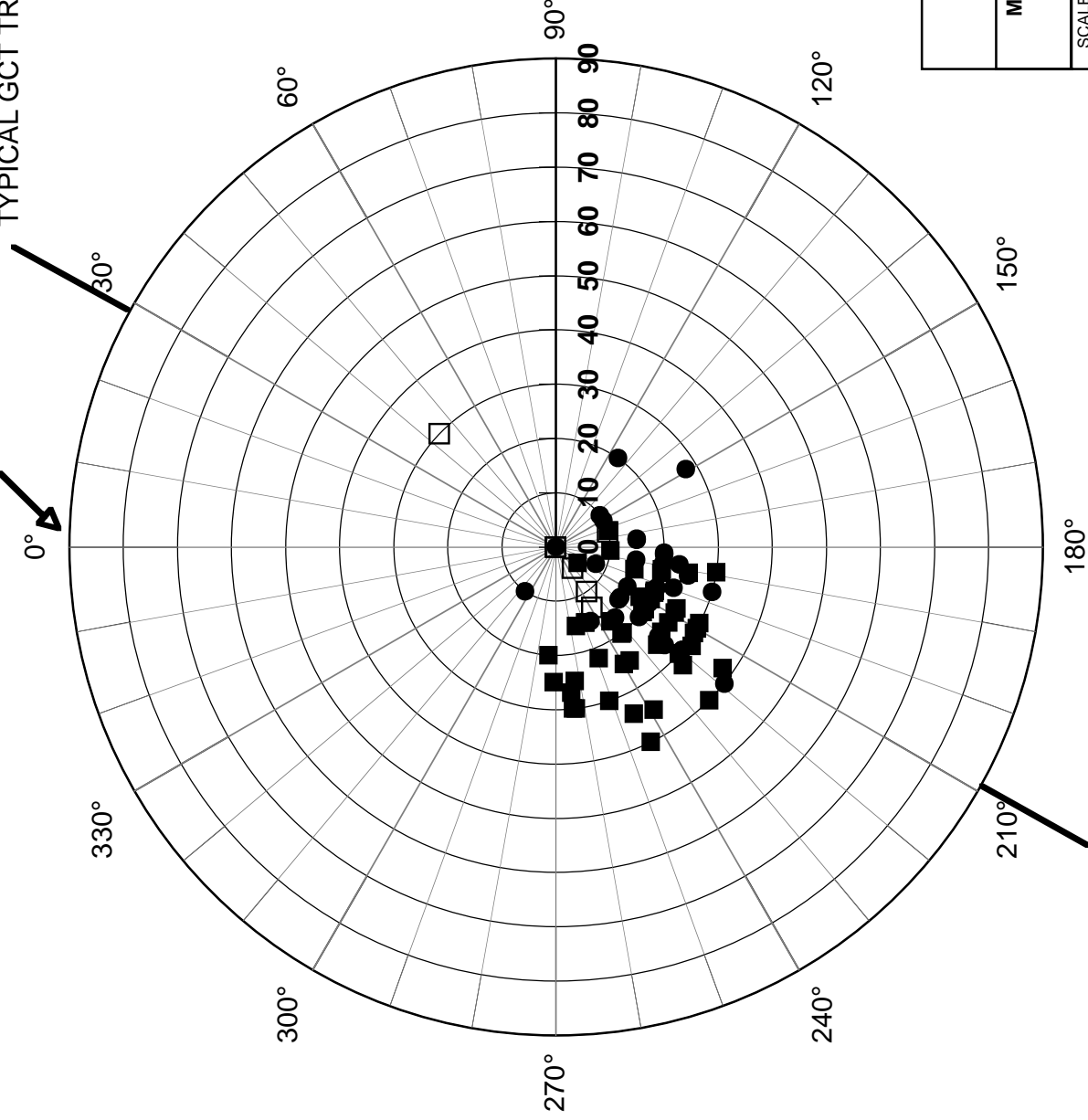
X = JOINT PLANES
CROSSING FOLIATION

ESCALATOR @ 47TH STREET

EAST SIDE ACCESS			
NEW YORK		NY	
MUESER RUTLEDGE CONSULTING ENGINEERS			
225 WEST 34TH STREET, NEW YORK, N.Y. 10122			
SCALE:	MADE BY:	CJM	DATE: 4-30-02
NONE	CH'KD BY:	RG	DATE: 5-2-02
POLAR PLOT OF PLANAR JOINT DISCONTINUITIES		FILE NO. 9171	
		PLATE NO. P-3	

TRUE NORTH

TYPICAL GCT TRACK ORIENTATION



BORING
LEGEND FOR
JOINT ORIENTATION

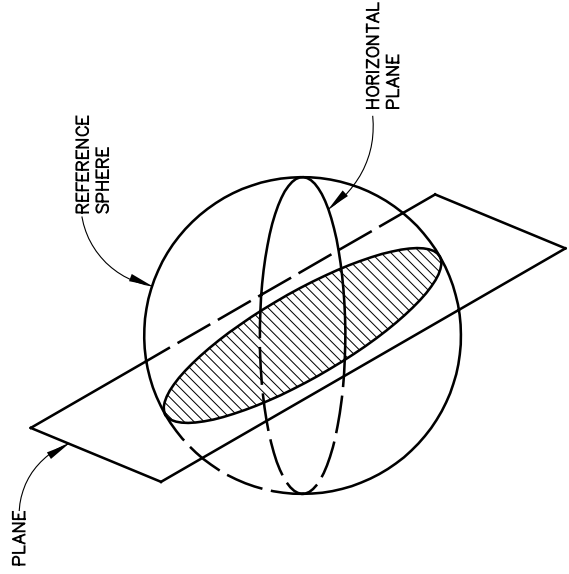
●	M-9 //	■	M-10 //
○	M-9 X	□	M-10 X

// = JOINT PLANES
PARALLEL TO FOLIATION

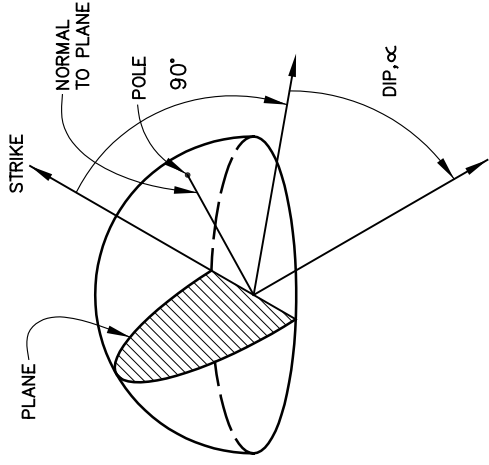
X = JOINT PLANES
CROSSING FOLIATION

ESCALATOR @ 48TH STREET

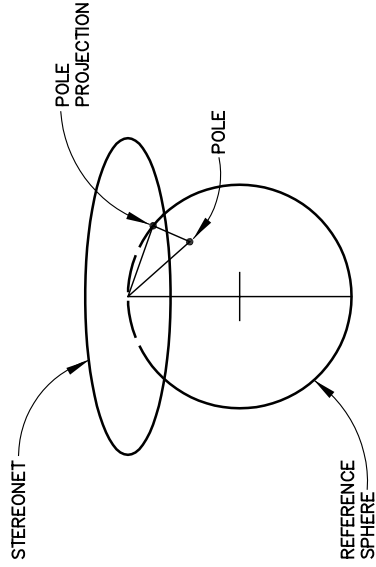
EAST SIDE ACCESS			
NEW YORK		NY	
MUESER RUTLEDGE CONSULTING ENGINEERS			
225 WEST 34TH STREET, NEW YORK, N.Y. 10122			
SCALE: NONE	MADE BY: CJM	DATE: 4-30-02	FILE NO. 9171
	CHK'D BY: RG	DATE: 5-2-02	
POLAR PLOT OF PLANAR JOINT DISCONTINUITIES			PLATE NO. P-4



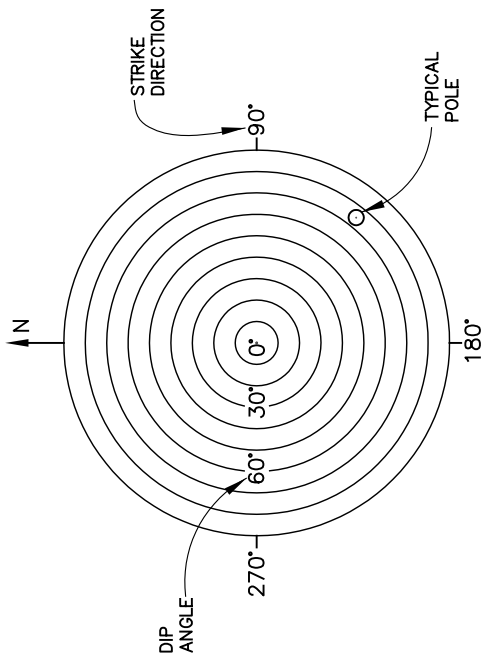
(A) TYPICAL PLANE AND REFERENCE SPHERE



(B) INTERSECTION OF NORMAL TO PLANE AND UPPER HEMISPHERE LOCATES POLE



(C) PROJECTION OF POLE ONTO EQUAL AREA, UPPER HEMISPHERE STEREO NET



(D) TYPICAL EQUAL AREA STEREO NET AND POLE

NOTE:

- FIGURES (A), (B), AND (C) SHOW PROJECTION OF POLE LOCATION ON UPPER HEMISPHERE EQUAL AREA STEREO NET. TYPICAL NET SHOWN IN FIGURE (D) IS GRAPHED TO ALLOW PLOTTING OF POLE PROJECTION DIRECTLY USING STRIKE AND DIP ANGLES.

EAST SIDE ACCESS	
NEW YORK	NEW YORK
MUESER RUTLEDGE CONSULTING ENGINEERS	
225 WEST 34TH STREET, NEW YORK, NY, 10122	
SCALE	MADE BY CJM
NONE	CH'D BY RG
DATE 4-30-02	DATE 5-2-02
FILE NO. 9171	DRAWING NO. RC-2
STEREONET REFERENCE DWG.	

APPENDIX A

MRCE LOGS OF BORINGS NOS. M-1 TO M-10

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: EAST SIDE ACCESS
 LOCATION : GRAND CENTRAL STATION, NEW YORK CITY, NEW YORK

BORING NO. M-7
 SHEET 1 OF 8
 FILE NO. 9171
 SURFACE ELEV. 311.7
 RES. ENGR. SARA MENDES

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING	REMARKS
	NO.	DEPTH	BLOWS/6"				BLOWS	
23:55 03-15-02 Friday	1C	1.0	REC=100%	See attached Rock Core Summary sheet for descriptions.	F		DRILLED	Used regular core barrel for top 6'.
		6.0	RQD=68%				AHEAD	
						3	3"	
						5		
00:50								
22:40 03-18-02 Monday	2OC	6.0	REC=97%				4.5*	*Coring time in minutes per foot.
		16.0	RQD=82%				4.25*	
							4.25*	
						10	4.5*	
							4.5*	
							5.75*	
							5.25*	
							4.5*	
						15	4.25*	
					R		4.0*	At 16', changed scribes, since others not working too well.
	3OC	16.0	REC=100%				4.0*	
		26.0	RQD=89%				3.25*	
							3.75*	
						20	5.0*	
							4.0*	
							4.5*	
							3.75*	
							5.0*	
						25	4.25*	
							3.5*	
							3.75*	
							4.75*	
							3.0*	
						30	3.75*	
							4.5*	End of Boring at 35'.
							2.5*	
							3.0*	
							4.0*	
02:15						35	4.0*	
						40		
						45		
						50		

BORING NO. M-7

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE LOG

PROJECT: EAST SIDE ACCESS
LOCATION : GRAND CENTRAL TERMINAL

BORING NO. M-7
SHEET 2 OF 8
FILE NO. 9171
SURFACE ELEV. 311.7
PREPARED BY CHERYL MOSS

DAILY PROGRESS	CORE			ROCK TYPE	WEATHERING	TEXTURE STRUCTURE	JOINTING			STRATA
	DEPTH	NO.	% REC. RQD.				JOINTS PER FOOT	DIP	CONDITION	
SEE BORING LOG		1C		FILL						
	5.0		100/68	Medium hard gray gneissic schist						
		2OC	97/82	Hard gray gneissic schist, trace pegmatite zones, garnet	Slightly weathered to unweathered	Medium to coarse grained and moderate to well foliated. Foliation dipping 0°-20° to the Southeast to Southwest	1	Mostly // F 0°-20° Southeast to Southwest with occasional joints X F	Joints typically unweathered to slightly weathered with occasional iron staining and mineral coating and are closed and tight to slightly open and slightly loose.	Hartland Formation
							1			
							2			
	10.0						1			
							0			
		0								
		2								
		1								
	15.0	1								
		4								
		0								
		2								
		1								
		1								
	20.0	0								
		2								
		1								
		0								
		2								
		1								
	25.0	0								
		1								
		0								
	0									
	1									
30.0	1									

NOTE

BORING NO. M-7

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE LOG

PROJECT: EAST SIDE ACCESS
LOCATION : GRAND CENTRAL TERMINAL

BORING NO. M-7
SHEET 3 OF 8
FILE NO. 9171
SURFACE ELEV. 311.7
PREPARED BY CHERYL MOSS

DAILY PROGRESS	CORE			ROCK TYPE	WEATHERING	TEXTURE STRUCTURE	JOINTING			STRATA
	DEPTH	NO.	% REC. RQD.				JOINTS PER FOOT	DIP	CONDITION	
SEE BORING LOG	35.0	4OC	99/90				2 2 2 2 2		*1 *2 *3	
	40.0									
	45.0									
	50.0									
	55.0									
	60.0									

NOTE

1. Joint approximately 2/3 open & fairly loose.
2. Joint moderately loose.
3. Joint approximately 1/2 open & moderately loose.

BORING NO. M-7

MUESER RUTLEDGE CONSULTING ENGINEERS ROCK CORE SKETCH

BORING NO. M7
SHEET 4 OF 8
FILE NO. 9171
SURFACE ELEV. 311.7
RES. ENGR. SARA MENDES

PROJECT EAST SIDE ACCESS

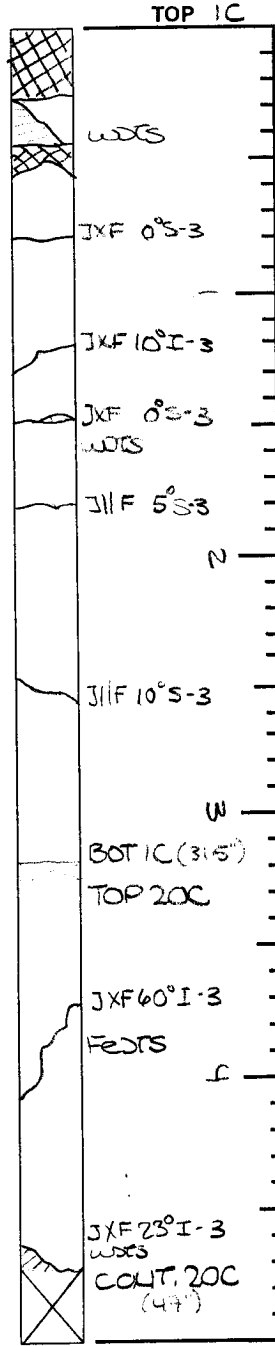
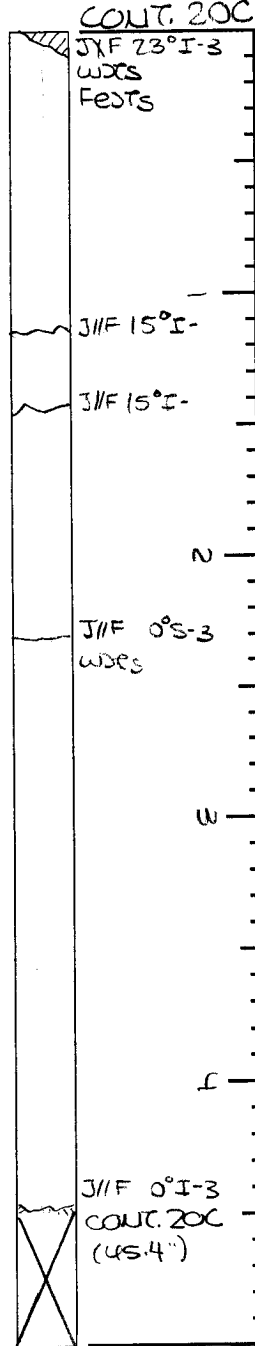
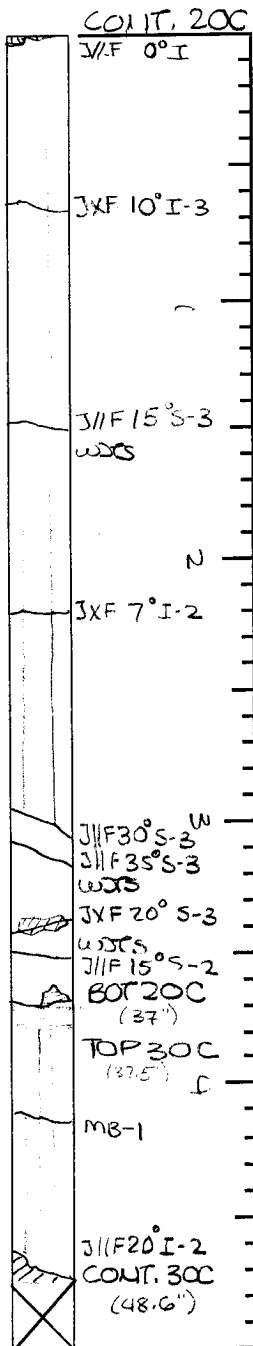
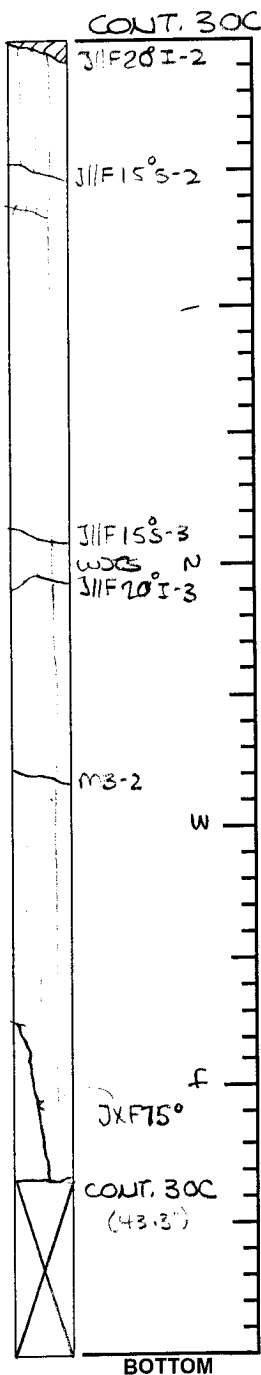
LOCATION GRAND CENTRAL STATION, NYC, NY

Run No.	REC / RQD
30C	100% 88.5%

Run No.	REC / RQD
20C	97% 82%
30C	100% 89%

Run No.	REC / RQD
20C	97% 82%

Run No.	REC / RQD
1C	
20C	97% 82%



ROCK CORE SKETCH LEGEND

JOINTING

- J - Joint
- MB - Mechanical Break
- ° - Angle w/ Horizontal
- // - Parallel
- X - Crossing
- F - Foliation
- S - Stratification
- U - Unfoliated or Unstratified

SURFACE

- C - Curved
- I - Irregular
- S - Straight

CONDITION

- 1 - Slick
- 2 - Smooth
- 3 - Rough

SKETCH SYMBOLS

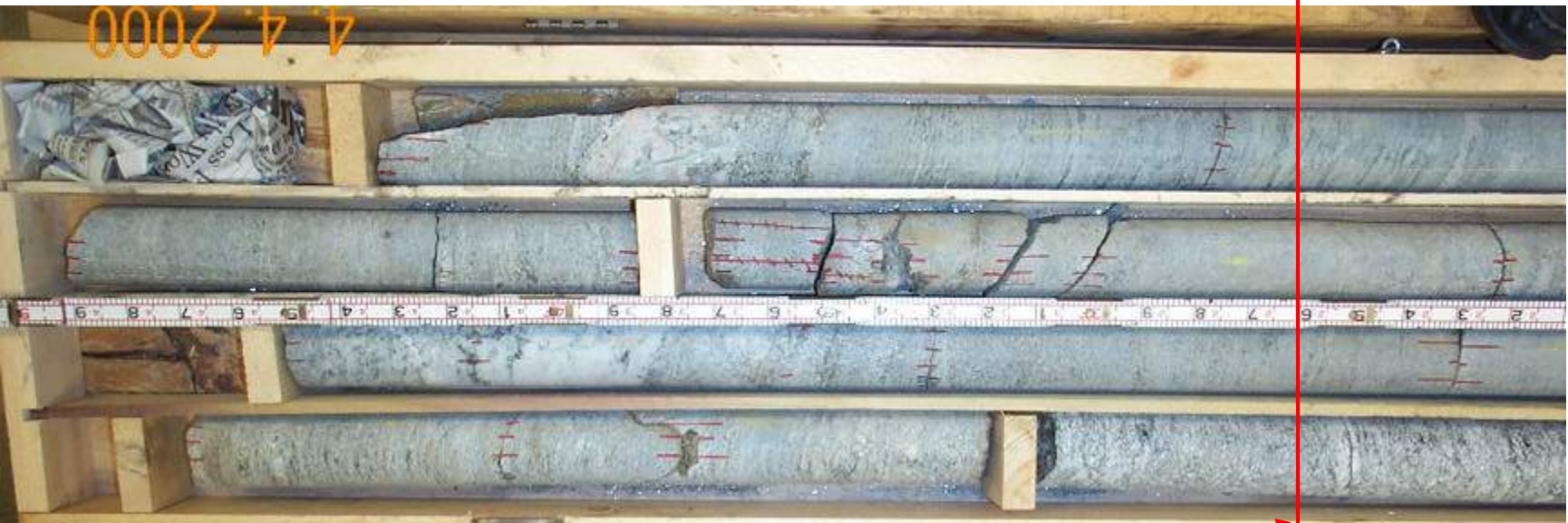
- Joint
- Healed Joint
- Broken
- Part of Core Not Recovered
- Cavities or Vugs in Core
- Clay
- Sand
- Empty Space

NOTES

Top of Box



Bottom of Box



Match Line

East Side Access, New York, NY

Boring No. M-7; Runs 1C, 2 OC and 3 OC Top

Mueser Rutledge Consulting Engineers
225 W. 34th Street · New York, NY 10122

9171

Sheet #5

BORING NO. M7
SHEET 6 OF 8
FILE NO. 9171
SURFACE ELEV. 311.7
RES. ENGR. SARA MENDES

LOCATION GRAND CENTRAL STATION, NYC, NY

Run No.	REC / RQD

Run No.	REC / RQD
40C	99% 90%

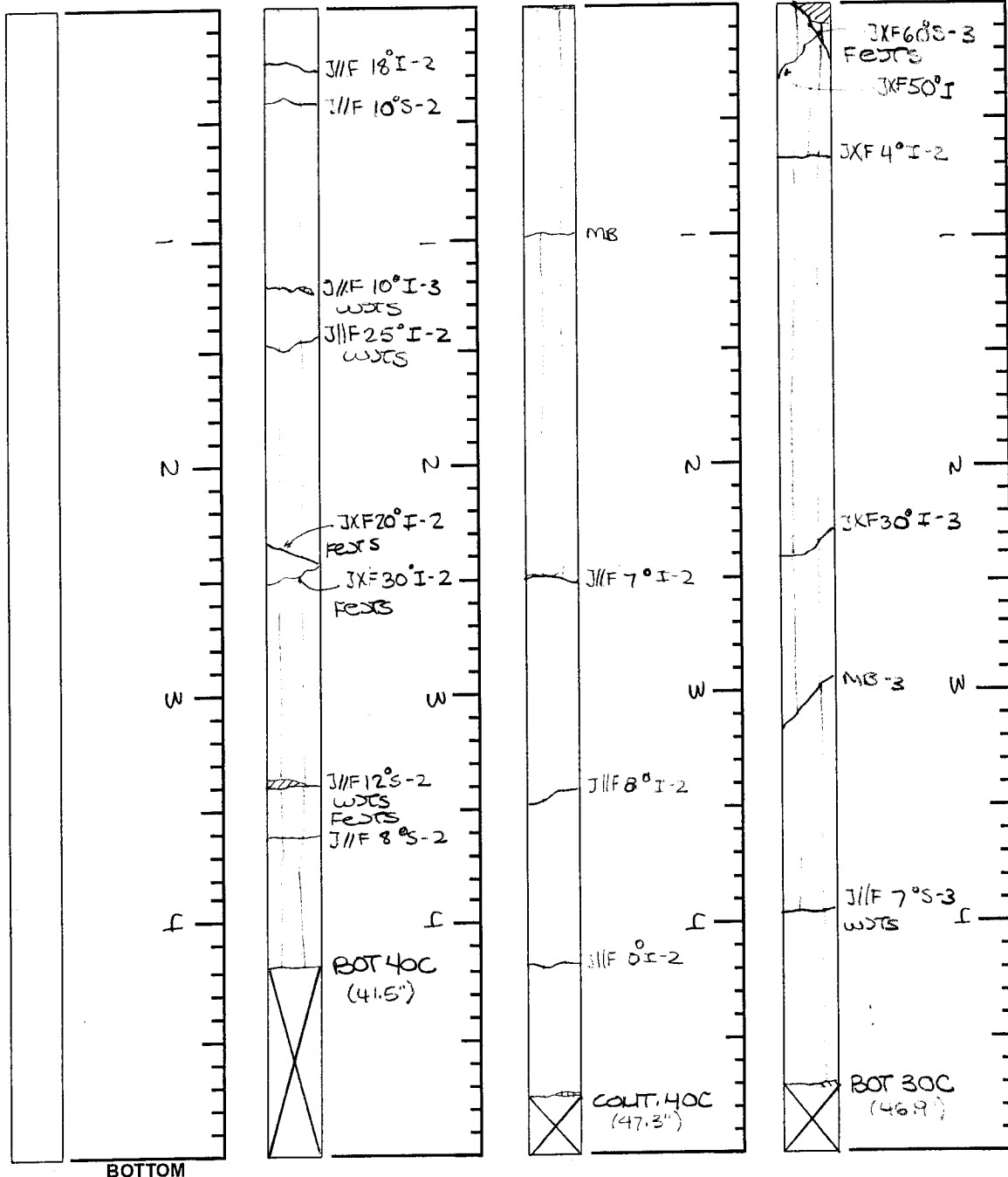
Run No.	REC / RQD
40C	99% $\frac{81}{90}$

Run No.	REC / RQD
300	100% 89%

111

1

CONT. 30C
TOP



SCALE: 1 division = 0.1 feet

	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

NOTES

Top of Box



Bottom of Box



Match Line



East Side Access, New York, NY

Boring No. M-7; Runs 3 OC Bottom and 4 OC

Mueser Rutledge Consulting Engineers
225 W. 34th Street · New York, NY 10122

9171

Sheet #7

MUESER RUTLEDGE CONSULTING ENGINEERS

PROJECT EAST SIDE ACCESS
LOCATION GRAND CENTRAL STATION, NEW YORK CITY, NEW YORK
BORING LOCATION SEE PLAN

BORING NO. M-7
SHEET 8 OF 8
FILE NO. 9171
SURFACE ELEV. 311.7
DATUM NAVD88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG TYPE OF FEED DURING CORING CASING USED ☒ YES ☐ NO
TRUCK ACKER MECHANICAL DIA., IN. 3 DEPTH, FT. FROM 0 TO 5.5
SKID HYDRAULIC X DIA., IN. DEPTH, FT. FROM TO
BARGE OTHER DIA., IN. DEPTH, FT. FROM TO
OTHER

TYPE AND SIZE OF: DRILLING MUD USED ☐ YES ☒ NO
D-SAMPLER DIAMETER OF ROTARY BIT, IN.
U-SAMPLER TYPE OF DRILLING MUD
S-SAMPLER
CORE BARREL NX DOUBLE BARREL
CORE BIT DIAMOND
DRILL RODS NWJ
AUGER USED ☐ YES ☒ NO
TYPE AND DIAMETER, IN.
CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. AVERAGE FALL, IN.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
3-18-02	21:48	6	5.5	4.64	OVER THE WEEKEND - USED WATER LEVEL INDICATOR.
3-19-02	21:00	35	5.5	10.56	OVERNIGHT - USED WATER LEVEL INDICATOR.

PIEZOMETER INSTALLED ☐ YES ☒ NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT. NO. OF 3" SHELBY TUBE SAMPLES
3.5" DIA. U-SAMPLE BORING LIN. FT. NO. OF 3" UNDISTURBED SAMPLES
CORE DRILLING IN ROCK LIN. FT. OTHER:

BORING CONTRACTOR WARREN GEORGE INC.
DRILLER CRAIG HELPERS DENNIS
REMARKS BOREHOLE GROUTED UPON COMPLETION.
RESIDENT ENGINEER SARA MENDES DATE 3-19-02

BORING NO. M-7

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: EAST SIDE ACCESS
 LOCATION : GRAND CENTRAL STATION, NEW YORK CITY, NEW YORK

BORING NO. M-8
 SHEET 1 OF 8
 FILE NO. 9171
 SURFACE ELEV. 312.1
 RES. ENGR. SARA MENDES

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
	NO.	DEPTH	BLOWS/6"					
23:55 03-26-02 Tuesday	1C	1.0		See attached Rock Core Summary sheet for descriptions.	F		DRILLED	Used regular core barrel for top 5'.
		5.0				2.5	3 "	
01:30						5	↓	
20:45	2OC	5.0	REC=100%				3.0*	
03-27-02 Wednesday		15.0	RQD=87%				3.5*	
							4.0*	*Coring time in minutes per foot.
							3.5*	
						10	4.5*	
							3.5*	
							4.0*	
				R			3.5*	Scribes not too noticeable.
							3.75*	
	3OC	15.0	REC=87%			15	4.25*	
		20.0	RQD=75%				5.0*	Changed scribes.
							4.0*	
							5.0*	
							4.75*	
						20	4.5*	
	4OC	20.0	REC=100%				5.25*	
		25.0	RQD=92%				3.75*	
							4.75*	
							4.5*	
						25	4.5*	
	5OC	25.0	REC=100%				3.25*	
		35.0	RQD=100%				3.75*	
							3.25*	
							3.5*	
						30	3.25*	
							3.75*	End of Boring at 35'.
							3.75*	
							4.0*	
							4.25*	
00:10						35	3.75*	
						40		
						45		
						50		

BORING NO. M-8

BORING NO.	M-8
SHEET 2 OF	8
FILE NO.	9171
SURFACE ELEV.	312.1
PREPARED BY	CHERYL MOSS

BORING NO.	M-8
SHEET 2 OF	8
FILE NO.	9171
SURFACE ELEV.	312.1
PREPARED BY	CHERYL MOSS

DAILY PROGRESS	CORE			ROCK TYPE	WEATHERING	TEXTURE STRUCTURE	JOINTING			STRATA	
	DEPTH	NO.	% REC. RQD.				JOINTS PER FOOT	DIP	CONDITION		
SEE BORING LOG		1C		FILL							
	5.0			Hard gray gneissic schist, trace pegmatite zones, garnet	SIW	Medium to coarse grained and moderate to well foliated. Foliation dipping 25°-45° to the South-Southeast to Southwest		Mostly // F 25°-45° to the South-Southeast to Southwest with occasional joints X F	Joints typically unweathered to slightly weathered with occasional iron staining and mineral coating and are closed and tight fitting to slightly open and slightly loose fitting	*1	
			Slightly weathered to unweathered								
	10.0	2OC			100/87						1
							3				
							0				
					1						
				2							
				1							
				0							
	15.0				0						
					2						
					0						
					3						
					0						
	20.0	3OC	87/75	Medium hard gray gneissic schist, trace pegmatite zones, garnet		1					
				1							
				3							
				0							
				1							
				1							
25.0	4OC	100/92	Hard gray gneissic schist, trace pegmatite zones, garnet	Unweathered							
						0					
						1					
						1					
					0						
					0						
					0						
					0						
30.0	5OC	100/100			0						

1. Joint approximately 1/3 open & fairly loose.
2. Joint moderately open & loose.

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE LOG

PROJECT: EAST SIDE ACCESS
LOCATION : GRAND CENTRAL TERMINAL

BORING NO. M-8
SHEET 3 OF 8
FILE NO. 9171
SURFACE ELEV. 312.1
PREPARED BY CHERYL MOSS

DAILY PROGRESS	CORE			ROCK TYPE	WEATHERING	TEXTURE STRUCTURE	JOINTING			STRATA
	DEPTH	NO.	% REC. RQD.				JOINTS PER FOOT	DIP	CONDITION	
SEE BORING LOG	35.0	50C	100/100				0 0 0 0 1			
	40.0									
	45.0									
	50.0									
	55.0									
	60.0									

NOTE

BORING NO. M-8

MUESER RUTLEDGE CONSULTING ENGINEERS ROCK CORE SKETCH

BORING NO. M9
SHEET 4 OF 8
FILE NO. 9171
SURFACE ELEV. 311.7
RES. ENGR. SARA MENDES

PROJECT EAST SIDE ACCESS

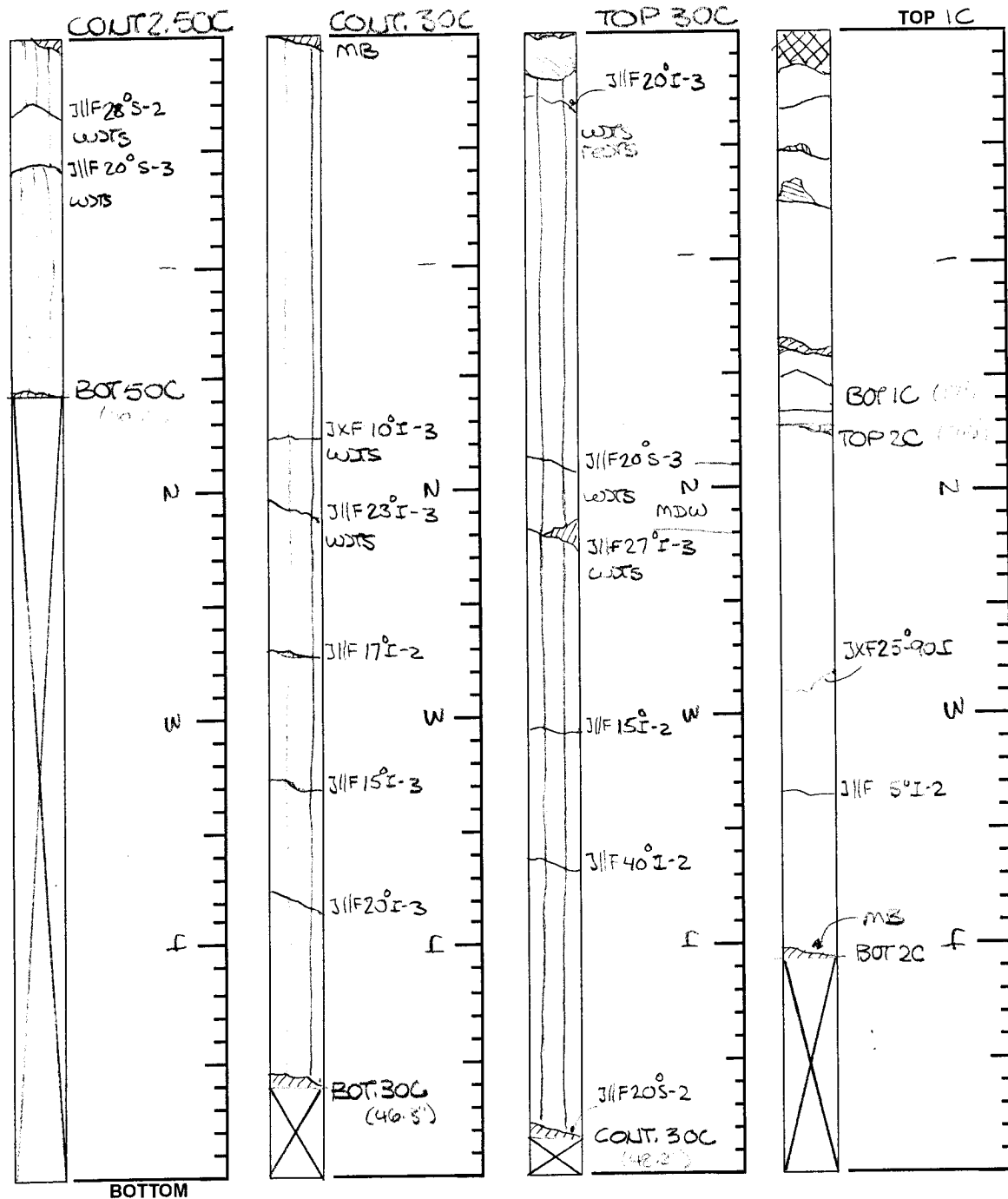
LOCATION GRAND CENTRAL STATION, NYC, NY

Run No.	REC / RQD
50C	100% 85%

Run No.	REC / RQD
30C	95% 86%

Run No.	REC / RQD
30C	95% 81%

Run No.	REC / RQD
1C	100% 30%
2C	100% 85%



ROCK CORE SKETCH LEGEND

JOINTING

- J - Joint
- MB - Mechanical Break
- Ǝ - Angle w/ Horizontal
- // - Parallel
- X - Crossing
- F - Foliation
- S - Stratification
- U - Unfoliated or Unstratified

SURFACE

- C - Curved
- I - Irregular
- S - Straight

CONDITION

- 1 - Slick
- 2 - Smooth
- 3 - Rough

SKETCH SYMBOLS

- Joint
- Healed Joint
- Broken
- Part of Core Not Recovered
- Cavities or Vugs in Core
- Clay
- Sand
- Empty Space

NOTES

Top of Box



Bottom of Box



Match Line

East Side Access, New York, NY

Boring No. M-8; Runs 1C, 2 OC and 3 OC

Mueser Rutledge Consulting Engineers
225 W. 34th Street · New York, NY 10122

9171

Sheet #5

MUESER RUTLEDGE CONSULTING ENGINEERS ROCK CORE SKETCH

BORING NO. M8
SHEET 6 OF 8
FILE NO. 9171
SURFACE ELEV. 312.1
RES. ENGR. SARA MENDES

PROJECT EAST SIDE ACCESS

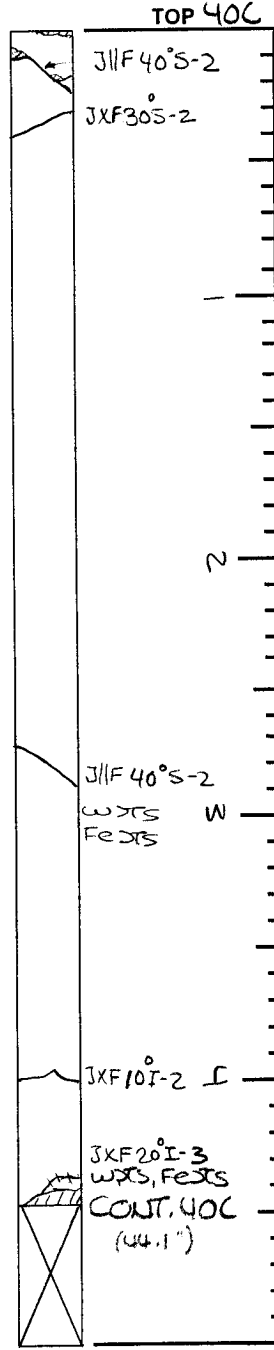
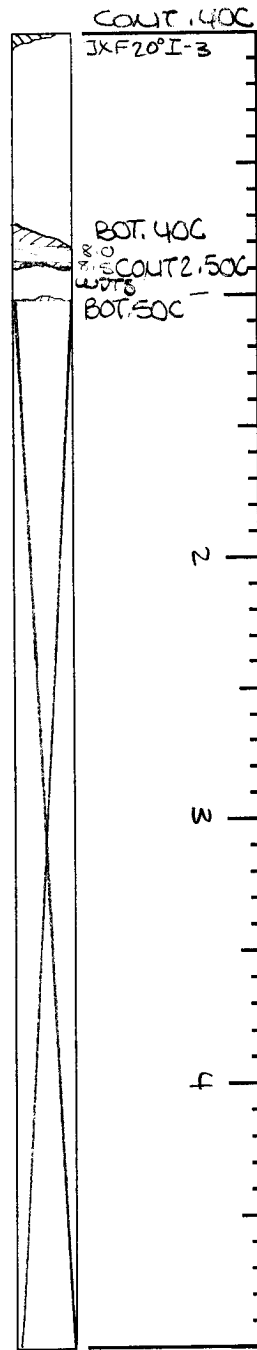
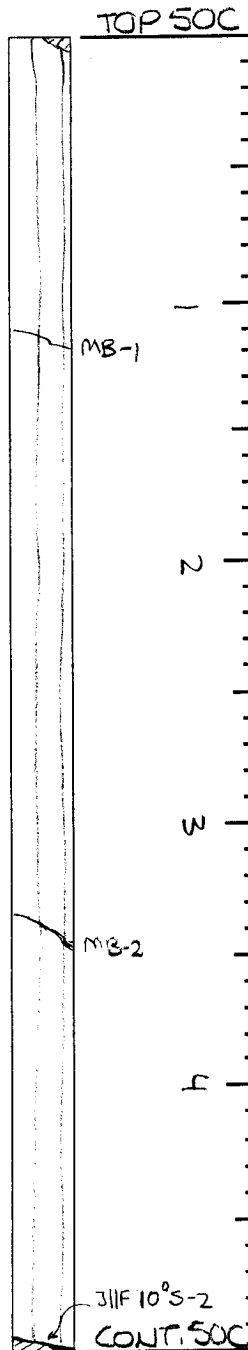
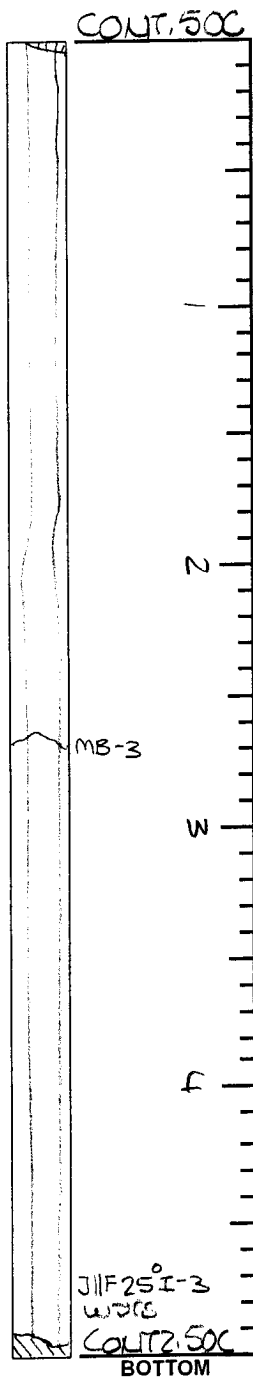
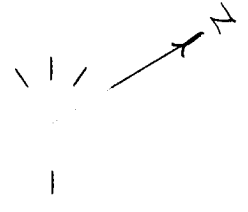
LOCATION GRAND CENTRAL STATION, NYC, NY

Run No.	REC / RQD
50C	100% 100%

Run No.	REC / RQD
50C	100% 100%

Run No.	REC / RQD
40C	100%
50C	100%

Run No.	REC / RQD
40C	100% 92% $\frac{46}{50}$



ROCK CORE SKETCH LEGEND	
JOINTING	
J	- Joint
MB	- Mechanical Break
∠	- Angle w/ Horizontal
//	- Parallel
X	- Crossing
F	- Foliation
S	- Stratification
U	- Unfoliated or Unstratified
SURFACE	
C	- Curved
I	- Irregular
S	- Straight
CONDITION	
1	- Slick
2	- Smooth
3	- Rough
SKETCH SYMBOLS	
	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

SCALE: 1 division = 0.1 feet

NOTES

Top of Box



Bottom of Box



Match Line



East Side Access, New York, NY

Boring No. M-8; Runs 4 OC and 5 OC

Mueser Rutledge Consulting Engineers
225 W. 34th Street · New York, NY 10122

9171

Sheet #7

MUESER RUTLEDGE CONSULTING ENGINEERS

PROJECT EAST SIDE ACCESS
LOCATION GRAND CENTRAL STATION, NEW YORK CITY, NEW YORK
BORING LOCATION SEE PLAN

BORING NO. M-8
SHEET 8 **OF** 8
FILE NO. 9171
SURFACE ELEV. 312.1
DATUM NAVD88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED DURING CORING	CASING USED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
TRUCK <u>ACKER</u>	MECHANICAL <u> </u>	DIA., IN. <u>3</u>	DEPTH, FT. FROM <u>0</u> TO <u>4.5</u>
SKID <u> </u>	HYDRAULIC <u>X</u>	DIA., IN. <u> </u>	DEPTH, FT. FROM <u> </u> TO <u> </u>
BARGE <u> </u>	OTHER <u> </u>	DIA., IN. <u> </u>	DEPTH, FT. FROM <u> </u> TO <u> </u>
OTHER <u> </u>			

TYPE AND SIZE OF:	DRILLING MUD USED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
D-SAMPLER <u> </u>	DIAMETER OF ROTARY BIT, IN. <u> </u>
U-SAMPLER <u> </u>	TYPE OF DRILLING MUD <u> </u>
S-SAMPLER <u> </u>	
CORE BARREL <u>NX DOUBLE BARREL</u>	AUGER USED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
CORE BIT <u>DIAMOND</u>	TYPE AND DIAMETER, IN. <u> </u>
DRILL RODS <u>NWJ</u>	
	CASING HAMMER, LBS. <u> </u> AVERAGE FALL, IN. <u> </u>
	SAMPLER HAMMER, LBS. <u> </u> AVERAGE FALL, IN. <u> </u>

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
3-27-02	20:35	5	4.5	4.5	OVERNIGHT - USED SURVEYOR'S TAPE.
3-27-02	00:10	35	4.5	5.5	UPON COMPLETION OF BOREHOLE - USED SURVEYOR'S TAPE.

PIEZOMETER INSTALLED ☐ YES ☒ NO **SKETCH SHOWN ON**

STANDPIPE:	TYPE <u> </u>	ID, IN. <u> </u>	LENGTH, FT. <u> </u>	TOP ELEV. <u> </u>
INTAKE ELEMENT:	TYPE <u> </u>	OD, IN. <u> </u>	LENGTH, FT. <u> </u>	TIP ELEV. <u> </u>
FILTER:	MATERIAL <u> </u>	OD, IN. <u> </u>	LENGTH, FT. <u> </u>	BOT. ELEV. <u> </u>

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT. <u> </u>	NO. OF 3" SHELBY TUBE SAMPLES <u> </u>	
3.5" DIA. U-SAMPLE BORING	LIN. FT. <u> </u>	NO. OF 3" UNDISTURBED SAMPLES <u> </u>	
CORE DRILLING IN ROCK	LIN. FT. <u> </u>	OTHER: <u> </u>	

BORING CONTRACTOR WARREN GEORGE INC.
DRILLER CRAIG HELPERS DENNIS
REMARKS BOREHOLE GROUTED UPON COMPLETION.
RESIDENT ENGINEER SARA MENDES **DATE** 3-27-02

BORING NO. M-8

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: EAST SIDE ACCESS
 LOCATION : GRAND CENTRAL STATION, NEW YORK CITY, NEW YORK

BORING NO. M-9
 SHEET 1 OF 8
 FILE NO. 9171
 SURFACE ELEV. 311.7
 RES. ENGR. SARA MENDES

DAILY	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING	REMARKS
PROGRESS	NO.	DEPTH	BLOWS/6"				BLOWS	
03-20-02	1C	1.0	REC=100%	See attached Rock Core Summary sheet for descriptions.	F		DRILLED	Used regular core barrel for top 7'.
Wednesday		5.0	RQD=30%				AHEAD	
						3 "		
					3.5	↓		
					5			
00:20	2C	5.0	REC=100%		R			
		7.0	RQD=85%					
20:40	3OC	7.0	REC=95%				*	*Coring time in minutes per foot. Coring time from 7' to 12' approximately 4 to 5 minutes per foot.
03-21-02		17.0	RQD=86%				*	
						10	*	
							*	
							*	
							3.0*	
							3.0*	
						15	3.0*	
							3.75*	
							3.25*	
	4OC	17.0	REC=100%				4.25*	
		27.0	RQD=87%				3.75*	
						20	4.0*	
							3.75*	
							3.75*	
							4.0*	
							3.75*	
				25		3.25*		
						3.5*		
						4.5*		
						11.75*	Driller fixed rig at 29'.	
	5OC	27.0	REC=100%			11.5*		
		37.0	RQD=85%	30	4.25*			
					4.25*			
					4.0*			
					3.25*			
					3.75*			
				35	3.25*			
					4.25*	End of Boring at 37'.		
01:00				37	6.25*			

BORING NO. M-9

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE LOG

PROJECT: EAST SIDE ACCESS
LOCATION : GRAND CENTRAL TERMINAL

BORING NO. M-9
SHEET 2 OF 8
FILE NO. 9171
SURFACE ELEV. 311.7
PREPARED BY CHERYL MOSS

DAILY PROGRESS	CORE			ROCK TYPE	WEATHERING	TEXTURE STRUCTURE	JOINTING			STRATA
	DEPTH	NO.	% REC. RQD.				JOINTS PER FOOT	DIP	CONDITION	
SEE BORING LOG				FILL						
	5.0	1C	100/30	Hard gray gneissic schist, trace pegmatite zones, garnet	Unweathered	Medium to coarse grained and moderate to well foliated. Foliation dipping 15°-30° to the South-Southeast to Southwest	1 1 1 2 1 0 2 1 2 0 0 1 1 1 2 1 1 2 2	// F mostly 15°-30° to the South-Southeast to Southwest	Joints typically unweathered to very slightly weathered with little or no iron staining and are closed and tight to slightly open and slightly loose <	

NOTE

1. Joints approximately 1/2-2/3 open & fairly loose.
2. Joints approximately 1/4 open & moderately loose.

BORING NO. M-9

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE LOG

PROJECT: EAST SIDE ACCESS
LOCATION : GRAND CENTRAL TERMINAL

BORING NO. M-9
SHEET 3 OF 8
FILE NO. 9171
SURFACE ELEV. 311.7
PREPARED BY CHERYL MOSS

DAILY PROGRESS	CORE			ROCK TYPE	WEATHERING	TEXTURE STRUCTURE	JOINTING			STRATA
	DEPTH	NO.	% REC. RQD.				JOINTS PER FOOT	DIP	CONDITION	
SEE BORING LOG	35.0	50C	100/85				1 1 0 1 0 2 1			
	40.0									
	45.0									
	50.0									
	55.0									
	60.0									

NOTE

BORING NO. M-9

MUESER RUTLEDGE CONSULTING ENGINEERS ROCK CORE SKETCH

BORING NO. M9
SHEET 4 OF 8
FILE NO. 9171
SURFACE ELEV. 311.7
RES. ENGR. SARA MENDES

PROJECT EAST SIDE ACCESS

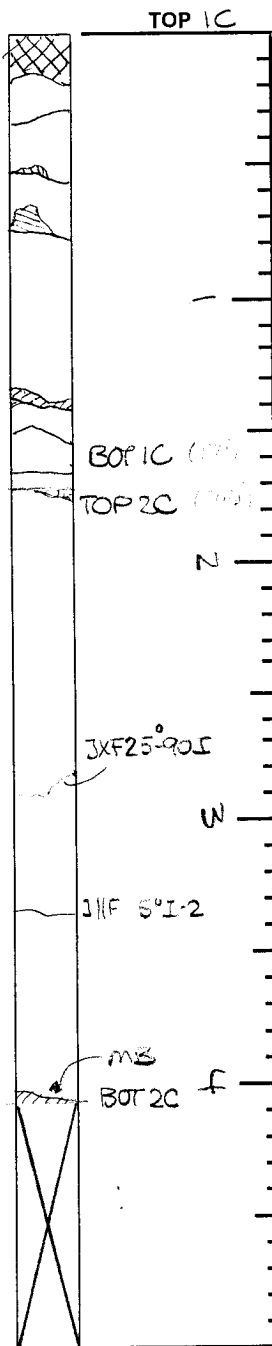
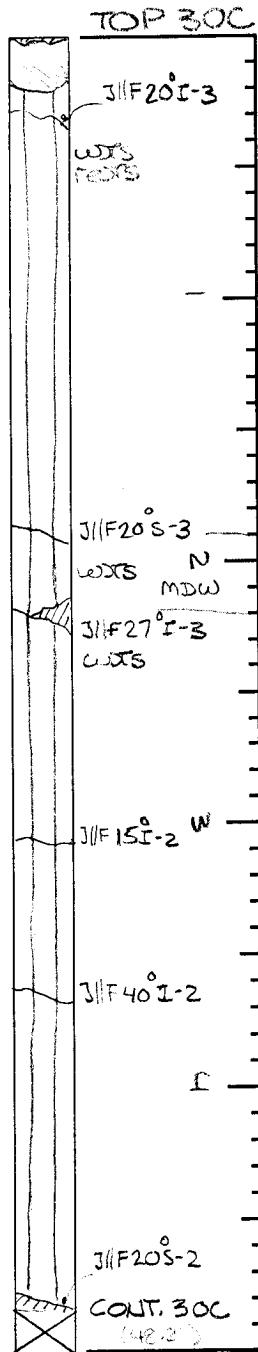
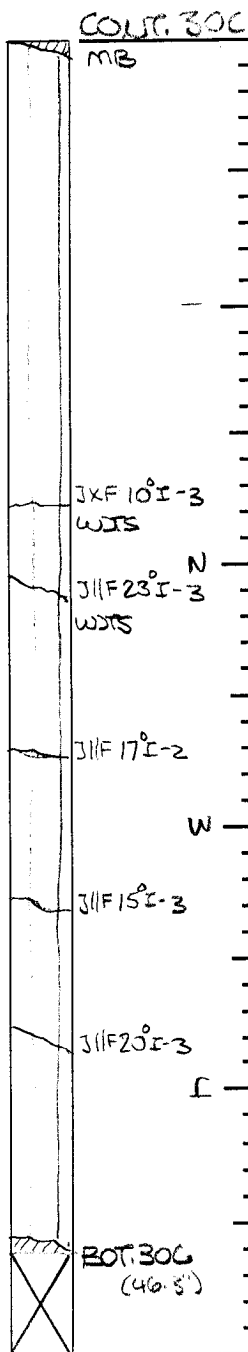
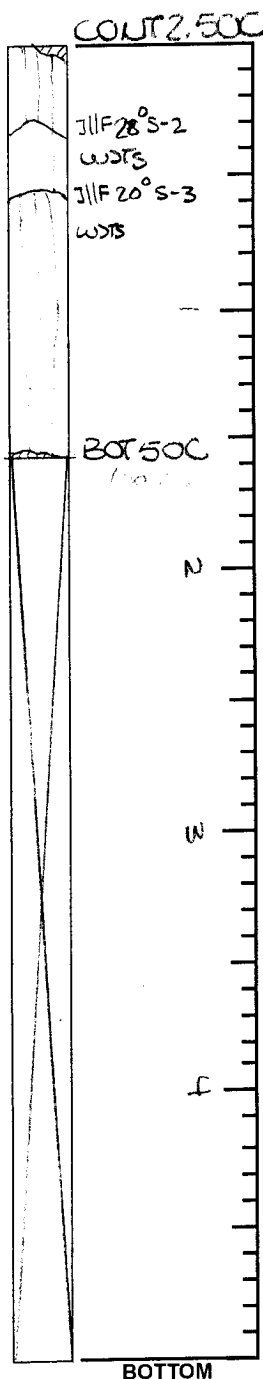
LOCATION GRAND CENTRAL STATION, NYC, NY

Run No.	REC / RQD
50C	100% 85%

Run No.	REC / RQD
30C	95% 86%

Run No.	REC / RQD
30C	95% 81%

Run No.	REC / RQD
1C	100% 30%
2C	100% 85%



ROCK CORE SKETCH LEGEND	
JOINTING	
J	- Joint
MB	- Mechanical Break
Ǝ	- Angle w/ Horizontal
//	- Parallel
X	- Crossing
F	- Foliation
S	- Stratification
U	- Unfoliated or Unstratified
SURFACE	
C	- Curved
I	- Irregular
S	- Straight
CONDITION	
1	- Slick
2	- Smooth
3	- Rough
SKETCH SYMBOLS	
	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

SCALE: 1 division = 0.1 feet

NOTES

Top of Box



Bottom of Box



Match Line



East Side Access, New York, NY

Boring No. M-9; Runs 1C, 2C, 3 OC and 5 OC Bottom

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9171

Sheet #5

MUESER RUTLEDGE CONSULTING ENGINEERS ROCK CORE SKETCH

BORING NO. M9
SHEET 6 OF 8
FILE NO. 9171
SURFACE ELEV. 311.7
RES. ENGR. SARA MENDES

PROJECT EAST SIDE ACCESS

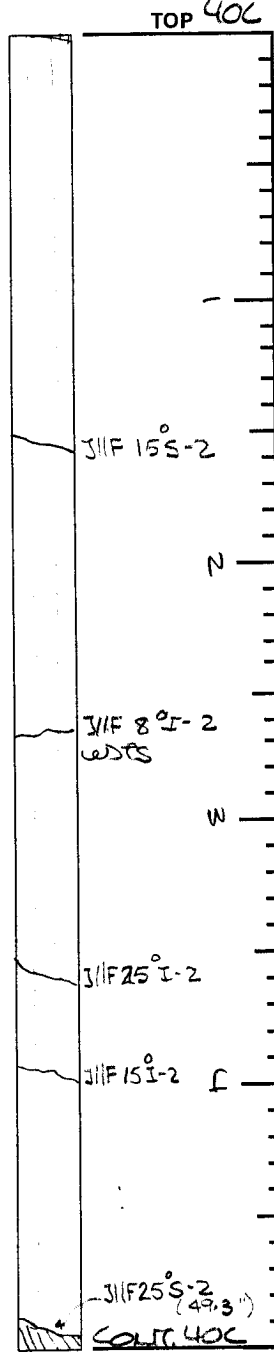
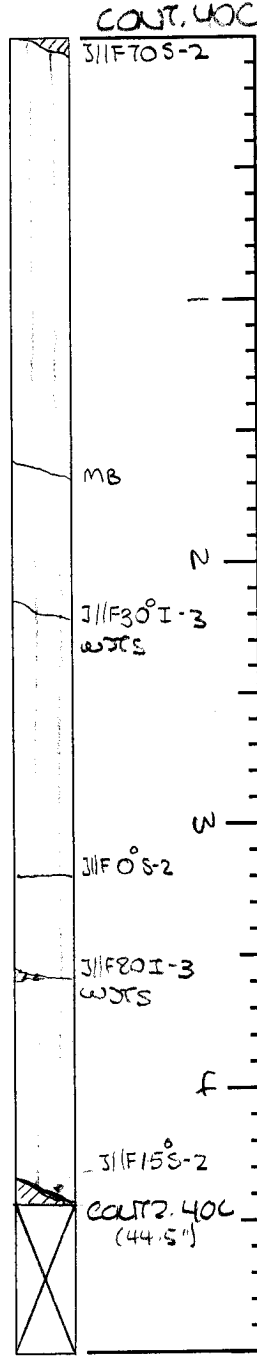
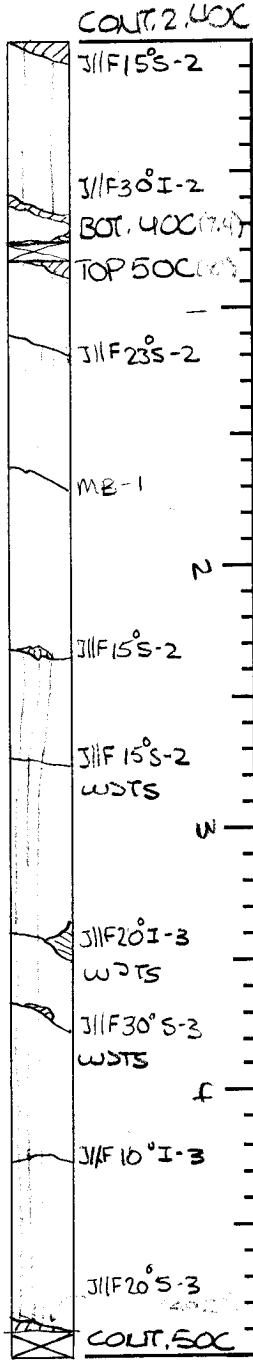
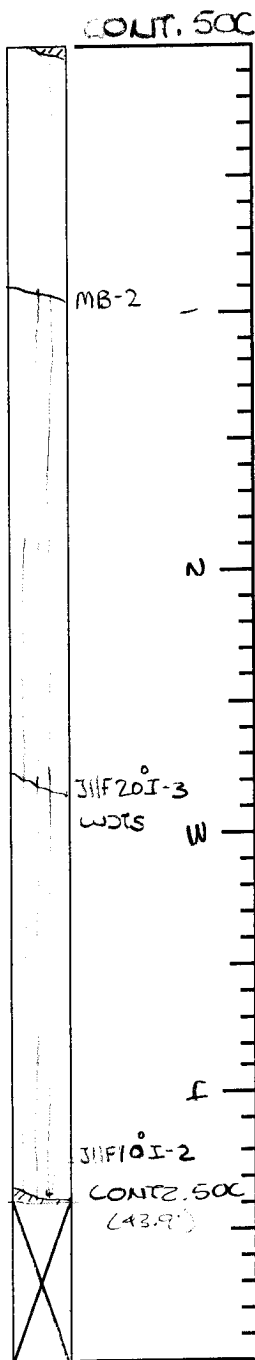
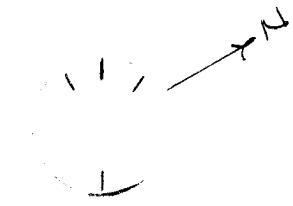
LOCATION GRAND CENTRAL STATION, NYC, NY

Run No.	REC / RQD
50C	100% 85%

Run No.	REC / RQD
40C	100%
50C	100% 85%

Run No.	REC / RQD
40C	100% 87%

Run No.	REC / RQD
40C	100% 87 100



ROCK CORE SKETCH LEGEND	
JOINTING	
J	- Joint
MB	- Mechanical Break
Ǝ	- Angle w/ Horizontal
//	- Parallel
X	- Crossing
F	- Foliation
S	- Stratification
U	- Unfoliated or Unstratified
SURFACE	
C	- Curved
I	- Irregular
S	- Straight
CONDITION	
1	- Slick
2	- Smooth
3	- Rough
SKETCH SYMBOLS	
	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

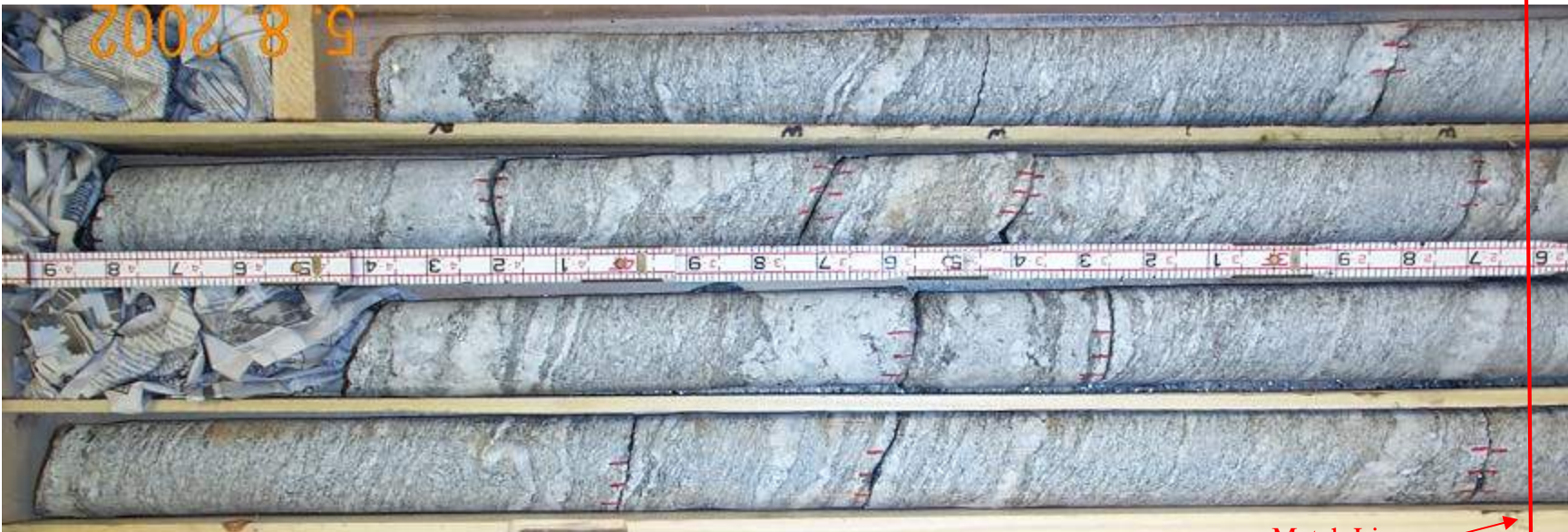
SCALE: 1 division = 0.1 feet

NOTES

Top of Box



Bottom of Box



Match Line

East Side Access, New York, NY

Boring No. M-9; Runs 4 OC and 5 OC Top

Mueser Rutledge Consulting Engineers
225 W. 34th Street · New York, NY 10122

9171

Sheet #7

MUESER RUTLEDGE CONSULTING ENGINEERS

PROJECT EAST SIDE ACCESS
LOCATION GRAND CENTRAL STATION, NEW YORK CITY, NEW YORK
BORING LOCATION SEE PLAN

BORING NO. M-9
SHEET 8 **OF** 8
FILE NO. 9171
SURFACE ELEV. 311.7
DATUM NAVD88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG TRUCK ACKER TYPE OF FEED DURING CORING MECHANICAL CASING USED ☒ YES ☐ NO
DEPTH, FT. FROM 0 TO 4.5
SKID HYDRAULIC ☒ DIA., IN. 3 DEPTH, FT. FROM TO
BARGE OTHER DIA., IN. DEPTH, FT. FROM TO
OTHER

TYPE AND SIZE OF: D-SAMPLER DRILLING MUD USED ☐ YES ☒ NO
U-SAMPLER DIAMETER OF ROTARY BIT, IN.
S-SAMPLER TYPE OF DRILLING MUD
CORE BARREL NX DOUBLE BARREL AUGER USED ☐ YES ☒ NO
CORE BIT DIAMOND TYPE AND DIAMETER, IN.
DRILL RODS NWJ
CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. AVERAGE FALL, IN.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
3-22-02	00:20	37	5	5.5	UPON COMPLETION OF BOREHOLE.

PIEZOMETER INSTALLED ☐ YES ☒ NO **SKETCH SHOWN ON**

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT. NO. OF 3" SHELBY TUBE SAMPLES
3.5" DIA. U-SAMPLE BORING LIN. FT. NO. OF 3" UNDISTURBED SAMPLES
CORE DRILLING IN ROCK LIN. FT. OTHER:

BORING CONTRACTOR WARREN GEORGE INC.
DRILLER CRAIG HELPERS DENNIS
REMARKS BOREHOLE GROUTED UPON COMPLETION.
RESIDENT ENGINEER SARA MENDES **DATE** 3-22-02

BORING NO. M-9

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: EAST SIDE ACCESS
 LOCATION : GRAND CENTRAL STATION, NEW YORK CITY, NEW YORK

BORING NO. M-10
 SHEET 1 OF 8
 FILE NO. 9171
 SURFACE ELEV. 311.9
 RES. ENGR. SARA MENDES

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING	REMARKS
	NO.	DEPTH	BLOWS/6"				BLOWS	
21:10 03-22-02 Friday	1C	1.0		See attached Rock Core Summary sheet for descriptions.	F		DRILLED	Used regular core barrel for top 5'. *Coring time in minutes per foot.
		5.0					AHEAD	
						2.5	3"	
						5		
	2OC	5.0	REC=100%				6.0*	
		15.0	RQD=65%				5.75*	
							7.25*	
							7.5*	
						10	6.0*	
							4.25*	
					R		4.5*	
							5.0*	
							4.5*	
	3OC	15.0	REC=100%			15	3.75*	
		25.0	RQD=72%				3.5*	
							3.25*	
							3.25*	
							3.75*	
						20	3.25*	
							4.5*	
							3.0*	
							3.25*	
							3.0*	
01:10						25	3.5*	
21:20 03-26-02 Tuesday	4OC	25.0	REC=100%				5.75*	Scribes not good; can barely make out marks.
		35.0	RQD=86%				5.25*	
							4.25*	
							5.75*	
						30	5.25*	
							4.75*	End of Boring at 35'.
							4.5*	
							4.75*	
							4.25*	
23:25						35	4.75*	
						40		
						45		
						50		

BORING NO. M-10

BORING NO.	M-10
SHEET 2 OF	8
FILE NO.	9171
SURFACE ELEV.	311.9
PREPARED BY	CHERYL MOSS

BORING NO.	M-10
SHEET 2 OF	8
FILE NO.	9171
SURFACE ELEV.	311.9
PREPARED BY	CHERYL MOSS

DAILY PROGRESS	CORE			ROCK TYPE	WEATHERING	TEXTURE STRUCTURE	JOINTING			STRATA
	DEPTH	NO.	% REC. RQD.				JOINTS PER FOOT	DIP	CONDITION	
SEE BORING LOG		1C		FILL						
	5.0	2OC	100/65	Medium hard gray gneissic schist, trace pegmatite zones, garnet	Unweathered	Medium to coarse grained and moderate to well foliated. Foliation dipping 15°-30° to the South to West	Broken	Joints mostly // F dipping 15°-30° to the South to West with occasional joints X F dipping 0°-10°	Joints are slightly to moderately open and slightly to moderately loose fitting	Hartland Formation
							5			
	10.0						3			
							2			
							3			
							0			
							1			
							1			
							1			
							0			
	15.0						1			
							1			
							1			
							1			
							3			
							Broken			
	20.0	3OC	100/72	Medium hard- hard gray gneissic schist, trace pegmatite zones, garnet	Slightly weathered to unweathered		2			
							1			
					2					
					3					
25.0					1					
					1					
					0					
					1					
30.0	4OC	100/86	Hard gray gneissic schist, trace pegmatite zones, garnet	Unweathered	2					

1. Joint open & loose.
2. Joints moderately open & moderately loose.

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE LOG

PROJECT: EAST SIDE ACCESS
LOCATION : GRAND CENTRAL TERMINAL

BORING NO. M-10
SHEET 3 OF 8
FILE NO. 9171
SURFACE ELEV. 311.9
PREPARED BY CHERYL MOSS

DAILY PROGRESS	CORE			ROCK TYPE	WEATHERING	TEXTURE STRUCTURE	JOINTING			STRATA
	DEPTH	NO.	% REC. RQD.				JOINTS PER FOOT	DIP	CONDITION	
SEE BORING LOG	35.0	40C	100/86				0 1 2 5 1			
	40.0									
	45.0									
	50.0									
	55.0									
	60.0									

NOTE

BORING NO. M-10

MUESER RUTLEDGE CONSULTING ENGINEERS ROCK CORE SKETCH

BORING NO. M10
SHEET 4 OF 8
FILE NO. 9171
SURFACE ELEV. 311.9
RES. ENGR. SARA MENDES

PROJECT EAST SIDE ACCESS

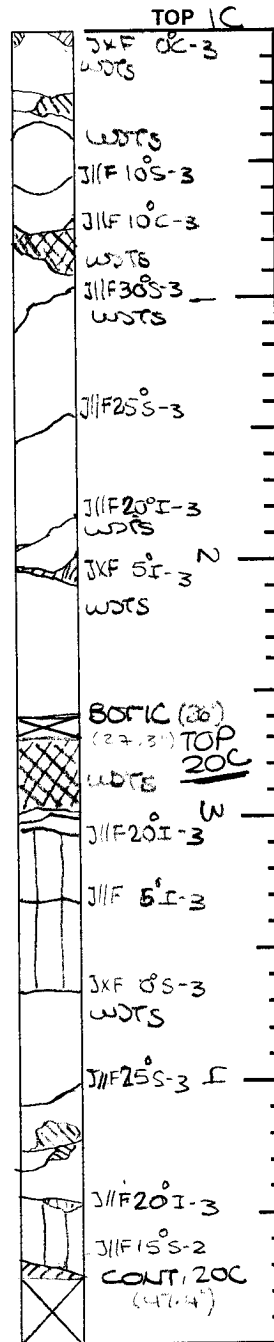
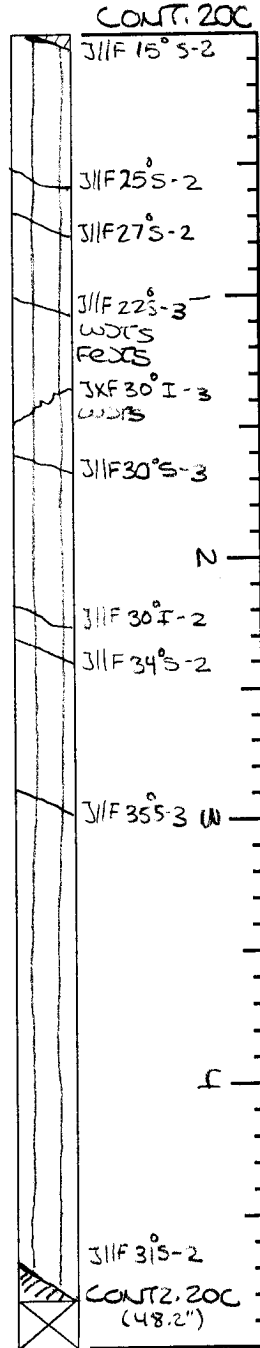
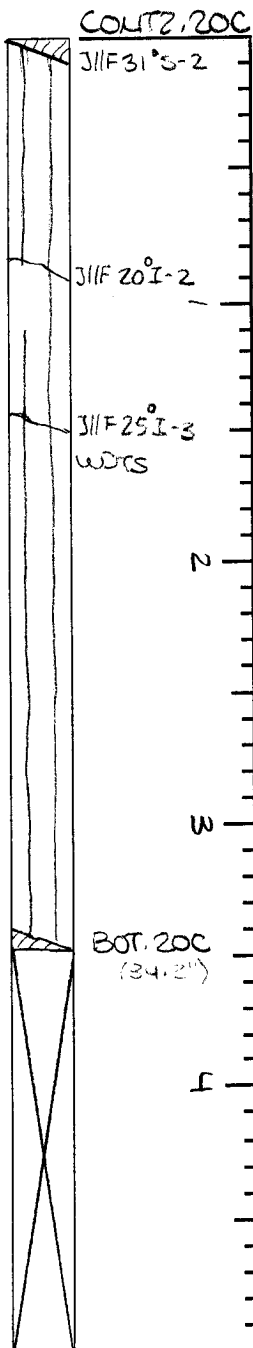
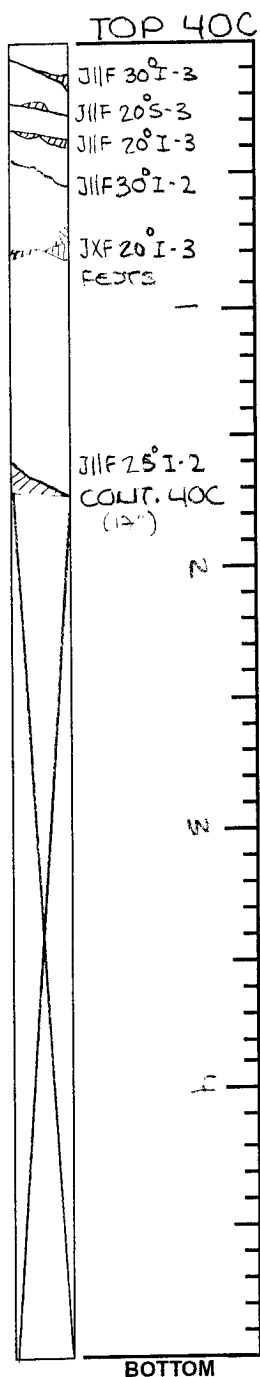
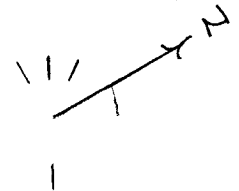
LOCATION GRAND CENTRAL STATION, NYC, NY

Run No.	REC / RQD
40C	100% 80%

Run No.	REC / RQD
20C	100% 65%

Run No.	REC / RQD
20C	100% 64.5 100

Run No.	REC / RQD
1C	100% 65%



ROCK CORE SKETCH LEGEND	
JOINTING	
J	- Joint
MB	- Mechanical Break
°	- Angle w/ Horizontal
//	- Parallel
X	- Crossing
F	- Foliation
S	- Stratification
U	- Unfoliated or Unstratified
SURFACE	
C	- Curved
I	- Irregular
S	- Straight
CONDITION	
1	- Slick
2	- Smooth
3	- Rough
SKETCH SYMBOLS	
	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

SCALE: 1 division = 0.1 feet

NOTES

Top of Box



Bottom of Box



Match Line

East Side Access, New York, NY

Boring No. M-10; Runs 1C, 2 OC and 4 OC Top

Mueser Rutledge Consulting Engineers
225 W. 34th Street · New York, NY 10122

9171

Sheet #5

MUESER RUTLEDGE CONSULTING ENGINEERS ROCK CORE SKETCH

BORING NO. 1410
SHEET 6 OF 8
FILE NO. 9171
SURFACE ELEV. 311.9
RES. ENGR. SARA MENDES

PROJECT EAST SIDE ACCESS

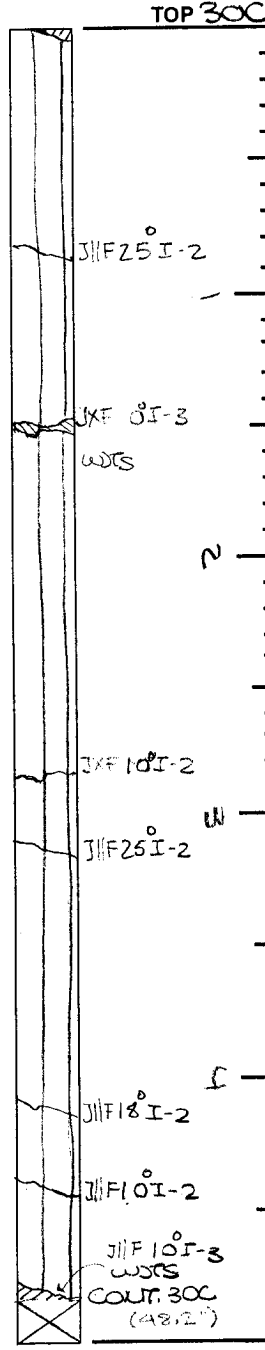
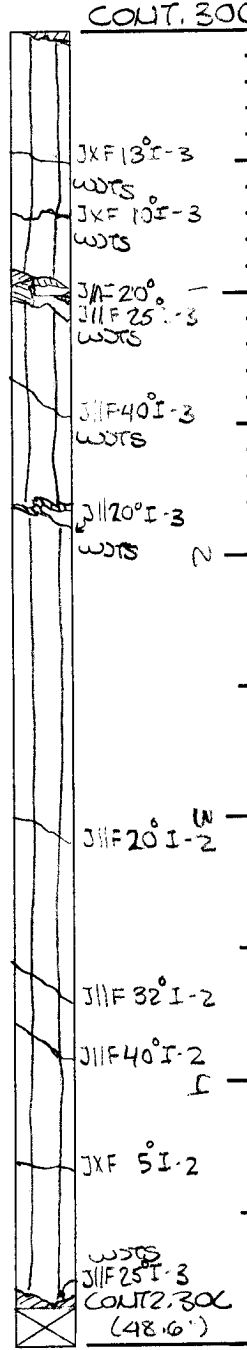
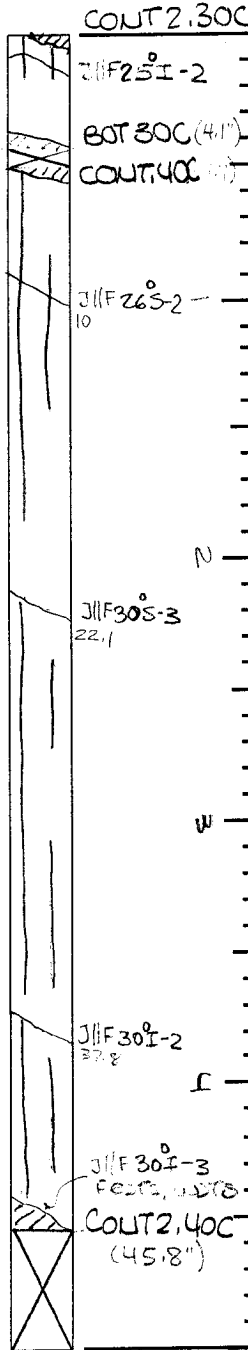
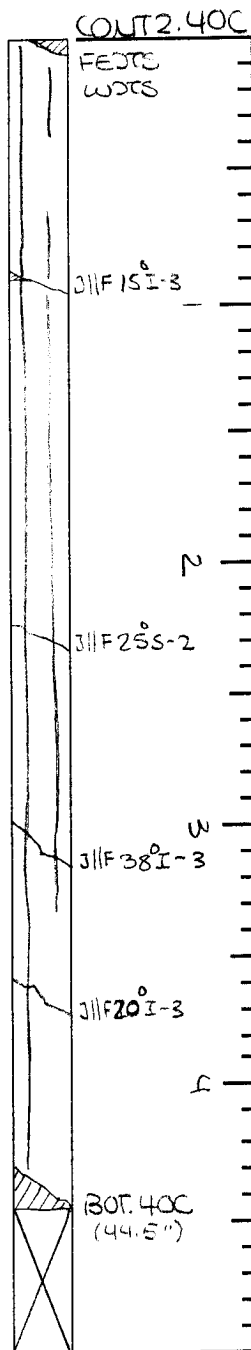
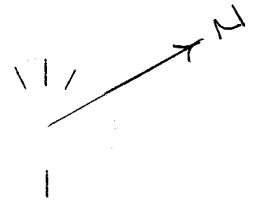
LOCATION GRAND CENTRAL STATION, NYC, NY

Run No.	REC / RQD
40C	100% 86%

Run No.	REC / RQD
30C	
40C	86% 100

Run No.	REC / RQD
30C	100% 72%

Run No.	REC / RQD
30C	100% 72%

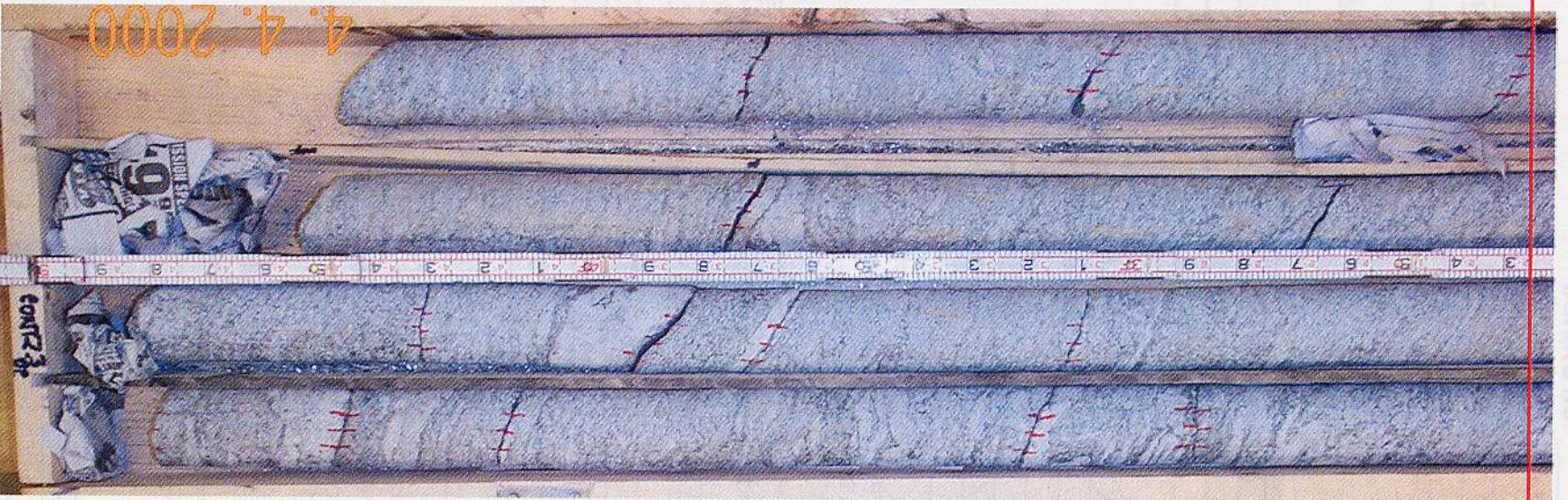
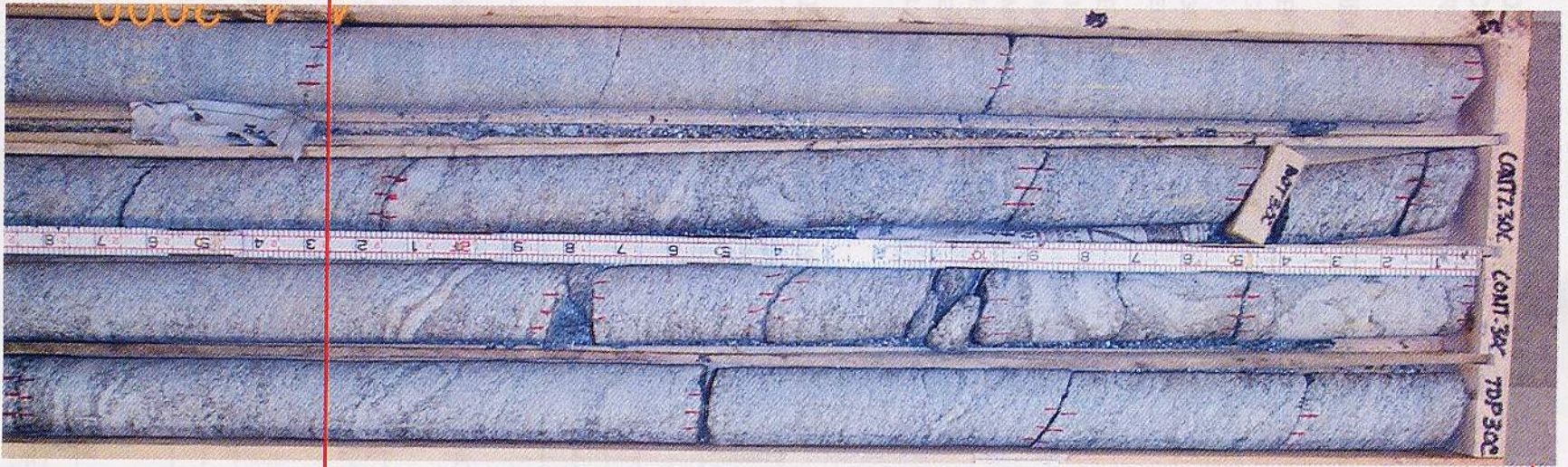


ROCK CORE SKETCH LEGEND	
JOINTING	
J	- Joint
MB	- Mechanical Break
∠	- Angle w/ Horizontal
//	- Parallel
X	- Crossing
F	- Foliation
S	- Stratification
U	- Unfoliated or Unstratified
SURFACE	
C	- Curved
I	- Irregular
S	- Straight
CONDITION	
1	- Slick
2	- Smooth
3	- Rough
SKETCH SYMBOLS	
	Joint
	Healed Joint
	Broken
	Part of Core Not Recovered
	Cavities or Vugs in Core
	Clay
	Sand
	Empty Space

SCALE: 1 division = 0.1 feet

NOTES

Top of Box



Match Line →

Bottom of Box

East Side Access, New York, NY

Boring No. M-10; Runs 3 OC and 4 OC Bottom

Mueser Rutledge Consulting Engineers
225 W. 34th Street • New York, NY 10122

9171

Sheet #7

MUESER RUTLEDGE CONSULTING ENGINEERS

PROJECT EAST SIDE ACCESS
LOCATION GRAND CENTRAL STATION, NEW YORK CITY, NEW YORK
BORING LOCATION SEE PLAN

BORING NO. M-10
SHEET 8 **OF** 8
FILE NO. 9171
SURFACE ELEV. 311.9
DATUM NAVD88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED DURING CORING	CASING USED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
TRUCK <u>ACKER</u>	MECHANICAL <u> </u>	DIA., IN. <u>3</u>	DEPTH, FT. FROM <u>0</u> TO <u>4.5</u>
SKID <u> </u>	HYDRAULIC <u>X</u>	DIA., IN. <u> </u>	DEPTH, FT. FROM <u> </u> TO <u> </u>
BARGE <u> </u>	OTHER <u> </u>	DIA., IN. <u> </u>	DEPTH, FT. FROM <u> </u> TO <u> </u>
OTHER <u> </u>			

TYPE AND SIZE OF:	DRILLING MUD USED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
D-SAMPLER <u> </u>	DIAMETER OF ROTARY BIT, IN. <u> </u>
U-SAMPLER <u> </u>	TYPE OF DRILLING MUD <u> </u>
S-SAMPLER <u> </u>	
CORE BARREL <u>NX DOUBLE BARREL</u>	AUGER USED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
CORE BIT <u>DIAMOND</u>	TYPE AND DIAMETER, IN. <u> </u>
DRILL RODS <u>NWJ</u>	
	CASING HAMMER, LBS. <u> </u> AVERAGE FALL, IN. <u> </u>
	SAMPLER HAMMER, LBS. <u> </u> AVERAGE FALL, IN. <u> </u>

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
3-26-02	20:40	25	4.5	10.26	OVERNIGHT - USED SURVEYOR'S TAPE.

PIEZOMETER INSTALLED ☐ YES ☒ NO **SKETCH SHOWN ON**

STANDPIPE:	TYPE <u> </u>	ID, IN. <u> </u>	LENGTH, FT. <u> </u>	TOP ELEV. <u> </u>
INTAKE ELEMENT:	TYPE <u> </u>	OD, IN. <u> </u>	LENGTH, FT. <u> </u>	TIP ELEV. <u> </u>
FILTER:	MATERIAL <u> </u>	OD, IN. <u> </u>	LENGTH, FT. <u> </u>	BOT. ELEV. <u> </u>

PAY QUANTITIES

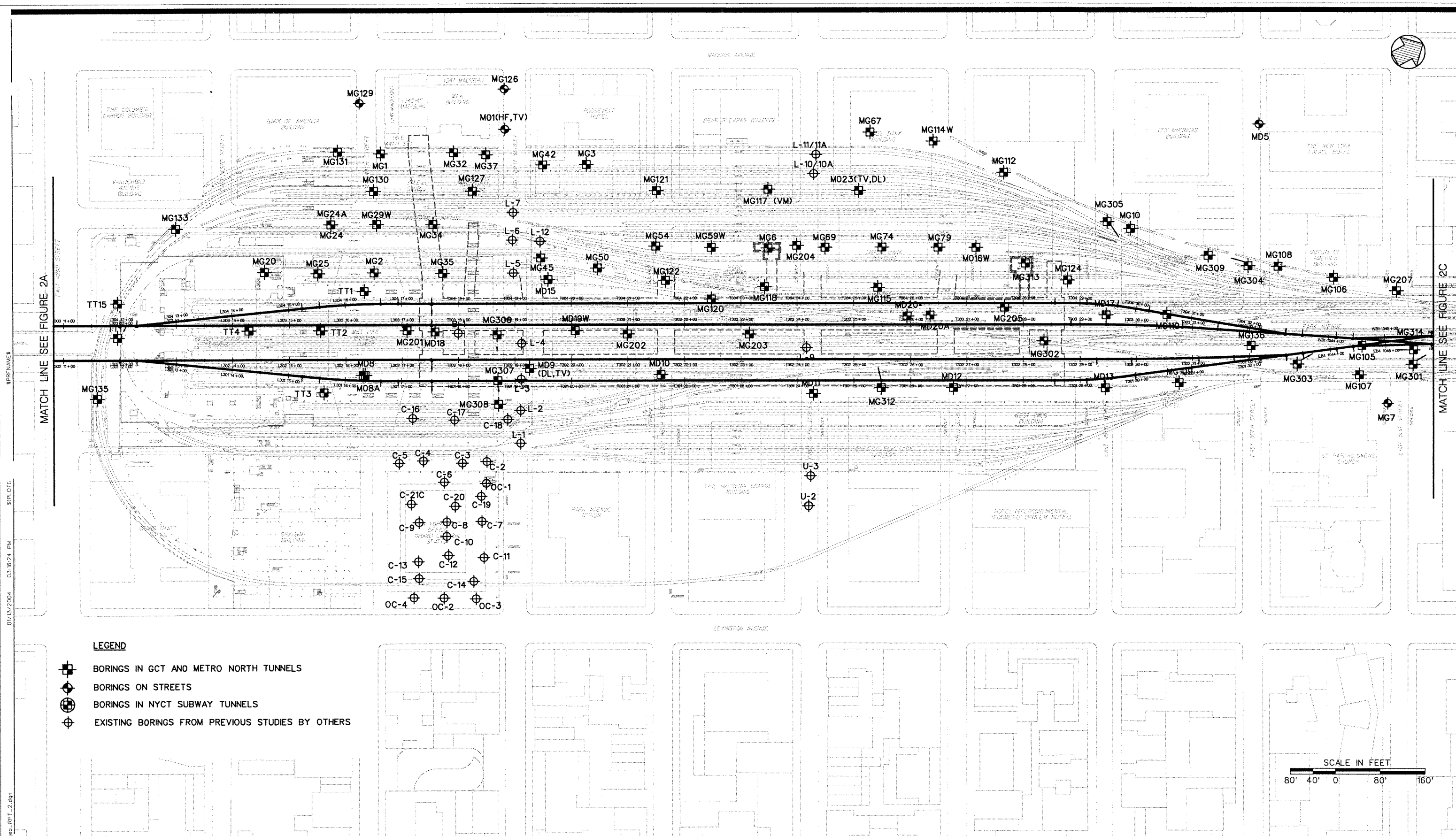
3.5" DIA. DRY SAMPLE BORING	LIN. FT. <u> </u>	NO. OF 3" SHELBY TUBE SAMPLES <u> </u>	
3.5" DIA. U-SAMPLE BORING	LIN. FT. <u> </u>	NO. OF 3" UNDISTURBED SAMPLES <u> </u>	
CORE DRILLING IN ROCK	LIN. FT. <u> </u>	OTHER: <u> </u>	

BORING CONTRACTOR WARREN GEORGE INC.
DRILLER CRAIG HELPERS DENNIS
REMARKS BOREHOLE GROUTED UPON COMPLETION.
RESIDENT ENGINEER SARA MENDES **DATE** 3-26-02

BORING NO. M-10

APPENDIX C

BORINGS FROM CONSTRUCTION CONTRACT
CM009 MTA/LIRR EAST SIDE ACCESS



EAST SIDE ACCESS
LONG ISLAND RAIL ROAD
GRAND CENTRAL CONNECTION

MANHATTAN SEGMENT BORING LOCATION PLAN

01/13/2004 03:16:24 PM \$PLOT: 986_RPT_2.dgn

ROCK DISCONTINUITY CLASSIFICATIONS

ROCK FRACTURE SPACING

DESCRIPTION	SPACING
EXTREMELY CLOSE OR CRUSHED	<3/4 INCHES
VERY CLOSE	3/4 TO 2-1/2 INCHES
CLOSE	2-1/2 TO 8 INCHES
MODERATE	8 INCHES TO 2 FEET
WIDE	2 TO 6 FEET
VERY WIDE	6 TO 20 FEET

NOTE:
FRACTURES REFER TO NATURAL
BREAKAGES INCLUDING JOINTS, SHEAR ZONES, AND
FAULT LINES. FRACTURE SPACING RANGE
DESIGNATIONS BASED ON ISRM GUIDELINES.

ROCK LAYERING

DESCRIPTION	SPACING
LAMINATED	<1/2 INCHES
VERY THIN	1/2 TO 2 INCHES
THIN	2 INCHES TO 1 FOOT
MEDIUM	1 TO 3 FEET
THICK	3 TO 10 FEET
MASSIVE	> 10 FEET

NOTE:
LAYERING REFERS TO NATURAL ROCK
FORMATION FEATURES SUCH AS FOLIATION,
SEAMS, BANDING, OR BEDDING.

SURFACE PLANARITY

DESIGNATION	CONDITION
PLANAR	A FLAT SURFACE
STEPPED	A SURFACE WITH ASPERITIES OR STEPS.
WAVY	A MODERATE UNDULATING SURFACE; CURVED, SMOOTHLY UNEVEN.

JOINT ROUGHNESS, Jr

DISCONTINUITY CATEGORY	DISCONTINUITY CONDITION (CONTACT SURFACE ROUGHNESS)	JOINT ROUGHNESS FACTOR Jr
DIRECT CONTACT BETWEEN SURFACES	DISCONTINUOUS JOINTS	4
	ROUGH OR IRREGULAR, UNDULATING	3
	SMOOTH, UNDULATING	2
	SLICKENSIDED, UNDULATING	1.5
	ROUGH OR IRREGULAR, PLANAR	1.5
	SMOOTH, PLANAR	1.0
NO DIRECT CONTACT BETWEEN SURFACES	SLICKENSIDED, PLANAR	0.5
	CLAY MINERAL ZONE PREVENTING ROCK WALL CONTACT	1.0(NOMINAL)
	SANDY, GRAVELLY, OR CRUSHED ZONE PREVENTING WALL CONTACT	1.0(NOMINAL)

JOINT ALTERATION, Ja

JOINT CATEGORY	JOINT CONDITION (CONTACT SURFACE ALTERATION)		JOINT ALTERATION FACTOR Ja
	DESCRIPTION	CONDITION	
DIRECT CONTACT BETWEEN SURFACES (JOINT COATING LESS THAN 1/8" THICK)	A. TIGHTLY HEALED	TIGHTLY HEALED, HARD, NON-SOFTENING, IMPERMEABLE FILLING	0.75
	B. UNALTERED	UNALTERED JOINT SURFACES, SURFACES STAINING ONLY	1.0
	C. SLIGHTLY ALTERED	SLIGHTLY ALTERED JOINT WALLS. NDN-SOFTENING MINERAL COATINGS, SANDY PARTICLES, CLAY FREE DISINTEGRATED ROCK ETC.	2.0
	D. COATED	SILTY OR SANDY CLAY COATINGS, SMALL CLAY FRACTION (NON-SOFTENING)	3.0
	E. CLAY COATED	SOFTENING OR LOW FRICTION CLAY MINERAL COATINGS, IE. KAOLINITE, MICA, CHLORITE, ETC.	4.0
NO DIRECT CONTACT BETWEEN SURFACES (JOINT COATING LESS THAN 1/4" THICK)	F. INFILLED	SANDY PARTICLES, CLAY-FREE DISINTEGRATED ROCK ETC.	4.0
	G. CLAY FILLED	STRONGLY OVERCONSOLIDATED, SOFTENING, CLAY MINERAL FILLINGS	6.0
	H. SOFT CLAY FILLED	MEDIUM OR LOW OVERCONSOLIDATION, SOFTENING, CLAY MINERAL FILLINGS	8.0
	J. SWELLING CLAY FILLED	SWELLING CLAY FILLINGS, IE. MONTMORILLONITE. (Ja VALUE FOR ITEM J DEPENDS ON PERCENT OF SWELLING CLAY-SIZE PARTICLES AND ACCESS TO WATER, ETC.)	8.0-12.0
NO DIRECT CONTACT BETWEEN SURFACES (JOINT COATING GREATER THAN 1/4" THICK)	L. CRUSHED ZONE	CRUSHED ROCK AND CLAY (SEE ITEMS G, H, AND J FOR DESCRIPTION OF CLAY CONDITION)	6.0, 8.0 OR 8.0-12.0
	N. DECOMPOSED ZONE	ZONES OR BANDS OF SILTY-OR SANDY CLAY, SMALL CLAY FRACTION (NON-SOFTENING)	5.0
	O. CLAY ZONE	THICK CONTINUOUS ZONES OR BANDS OF CLAY (SEE ITEMS G, H, AND J FOR DESCRIPTION OF CLAY CONDITION)	10.0, 13.0 OR 13.0-20.0

ROCK QUALITY DESIGNATION, RQD

RQD PERCENT	ROCK QUALITY
< 25	VERY POOR
25-50	POOR
50-75	FAIR
75-90	GOOD
90-100	EXCELLENT

ROCK CORE CONTINUITY

DESCRIPTION	AVERAGE LENGTH OF PIECES
SOUND	> 8 INCHES
SLIGHTLY FRACTURED	4 TO 8 INCHES
MODERATELY FRACTURED	1 TO 4 INCHES
EXTREMELY FRACTURED	< 1 INCH

NOTES:
ROCK CORE CONTINUITY REFERS TO A GENERAL DESCRIPTIVE
TERM DESCRIBING THE OVERALL DEGREE OF FRACTURING
CONDITION OF EACH ROCK CORE RUN.

ROCK CLASSIFICATION NOTES:

- CORE RECOVERY:** CORE RECOVERY IS EXPRESSED IN TWO WAYS. FIRST, AS THE SIMPLE NET LENGTH OF CORE RECOVERED IN INCHES. SECONDLY, AS THE RATIO OF THE LENGTH OF NET CORE RECOVERED TO THE OVERALL LENGTH OF THE CORE RUN, EXPRESSED AS A PERCENTAGE. CORE RECOVERY IS GENERALLY DETERMINED SEPARATELY FOR EACH SEPARATE CORING RUN.
- RQD** (ROCK QUALITY DESIGNATION) IS A GENERAL INDEX OF ROCK CORE CONDITION FOR ENGINEERING PURPOSES. RQD IS EXPRESSED AS A MODIFIED CORE RECOVERY PERCENTAGE IN WHICH ONLY THE SUM OF THE LENGTHS OF PIECES OF UNWEATHERED OR SLIGHTLY WEATHERED CORE OVER 4 INCHES LONG IS DIVIDED BY THE OVERALL LENGTH OF THE CORE RUN. THE AVERAGE LENGTH OF CORE PIECES IS USED WHERE END FRACTURES ARE NOT PERPENDICULAR TO THE CORE AXIS (IE. WHERE ENDS OF CORE PIECES ARE SLANTED, BY MEASURING TO THE MIDDLE OF THE BREAK). FRESH CORE FRACTURES CREATED BY MECHANICAL BREAKAGE DURING DRILLING AND/OR HANDLING OF THE CORE ARE IGNORED IN COMPUTING RQD. RQD IS GENERALLY DETERMINED SEPARATELY FOR EACH SEPARATE CORE RUN.
- DISCONTINUITY ORIENTATION ANGLE** ORIENTATION OF DISCONTINUITIES IS GENERALLY EXPRESSED AS AN ANGLE (IN DEGREES). THIS ORIENTATION REFERS TO THE ANGLE BETWEEN THE AVERAGE DIRECTION OF A DISCONTINUITY AND A PLANE PERPENDICULAR TO THE CORE AXIS. (E.G. FOR A VERTICAL BORING DISCONTINUITY ANGLE OF 0 DEGREES REFERS TO A HORIZONTAL DISCONTINUITY). THE COMPASS DIRECTION OF ROCK CORE DISCONTINUITIES IS GENERALLY NOT DIRECTLY DETERMINABLE FROM CORE INSPECTION ALONE WITH THE CORING METHODS USED FOR THIS PROJECT.

ROCK CLASSIFICATION REFERENCES:

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- INTERNATIONAL SOCIETY OF ROCK MECHANICS (ISRM), "SUGGESTED METHODS FOR THE QUANTITATIVE DESCRIPTION OF DISCONTINUITIES IN ROCK MASSES", COMMISSION ON STANDARDIZATION OF LABORATORY AND FIELD TESTS, INTERNATIONAL JOURNAL OF ROCK MECHANICS AND MINING SCIENCES, VOL. 15, 1978, PP. 319-368. REPRINTED, ISRM, "SUGGESTED METHODS: ROCK CHARACTERIZATION, TESTING, AND MONITORING", E.T. BROWN, ED. PERGAMON PRESS, 211PP, (1981).
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- BIENIAWSKI, Z. T., 1989, ENGINEERING ROCK MASS CLASSIFICATIONS: A COMPLETE MANUAL FOR ENGINEERS AND GEOLOGISTS IN MINING, CIVIL AND PETROLEUM ENGINEERING. NEW YORK: JOHN WILEY AND SONS, 251 PAGES.
- BARTON, N., 1995, THE INFLUENCE OF JOINT PROPERTIES IN MODELING JOINTED ROCK MASSES. KEYNOTE LECTURE, 8th CONGRESS OF ISRM, TOKYO, VOL. 3. ROTTERDAM: BALKEMA.

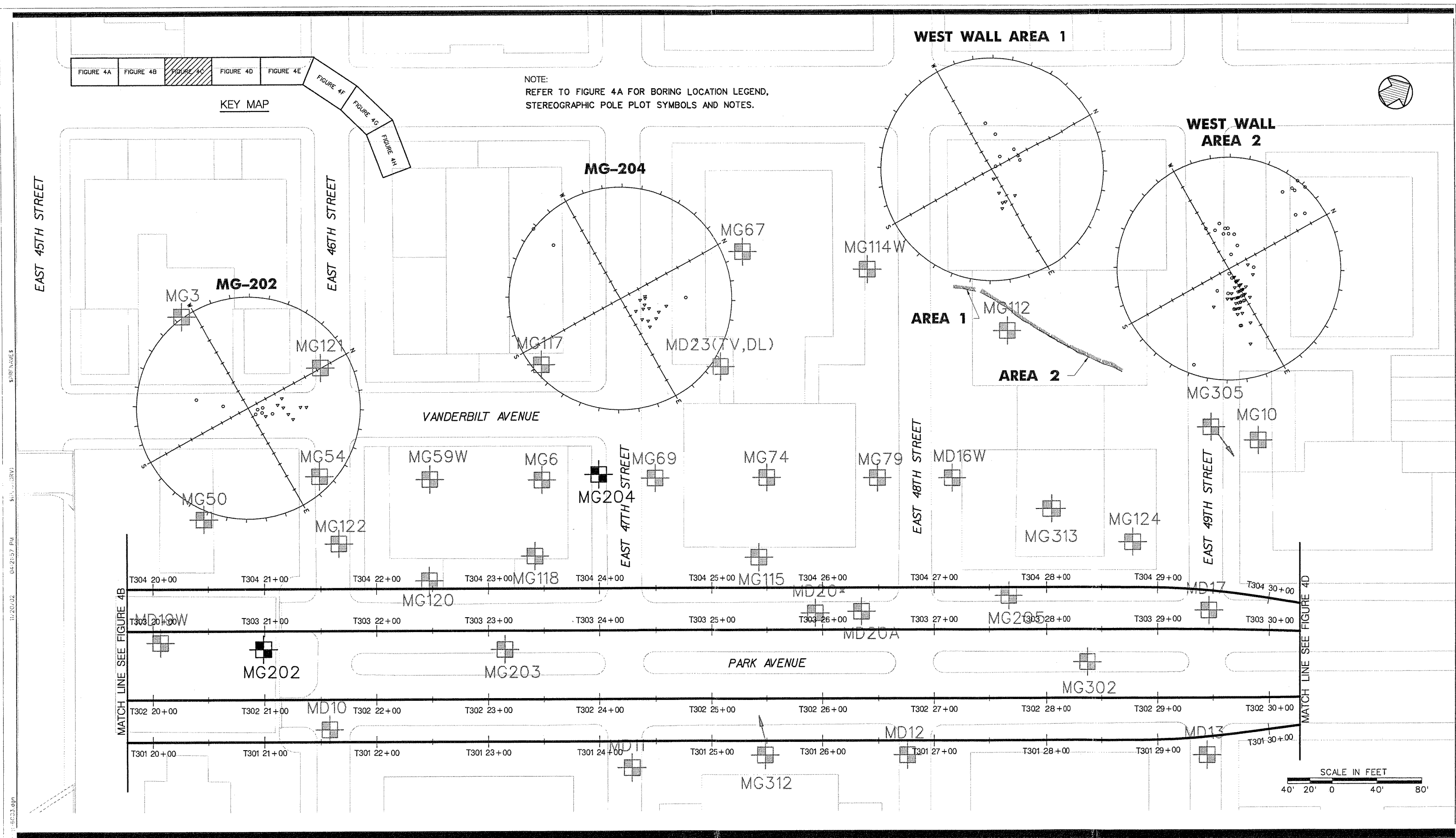
EAST SIDE ACCESS
LONG ISLAND RAIL ROAD
GRAND CENTRAL CONNECTION

GENERAL NOTES, SOIL AND ROCK CLASSIFICATION SYSTEM



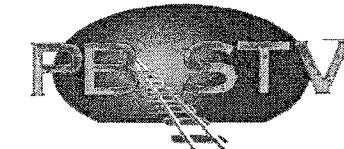
Parsons Brinckerhoff Quade & Douglas, Inc./STV Incorporated

FIGURE 3D



EAST SIDE ACCESS
LONG ISLAND RAIL ROAD
GRAND CENTRAL CONNECTION

MANHATTAN SEGMENT GEOTECHNICAL DRAWINGS
STEREOGRAPHIC POLE PLOTS OF DISCONTINUITIES



Parsons Brinckerhoff Quade & Douglas, Inc./STV Incorporated

FIGURE 4C

APPENDIX A
EAST SIDE ACCESS PROJECT BORING
LOGS



BORING LOG

BORING NUMBER: **MD-23**SHEET NUMBER: 1 of 8

PROJECT NUMBER:

PROJECT: **East Side Access**
LOCATION: **Manhattan Segment**
CLIENT: **MTA**
CONTRACTOR: **WGI/JBD**


DRILLER: **F. Carroza/C. Cruz**
INSPECTOR: **K. Ravishankar**

DRILLING METHOD: **Rotary Wash**
RIG TYPE: **Hi-Rail**

LOCATION: **GCT, Track 120**
COORD. N: **214,659.4** E: **990,886.5**
STN. NO.: **25+08.63** OFFSET: **W299.08**
SURFACE ELEV.: **311.6 feet**
DATUM: **ESA Project Datum**

START DATE: **2/24/00** TIME:
FINISH DATE: **3/1/00** TIME: **2:00 am**

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel	GROUNDWATER DATA				
		S	U	P	G	C	Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
I.D.	3.25"	1.375"	2.938"	2.938"		1.875"	2/24/00	9:30 pm	7.0	5.0	10.0
O.D.	3.5"	2"	3"	3"		2.5"	2/25/00	10:15 pm	7.0	7.0	45.0
Length	5	24"	24"	24"		13.2'	2/28/00	11:00 pm	7.5	7.0	95.0
Hammer Wt.	140 lbs	140 lbs	Drill Rod Size		N		2/29/00	10:00 pm	7.5	7.0	115.0
Hammer Fall	30"	30"	I.D. (O.D.)		2.625" (2.75")						

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE				SOIL (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS		
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0/6	6/12	12/18	18/24	REC. (in.)			
							CORING							
							RUN (in.)	REC. (in.)	REC. %	L>4" (in.)	RQD %		Depth Elev.	
5			G	1		0.0 - 2.0							Hand augered up to 2'. From 0-2', gray, coarse to medium GRAVEL. (GW)(Fill) Top of rock at 2'. Roller bit to 5'. Casing installed at 5'. Started coring at 5'.	
10														
15														
20														

ESA BORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

BORING NUMBER: MD-23

SHEET NUMBER: 2 of 8

PROJECT NUMBER:

PROJECT: East Side Access
LOCATION: Manhattan Segment
CLIENT: MTA
CONTRACTOR: WGI/JBD

DRILLER: F. Carroza/C. Cruz
INSPECTOR: K. Ravishankar

DRILLING METHOD: Diamond Drilling
RIG TYPE: Hi-Rail

LOCATION: GCT, Track 120
COORD. N: 214,659.4 E: 990,886.5
STN. NO.: 25+08.63 OFFSET: W299.08
SURFACE ELEV.: 311.6 feet
DATUM: ESA Project Datum

START DATE: 2/24/00 TIME:
FINISH DATE: 3/1/00 TIME: 2:00 am

CORE BARREL DATA:

NOTES:

TYPE: NQ

CORE SIZE: 1.99"

O.D.: 2.5"

I.D.: 1.875"

CASING SIZE: 3.25" (3.5")

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
2/24/00	9:30 pm	7.0	5.0	10.0
2/25/00	10:15 pm	7.0	7.0	45.0
2/28/00	11:00 pm	7.5	7.0	95.0
2/29/00	10:00 pm	7.5	7.0	115.0

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
10	2.5	C-1 5.0 - 10.0	46	77	62	Dark gray, coarse to medium grained SCHIST, moderately weathered from 5'-6.15' to slightly weathered from 6.15-10', weak from 5-6.15' to medium strong from 6.15-10', extremely fractured from 5-6.15' to slightly fractured from 6.15-10', foliated. Core loss from 5-6.15'. 3" casing spun to 7'.	2	R3	0	1.5	1	6.15
	4								5	1.5	1	6.6
	5								*20	1.5	1	6.8
	4.5								*20	1.5	1	7.15
	4.5								*20	1.5	1	7.2
	4.5	C-2 10.0 - 15.0	60	100	93	Dark gray, coarse to medium grained SCHIST, slightly weathered to unweathered, strong rock, sound to slightly to moderately fractured from 14.2-15', foliated.	2-1	R4	*25 _{MB}	-	-	7.7
	4.5								20	1.5	2	8.2
	4.5								30	1.5	1	8.55
	4.5								0	1.5	1	9.6
	4.5								0	1.5	1	9.7
15	4.5	C-3 15.0 - 25.0	120	100	98	As above with white coarse to medium grained Quartz and Feldspar vein from 20.9-21.2', unweathered to slightly weathered, very strong to strong rock, sound to slightly fractured, foliated.	1-2	R5-R4	*30	1.5	1	9.8
	4								*15	1	2	11.15
	4.5								5	1	1	14.2
	4.5								50	1.5	1	14.21
	4.5								30	1.5	1	14.75
	4.5								90	1.5	1	15
	5								*30	1.5	1	16
	4.5								*30	1	1	16.9
	4.5								*20	1	2	17.55
	4.5								35	1.5	1	17.75
20	4.5								*20	1	2	18.2
	4.5								35	1.5	1	18.85
	5.5								30 _{MB}	-	-	20
	4.5								0 _{MB}	-	-	21.15
	4											
	4											
	4								20	1	1	24.3
	4.5								*20	1.5	1	25.5
	4.5								30	1.5	1	25.6
	4								15	1	1	25.9
25	4								30	1.5	1	27.1
	4.5	C-4				As above with white coarse to medium grained Quartz and Feldspar veins from 27.9-28.1', 32.1', 32.2-32.3', and 33.9-34.4', very strong rock.	1-2	R5	20 _{MB}	-	-	28

ESA CORING LOG MG-MA-GPJ MAINLIB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: **MD-23**

SHEET NUMBER: 3 of 8

PROJECT NUMBER:

PROJECT: **East Side Access**

LOCATION: **Manhattan Segment**

CLIENT: **MTA**

CONTRACTOR: **WGI/JBD**

DRILLER: **F. Carroza/C. Cruz**

INSPECTOR: **K. Ravishankar**

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
35	4.5	25.0 - 35.0	120	100	99				10 _{MB}	-	-	30
	5								*15 _{MB}	-	-	30.5
	5								45	2	1	31.4
	4.5								*30 _{MB}	-	-	31.55
	4.5											
	4.5								*25	1.5	1	34.55
	4.5					As above with white coarse to medium grained Quartz and Feldspar veins from 43.8-44.4', unweathered, sound.	1	R5				
	5								40	1.5	1	38.3
	4.5								0 _{MB}	-	-	39.45
	5								20 _{MB}	-	-	40
40	5	C-5 35.0 - 45.0	120	100	100				20 _{MB}	-	-	40.35
	5											
	5											
	5											
	5											
	5								*20	1.5	1	43.8
	5								20	1.5	1	44.4
	5								10 _{MB}	-	-	44.8
	4.5								*20 _{MB}	-	-	46.65
	5											
45	5					As above with white coarse to medium grained Quartz and Feldspar veins from 48.1-48.2', 49.2-50.7', and 53.1-53.2', 1/2" thick veins at 46.7', 47.6', and 47.8'.	1	R5				
	5											
	5											
	5											
	5											
	4.5											
	5								30 _{MB}	-	-	49.35
	5								25 _{MB}	-	-	49.8
	4.5								20 _{MB}	-	-	50
	5								20 _{MB}	-	-	50.1
50	4.5	C-6 45.0 - 55.0	120	100	100				*20	1	1	51.15
	4.5								*20	1	2	51.65
	4								10 _{MB}	-	-	53.25
	5								*35	1.5	1	54.1
	5								10 _{MB}	-	-	54.65
	5											
	4.5								0 _{MB}	-	-	57
	4.5											
	4.5								*40	1	3	59.6
	4.5								*30	1	2	60
55	4.5											
	4								*40 _{MB}	-	-	62.6
	4											
	4								*35 _{MB}	-	-	64.4
	4											
	4											
	4											
	4											
	4											
	4											
60	4											
	4											
	4											
	4											
	4											
	4											
	4											
	4											
	4											
	4											

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: **MD-23**

SHEET NUMBER: 4 of 8

PROJECT NUMBER:

PROJECT: **East Side Access**

LOCATION: **Manhattan Segment**

CLIENT: **MTA**

CONTRACTOR: **WGI/JBD**

DRILLER: **F. Carroza/C. Cruz**

INSPECTOR: **K. Ravishankar**

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
70	5	C-8 65.0 - 75.0	120	100	100	As above with white coarse to medium grained Quartz and Feldspar vein from 71.9-72.1'.	1	R5				
	5								80	1.5	1	66.6
	5								20 _{MB}	-	-	67.5
	4.5								20 _{MB}	-	-	70
	5								*45	1	1	71.5
75	4.5	C-9 75.0 - 85.0	120	100	100	As above with white coarse to medium grained Quartz and Feldspar veins from 76.6-76.8' and 79.6-79.7'.	1	R5	*45	1	1	72.8
	5								35 _{MB}	-	-	73.8
	4.5								*30 _{MB}	-	-	74.65
	5											
	5											
80	5.5	C-10 85.0 - 95.0	120	100	100	As above with white coarse to medium grained Quartz and Feldspar vein from 87.8-87.9'.	1	R5				
	5											
	6											
	5.5								*30 _{MB}	-	-	79.85
	6								*30 _{MB}	-	-	80
85	6	C-11				As above with white coarse to medium grained Quartz and Feldspar veins from 96.4-96.5', 98-98.1', and 98.5-98.6', sound with a slightly fractured zone from 100.3-101.6'.	1	R5				
	5.5								*30 _{MB}	-	-	83.3
	6								0 _{MB}	-	-	84.2
	5.5								30 _{MB}	-	-	84.5
	6											
90	6	C-11				As above with white coarse to medium grained Quartz and Feldspar veins from 96.4-96.5', 98-98.1', and 98.5-98.6', sound with a slightly fractured zone from 100.3-101.6'.	1	R5	*20	1	3	88.15
	5.5								*30	1.5	1	89.6
	6								30 _{MB}	-	-	90
	5								30 _{MB}	-	-	91.3
	6											
95	5.5	C-11				As above with white coarse to medium grained Quartz and Feldspar veins from 96.4-96.5', 98-98.1', and 98.5-98.6', sound with a slightly fractured zone from 100.3-101.6'.	1	R5	20	1.5	1	94.2
	6											
	5.5											
	6.5								20	1.5	1	97.95
	6								*30 _{MB}	-	-	98.5
	5.5								20 _{MB}	-	-	99.35

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: **MD-23**SHEET NUMBER: 5 of 8

PROJECT NUMBER:

PROJECT: **East Side Access**LOCATION: **Manhattan Segment**CLIENT: **MTA**CONTRACTOR: **WGI/JBD**DRILLER: **F. Carroza/C. Cruz**INSPECTOR: **K. Ravishankar**

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA					
									ANGLE (deg)	Jr	Ja	DEPTH (feet)		
105	5.5	95.0 - 105.0	120	100	98	Dark gray, coarse to medium grained SCHIST and schistose GNEISS, unweathered, very strong to extremely hard rock, sound, foliated. White coarse to medium grained Quartz veins from 105.6-105.7', 106.9-107.4', and 108.8-108.9',	1	R5-R6	0 _{MB}	-	-	100		
	6								*30	.5	2	100.3		
	6								20 _{MB}	-	-	100.4		
	6								*30	.5	2	100.9		
	5.5								*35	1	2	101.4		
	6	55	1	2	101.6									
	6	0 _{MB}	-	-	102.8									
	6.5	*30	1.5	1	104.15									
	7.5	30 _{MB}	-	-	104.75									
	7.5	20 _{MB}	-	-	107.3									
110	8	C-12 105.0 - 115.0	120	100	100				1	R6	10 _{MB}	-	-	110
	7.5						10 _{MB}	-			-	110		
	7						10 _{MB}	-			-	110		
	8						10 _{MB}	-			-	110		
9.5	10 _{MB}						-	-			110			
115	11.5	C-13 115.0 - 125.0	120	100	100		1	R6			20 _{MB}	-	-	113.6
	11.5										*30 _{MB}	-	-	114.65
	12.5										*30	1.5	1	116.9
	14.5										*30	1.5	1	116.9
17	*30										1.5	1	116.9	
120	16.5	C-13 115.0 - 125.0	120	100	100						1	R6	*20 _{MB}	-
	17								*25	1.5			1	121
	16.5								*25	1.5			1	121
	20								*25	1.5			1	121
18	*25								1.5	1			121	
125	18	C-14 125.0 - 135.0	120	100	93				1	R6			*30 _{MB}	-
	16.5						*35	1.5					1	123.15
	15.5						*35	1.5					1	124.2
	14						25 _{MB}	-					-	124.4
13.5	0 _{MB}						-	-					124.7	
130	14	C-14 125.0 - 135.0	120	100	93	1	R6	50 _{MB}					-	-
	15							80			1.5	1	125.25	
	17.5							20			1.5	1	125.5	
	17.5							20			1.5	1	125.5	
16.5	20							1.5			1	125.5		
130	16	C-14 125.0 - 135.0	120	100	93			1			R6	60	1.5	1
	21								40 _{MB}	-		-	129.4	
	21								40 _{MB}	-		-	130	
	21								40 _{MB}	-		-	130.1	
21	20 _{MB}								-	-		131.9		

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: **MD-23**

SHEET NUMBER: 6 of 8

PROJECT NUMBER:

PROJECT: **East Side Access**

LOCATION: **Manhattan Segment**

CLIENT: **MTA**

CONTRACTOR: **WGI/JBD**

DRILLER: **F. Carroza/C. Cruz**

INSPECTOR: **K. Ravishankar**

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
140						Borehole Acoustic Televiewer Survey performed in the borehole. Dilatometer testing performed at 22', 33', 43', 53', 63', 78', 83', 93', and 107'. Borehole cement-grouted after testing. End of boring at 135'.						
145												
150												
155												
160												
165												

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



SUMMARY LOG

BORING NUMBER: **MD-23**

SHEET NUMBER: 7 of 8

PROJECT NUMBER:

PROJECT: East Side Access

LOCATION: GCT, Track 120

CLIENT: MTA

CONTRACTOR: WGI/JBD

DRILLER: F. Carroza/C. Cruz

INSPECTOR: K. Ravishankar

Depth
(ft.)

Foliation Dip
(deg)

Extremely Fractured
Zones (ft)

5.0 - 6.2

5.0 - 6.1	20
6.1 - 7.5	20
7.5 - 9.5	25
9.5 - 10.0	30
10.0 - 10.9	30
10.9 - 12.2	15
12.2 - 12.8	20
12.8 - 15.0	10
15.0 - 15.7	20
15.7 - 17.2	30
17.2 - 20.9	20
21.2 - 23.5	35
23.5 - 25.0	40
25.0 - 27.9	20
28.1 - 30.9	15
30.9 - 32.0	30
32.1 - 32.2	30
32.3 - 33.9	30
34.4 - 35.0	25
35.0 - 36.1	20
36.1 - 38.6	25
38.6 - 41.2	20
41.2 - 42.2	30
42.2 - 43.8	20
44.4 - 45.0	20
45.0 - 47.4	20
47.4 - 48.1	30
48.2 - 48.4	35
48.4 - 49.2	20
50.7 - 51.7	20
51.7 - 53.1	10
53.2 - 53.8	10
53.8 - 54.4	35
54.4 - 55.0	15
55.0 - 55.5	20
55.5 - 56.2	10
56.2 - 57.7	30
57.7 - 59.0	35
59.0 - 59.8	40
59.8 - 61.2	30
61.2 - 62.6	40
62.8 - 63.8	30
63.8 - 65.0	35
65.0 - 65.4	35
65.4 - 66.1	30
66.1 - 67.0	35
67.0 - 68.5	40
68.5 - 70.9	20
70.9 - 71.2	40
71.2 - 71.6	45
71.6 - 71.9	30
72.1 - 72.6	30
72.6 - 73.4	45
73.4 - 73.9	35

ESA SUMMARY LOG MG MA.GPJ MAINLIB.GLB 9/26/02



SUMMARY LOG

(continued)

BORING NUMBER: MD-23

SHEET NUMBER: 8 of 8

PROJECT NUMBER:

PROJECT: East Side Access

LOCATION: GCT, Track 120

CLIENT: MTA

CONTRACTOR: WGI/JBD

DRILLER: F. Carroza/C. Cruz

INSPECTOR: K. Ravishankar

Depth (ft.)	Foliation Dip (deg)	Extremely Fractured Zones (ft)
73.9 - 74.5	45	
74.5 - 75.0	30	
75.0 - 75.8	35	
75.8 - 76.6	40	
76.8 - 77.9	35	
77.9 - 79.6	40	
79.7 - 80.8	30	
80.8 - 81.9	35	
81.9 - 85.0	30	
85.0 - 87.1	20	
87.1 - 87.8	35	
87.9 - 88.6	20	
88.6 - 91.8	30	
91.8 - 93.9	35	
93.9 - 95.0	30	
95.0 - 96.4	30	
96.5 - 96.8	35	
96.8 - 98.0	30	
98.1 - 98.5	30	
98.6 - 101.2	30	
101.2 - 102.3	35	
102.3 - 105.0	30	
105.0 - 10.6	30	
105.7 - 106.5	35	
106.5 - 106.9	40	
107.4 - 107.5	0	
107.5 - 108.7	15	
108.7 - 108.8	40	
108.9 - 109.5	30	
109.5 - 111.0	20	
111.0 - 115.0	30	
115.0 - 119.8	30	
119.8 - 120.6	20	
120.6 - 121.4	25	
121.4 - 123.1	30	
123.1 - 125.0	35	

ESA SUMMARY LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

BORING NUMBER: MG-67

SHEET NUMBER: 1 of 5

PROJECT NUMBER:

PROJECT: East Side Access
LOCATION: Manhattan Segment
CLIENT: MTA
CONTRACTOR: WGI/JBD

LOCATION: GCT, Track 126
COORD. N: 214,727.2 E: 990,805.9
STN. NO.: 25+28.91 OFFSET: W402.49
SURFACE ELEV.: 312.7 feet
DATUM: ESA Project Datum

DRILLER: J. Harris
INSPECTOR: Y. Awad

START DATE: 5/12/99 TIME: 9:00 pm
FINISH DATE: 5/17/99 TIME:

DRILLING METHOD: Diamond Drilling
RIG TYPE: DK-50 Track Mounted

CORE BARREL DATA:

NOTES:

TYPE: NXBW

Christensen 5' split NXBW (2.125" ID, 2.875"

CORE SIZE: 1.99"

OD)

O.D.: 2.875"

I.D.: 2.125"

CASING SIZE: 3" (3.5")

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
5/17/99	12:00 am	5.0		80.0

DEPTH (feet)	CORING RATE (#/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
		C-1 0.0 - 0.2				From 0'-0.2' roller bit through concrete. From 0.2-3.9' additional 4" reinforced concrete over cobbles.						
2.5		C-2 3.4 - 5.0	19	100	37	Dark gray, medium to coarse grained SCHIST, moderately weathered from 3.4-3.9', slightly weathered to sound below 3.9', slightly fractured, strong, foliated. Granitic pegmatite vein from 3.7-3.9'.	3-2	R4				
5							1-2	R5				
6												
7		C-3 5.0 - 10.0	60	100	100	As above with little veins of dark pink Garnet, closely spaced discontinuities. Slight loss of drilling fluid from 5-10'.			*20	1.5	2	5.9
7									*20 _{MB}	-	-	6.5
7									50	3	1	6.8
7									10 _{MB}	-	-	7.3
7									10	1.5	1	7.8
6									20	3	1	8.05
10									30	3	2	8.75
6							2-1	R5	10	1.5	1	9.15
7									10 _{MB}	-	-	10.55
7		C-4 10.0 - 15.0	59	98	95	As above, medium grained with trace of pink Garnet and white gray Quartz and Feldspar veins, slightly to moderately fractured, moderately spaced discontinuities. Granitic Pegmatite vein from 14.6-14.7'.			20	3	1	12.15
4									50	3	2	13.2
15												
4												
4.5							1-2	R5				
3												
3.5		C-5 15.0 - 20.0	59	98	98	As above medium to coarse grained. Slightly foliated from 14.7-17.5'.			30 _{MB}	-	-	16.85
3.5									40	3	2	17.6
5									40 _{MB}	-	-	18.35
20												
6							1-2	R5	20	1	2	20.2
3.5									10 _{MB}	-	-	20.85
3.5		C-6 20.0 - 25.0	60	100	100				*30 _{MB}	-	-	21.65
3									*30 _{MB}	-	-	21.95
3.5									*20 _{MB}	-	-	23.45
									*20 _{MB}	-	-	23.9

ESA CORING LOG MG_MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: **MG-67**

SHEET NUMBER: 2 of 5

PROJECT NUMBER:

PROJECT: **East Side Access**

LOCATION: **Manhattan Segment**

CLIENT: **MTA**

CONTRACTOR: **WGI/JBD**

DRILLER: **J. Harris**

INSPECTOR: **Y. Awad**

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
30	5	C-7 25.0 - 30.0	60	100	87	As above, medium grained, moderately fractured, closely to very closely spaced discontinuities. 2 parallel 60° joints intersecting with 2 parallel, non continuous 30° joints, at 25.65'. Difficulty pulling the core barrel out of the borehole. Drilling mud (revert) added and pulled the core barrel out. Casing installed to 4'.	2	R5	*20 _{MB}	-	-	24.4
	3								*20	1	1	24.45
	3								*30	1.5	1	25.55
	3								60	1	4	25.6
	3								60	3	2	25.7
	3.5								*30	1.5	1	25.75
									10 _{MB}	-	-	26.1
									40	3	1	26.4
35	8	C-8 30.0 - 35.0	59	98	83	As above, medium to coarse grained. Slickensided joint at 32.15'. From 32.6-32.7' Quartz and Feldspar vein. Reamed the borehole with core barrel before coring.	2	R5	20 _{MB}	-	-	26.8
	3								*40 _{MB}	-	-	27.1
	6								*40	3	3	27.25
	6								*40	3	2	27.75
	6								10 _{MB}	-	-	27.95
	7								*40	3	2	28.2
									*40	1.5	1	28.35
									*40	1	3	28.4
40	4	C-9 35.0 - 40.0	58	97	85	As above. Extremely fractured with clay coated fragments and occasional slickensided surfaces from 38.1-38.5'. Slickensided joint at 38.15'.	2	R5-R4	30	1	2	28.6
	4								30 _{MB}	-	-	28.75
	4								20	1	2	28.95
	4								20	1	2	29
	5.5								10 _{MB}	-	-	29.2
	3								30	1.5	3	29.4
									*30 _{MB}	-	-	30.3
									*60 _{MB}	-	-	30.4
45	6	C-10 40.0 - 45.0	60	100	100	As above, moderately fractured, closely spaced discontinuities. From 41.4-41.7' white, gray, black, coarse to medium grained Granitic PEGMATITE, unweathered, moderately fractured, closely spaced discontinuities, very strong. Slickensided joints at 40.4' and 41.4'.	2-1	R5	10	1	2	30.5
	7.5								30	1	2	30.6
	6								*30 _{MB}	-	-	30.85
	7								20 _{MB}	-	-	31
	7								*30 _{MB}	-	-	31.35
	6								20 _{MB}	-	-	31.9
	6								50	.5	2	32.15
	7								*30	1.5	2	32.35
50	6	C-11 45.0 - 50.0	59	98	95	As above. Slickensided joint at 45.2'. From 47.4-47.6' Granitic Pegmatite.	2-1	R5	20	1	2	32.9
	7								20 _{MB}	-	-	33.55
	7								20	1	2	33.9
	7								20 _{MB}	-	-	34.4
	4								50	3	2	35
	4								10 _{MB}	-	-	35.7
	5.5								20 _{MB}	-	-	36
									30	1.5	2	36.4
55	5	C-12 50.0 - 55.0	59	98	98	As above. From 51.3-51.5' Quartz vein. Joints coated with Calcite, Quartz, and Mica.	1-2	R5	30	1	4	36.5
	5								20 _{MB}	-	-	37.05
	6								20 _{MB}	-	-	37.3
	6								20 _{MB}	-	-	37.65
	7								*50	3	1	37.7
	7								50	1	4	38.1
	7								50	.5	6	38.15
	7								30	1	2	38.55
60	4	C-13 55.0 - 60.0	60	100	97	As above, slightly to moderately fractured, closely to very closely spaced discontinuities. From 55.75-55.9' Quartz vein. From 59.4-60.0' Granitic Pegmatite.	1-2	R5	30	1	2	38.9
	6								50	1	4	39.5
	6								40	.5	3	40.4
	6								50 _{MB}	-	-	40.5
	6								50	1.5	2	40.9
	6								50 _{MB}	-	-	41.2
	6								50	.5	2	41.4
	6.5								*40 _{MB}	-	-	41.65
									*40 _{MB}	-	-	41.85
									20 _{MB}	-	-	42.2

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: MG-67

SHEET NUMBER: 3 of 5

PROJECT NUMBER:

PROJECT: East Side Access

LOCATION: Manhattan Segment

CLIENT: MTA

CONTRACTOR: WGI/JBD

DRILLER: J. Harris

INSPECTOR: Y. Awad

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
65	7	C-14 60.0 - 65.0	60	100	100	As above, slightly fractured, closely spaced discontinuities. From 62-62.6' two 0.5" Quartz veins.	1-2	R5	20 _{MB}	-	-	42.5
	6								*50	1.5	2	42.85
	7.5								20 _{MB}	-	-	42.9
	9								20 _{MB}	-	-	43.7
	8.5								10 _{MB}	-	-	43.9
	5	C-15 65.0 - 70.0	60	100	100	As above. From 66.95-67.05' and 69.6-69.7' Quartz veins.	1-2	R5	50	.5	2	44.3
	7								20	1.5	1	45.2
	7								40	1	4	45.65
	7								30	3	2	45.9
	8								30	1.5	1	46.1
70	7	C-16 70.0 - 75.0	60	100	93	As above. 2 intersecting joints dipping in opposite direction at 71.2'. Slickensided joints at 72' and 72.55'.	2	R5	40 _{MB}	-	-	46.65
	8								10 _{MB}	-	-	47.4
	8								10 _{MB}	-	-	47.6
	7								*30 _{MB}	-	-	48.3
	8								20	1.5	2	48.9
	8	C-17 75.0 - 80.0	60	100	100	As above.	1	R5	40 _{MB}	-	-	49.5
	7								10 _{MB}	-	-	50.2
	8								*20 _{MB}	-	-	50.65
	7								60	3	3	50.9
	8								20 _{MB}	-	-	51.2
75	7	C-17 75.0 - 80.0	60	100	100	As above.	1	R5	30 _{MB}	-	-	51.5
	8								10 _{MB}	-	-	51.9
	8								20 _{MB}	-	-	52.35
	5								30 _{MB}	-	-	52.6
	6								10 _{MB}	-	-	52.9
	7	C-17 75.0 - 80.0	60	100	100	As above.	1	R5	10 _{MB}	-	-	53.3
	5.5								20 _{MB}	-	-	53.65
	6								20 _{MB}	-	-	54.15
	7								20 _{MB}	-	-	54.35
	6								10 _{MB}	-	-	54.35
80	5.5	C-17 75.0 - 80.0	60	100	100	As above.	1	R5	20 _{MB}	-	-	55.25
	6								10 _{MB}	-	-	55.6
	7								20 _{MB}	-	-	55.7
	6								70	3	2	55.7
	6								10 _{MB}	-	-	55.8
	6	Borehole cement-grouted after completion. End of boring at 80'.							10 _{MB}	-	-	55.95
	6								10 _{MB}	-	-	56.4
	6								20 _{MB}	-	-	56.65
	6								40 _{MB}	-	-	56.85
	6								40 _{MB}	-	-	57.15
85	6	Borehole cement-grouted after completion. End of boring at 80'.							20 _{MB}	-	-	57.45
	6								10 _{MB}	-	-	57.95
	6								10 _{MB}	-	-	58.55
	6								10 _{MB}	-	-	59
	6								30 _{MB}	-	-	59.6
	6	Borehole cement-grouted after completion. End of boring at 80'.							20 _{MB}	-	-	60.6
	6								20 _{MB}	-	-	61.1
	6								20 _{MB}	-	-	61.6
	6								10 _{MB}	-	-	62.2
	6								10 _{MB}	-	-	62.65
90	6	Borehole cement-grouted after completion. End of boring at 80'.							10 _{MB}	-	-	62.95
	6								10 _{MB}	-	-	62.95
	6								*30	1.5	2	63.2
	6								*30 _{MB}	-	-	63.7
	6								20 _{MB}	-	-	64.4
	6	Borehole cement-grouted after completion. End of boring at 80'.							20 _{MB}	-	-	64.65
	6								20 _{MB}	-	-	65.2
	6								*30 _{MB}	-	-	65.65
	6								*30 _{MB}	-	-	65.95
	6								*30 _{MB}	-	-	66.45
	6								*30 _{MB}	-	-	66.95

ESACORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: **MG-67**

SHEET NUMBER: 4 of 5

PROJECT NUMBER:

PROJECT: **East Side Access**

LOCATION: **Manhattan Segment**

CLIENT: **MTA**

CONTRACTOR: **WGI/JBD**

DRILLER: **J. Harris**

INSPECTOR: **Y. Awad**

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
100									20 _{MB}	-	-	67.2
									30 _{MB}	-	-	67.4
									20 _{MB}	-	-	67.65
									30 _{MB}	-	-	68
									10 _{MB}	-	-	68.55
									*30 _{MB}	-	-	68.95
									20 _{MB}	-	-	69.35
									20 _{MB}	-	-	69.5
									30	3	1	70.2
									*40 _{MB}	-	-	70.6
105									*40 _{MB}	-	-	70.8
									*40	1.5	2	71.1
									60	3	2	71.2
									30 _{MB}	-	-	71.55
									40	1.5	2	71.8
									40	.5	6	72
									10 _{MB}	-	-	72.2
									10 _{MB}	-	-	72.45
									70	3	3	72.5
									40	.5	2	72.55
110									40	1.5	2	72.65
									20 _{MB}	-	-	73.1
									20 _{MB}	-	-	73.8
									30 _{MB}	-	-	74.4
									10 _{MB}	-	-	75.55
									20 _{MB}	-	-	76.15
									40	1.5	2	77.3
									40 _{MB}	-	-	77.9
									40 _{MB}	-	-	78.45
									20 _{MB}	-	-	79
115												
120												
125												

ESA CORING LOG MG_MA.GPJ MAINLIB.GLB 9/26/02



SUMMARY LOG

BORING NUMBER: MG-67

SHEET NUMBER: 5 of 5

PROJECT NUMBER:

PROJECT: East Side Access

LOCATION: GCT, Track 126

CLIENT: MTA

CONTRACTOR: WGI/JBD

DRILLER: J. Harris

INSPECTOR: Y. Awad

Depth (ft.)	Foliation Dip (deg)	Extremely Fractured Zones (ft)
3.4 - 4.6	20-35	
4.6 - 14.6	10-20	
17.5 - 27.5	10-20	
27.5 - 30.0	20-30	
30.0 - 35.0	10-25	
35.0 - 36.5	10-20	
36.5 - 40.0	20-35	
40.0 - 41.4	35-50	
41.7 - 43.4	30-50	
43.4 - 45.0	10-30	
45.0 - 47.0	20-30	
47.6 - 48.5	30-50	
48.5 - 50.0	10-30	
50.0 - 55.8	10-20	
55.9 - 59.4	20-25	
60.0 - 62.0	15-30	
62.6 - 64.0	20-30	
64.0 - 65.0	15-20	
65.0 - 70.0	10-20	
70.0 - 73.0	20-30	
73.0 - 77.0	10-20	
77.0 - 78.8	20-30	
77.8 - 80.0	10-20	



BORING LOG

BORING NUMBER: **MG-69**SHEET NUMBER: 1 of 3

PROJECT NUMBER:

PROJECT: **East Side Access**
LOCATION: **Manhattan Segment**
CLIENT: **MTA**
CONTRACTOR: **WGI/JBD**

LOCATION: **GCT, Track 166**
COORD. N: **214,558.8** E: **990,945.6**
STN. NO.: **24+49.31** OFFSET: **198.67**
SURFACE ELEV.: **311.8 feet**
DATUM: **ESA Project Datum**

DRILLER: **J. Harris**
INSPECTOR: **Y. Awad**

DRILLING METHOD: **Rotary Wash**
RIG TYPE: **DK-50 Track Mounted**

START DATE: **6/7/99** TIME: **11:30 pm**
FINISH DATE: **6/8/99** TIME:

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel	GROUNDWATER DATA				
I.D.		S ■	U □	P □	G ☒	C □	Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
O.D.	3"	1.375"	2.938"	2.938"		2.125"	6/8/99	12:00 am	3.7		19.5
Length	3.5"	2"	3"	3"		2.875"	6/8/99	2:50 am	2.8	3.5	19.5
Hammer Wt.	140 lbs	140 lbs	Drill Rod Size		NX						
Hammer Fall	30"	30"	I.D. (O.D.)		1.875" (2.5")						

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE				SOIL (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS		
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0/6	6/12	12/18	18/24	REC. (in.)			
							CORING							
							RUN (in.)	REC. (in.)	REC. %	L>4" (in.)	RQD %			Depth Elev.
			S	1		0.0 - 1.0	5	16	35/0"		3	1.0	Gray, coarse to fine GRAVEL, little coarse to fine Sand, trace Wood fragments. (GW)(Fill) Started coring at 1'.	
5														
10														
15														
20														

ESA BORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

BORING NUMBER: **MG-69**SHEET NUMBER: 2 of 3

PROJECT NUMBER:

PROJECT: **East Side Access**LOCATION: **Manhattan Segment**CLIENT: **MTA**CONTRACTOR: **WGI/JBD**DRILLER: **J. Harris**INSPECTOR: **Y. Awad**DRILLING METHOD: **Diamond Drilling**RIG TYPE: **DK-50 Track Mounted**LOCATION: **GCT, Track 166**COORD. N: **214,558.8** E: **990,945.6**STN. NO.: **24+49.31** OFFSET: **198.67**SURFACE ELEV.: **311.8 feet**DATUM: **ESA Project Datum**START DATE: **6/7/99** TIME: **11:30 pm**FINISH DATE: **6/8/99** TIME:**CORE BARREL DATA:****NOTES:**TYPE: **NXBW**

Christensen 5' split NXBW (2.125" ID, 2.875"

CORE SIZE: **1.99"**

OD)

O.D.: **2.875"**I.D.: **2.125"**CASING SIZE: **3" (3.5")****GROUNDWATER DATA**

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
6/8/99	12:00 am	3.7		19.5
6/8/99	2:50 am	2.8	3.5	19.5

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
5	1.5	C-1 1.0 - 5.0	28	57	30	Dark gray, medium to coarse grained SCHIST with Quartz from 2.6-2.85', slightly to moderately weathered, strong, slightly to moderately fractured, extremely fractured from 2.55-2.6', foliated.	2-3	R4	75-25	1	12	1.25
	2.5								*20	1.5	4	1.45
	3								45-55	1	8	1.9
	4								45	1.5	4	2.45
	5								45	1	12	2.55
10	6	C-2 5.0 - 9.5	54	100	100	As above. Granitic Pegmatite from 7.05-7.2' and 8.8-8.9'.	2-1	R5	50	1	12	2.6
	4								*40	1.5	4	2.95
	4								*40	1	8	2.96
	2								60	1	1	5.45
	7											
15	5.5	C-3 9.5 - 14.5	60	100	100	As above. Quartz from 11.6-11.85', 12.55-12.6', 13.1-13.4', and 13.95-14.05'.	2-1	R5				
	6											
	6.5											
	5											
	4.5											
20	5	C-4 14.5 - 19.5	60	100	100	As above Granitic Pegmatite from 15-15.1', 18.75-18.85'. Quartz vein at 19.3'.	2-1	R5				
	5.5											
	5											
	5											
	6											
25						Borehole cement-grouted after completion. End of boring at 19.5'. MB - not recorded.						
						Packer Test Summary From 7.5ft. to 19.5ft. permeability is 3.0E-4 cm/sec						

ESA CORING LOG MG_MA.GPJ MAINLIB.GLB 9/26/02



SUMMARY LOG

BORING NUMBER: MG-69

SHEET NUMBER: 3 of 3

PROJECT NUMBER:

PROJECT: East Side Access

LOCATION: GCT, Track 166

CLIENT: MTA

CONTRACTOR: WGI/JBD

DRILLER: J. Harris

INSPECTOR: Y. Awad

Depth (ft.)	Foliation Dip (deg)	Extremely Fractured Zones (ft)
1.0 - 1.8	25	
1.8 - 2.6	35	
2.9 - 3.2	40	
5.0 - 7.0	25	
7.2 - 8.8	40	
8.9 - 9.5	30	
9.5 - 11.6	30	
11.9 - 12.5	20	
12.6 - 13.1	15	
13.4 - 13.9	25	
14.1 - 14.5	20	
14.5 - 15.0	15	
15.1 - 18.7	25	
18.9 - 19.5	30	



BORING LOG

BORING NUMBER: MG-74

SHEET NUMBER: 1 of 5

PROJECT NUMBER:

PROJECT: East Side Access
LOCATION: Manhattan Segment
CLIENT: MTA
CONTRACTOR: WGI/JBD

DRILLER: J. Harris
INSPECTOR: Y. Awad

DRILLING METHOD: Rotary Wash
RIG TYPE: DK-50 Track Mounted

LOCATION: GCT, Track 166
COORD. N: 214,647.0 E: 990,994.1
STN. NO.: 25+49.99 OFFSET: W148.97
SURFACE ELEV.: 311.8 feet
DATUM: ESA Project Datum

START DATE: 6/8/99 TIME: 11:10 pm
FINISH DATE: 6/11/99 TIME:

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel	GROUNDWATER DATA				
I.D.		S	U	P	G	C	Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
O.D.	3"	1.375"	2.938"	2.938"		2.125"	6/11/99	12:00 am	4.0		89.5
Length		24"	24"	24"		5'					
Hammer Wt.	140 lbs	140 lbs	Drill Rod Size		NX						
Hammer Fall	30"	30"	I.D. (O.D.)		1.875" (2.5")						

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SOIL (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS			
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0/6	6/12	12/18	18/24			REC. (in.)	
							CORING							
							RUN (in.)	REC. (in.)	REC. %	L>4" (in.)			RQD %	
			S	1		0.0 - 1.3	11	19	100/4"		4	1.3	Dark gray, coarse to fine GRAVEL and coarse to fine SAND, trace Silt. (GW-GM/SW-SM)	
														Started coring at 1.3'
5														
10														
15														
20														

ESA BORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

BORING NUMBER: MG-74

SHEET NUMBER: 2 of 5

PROJECT NUMBER:

PROJECT: East Side Access
LOCATION: Manhattan Segment
CLIENT: MTA
CONTRACTOR: WGI/JBD

LOCATION: GCT, Track 166
COORD. N: 214,647.0 E: 990,994.1
STN. NO.: 25+49.99 OFFSET: W148.97
SURFACE ELEV.: 311.8 feet
DATUM: ESA Project Datum

DRILLER: J. Harris

INSPECTOR: Y. Awad

DRILLING METHOD: Diamond Drilling

RIG TYPE: DK-50 Track Mounted

START DATE: 6/8/99 TIME: 11:10 pm

FINISH DATE: 6/11/99 TIME:

CORE BARREL DATA:**NOTES:**

TYPE: NXBW

Christensen 5' split NXBW (2.125" ID, 2.875"

CORE SIZE: 1.99"

OD)

O.D.: 2.875"

I.D.: 2.125"

CASING SIZE: 3" (3.5")

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
6/11/99	12:00 am	4.0		89.5

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
5	1.5	C-1 1.3 - 5.5	33	66	0	Top 22.5" CONCRETE. Middle 3" Coarse to fine GRAVEL, rock fragments. Bottom 7.5" dark gray, medium grained SCHIST with Quartz and Feldspar veins, moderately fractured, foliated.	2	R4				
	1.5											
	1											
	2	C-2 5.5 - 9.5	48	100	96	Dark gray, medium to coarse grained SCHIST with Quartz and Feldspar veins, slightly weathered to unweathered, very strong, sound, moderately spaced discontinuities, foliated.	2-1	R5	*20 _{MB}	-	-	5.9
	3								*30 _{MB}	-	-	6.9
	3.5								*30 _{MB}	-	-	8.1
10	3	C-3 9.5 - 14.5	59	98	98	As above. From 11.5'-19.5': Granitic Pegmatite veins distort foliations.	2-1	R5	*40	1.5	4	9.3
	3								*30	1.5	1	10.4
	3								*30 _{MB}	-	-	10.5
	4								*20 _{MB}	-	-	11.1
	4								*20 _{MB}	-	-	12.65
15	3	C-4 14.5 - 19.5	60	100	100	As above. Quartz vein from 15.2-15.3'. From 19.1'-19.3': Granitic Pegmatite vein.	2-1	R5	*30 _{MB}	-	-	13.95
	3.5								30 _{MB}	-	-	15.35
	3.5								30	1.5	1	16.65
	3								*30	1.5	1	17.35
	3											
20	4	C-5 19.5 - 24.5	60	100	93	As above, slightly fractured, moderately spaced discontinuities. Quartz from 22-22.3', and 24.15-24.25'. Slickensided joint at 23.05'. From 21.7-21.9, 22.8-23' Granitic Pegmatite. Slight loss of drilling fluid from 22'.	2-1	R5	*30 _{MB}	-	-	20.1
	3								10 _{MB}	-	-	20.7
	3.5								20	1	2	21.9
	3.5								10	1	2	22.05
	4								20 _{MB}	-	-	22.1
25	10								10	1.5	1	22.2
	4								10	.5	2	23.05
	4								20	1.5	1	23.1
	3								40	1	2	23.55

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: **MG-74**

SHEET NUMBER: 3 of 5

PROJECT NUMBER:

PROJECT: **East Side Access**

LOCATION: **Manhattan Segment**

CLIENT: **MTA**

CONTRACTOR: **WGI/JBD**

DRILLER: **J. Harris**

INSPECTOR: **Y. Awad**

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
30	3	C-6 24.5 - 29.5	60	100	100	As above.	2-1	R5	*30 _{MB}	-	-	26
	3								*30 _{MB}	-	-	27.2
	3								30 _{MB}	-	-	28.85
	2.5								*30 _{MB}	-	-	30.25
	3								*30 _{MB}	-	-	32.3
35	3	C-7 29.5 - 34.5	60	100	100	As above.	2-1	R5	*20 _{MB}	-	-	32.3
	3.5								*20 _{MB}	-	-	34.2
	3.5								*20 _{MB}	-	-	36.4
	3								*30 _{MB}	-	-	37.8
	4	C-8 34.5 - 39.5	60	100	100				30 _{MB}	-	-	39
40	3.5					As above, slightly fractured, closely spaced discontinuities. Slickensided joint at 41.2'. 0.5" thick zone filled with crushed rock (1/16" to 1/8" sizes). From 44.1'-44.3': Granitic Pegmatite vein. Loss of drilling fluid circulation from about 41.25'.	2-1	R5	30 _{MB}	-	-	40.55
	3								*20 _{MB}	-	-	41
	3	C-9 39.5 - 44.5	59	98	92				*30	1.5	1	41.2
	2.5								*30	.5	2	41.65
	3								*30 _{MB}	-	-	43
45	6					As above, sound, moderately spaced discontinuities.	2-1	R5	50 _{MB}	-	-	43.55
	4								10 _{MB}	-	-	44.1
	4	C-10 44.5 - 49.5	60	100	100				*30 _{MB}	-	-	47.2
	3.5								*20 _{MB}	-	-	48.3
	4								*20 _{MB}	-	-	48.8
50	3.5					As above.	2-1	R5	*30 _{MB}	-	-	50.15
	3.5	C-11 49.5 - 54.5	60	100	100				*30 _{MB}	-	-	53
	3								*30 _{MB}	-	-	57.6
	3								*30	1.5	2	58.65
	3	C-12 54.5 - 59.5	60	100	97				*20	1.5	2	58.8
60	3					As above, slightly fractured, closely spaced discontinuities. Slickensided joints at 59.7' and 59.75'.	2-1	R5	*30	.5	2	59.7
	3								*30	.5	2	59.75
	3								*30	.5	2	59.75

ESA CORING LOG MG_MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: **MG-74**SHEET NUMBER: 4 of 5

PROJECT NUMBER:

PROJECT: **East Side Access**LOCATION: **Manhattan Segment**CLIENT: **MTA**CONTRACTOR: **WGI/JBD**DRILLER: **J. Harris**INSPECTOR: **Y. Awad**

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
65	3	C-13 59.5 - 64.5	60	100	92		2-1	R5	60	1.5	1	60
	3.5								*30	1.5	1	60.6
	4								*30	1.5	1	62.15
	4								*30	1.5	1	63.15
	6.5								20 _{MB}	-	-	63.7
70	6.5	C-14 64.5 - 69.5	60	100	87	As above.	2-1	R5	*20 _{MB}	-	-	64.7
	6								40	1.5	1	65.2
	5								*20	1.5	2	66.5
	4								*30	1.5	2	66.6
	4								*20	1.5	1	66.8
75	4	C-15 69.5 - 74.5	60	100	90	As above. Quartz veins from 73.2-73.85' and 73-74.1'. Extremely fractured zone from 70.8-71.3'.	2-1	R5	*30	1.5	1	67.15
	4								50	1.5	1	67.9
	4								20	1.5	1	68
	5								20 _{MB}	-	-	68.8
	7								10 _{MB}	-	-	69.1
80	7	C-16 74.5 - 79.5	60	100	100	As above. Slickensided joint at 79'.	2-1	R5	*30	1.5	1	69.5
	6.5								20 _{MB}	-	-	70.75
	5.5								30	1.5	2	70.9
	4.5								30 _{MB}	-	-	70.95
	6								30 _{MB}	-	-	71.1
85	4.5	C-17 79.5 - 84.5	58	97	97	As above. Quartz and Feldspar veins from 83.8-84.3'.	2-1	R5	85	1.5	1	71.15
	4.5								10 _{MB}	-	-	71.25
	8.5								30	1	2	72.1
	8								50	1.5	1	74.5
	4.5								10 _{MB}	-	-	75
90	4.5	C-18 84.5 - 89.5	59	98	97	As above, slightly fractured, closely spaced discontinuities. Moderately weathered zone from 88.9-89'. From 87.4'-88.1': Granitic Pegmatite vein. Slickensided joints at 88.9' and 89.95'.	2-1	R5	*20 _{MB}	-	-	76.1
	4.5								*20 _{MB}	-	-	76.15
	5.5								*30 _{MB}	-	-	77.2
	4.5								20 _{MB}	-	-	77.3
	4.5								40 _{MB}	-	-	78.5
95	4.5					Borehole cement-grouted after completion. End of boring at 89.5'.	2-1	R5	10	.5	2	79
	4.5								*10 _{MB}	-	-	80.25
	5.5								*10 _{MB}	-	-	81.35
	4.5								20 _{MB}	-	-	82.2
	4.5								10 _{MB}	-	-	82.55
	4.5						2-1	R5	20 _{MB}	-	-	82.85
	4.5								20	1.5	1	83.8
	4.5								*30 _{MB}	-	-	85.15
	4.5								*30 _{MB}	-	-	85.4
	4.5								*30 _{MB}	-	-	85.55
	4.5						2-1	R5	80	1.5	1	85.7
	4.5								30 _{MB}	-	-	86.3
	4.5								20 _{MB}	-	-	86.85
	4.5								30	1.5	1	87
	4.5								30 _{MB}	-	-	87.55
	4.5						2-1	R5	10 _{MB}	-	-	88.3
	4.5								10	.5	3	88.9
	4.5								10	.5	3	88.95
	4.5								10	.5	3	88.95
	4.5								10	.5	3	88.95

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



SUMMARY LOG

BORING NUMBER: MG-74

SHEET NUMBER: 5 of 5

PROJECT NUMBER:

PROJECT: East Side Access

LOCATION: GCT, Track 166

CLIENT: MTA

CONTRACTOR: WGI/JBD

DRILLER: J. Harris

INSPECTOR: Y. Awad

Depth (ft.)	Foliation Dip (deg)	Extremely Fractured Zones (ft)
1.3 - 5.5	30-40	
5.5 - 9.5	35	
9.5 - 14.5	30-40	
14.5 - 18.0	30-40	
18.0 - 19.5	40-50	
19.5 - 24.5	20-30	
24.5 - 29.5	25-35	
29.5 - 34.5	25-35	
34.5 - 39.5	30-40	
39.5 - 44.5	25-35	
44.5 - 49.5	20-30	
49.5 - 54.5	30-40	
54.5 - 59.5	20-30	
59.5 - 64.5	20-30	
64.5 - 69.5	20-30	
69.5 - 74.5	10-20	
74.5 - 75.5	10-20	70.8 - 71.3
75.5 - 76.0	20-30	
76.0 - 79.5	30-40	
79.5 - 82.0	10-20	
82.0 - 84.5	20-30	
84.5 - 88.5	30-40	
88.5 - 89.5	5-15	



BORING LOG

BORING NUMBER: **MG-79**SHEET NUMBER: 1 of 3

PROJECT NUMBER:

PROJECT: **East Side Access**
LOCATION: **Manhattan Segment**
CLIENT: **MTA**
CONTRACTOR: **WGI/JBD**

LOCATION: **GCT, Track 166**
COORD. N: **214,733.3** E: **991,042.4**
STN. NO.: **26+48.93** OFFSET: **W198.63**
SURFACE ELEV.: **311.7 feet**
DATUM: **ESA Project Datum**

DRILLER: **J. Harris**
INSPECTOR: **Y. Awad**

DRILLING METHOD: **Rotary Wash**
RIG TYPE: **DK-50 Track Mounted**

START DATE: **6/14/99** TIME: **8:45 pm**
FINISH DATE: **6/15/99** TIME: **1:30 am**

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel	GROUNDWATER DATA				
I.D.	3"	1.375"	2.938"	2.938"		2.125"	Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
O.D.	3.5"	2"	3"	3"		2.875"	6/14/99	11:35 pm	4.0	3.2	19.5
Length	3.2	24"	24"	24"		5'					
Hammer Wt.	140 lbs	140 lbs	Drill Rod Size		NX						
Hammer Fall	30"	30"	I.D. (O.D.)		1.875" (2.5")						

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SOIL (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS		
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0/6	6/12	12/18	18/24			REC. (in.)
							CORING						
							RUN (in.)	REC. (in.)	REC. %	L>4" (in.)			RQD %
			S	1	0.0 - 0.9	5	100/5"			15	0.9	Gray BALLAST, coarse to fine gravel size, fill. (GW) Started coring at 0.9'.	
5													
10													
15													
20													

ESA BORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

BORING NUMBER: MG-79

SHEET NUMBER: 2 of 3

PROJECT NUMBER:

PROJECT: East Side Access
LOCATION: Manhattan Segment
CLIENT: MTA
CONTRACTOR: WGI/JBD

LOCATION: GCT, Track 166
COORD. N: 214,733.3 E: 991,042.4
STN. NO.: 26+48.93 OFFSET: W198.63
SURFACE ELEV.: 311.7 feet
DATUM: ESA Project Datum

DRILLER: J. Harris
INSPECTOR: Y. Awad

DRILLING METHOD: Diamond Drilling
RIG TYPE: DK-50 Track Mounted

START DATE: 6/14/99 TIME: 8:45 pm
FINISH DATE: 6/15/99 TIME: 1:30 am

CORE BARREL DATA:**NOTES:**

TYPE: NXBW

Christensen 5' split NXBW (2.125" ID, 2.875"

CORE SIZE: 1.99"

OD)

O.D.: 2.875"

I.D.: 2.125"

CASING SIZE: 3" (3.5")

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
6/14/99	11:35 pm	4.0	3.2	19.5

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
5	1.5	C-1 0.9 - 4.5	23	53	19	From 2.6' SCHIST, moderately to highly weathered, extremely to moderately fractured. From 1.1' dark gray, medium to coarse grained SCHIST with Quartz and Feldspar veins, slightly weathered, strong, moderately to slightly fractured, foliated.	3-4-2	R4				
	3					Extremely fractured from 0.9-2.6'. Granitic Pegmatite from 3.8'-4' and 4.35'-4.45'.	2-1	R5	*20	1	8	3.35
	4					Dark gray, medium to coarse grained SCHIST with Quartz and Feldspar, slightly weathered to unweathered, very strong, slightly fractured to sound, foliated.			*45	1.5	4	3.65
	4					Granitic Pegmatite from 6.15'-6.25'.			*45	1.5	2	3.8
	3	C-2 4.5 - 9.5	60	100	96				*35	1.5	2	4.15
	3								*45	1	2	4.7
10	3.5								*35	1.5	4	7.95
	4					As above.	2-1	R5	*30	1.5	4	8.35
	4.5	C-3 9.5 - 14.5	60	100	100	Granitic Pegmatite from 12.1'-12.5'.			45	1.5	2	10.25
	4.5											
15	6											
	4.5					As above.	2-1	R5				
	5.5	C-4 14.5 - 19.5	60	100	100	Quartz vein from 16.65-16.9'.			*25	1	4	15.3
	6											
20	5.5											
	7											
25						Borehole cement-grouted after completion. End of boring at 19.5'. MB - not recorded.						
						Packer Test Summary From 8.5ft. to 19.5ft. permeability is 1.0E-7 cm/sec						

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



SUMMARY LOG

BORING NUMBER: MG-79

SHEET NUMBER: 3 of 3

PROJECT NUMBER:

PROJECT: East Side Access

LOCATION: GCT, Track 166

CLIENT: MTA

CONTRACTOR: WGI/JBD

DRILLER: J. Harris

INSPECTOR: Y. Awad

Depth (ft.)	Foliation Dip (deg)	Extremely Fractured Zones (ft)
0.9 - 3.4	20	0.9 - 2.6
3.4 - 3.8	30	
4.0 - 4.2	35	
4.2 - 4.5	50	
4.5 - 5.6	35	
5.6 - 7.2	45	
7.2 - 8.0	40	
8.9 - 9.5	30	
9.5 - 10.7	40	
10.7 - 11.5	30	
11.5 - 12.0	50	
12.5 - 13.5	45	
13.5 - 14.5	35	
14.5 - 16.0	35	
16.0 - 16.6	25	
16.9 - 17.3	60	
17.3 - 18.1	35	
18.1 - 19.5	45	



BORING LOG

BORING NUMBER: MG-114w

SHEET NUMBER: 1 of 7

PROJECT NUMBER:

PROJECT: East Side Access
LOCATION: Manhattan Segment
CLIENT: MTA
CONTRACTOR: WGI/JBD

LOCATION: GCT, Track 125
COORD. N: 214,817.0 E: 990,874.2
STN. NO.: 26+40.50 OFFSET: W386.32
SURFACE ELEV.: 312.2 feet
DATUM: ESA Project Datum

DRILLER: F. Navarro
INSPECTOR: R. Jeremic

DRILLING METHOD: Rotary Wash
RIG TYPE: DK-50 Track Mounted

START DATE: 9/29/99 TIME: 9:00 pm
FINISH DATE: 10/7/99 TIME:

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel	GROUNDWATER DATA*				
I.D.	3"	1.375"	2.938"	2.938"		2.375"	Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
O.D.	3.5"	2"	3"	3"		2.75"	9/30/99	10:03 pm	3.4	5.5	13.5
Length	5.5'	24"	24"	24"		5'/10'	10/5/99	1:20 pm	3.2	5.5	13.5
Hammer Wt.	140 lbs	140 lbs	Drill Rod Size		NX		10/7/99	10:45 pm	3.7		110.0
Hammer Fall	30"	30"	I.D. (O.D.)		1.875" (2.5")		10/8/99	9:45 pm	3.8		110.0

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SOIL (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS		
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0/6	6/12	12/18	18/24			REC. (in.)
							CORING						
							RUN (in.)	REC. (in.)	REC. %	L>4" (in.)	RQD %	Depth Elev.	
			S	1		0.5 - 2.5	4	2	22	23	4	CONCRETE slab 6.5" thick. Gray, coarse to fine SAND and fine GRAVEL, little clayey Silt, moist. (SM/GM) (Fill) Brownish gray, coarse to fine SAND, little fine Gravel, little clayey Silt, moist. (SM) (Fill) (Occasional rock and brick fragments)	
			S	2		2.5 - 4.0	9	6	32	50/2"	6		4.0
5													
10													
15													
20													

*For additional readings, see MG-114w Well Installation Log.

FIELD CLASSIFICATION AND REMARKS

CONCRETE slab 6.5" thick.
Gray, coarse to fine SAND and fine GRAVEL, little clayey Silt, moist. (SM/GM) (Fill)

Brownish gray, coarse to fine SAND, little fine Gravel, little clayey Silt, moist. (SM) (Fill)
(Occasional rock and brick fragments)

ESA BORING LOG MG MA.GPJ MAINLIB.GLB 9/28/02



CORING LOG

BORING NUMBER: MG-114w

SHEET NUMBER: 2 of 7

PROJECT NUMBER:

PROJECT: East Side Access
LOCATION: Manhattan Segment
CLIENT: MTA
CONTRACTOR: WGI/JBD

LOCATION: GCT, Track 125
COORD. N: 214,817.0 E: 990,874.2
STN. NO.: 26+40.50 OFFSET: W386.32
SURFACE ELEV.: 312.2 feet
DATUM: ESA Project Datum

DRILLER: F. Navarro
INSPECTOR: R. Jeremic
DRILLING METHOD: Diamond Drilling
RIG TYPE: DK-50 Track Mounted

START DATE: 9/29/99 TIME: 9:00 pm
FINISH DATE: 10/7/99 TIME:

CORE BARREL DATA:

NOTES:

TYPE: NQ2
CORE SIZE: 1.99"
O.D.: 2.75"
I.D.: 2.375"
CASING SIZE: 3" (3.5")

Christensen 5' split NXBW (2.125" ID, 2.875"
OD) Longyear 10' NQ2 wire line.

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
9/30/99	10:03 pm	3.4	5.5	13.5
10/5/99	1:20 pm	3.2	5.5	13.5
10/7/99	10:45 pm	3.7		110.0
10/8/99	9:45 pm	3.8		110.0

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
5		C-1 4.0 - 5.0	12	100	100	Top of bedrock encountered at 4 ft.	2	R4 R3	0	1.5	1	5.2
		C-2 5.0 - 10.0	60	100	92	Gray, medium grained SCHIST with Quartz vein at 4.2', slightly weathered, very strong, sound, moderately spaced discontinuities, thinly foliated.			*10 *10 *30 40 20	1.5 1.5 1 3 3	1 1 4 1 2	6.6 6.7 7.4 7.6 7.7
10	5.5					Dark gray, fine to medium grained SCHIST, unweathered, strong, sound, moderately spaced discontinuities, very thinly foliated.	1	R4	10 _{MB} *20 _{MB} *20 _{MB} *10 _{MB}	- - - -	- - - -	8.4 10.25 10.6 11.5
	5								*20 _{MB}	-	-	12.5
	4.5								*20 _{MB}	-	-	13.2
15	4	C-3 10.0 - 20.0	115	96	96				*20 _{MB}	-	-	13.8
	3.5								*20 _{MB}	-	-	14.5
	4								50	1.5	1	15.6
	4								*10 _{MB}	-	-	15.9
	4								30	1.5	1	16.3
	4								10 _{MB}	-	-	17.3
20	4.5								10 _{MB}	-	-	18.5
	6					Dark gray, fine to medium grained SCHIST slightly weathered, strong, slightly fractured, , closely spaced discontinuities, very thinly foliated.	2	R4	30 _{MB}	-	-	19.4
	5								*20 _{MB}	-	-	20.65
	4								*20 _{MB}	-	-	20.9
	4								*20 _{MB}	-	-	21.7
	4								*20 _{MB}	-	-	22.55
	4.5								*30 _{MB}	-	-	23.15
25	4	C-4 20.0 - 30.0	115	96	96				*30 _{MB}	-	-	24
	3.5								*20 _{MB}	-	-	24.25
	4								*30 _{MB}	-	-	25.7
	5								*30	1.5	1	26.5
									10 _{MB}	-	-	27.15
									*40	1.5	1	28

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: MG-114w

SHEET NUMBER: 3 of 7

PROJECT NUMBER:

PROJECT: East Side Access

LOCATION: Manhattan Segment

CLIENT: MTA

CONTRACTOR: WGI/JBD

DRILLER: F. Navarro

INSPECTOR: R. Jeremic

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
30	4.5					Dark gray, fine to medium grained SCHIST, unweathered, strong, sound, moderately spaced discontinuities, very thinly foliated.	2	R4	10 _{MB}	-	-	28.4
	5								50	1.5	1	28.85
	4								*30 _{MB}	-	-	28.95
	4								50 _{MB}	-	-	29.2
	4								*20	2	1	29.3
	4								*20 _{MB}	-	-	29.65
	4								*20 _{MB}	-	-	30.8
	4								*30 _{MB}	-	-	32.5
	4								*20 _{MB}	-	-	33.45
	4								*20 _{MB}	-	-	34.2
35	5	C-5 30.0 - 40.0	118	98	98				10 _{MB}	-	-	34.8
	5											
	5											
	4.5								*20 _{MB}	-	-	37.25
	4											
40	4.5					As above.	1	R4	*50 _{MB}	-	-	38.7
	4								10 _{MB}	-	-	39.2
	4								10 _{MB}	-	-	39.55
	3.5								0 _{MB}	-	-	40.75
	3.5								*20 _{MB}	-	-	41.7
	4								*10 _{MB}	-	-	42.6
	4								*10 _{MB}	-	-	43.5
	4								*10 _{MB}	-	-	44.3
	3.5								*20 _{MB}	-	-	44.9
	4								*20 _{MB}	-	-	45.45
45	4	C-6 40.0 - 50.0	118	98	98				*20 _{MB}	-	-	46.4
	3.5											
	4								*20 _{MB}	-	-	47.65
	4								*30 _{MB}	-	-	48.35
	4.5								*20 _{MB}	-	-	48.75
50	3.5					As above. Quartz veins at 51.2-53'.	1	R4	*20 _{MB}	-	-	49.2
	3.5											
	3								*20 _{MB}	-	-	52.2
	3.5								*10 _{MB}	-	-	53
	3								*10 _{MB}	-	-	54.1
	3.5								*30 _{MB}	-	-	54.5
	3								*20 _{MB}	-	-	54.9
	3								*20 _{MB}	-	-	55
	3								*20 _{MB}	-	-	55.45
	3.5								*20	1.5	1	56.1
	3.5								*10 _{MB}	-	-	56.7
	3.5								*10 _{MB}	-	-	57.3
	3								*10 _{MB}	-	-	57.6
55	3								*20 _{MB}	-	-	58.1
	3								*20 _{MB}	-	-	58.75
	3								*20 _{MB}	-	-	59.4
	2.5								*30	1.5	1	60
									*30 _{MB}	-	-	60.3
									*10 _{MB}	-	-	60.8
									*10 _{MB}	-	-	61.85

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: **MG-114w**SHEET NUMBER: 4 of 7

PROJECT NUMBER:

PROJECT: **East Side Access**LOCATION: **Manhattan Segment**CLIENT: **MTA**CONTRACTOR: **WGI/JBD**DRILLER: **F. Navarro**INSPECTOR: **R. Jeremic**

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
65	3	C-8 60.0 - 70.0	117	98	98				*10 _{MB}	-	-	62.75
	4								*20 _{MB}	-	-	63.35
	5								*20 _{MB}	-	-	64.2
	4								*20 _{MB}	-	-	64.7
	3								*10 _{MB}	-	-	64.9
70	3					As above, slightly fractured, closely spaced discontinuities. Quartz vein from 70.2-70.4'.	1	R5 R4	*10 _{MB}	-	-	65.4
	4								*10 _{MB}	-	-	66.1
	4								*10 _{MB}	-	-	66.6
	5								*10 _{MB}	-	-	67.75
	4								*10 _{MB}	-	-	69
75	3.5	C-9 70.0 - 80.0	119	99	99				*10 _{MB}	-	-	69.5
	3.5								*10 _{MB}	-	-	70.2
	4.5								*20 _{MB}	-	-	70.6
	4								*30 _{MB}	-	-	71
	4.5								*20 _{MB}	-	-	71.3
80	4.5					As above, medium strong, slightly to moderately fractured, closely spaced discontinuities.	2	R3	*20 _{MB}	-	-	71.75
	3								*20 _{MB}	-	-	72.4
	4								*20 _{MB}	-	-	73
	3								*30 _{MB}	-	-	73.7
	3								*0 _{MB}	-	-	74
85	3.5	C-10 80.0 - 90.0	118	98	78	Slightly to moderately fractured with moderately fractured zone from 82.4-87.8'.			*20 _{MB}	-	-	74.9
	4.5								*20 _{MB}	-	-	75.4
	4.5								*20 _{MB}	-	-	76
	5								*20 _{MB}	-	-	76.4
	5.5								*20 _{MB}	-	-	77.4
90	5					Dark gray, fine to medium grained SCHIST unweathered to slightly weathered, strong, slightly to moderately fractured, closely spaced discontinuities, very thinly foliated.	1	R4	*20 _{MB}	-	-	77.8
	3								*20 _{MB}	1.5	1	78.35
	4								*20 _{MB}	-	-	78.9
	3.5								*20 _{MB}	1.5	1	79.25
	4								*10 _{MB}	-	-	80.6
95	7	C-11 90.0 - 100.0	116	97	97				*10 _{MB}	-	-	81.35
	4								*10 _{MB}	-	-	81.9
	3.5								*10 _{MB}	1.5	2	82.5
	4								*10 _{MB}	3	1	83
	4								*10 _{MB}	3	1	83.65



CORING LOG

(continued)

BORING NUMBER: MG-114w

SHEET NUMBER: 5 of 7

PROJECT NUMBER:

PROJECT: East Side Access

LOCATION: Manhattan Segment

CLIENT: MTA

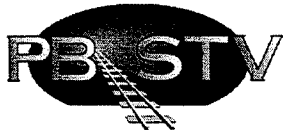
CONTRACTOR: WGI/JBD

DRILLER: F. Navarro

INSPECTOR: R. Jeremic

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
100	3.5					As above, very closely spaced discontinuities. Quartz zone from 103.5-105', strong, Moderately fractured, extremely fractured from 102.9-105', 106-106.9' and slightly fractured from 100-101.6' and 109.4-110'. Possible shear zone from 102.9-106.9'.	1	R4	*20	1.5	1	94.1
	4								*20 _{MB}	-	-	94.5
	6.5								*20 _{MB}	-	-	94.85
	10								*10 _{MB}	-	-	95.35
	7								*20 _{MB}	-	-	95.85
105	8	C-12 100.0 - 110.0	118	98	28		*10 _{MB}	-	-	96.4		
	*10 _{MB}						-	-	96.65			
	*10 _{MB}						-	-	97.25			
	*20 _{MB}						-	-	97.6			
	*20 _{MB}						-	-	98.1			
6.5	*20						1.5	1	98.7			
6	*20 _{MB}						-	-	98.9			
7.5	*20 _{MB}						-	-	99.35			
6	*10 _{MB}						-	-	100.2			
6	*10 _{MB}						-	-	101.2			
110	6					*20 _{MB}	-	-	101.6			
						*20 _{MB}	-	-	101.7			
						*20	1.5	1	101.9			
						*20	1.5	1	102.1			
						*20	1.5	1	102.4			
115		C-13 110.0 - 120.0	116	97	97	*20	1.5	1	102.6			
	*10					1.5	1	102.75				
	*10					1.5	1	102.9				
	*20					1.5	1	103				
	*20					1.5	1	103.1				
7.5	*10 _{MB}					-	-	103.2				
6	*10					1.5	1	103.3				
6.5	*10					1.5	1	103.4				
7	*10					1.5	1	103.5				
6.5	*10					1.5	1	103.6				
120						20	1.5	1	103.7			
						20	1.5	1	103.8			
						*10	1.5	1	103.95			
						*10	1.5	1	104.1			
						*10 _{MB}	-	-	104.15			
125	4.5	C-14 120.0 - 130.0	120	100	100	*10	1.5	1	104.25			
	*10					1.5	1	104.4				
	*10					1.5	1	104.5				
	*10					1.5	1	104.65				
	0 _{MB}					-	-	104.7				
6	20					1.5	1	104.75				
6	0					1.5	1	104.85				
5	20					1.5	1	104.95				
5.5	20					1.5	1	105				
5	*10 _{MB}					-	-	105.35				
130	5.5					20 _{MB}	-	-	105.5			
	5					0	1.5	1	105.7			
	5.5					0	1	2	105.9			
	5					0	1	2	106.1			
	5					0	1.5	1	106.2			
	6	C-15 130.0 - 135.0	60	100	100	10	1.5	1	106.35			
	0					1.5	1	106.5				
	10					1.5	1	106.6				
	0					1.5	1	106.8				
	0					1.5	1	106.9				
9	10					1.5	2	107				
5	20					1	2	107.1				
	0					1	2	107.3				

ESA CORING LOG MG MA.GPJ MAIN\IB.GLB 9/26/02



CORING LOG

(continued)

BORING NUMBER: **MG-114w**

SHEET NUMBER: 6 of 7

PROJECT NUMBER:

PROJECT: **East Side Access**

LOCATION: **Manhattan Segment**

CLIENT: **MTA**

CONTRACTOR: **WGI/JBD**

DRILLER: **F. Navarro**

INSPECTOR: **R. Jeremic**

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
135	5					Observation well installed upon completion of boring, slotted PVC pipe from 99.5'-109.5' bottom of seal at 98.5'. End of boring at 135'.			10	1.5	1	107.45
									10	1.5	1	107.6
									10	1.5	1	107.7
									0	1.5	1	107.85
									10	1.5	1	108.05
									20	1.5	1	108.2
									*20	1.5	1	108.35
									*20 _{MB}	-	-	108.7
									*20 _{MB}	-	-	109
140						<u>Packer Test Summary</u> From 100ft. to 135ft. permeability is 2.3E-4 cm/sec			*20 _{MB}	-	-	109.5
									*20 _{MB}	-	-	110.75
									*30 _{MB}	-	-	111.25
									*10 _{MB}	-	-	112.45
									10 _{MB}	-	-	112.9
									*20 _{MB}	-	-	113.4
									20 _{MB}	-	-	114.55
									*10 _{MB}	-	-	114.8
145									*10 _{MB}	-	-	115.4
									*10 _{MB}	-	-	116.2
									*10 _{MB}	-	-	117.3
									*10 _{MB}	-	-	117.75
									*10 _{MB}	-	-	118.25
									*10 _{MB}	-	-	119.15
									10 _{MB}	-	-	121.11
									10 _{MB}	-	-	121.95
									*20 _{MB}	-	-	122.5
150									*20 _{MB}	-	-	123.95
									10 _{MB}	-	-	124.5
									10 _{MB}	-	-	125.45
									*20 _{MB}	-	-	126.4
									10 _{MB}	-	-	127.65
									10 _{MB}	-	-	128.8
									*30 _{MB}	-	-	131
155									10 _{MB}	-	-	131.8
									*30 _{MB}	-	-	133
									10 _{MB}	-	-	133.65
160												
165												

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



SUMMARY LOG

BORING NUMBER: **MG-114w**

SHEET NUMBER: 7 of 7

PROJECT NUMBER:

PROJECT: **East Side Access**

LOCATION: **GCT, Track 125**

CLIENT: **MTA**

CONTRACTOR: **WGI/JBD**

DRILLER: **F. Navarro**

INSPECTOR: **R. Jeremic**

Depth (ft.)	Foliation Dip (deg)	Extremely Fractured Zones (ft)
5.0 - 10.0	25	
10.0 - 20.0	20	
20.0 - 25.0	30	
25.0 - 30.0	25	
30.0 - 35.0	30	
35.0 - 50.0	25	
50.0 - 60.0	30	
60.0 - 70.0	20	
70.0 - 75.0	30	
75.0 - 90.0	20	
90.0 - 95.0	25	
95.0 - 100.0	20	
		102.9 - 105.0
		106.0 - 106.9
110.0 - 115.0	20	
115.0 - 120.0	25	
120.0 - 125.0	20	
125.0 - 130.0	15	



BORING LOG

BORING NUMBER: MG-115

SHEET NUMBER: 1 of 3

PROJECT NUMBER:

PROJECT: East Side Access
LOCATION: Manhattan Segment
CLIENT: MTA
CONTRACTOR: WGI/JBD

LOCATION: GCT, Track 115
COORD. N: 214,605.9 E: 991,053.4
STN. NO.: 25+42.81 OFFSET: W127.2
SURFACE ELEV.: 311.2 feet
DATUM: ESA Project Datum

DRILLER: G. Marney
INSPECTOR: L. Moretti

DRILLING METHOD: Rotary Wash
RIG TYPE: DK-50 Track Mounted

START DATE: 7/7/99 TIME: 12:30 am
FINISH DATE: 7/8/99 TIME: 3:30 am

	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel	GROUNDWATER DATA				
Type/Symbol		S ■	U □	P □	G ☒	C □					
I.D.	3"	1.375"	2.938"	2.938"		2.125"	Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
O.D.	3.5"	2"	3"	3"		2.875"	7/8/99	3:00 am	2.0	5.0	22.0
Length	5'	24"	24"	24"		5'					
Hammer Wt.	140 lbs	140 lbs	Drill Rod Size		NW						
Hammer Fall	30"	30"	I.D. (O.D.)		2.25" (2.625")						

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE				SOIL (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS	
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0/6	6/12	12/18	18/24	REC. (in.)		
							CORING						
							RUN (in.)	REC. (in.)	REC. %	L>4" (in.)	RQD %		
			S	1		0.0 - 2.0	6	22	37	100/4"		2.0	Gray, angular Ballast over completely weathered rock.
5													Started coring at 2'.
10													
15													
20													

ESA BORING LOG MG MA.GPJ MAINJ.BGLB 9/26/02



CORING LOG

BORING NUMBER: MG-115

SHEET NUMBER: 2 of 3

PROJECT NUMBER:

PROJECT: East Side Access
LOCATION: Manhattan Segment
CLIENT: MTA
CONTRACTOR: WGI/JBD

DRILLER: G. Marney
INSPECTOR: L. Moretti

DRILLING METHOD: Diamond Drilling
RIG TYPE: DK-50 Track Mounted

LOCATION: GCT, Track 115
COORD. N: 214,605.9 E: 991,053.4
STN. NO.: 25+42.81 OFFSET: W127.2
SURFACE ELEV.: 311.2 feet
DATUM: ESA Project Datum

START DATE: 7/7/99 TIME: 12:30 am
FINISH DATE: 7/8/99 TIME: 3:30 am

CORE BARREL DATA:**NOTES:**

TYPE: NXBW

Christensen 5' split NXBW (2.125" ID, 2.875"

CORE SIZE: 1.99"

OD)

O.D.: 2.875"

I.D.: 2.125"

CASING SIZE: 3" (3.5")

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
7/8/99	3:00 am	2.0	5.0	22.0

DEPTH (feet)	CORING RATE (ft/min)	CORE RUN NO. AND DEPTH (ft)	RECOVERY (in)	RECOVERY (%)	RQD (%)	DESCRIPTION AND REMARKS (Lithology, Structure, Weathering, Continuity, Strength, Color, Grain Size) * - Denotes discontinuity along foliation MB - Denotes mechanical break	WEATHERING	STRENGTH	DISCONTINUITY DATA			
									ANGLE (deg)	Jr	Ja	DEPTH (feet)
5	3	C-1 2.0 - 7.0	48	80	50	Gray, medium grained SCHIST, slightly weathered, medium strong, slightly fractured, foliated.	2	R3				
	3								*40	3	2	2.9
	4								*40	3	2	4.8
	3					From 5.2-7' extremely fractured.			*40	1.5	2	5.2
10	4	C-2 7.0 - 12.0	60	100	67	Gray, medium grained SCHIST, slightly weathered, strong, moderately fractured, foliated.	3	R3				
	5								*20	1.5	2	8
	6								*10	1.5	2	9.2
	7											
15	8	C-3 12.0 - 17.0	60	100	100	Gray, fine grained SCHIST, unweathered, very strong, sound to moderately fractured, foliated.	1	R5	*10	1.5	2	11.4
	8								*0	1.5	2	11.7
	9								*0	1.5	3	12.8
	9								*20	1.5	3	13.3
20	10	C-4 17.0 - 22.0	60	100	100	As above.	1	R5				
	10								*40	1.5	3	17.4
	10								*40	1.5	3	18.1
	10											
25						Borehole cement-grouted after completion. End of boring at 22'. MB - not recorded.						

ESA CORING LOG MG MA.GPJ MAINLIB.GLB 9/26/02



SUMMARY LOG

BORING NUMBER: MG-115

SHEET NUMBER: 3 of 3

PROJECT NUMBER:

PROJECT: East Side Access

LOCATION: GCT, Track 115

CLIENT: MTA

CONTRACTOR: WGI/JBD

DRILLER: G. Marney

INSPECTOR: L. Moretti

**Depth
(ft.)**

2.0 - 7.0

7.0 - 17.0

17.0 - 22.0

**Foliation Dip
(deg)**

0-40

0-20

20-40

**Extremely Fractured
Zones (ft)**

5.2 - 7.0

ESA SUMMARY LOG MG MA.GPJ MAINLIB.GLB 9/26/02