

REPORT

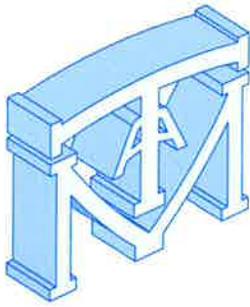
GEOTECHNICAL ENGINEERING CONSULTATION

**PROPOSED WATERFRONT PARK
NORTH BERGEN TOWNSHIP, NEW JERSEY
RSC ARCHITECTS**

October 18, 2011

**Prepared By:
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MTA Project No. 2610-002*1D



**MELICK-TULLY
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October 18, 2011

RSC Architects
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Cliffside Park, New Jersey 07010

Attention: Mr. Kenneth P. Mihalik, AIA

Gentlemen:

**Report
Geotechnical Engineering Consultation
Proposed Waterfront Park
North Bergen Township, New Jersey**

Introduction

This report presents the results of the geotechnical engineering consultation provided by Melick-Tully and Associates, P.C. (MTA) for the proposed waterfront park to be constructed in and for the Township of North Bergen, New Jersey. The site is located adjacent to and east of River Road, west of the Hudson River and north of Lydia Drive. This study was performed in accordance with our revised proposal dated September 6, 2011.

Proposed Construction

Plans provided to us indicate that the parcel would be developed by a series of walkways, a small paved parking lot, and an amphitheater. The Hudson River Waterfront Walkway would be constructed adjacent to the river from the adjacent developments to the north and south. Grading and topographic plans provided to us indicate that cuts of up to about one foot and fills of five feet would be required to reach the final grades and fills of up to two feet would also be required along the Walkway. It is our understanding that the site will be regraded using the on-site materials to a level of two feet

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below the final grades and that two feet of imported materials (equating to approximately 3,700 cubic yards) will be placed as a cap.

Background

MTA previously performed a subsurface explorations on the parcel in 2002 for a residential development that included buildings on this parcel, as well as the adjacent northern (Hudson Pointe) property. The northern building was completed, but the structure on the subject property was never constructed.

Purpose and Scope of Work

The purpose of our services was to:

- 1) review the geotechnical soil boring and laboratory testing information available in our files;
- 2) review any settlement monitoring data from the residential development on the parcel to the north;
- 3) conduct a site visit to evaluate whether any of the changes to the property since the time of our borings in 2002 impact the proposed construction;
- 4) estimate settlements that would occur from the weight of fill placed to reach the proposed elevations for the new park;
- 5) perform stability analyses of the grading required for construction of the Waterfront Walkway; and
- 6) prepare a short report with our findings.

Discussion

- 1) The surface grades at the time of the borings varied from approximately Elevation +6 to +8.5 feet. Based on topographic information provided to us, fills of up to five feet would be placed to achieve the final surface grades within the proposed waterfront park which are shown to be approximately Elevation +7 feet adjacent to the river, slope up to about Elevation +13 feet in the center of the park, and slope back down to around +9 feet adjacent to River Road.
- 2) The test borings previously performed at the site encountered fill materials comprised of silty sands and sands containing varying amounts of gravel,

cobbles, boulders, and miscellaneous debris such as wood, bricks, concrete etc. The fill materials extended to depths varying from approximately 12.5 to 30 feet below the surface. The fill materials were underlain by very soft to medium organic silty clay that extended to depths of approximately 26 to 44 feet below grade. The organic soils were underlain by medium dense to very dense silty sands and sands containing varying amounts of gravel that extended to the completion depths of the borings at approximately 37 to 57 feet below the surface. Rock was encountered below the sands in Boring B-23 at a depth of approximately 47.5 feet below the surface. Plate 1 shows the approximate locations of our prior soil borings on a plan depicting the proposed construction and new grading.

- 3) The organic soils are compressible so that raising the grades will cause settlement over time. A settlement analysis was performed using the consolidation characteristics of the compressible deposits determined from the laboratory tests previously performed by MTA on undisturbed samples of the organic deposits retrieved from the borings. The organic clay stratum underlying the fill materials varied from 10 to 29 feet in thickness. This organic clay stratum would be subject to loads imposed by raising the surface grades at the site. If the grades are raised using conventional fill materials (typical unit weight = 125 pounds per cubic foot), MTA estimated that the organic clay stratum could undergo long term total settlements varying from approximately 3 to 11 inches. Consolidation settlements are made up of two components, primary settlement and secondary settlement. Primary settlement is a function of the layer thickness and applied load. Primary settlements were estimated to vary from 2 to 7 inches and we estimate that time periods varying from 9 to 64 months for 90 percent of these settlements to occur under the loads imposed by the proposed final grades. Secondary compression or creep is a long-term settlement that is dependent on the layer thickness only, and is independent of loading. The secondary settlements were estimated to vary from an additional 2 to 5 inches over a period varying from approximately 10 to 50 years.
- 4) MTA also evaluated the consolidation settlements assuming that lightweight fill materials (typical unit weight = 60 pounds per cubic foot) could be used to raise the grades. The total settlements would be on the order of 4 to 8 inches, of which the primary consolidation settlements were estimated to be on the order of 2 to 4 inches during similar time periods as estimated above. The secondary consolidation settlements would be the same 2 to 5 inches. Based on the costs associated with the light weight fill, it was determined by the design team not to pursue this option.
- 5) Additionally, MTA was asked to evaluate the effectiveness of placing a surcharge fill over the proposed final grades at the site for about a six month period. Our analysis indicates that placement of approximately five feet of conventional surcharge fill materials over a six month period would result in approximately 40 percent of the estimated primary consolidation and it would

require up to approximately 14 months to achieve the 90 percent of primary consolidation. The surcharge would not impact secondary compression. Increasing the surcharge height up to eight feet would not significantly impact the surcharge duration. Given the limited effectiveness of a moderate height surcharge for a six month (\pm) time frame, it was determined not to pursue a site wide surcharge program. During our subsequent meetings and discussions, it was determined that a maintenance budget would be set aside to account for the settlement that will occur over time and that the following steps will be implemented to help minimize impacts of the settlement:

- a) Differential settlements will be most problematic where the at-grade sidewalks abut the pile supported walkway, amphitheater and restroom building. It was determined that where the walks abut these structures, they will be structurally connected to the pile structures with a hinged connection to better accommodate the expected movement. The remainder of the walks and pavements will be supported on-grade.
- b) The site development contract will be awarded in two phases. The initial phase will be to grade the site to the proposed subgrade level (two feet below final grade), install the piles and import the required cap material.
- c) The required cap material will be placed at the two most critical areas as a soil surcharge, where the main walkway connects to the amphitheater and in front of the restrooms. These areas should be filled to approximately 15 feet above the final grades and the approximate limits are shown on the Plot Plan. The surcharge fill should be placed in thin layers and compacted to at least 95 percent of ASTM D-1557 maximum dry density to one foot above the final grade. Above this level, the fill should be spread in layers of two feet or less and nominally compacted with the construction equipment.
- d) We recommend at least five settlement plates be established for monitoring purposes, three within the larger area of surcharge and two within the surcharge adjacent to the restroom building. The settlement plates should be surveyed twice per week for the first two weeks, once per week for the next six weeks and once per every two weeks thereafter. A Detail for the settlement plates is attached as Plate 2. While surcharging will reduce post-construction settlements, it will not completely eliminate them. Additional long-term settlements in portions of the site of several inches will still occur and periodic maintenance will be required.
- 6) Due to the estimated settlements of the organic clay under the final grades, you have indicated that support of the walkway, amphitheater and restroom building on a pile foundation system would be desired. It is our opinion that a deep

foundation system comprised of steel H-Piles or concrete filled pipe piles would be appropriate. The required pile capacities are not known at this time. MTA evaluated different piles sizes to provide a range of pile capacities that could be achieved which are summarized in the following table:

<i>Pile Capacity</i>	<i>HP-8 x 36 H-Pile</i>	<i>HP – 10 x 57 H-Pile</i>	<i>8” dia x 0.25” Pipe Pile</i>	<i>10” dia x 0.25” Pipe Pile</i>	<i>8” Tip Treated Timber</i>
Ultimate (tons)	120	180	110	140	60
Downdrag (tons)	30	37	26	29	30
Allowable (tons)	45	71	42	55	15
Uplift (tons)	10	12	9	10	10

The existing organic deposits will undergo long-term compression due to the loads imposed by the overlying existing and new fill materials resulting in downdrag on the piles. Estimated downdrag loads are on the order of 26 to 37 tons per pile, as mentioned above, and could overstress the piles if not accounted for in design. Downdrag loads are subtracted from the ultimate load of the pile before applying a factor of safety.

Timber piles typically would be installed to a maximum allowable capacity of 30 tons per pile. The estimated downdrag loads would reduce the available capacity of timber piles to 15 tons. In addition, the obstructions in the fill may make installation of timber piles very difficult as they could get damaged during driving.

- 7) Prior to mobilization, the contractor should perform and submit for review a wave equation analysis for the selected pile driving system (including hammer type, hammer weight, energy, splices, cushion type and thickness) to confirm that the system is capable of transferring the appropriate energy to the pile tip without overstressing the pile. The geotechnical engineer should be allowed to review the wave equation analysis to develop a provisional pile driving criteria for installation of the test piles.

Based on the borings, we estimate pile lengths on the order of 35 to 55 feet will be required to achieve the above capacities. Prior to production pile installation, we recommend that at least six to ten indicator piles be driven throughout the site to confirm the design assumptions and the required pile lengths. The responsibility for delivering the proper length piles to the site should be solely the contractor's. The contractor should be required to perform all spudding or preaugering operations necessary to advance the piles through the fill without damaging the piles.

Following installation of test piles, it is recommended that selected test pile(s) be load tested in accordance with the requirements of Section 1810.3.3.1.2 "Load Tests", of the IBC 2009, New Jersey Edition. The code requires load testing for all piles driven to capacities of more than 40 tons and that test piles could be subjected to a static load test (ASTM D-1145) or dynamic tests (ASTM D-4945). MTA recommends that instead of a static load test, dynamic load tests using Pile Driving Analyzer (PDA) equipment be performed on at least four of the test piles to further evaluate the driving conditions and the pile hammer driving system selected by the contractor. It is anticipated that one day of dynamic testing with the PDA equipment would be required to evaluate the test piles installed at the site. The dynamic load testing should be conducted by an experienced engineer retained by the contractor and observed by the geotechnical engineer. Based on further evaluation of the dynamic load test results by the geotechnical engineer, a final pile driving criteria should be adopted to install the production piles at the site.

- 8) MTA performed a slope stability analysis considering a site cross section at the location of the proposed amphitheatre, the adjacent grades sloping towards the river, the encountered subsurface soils and the groundwater conditions. The increase in surface grades was considered as a uniform load placed over the existing surface grades. The strength characteristics of the subsurface soils were obtained from previous laboratory test results and on our estimation of the strength parameters based on the results of the test borings. The strength parameters of the subsurface soils used in our analysis are summarized below:

<i>Soil</i>	<i>Total Unit Weight (pcf)</i>	<i>Cohesion (psf)</i>	<i>Friction Angle (degrees)</i>
Lightweight Fill	60	0	30
New or Existing Fill	125	0	30
River Mud	95	200	0
Organic Clay	100	500 to 800	0
Natural Silty Sands	130	0	34

- 9) MTA performed the slope stability analysis considering the various soil strength parameters and the loads imposed by the new fill materials. Typically, a factor of safety of 1.3 or greater is considered acceptable for slope stability. Properties of the river mud were adjusted to obtain a factor of safety of 1.3 for the existing conditions, and a total unit weight of 95 pounds per cubic foot and cohesion of 200 pounds per square foot resulted in this factor of safety. These soil properties appear to be reasonable based on our prior testing of the organic soils. The placement of the new fill materials and the additional loads imposed by raising the surface grades would lower the factor of safety of the analyzed slope to about 1.2 if conventional fill is placed and to about 1.28 if lightweight fill is placed. It is recommended that as the proposed walkway be supported by a deep pile foundation system, new fill materials should not be placed to raise the

existing surface grades below the walkway and in areas of the site adjacent to river. We also recommend the installation of inclinometers along the edges of the site along the water to monitor the lateral movement of the subsurface soils.

Limitations: The analyses and recommendations provided herein are based on our previous exploration and testing, and are subject to the limitations attached as Appendix III to this report.

Please contact us if you have any questions about this information.

The following Plates and Appendices are attached and complete this report.

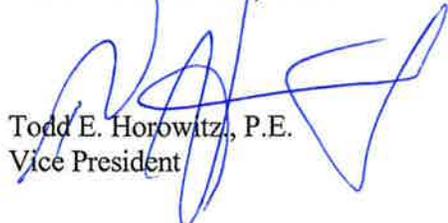
Plate 1 – Plot Plan
Plate 2 – Typical Settlement Plate Detail
Plate 3 – Slope Cross Section
Appendix I – Previous Test Borings by MTA
Appendix II – Selected Slope Stability Runs
Appendix III - Limitations

Very truly yours,

MELICK-TULLY and ASSOCIATES, P.C.

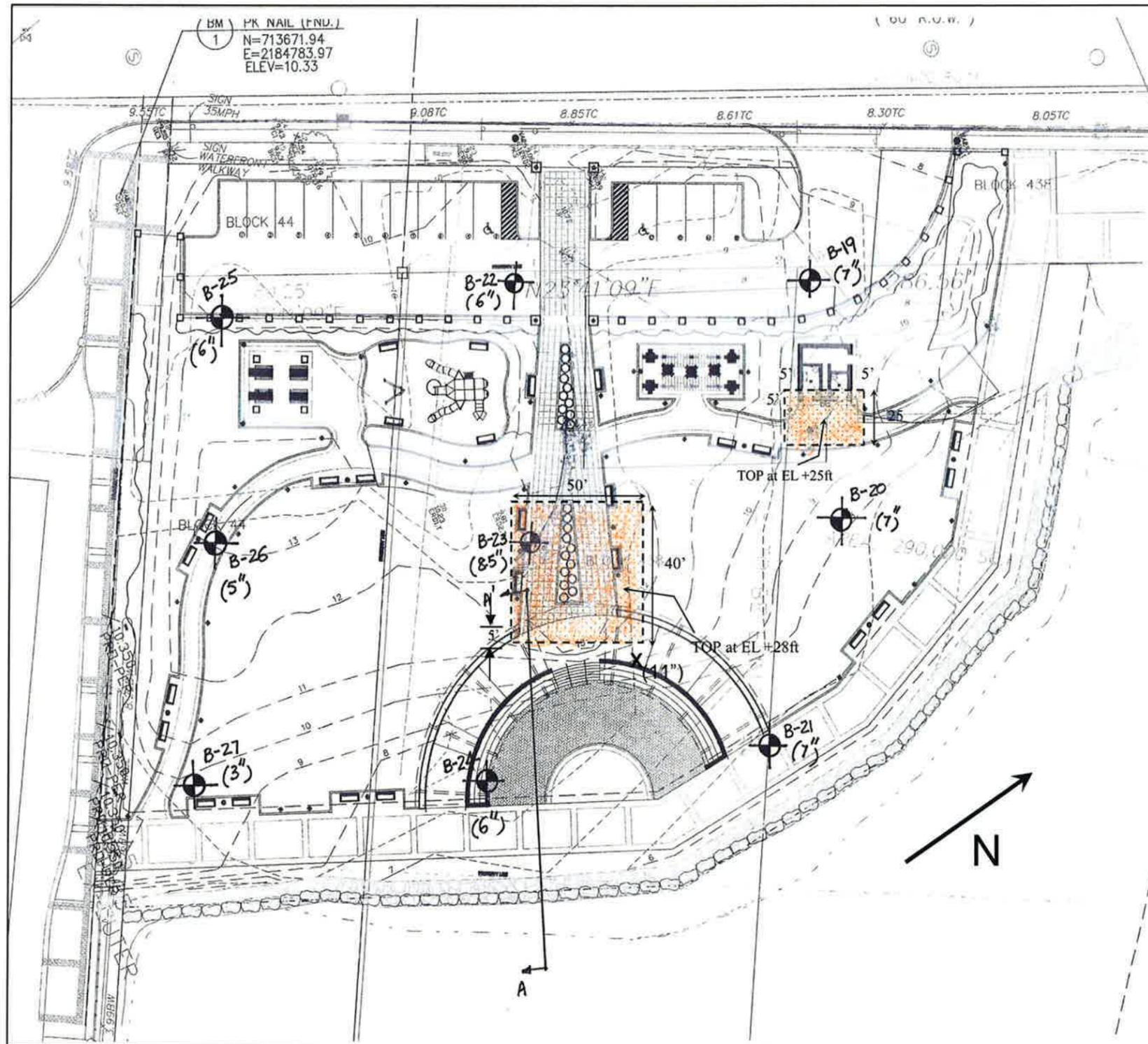


Prasanna Rachakatla, Ph.D.



Todd E. Horowitz, P.E.
Vice President

PR:TEH/pr
2610-002*1D
(3 copies submitted)



NUMBER AND APPROXIMATE LOCATION OF TEST BORINGS PREVIOUSLY PERFORMED AT THE SITE BY MTA IN 2002.

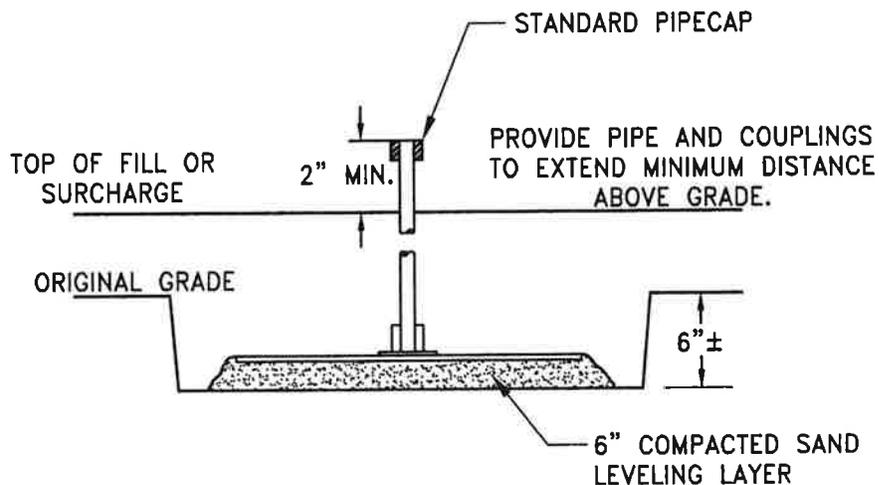
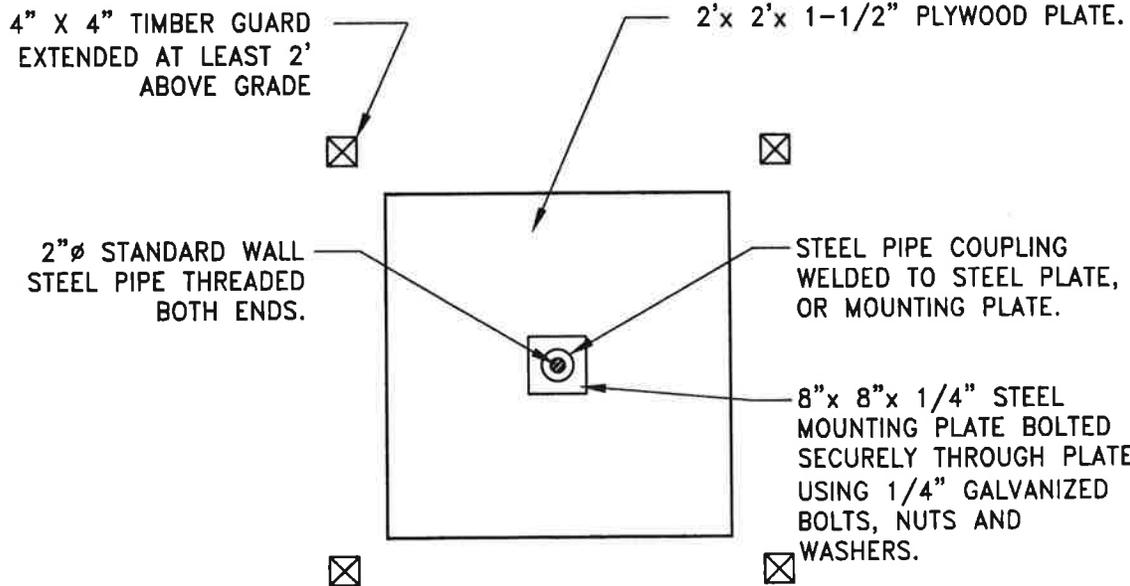
(7") - ESTIMATED TOTAL CONSOLIDATION SETTLEMENT.

A - A' LOCATION OF CROSS SECTION FOR SLOPE STABILITY

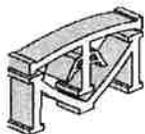
X - AVERAGED SUBSURFACE CONDITIONS FOR BORINGS B-21, B-23, AND B-24

SOURCE: "EXISTING TOPOGRAPHIC CONDITIONS", PARTIAL TOPO OF WATER FRONT PARK, HUDSON COUNTY, NORTH BERGEN TOWNSHIP, NEW JERSEY. PREPARED BY: REMINGTON & VERNICK ENGINEERS, DATED: JULY 2011.

PROPOSED WATERFRONT PARK
NORTH BERGEN TOWNSHIP, NEW JERSEY
RSC ARCHITECTS
 PLATE 1 - PLOT PLAN
 Not To Scale
 MTA JOB NO. 2610-002*1C



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SETTLEMENT PLATE DETAIL

PROPOSED WATERFRONT PARK
NORTH BERGEN TOWNSHIP, NEW JERSEY
RSC ARCHITECTS

JOB NO.
2610-002*1C

FILE NO.
25099

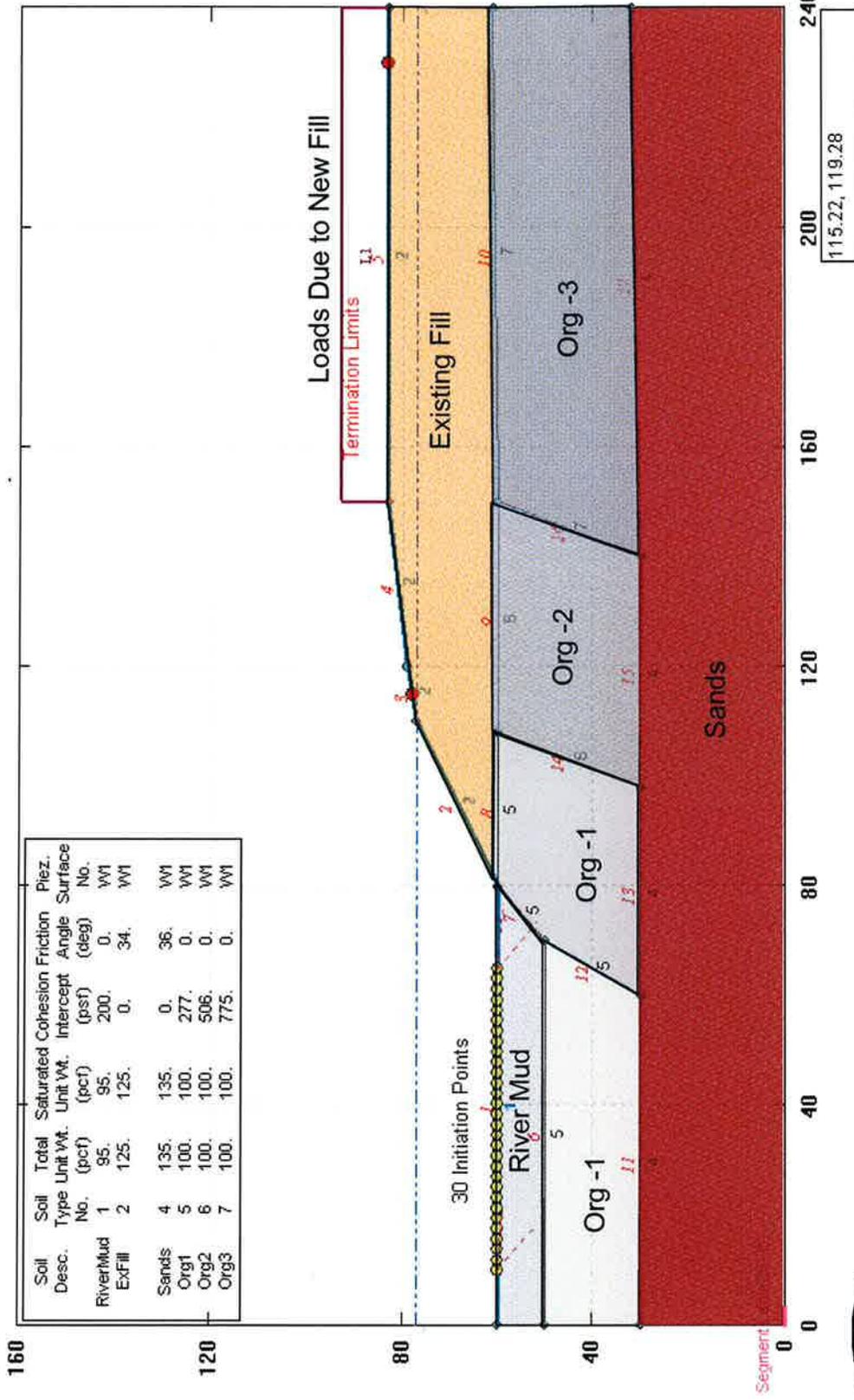
DR. BY
PR

CHK. BY
PR

DATE
10/18/2011

SCALE
NTS

PLATE
2



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion (psf)	Friction Angle (deg)	Piez. Surface No.
River/Mud	1	95.	95.	200.	0.	WW1
ExFill	2	125.	125.	0.	34.	WW1
Sands	4	135.	135.	0.	36.	WW1
Org1	5	100.	100.	277.	0.	WW1
Org2	6	100.	100.	506.	0.	WW1
Org3	7	100.	100.	775.	0.	WW1

Plate 3 – Slope Cross Section
 Proposed Water Front Park
 Township of North Bergen, New Jersey
 MTA Job No. 2610-002*1C



APPENDIX – I
LOGS OF PREVIOUS TEST BORINGS

LOG OF BORING

BORING NO. 19

COMPLETION DATE: 07/25/02

SURFACE ELEVATION: +6' (±)

WATER LEVEL: 8'

JOB NUMBER: 2338-706*1G

READING DATE: 07/25/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
5	S-1	48			FILL - Brown fine to medium sand, little to some silt, little fine to coarse gravel, with roots (dry) (medium dense to dense)	5
	S-2	19			- grading with some/and silt (moist)	
10	S-3	31			- grading with brick fragments (wet)	10
15	S-4	4		OH	Gray silty organic clay, trace fine sand (wet) (very soft to soft)	15
20	S-5	2				20
25						25

NOTES FOR COLUMNS:
 1. SAMPLE AT AVERAGE SAMPLING DEPTH
 2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02
 TRACE 0 - 10%
 LITTLE 10 - 20%
 SOME 20 - 35%
 AND OVER 35%

LOG OF BORING

BORING NO. 19

COMPLETION DATE: 07/25/02

SURFACE ELEVATION: +6' (±)

WATER LEVEL: 8'

JOB NUMBER: 2338-706*1G

READING DATE: 07/25/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
30	S-6	5		OH	Gray silty organic clay, trace fine sand (wet) (medium)	30
	S-7	12			- grading with trace fine gravel, trace shell fragments (wet) (stiff)	
35	S-8	116		SM	Brown fine to coarse sand, little fine gravel, little silt (wet) (very dense)	35
40					Test Boring Completed @ 37'	40
45						45
50						50

NOTES FOR COLUMNS:

1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:

- TRACE 0 - 10%
- LITTLE 10 - 20%
- SOME 20 - 35%
- AND OVER 35%

Typist/Date: pr:kep-7-02

LOG OF BORING

BORING NO. 20

COMPLETION DATE: 07/25/02

SURFACE ELEVATION: +6' (±)

WATER LEVEL: 8'

JOB NUMBER: 2338-706*1G

READING DATE: 07/25/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
5	S-1	38	9		FILL - Dark brown fine to coarse sand, some fine gravel, some silt with roots, brick and concrete fragments (dry) (dense)	5
	S-2	21			- grading with ash (very moist) (medium dense)	
10	S-3	10			- grading with some black organic clayey silt, with roots, concrete and brick fragments (wet) (loose)	10
15	S-4	4				15
20	S-5	3	47	OH	Dark gray silty organic clay, trace peat (wet) (soft)	20
25						25

NOTES FOR COLUMNS:

1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:

- TRACE 0 - 10%
- LITTLE 10 - 20%
- SOME 20 - 35%
- AND OVER 35%

Typist/Date: pr:kep-7-02

LOG OF BORING

COMPLETION DATE: 07/25/02
 JOB NUMBER: 2338-706*1G

BORING NO. 20
 SURFACE ELEVATION: +6' (±)

WATER LEVEL: 8'
 READING DATE: 07/25/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
30	S-6	4	65		Dark gray silty organic clay, trace peat (wet) (soft)	30
	S-7	2	62		- grading with trace fine sand, trace shell fragments (very moist) (very soft)	
35	S-9			OH		35
	S-8	WOH	62			
40		34		SM	Brown fine to coarse sand and fine to coarse gravel, little clayey silt (wet) (dense)	40
45					Test Boring Completed @ 42'	45
50						50

NOTES FOR COLUMNS:
 1. SAMPLE AT AVERAGE SAMPLING DEPTH
 2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02
 TRACE 0 - 10%
 LITTLE 10 - 20%
 SOME 20 - 35%
 AND OVER 35%

LOG OF BORING

BORING NO. 21

COMPLETION DATE: 07/26/02

SURFACE ELEVATION: +6' (±)

WATER LEVEL: 9'

JOB NUMBER: 2338-706*1G

READING DATE: 07/26/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
5	S-1	50			FILL - Gray-brown fine to coarse sand, some/and fine to coarse gravel, little silt, with brick and concrete fragments (dry) (very dense)	5
	S-2	10			- grading (medium dense)	
10	S-3	13			- grading with little black clayey silt, little fine to coarse gravel (wet)	10
15	S-4	100/6"			- grading with wood fragments	15
20	S-5	2		OH	Black-dark gray silty organic clay, trace fine to medium sand (wet) (very soft)	20
25						25

NOTES FOR COLUMNS:

1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:

- TRACE 0 - 10%
- LITTLE 10 - 20%
- SOME 20 - 35%
- AND OVER 35%

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Sheet: 1 of 3 PLATE: 3BB

LOG OF BORING

BORING NO. 21

COMPLETION DATE: 07/26/02

SURFACE ELEVATION: +6' (±)

WATER LEVEL: 9'

JOB NUMBER: 2338-706*1G

READING DATE: 07/26/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
30	S-6	2			Black-dark gray silty organic clay, trace fine to medium sand (wet) (very soft)	30
35	S-7	2				35
40	S-8	3			- grading (soft)	40
45	T1			OH	-undisturbed thin tube sample from 40'-42'	45
50	S-9	3		SM	Dark gray fine to coarse sand, little silt, little fine to coarse gravel (wet) (dense)	50

<p>NOTES FOR COLUMNS:</p> <p>1. SAMPLE AT AVERAGE SAMPLING DEPTH</p> <p>2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES</p>	<p>SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02</p> <p>TRACE 0 - 10%</p> <p>LITTLE 10 - 20%</p> <p>SOME 20 - 35%</p> <p>AND OVER 35%</p>
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LOG OF BORING

COMPLETION DATE: 07/26/02
JOB NUMBER: 2338-706*1G

BORING NO. 21
SURFACE ELEVATION: +6' (±)

WATER LEVEL: 9'
READING DATE: 07/26/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
55	S-10	42		SM/GM	Dark gray fine to coarse sand, little silt, little fine to coarse gravel (wet) (dense)	55
55	S-11	50/2"			- grading with some fine to coarse gravel and weathered rock fragments (wet) (very dense)	55
60					Test Boring Completed @ 57'	60
65						65
70						70
75						75

NOTES FOR COLUMNS:
 1. SAMPLE AT AVERAGE SAMPLING DEPTH
 2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02
 TRACE 0 - 10%
 LITTLE 10 - 20%
 SOME 20 - 35%
 AND OVER 35%

LOG OF BORING

BORING NO. 22

COMPLETION DATE: 07/26/02

SURFACE ELEVATION: +6' (±)

WATER LEVEL: 8'

JOB NUMBER: 2338-706*1G

READING DATE: 07/26/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
5	S-1	16			FILL - Brown fine to coarse sand, little to some silt, little fine to coarse gravel, with concrete and brick fragments (dry to moist) (medium dense)	5
10	S-2	18				10
15	S-3	8			- grading (wet) (loose)	15
20	S-4	3		OH	Dark gray silty organic clay, trace fine sand (very moist) (soft)	20
25	S-5	2			- grading (very soft)	25

NOTES FOR COLUMNS:

1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:

- TRACE 0 - 10%
- LITTLE 10 - 20%
- SOME 20 - 35%
- AND OVER 35%

Typist/Date: pr:kep-7-02

LOG OF BORING

BORING NO. 22

COMPLETION DATE: 07/26/02

SURFACE ELEVATION: +6' (±)

WATER LEVEL: 8'

JOB NUMBER: 2338-706*1G

READING DATE: 07/26/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
	S-6	WOH			Dark gray silty organic clay, trace fine sand (very moist) (very soft)	
30	S-7	12		OH	- grading with little fine to medium sand, little fine gravel (wet) (stiff)	30
35	S-8	52			Brown fine to coarse sand, little silt, little fine to medium gravel (wet) (very dense)	35
40	S-10	42		SM	- grading with some fine to coarse gravel and weathered rock fragments (wet) (dense to very dense)	40
45	S-11	50/4"				45
					Test Boring Completed @ 46'	
50						50

NOTES FOR COLUMNS:
 1. SAMPLE AT AVERAGE SAMPLING DEPTH
 2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02
 TRACE 0 - 10%
 LITTLE 10 - 20%
 SOME 20 - 35%
 AND OVER 35%

LOG OF BORING

BORING NO. 23

COMPLETION DATE: 07/29/02

SURFACE ELEVATION: +8' (±)

WATER LEVEL: 5'

JOB NUMBER: 2338-706*1G

READING DATE: 07/29/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
	S-1	100/5"			FILL - Brown fine to coarse sand, some fine gravel, little to some silt, with brick fragments (dry) (very dense)	
5	S-2	100/2"				5
10	S-3	29			- grading (wet) (medium dense)	10
15	S-4	7			- grading with roots (loose)	15
20	S-5	16				20
25				OH	Dark gray-black silty organic clay, trace fine sand (very moist) (stiff)	25

NOTES FOR COLUMNS:

1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:

- TRACE 0 - 10%
- LITTLE 10 - 20%
- SOME 20 - 35%
- AND OVER 35%

Typist/Date: pr:kep-7-02

LOG OF BORING

COMPLETION DATE: 07/29/02
JOB NUMBER: 2338-706*1G

BORING NO. 23
SURFACE ELEVATION: +8' (±)

WATER LEVEL: 5'
READING DATE: 07/29/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
30	S-6	5			Dark gray-black silty organic clay, trace fine sand (very moist) (soft to medium)	30
35	S-7	3		OH		35
40	S-8	7				- no recovery @ 36'
45	S-9	17		SM	Brown fine to coarse sand and fine to coarse gravel, little clayey silt (wet) (medium dense)	45
50	S-10	117			Weathered brown rock fragments and fine to coarse sand, little silt (wet) (very dense)	50
50	CORE RUN NO. 1				Highly weathered light brown-brown sandstone NX Rock Core Run No. 1, 48' to 53' REC: = 27% RQD: = 0%	50

NOTES FOR COLUMNS:
1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02
TRACE 0 - 10%
LITTLE 10 - 20%
SOME 20 - 35%
AND OVER 35%

Sheet: 2 of 3 PLATE: 3CC

LOG OF BORING

COMPLETION DATE: 07/29/02
 JOB NUMBER: 2338-706*1G

BORING NO. 23
 SURFACE ELEVATION: +8' (±)

WATER LEVEL: 5'
 READING DATE: 07/29/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
					Highly weathered light brown-brown sandstone NX Rock Core Run No. 1, 48' to 53' REC: = 27% RQD: = 0%	
55					Test Boring Completed @ 55'	55
60						60
65						65
70						70
75						75

NOTES FOR COLUMNS:
 1. SAMPLE AT AVERAGE SAMPLING DEPTH
 2. INDICATES THE NUMBER OF BLOWS TO
 ADVANCE A 2" OD SAMPLER A DISTANCE
 OF 12 INCHES USING A 140 POUND
 WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02
 TRACE 0 - 10%
 LITTLE 10 - 20%
 SOME 20 - 35%
 AND OVER 35%

LOG OF BORING

BORING NO. 24

COMPLETION DATE: 07/29/02

SURFACE ELEVATION: +7' (±)

WATER LEVEL: 5.5'

JOB NUMBER: 2338-706*1G

READING DATE: 07/29/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
	S-1	8			FILL - Brown fine to coarse sand, some silt, little fine to coarse gravel, with roots (dry) (loose)	
5	S-2	51			- grading (very dense)	5
10	S-3	11			- grading (wet) (loose to medium dense)	10
15	S-4	19			- grading with glass fragments	15
20	S-5	7				20
25				OH	Black-dark gray silty organic clay, trace fine sand (very moist) (soft)	25

NOTES FOR COLUMNS:

1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:

- TRACE 0 - 10%
- LITTLE 10 - 20%
- SOME 20 - 35%
- AND OVER 35%

Typist/Date: pr:kep-7-02

LOG OF BORING

COMPLETION DATE: 07/29/02
JOB NUMBER: 2338-706*1G

BORING NO. 24
SURFACE ELEVATION: +7' (±)

WATER LEVEL: 5.5'
READING DATE: 07/29/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
30	S-6	2			Black-dark gray silty organic clay, trace fine sand (very moist) (soft)	30
	S-7	3				
35	S-8	1		OH	- grading (very soft)	35
40	S-9	1				40
45	S-10	WOH				45
50				SM	Gray-brown fine to coarse sand and fine to coarse gravel, little silt (wet) (very dense)	50

NOTES FOR COLUMNS:
1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02
TRACE 0 - 10%
LITTLE 10 - 20%
SOME 20 - 35%
AND OVER 35%

LOG OF BORING

BORING NO. 24

COMPLETION DATE: 07/29/02

SURFACE ELEVATION: +7' (±)

WATER LEVEL: 5.5'

JOB NUMBER: 2338-706*1G

READING DATE: 07/29/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
55	S-11	100/1"		SM	Gray-brown fine to coarse sand and fine to coarse gravel, little silt (wet) (very dense)	55
60					Test Boring Completed @ 51'	60
65						65
70						70
75						75

<p>NOTES FOR COLUMNS:</p> <p>1. SAMPLE AT AVERAGE SAMPLING DEPTH</p> <p>2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES</p>	<p>SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02</p> <p>TRACE 0 - 10%</p> <p>LITTLE 10 - 20%</p> <p>SOME 20 - 35%</p> <p>AND OVER 35%</p>
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LOG OF BORING

BORING NO. 25

COMPLETION DATE: 07/30/02

SURFACE ELEVATION: +6' (±)

WATER LEVEL: 11'

JOB NUMBER: 2338-706*1G

READING DATE: 07/30/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
5	S-1	16			FILL - Brown fine to coarse sand and silt, some fine to coarse gravel, with brick fragments (dry) (medium dense)	5
	S-2	15			- grading with little fine gravel (moist)	
10	S-3	24			- grading to black fine to coarse sand and fine to coarse gravel, little silt, trace organics (wet)	10
15	S-4	7			Black-dark gray silty organic clay, trace fine sand (very moist) (medium)	15
20	S-5	4		OH	- grading (soft)	20
25						25

NOTES FOR COLUMNS:

1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:

- TRACE 0 - 10%
- LITTLE 10 - 20%
- SOME 20 - 35%
- AND OVER 35%

Typist/Date: pr:kep-7-02

LOG OF BORING

BORING NO. 25

COMPLETION DATE: 07/30/02

SURFACE ELEVATION: +6' (±)

WATER LEVEL: 11'

JOB NUMBER: 2338-706*1G

READING DATE: 07/30/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
	S-6	80			Brown fine to coarse sand, some fine to coarse gravel, little silt (wet) (dense to very dense)	
30	S-7	41		SM		30
35	S-8	63				35
40	S-9	100/5"				40
45					Test Boring Completed @ 44'	45
50						50

NOTES FOR COLUMNS:
 1. SAMPLE AT AVERAGE SAMPLING DEPTH
 2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02
 TRACE 0 - 10%
 LITTLE 10 - 20%
 SOME 20 - 35%
 AND OVER 35%

LOG OF BORING

COMPLETION DATE: 07/30/02
JOB NUMBER: 2338-706*1G

BORING NO. 26
SURFACE ELEVATION: +8.5' (±)

WATER LEVEL: 11'
READING DATE: 07/30/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
5	S-1	18			FILL - Gray-dark brown fine to coarse sand and silt, little fine to coarse gravel, with brick fragments and roots (dry) (medium dense to dense)	5
	S-2	43			- grading with concrete fragments	
10	S-3	21			- grading (wet)	10
15	S-4	5			- grading (loose)	15
20	S-5	5		OH	Dark gray silty organic clay, trace fine sand, trace shell fragments (very moist) (medium)	20
25						25

NOTES FOR COLUMNS:
 1. SAMPLE AT AVERAGE SAMPLING DEPTH
 2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02
 TRACE 0 - 10%
 LITTLE 10 - 20%
 SOME 20 - 35%
 AND OVER 35%

LOG OF BORING

BORING NO. 26

COMPLETION DATE: 07/30/02

SURFACE ELEVATION: +8.5' (±)

WATER LEVEL: 11'

JOB NUMBER: 2338-706*1G

READING DATE: 07/30/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
30	S-6	3		OH	Dark gray silty organic clay, trace fine sand, trace shell fragments (very moist) (soft)	30
	S-7	4			- grading with trace fine to coarse sand	
35	S-8	56		SM	Gray-brown fine to coarse sand, some fine to coarse gravel, little silt (wet) (very dense)	35
40	S-9	123				40
45					Test Boring Completed @ 44'	45
50						50

<p>NOTES FOR COLUMNS:</p> <p>1. SAMPLE AT AVERAGE SAMPLING DEPTH</p> <p>2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES</p>	<p>SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02</p> <p>TRACE 0 - 10%</p> <p>LITTLE 10 - 20%</p> <p>SOME 20 - 35%</p> <p>AND OVER 35%</p>
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LOG OF BORING

BORING NO. 27

COMPLETION DATE: 07/29/02

SURFACE ELEVATION: 7' (±)

WATER LEVEL: 5'

JOB NUMBER: 2338-706*1G

READING DATE: 07/29/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
5	S-1	34			FILL - Brown fine to coarse sand, little to some silt, little to some fine to coarse gravel, with wood and concrete fragments (dry) (dense)	5
	S-2	8			- grading (very moist) (loose)	
10	S-3	24			- grading with plywood fragments (wet) (medium dense)	10
					- auger refusal @ 14'	
15					Boring relocated by 6'. See Boring 27A	15
20						20
25						25

NOTES FOR COLUMNS:

1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2' OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:

- TRACE 0 - 10%
- LITTLE 10 - 20%
- SOME 20 - 35%
- AND OVER 35%

Typist/Date: pr:kep-7-02

LOG OF BORING

COMPLETION DATE: 07/30/02
 JOB NUMBER: 2338-706*1G

BORING NO. 27A
 SURFACE ELEVATION: +7' (±)

WATER LEVEL: 5'
 READING DATE: 07/29/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
5					FILL, augering to 15'	5
15	S-1	100/5"			- no recovery @ 15'	15
20	S-2	38			- no recovery @ 20'	20
25						25

NOTES FOR COLUMNS:
 1. SAMPLE AT AVERAGE SAMPLING DEPTH
 2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS: Typist/Date: pr:kep-7-02
 TRACE 0 - 10%
 LITTLE 10 - 20%
 SOME 20 - 35%
 AND OVER 35%

LOG OF BORING

BORING NO. 27A

COMPLETION DATE: 07/30/02

SURFACE ELEVATION: +7' (±)

WATER LEVEL: 5'

JOB NUMBER: 2338-706*1G

READING DATE: 07/29/02

DEPTH	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH
30	S-3	17			FILL - Brown fine to coarse sand, some silt, little fine gravel, with brick fragments	30
35	S-4	9			Dark gray silty organic clay, trace fine to medium sand (very moist) (medium to stiff)	35
40	S-5	7		OH	- grading with trace shell fragments	40
45	S-6	20		SM	Gray fine to medium sand and clayey silt, little fine to coarse gravel (wet) (medium dense)	45
50	S-7	100/6"			- grading to light brown fine to coarse sand and fine to coarse gravel with weathered rock fragments, little silt (very dense)	50
Test Boring Completed @ 46.5'						

NOTES FOR COLUMNS:

1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:

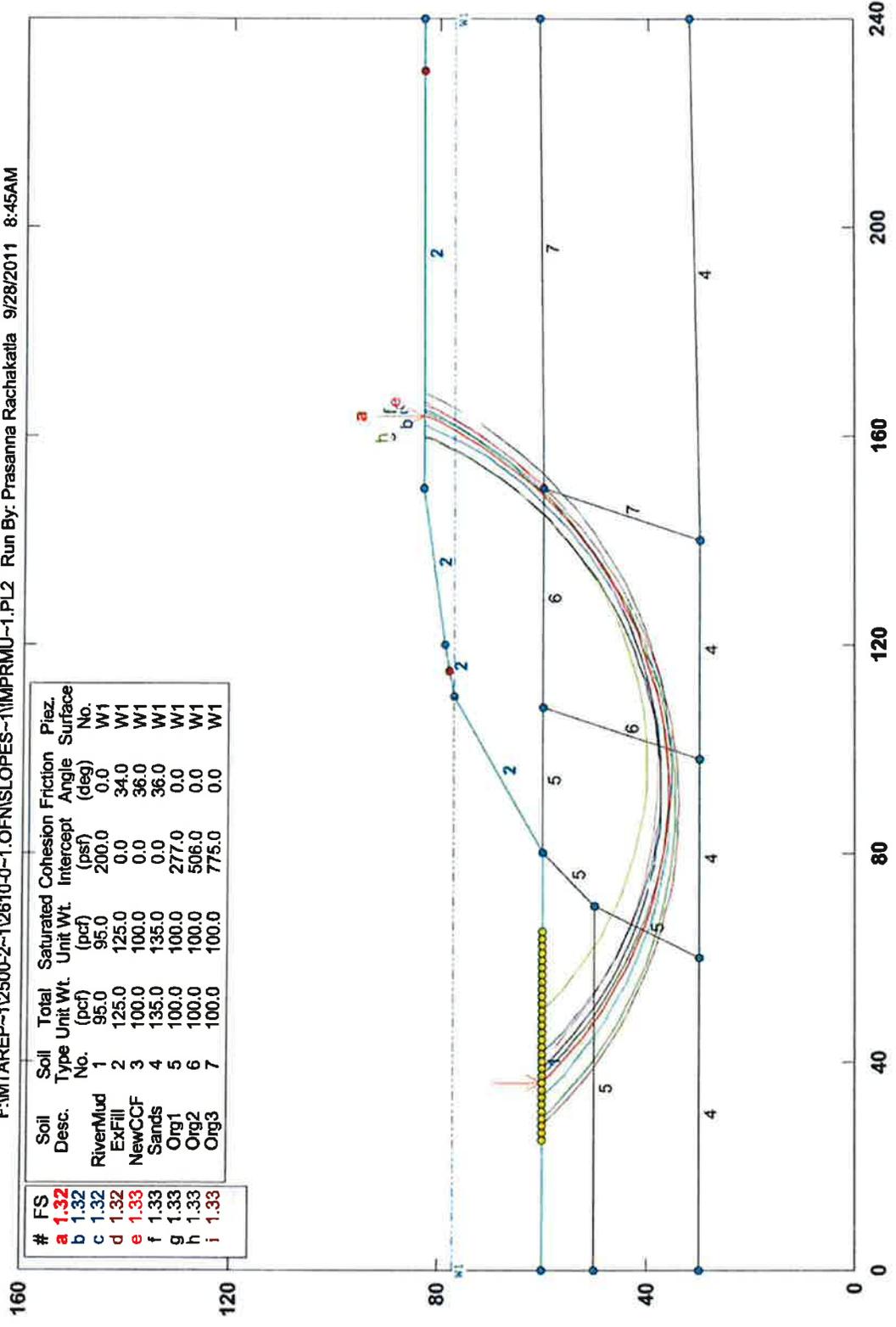
- TRACE 0 - 10%
- LITTLE 10 - 20%
- SOME 20 - 35%
- AND OVER 35%

Typist/Date: pr:kep-7-02

APPENDIX – II
SELECTED STABILITY RUNS

2610-002*1C, Section B-24-23, Existing Grades w/ Imp River Mud

F:\MTAREP~1\2500-2~1\2610-0~1.OFNISLOPES~1\IMPRMU~1.PL2 Run By: Prasanna Rachakatta 9/28/2011 8:45AM



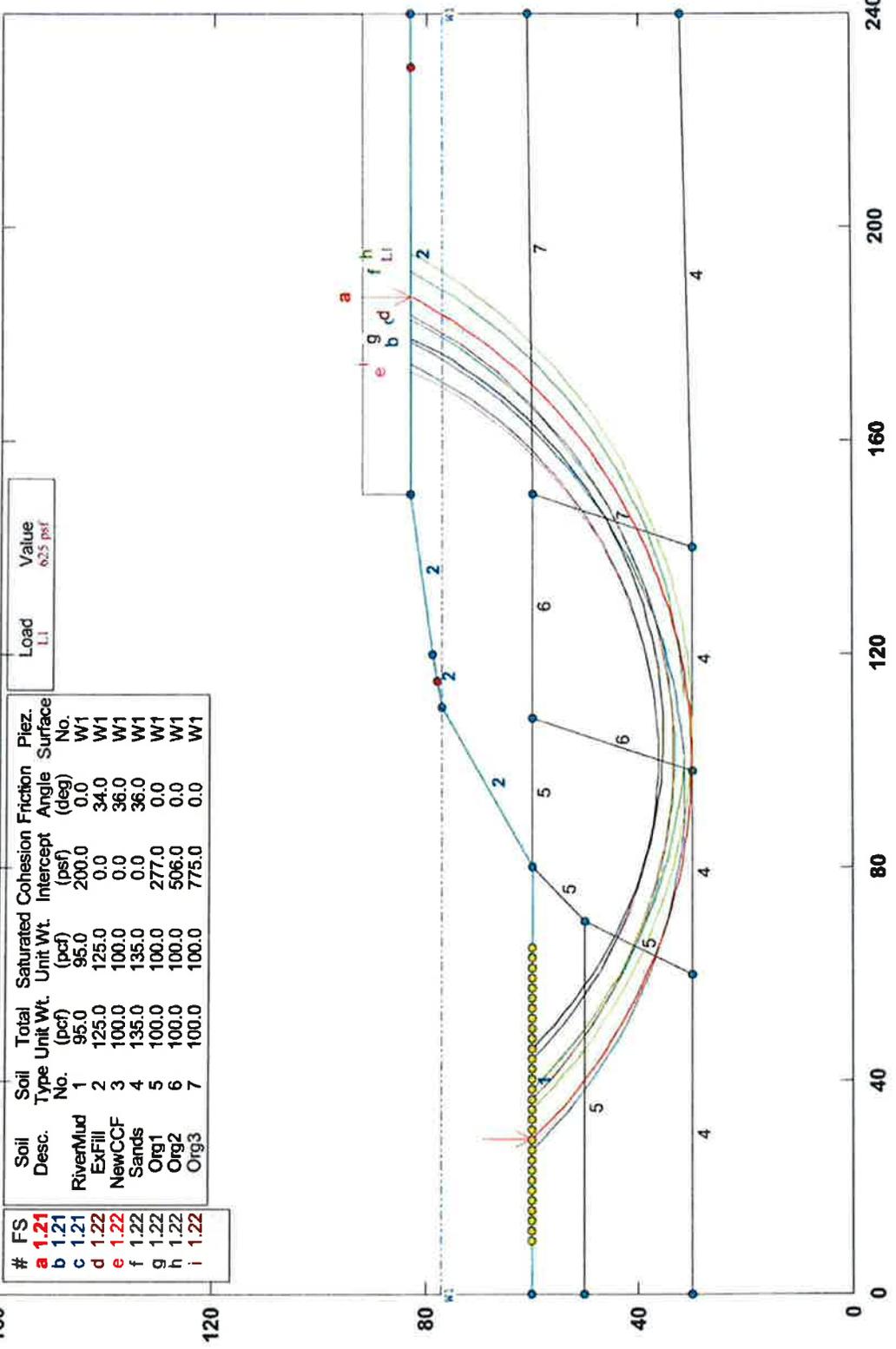
#	FS	Soil Desc.	Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Intercept (psf)	Friction Angle (deg)	Cohesion (psf)	Piez. Surface No.
a	1.32	RiverMud	1	95.0	95.0	200.0	0.0	0.0	W1
b	1.32	ExFill	2	125.0	125.0	0.0	34.0	0.0	W1
c	1.32	NewCCF	3	100.0	100.0	0.0	36.0	0.0	W1
d	1.33	Sands	4	135.0	135.0	0.0	36.0	0.0	W1
e	1.33	Org1	5	100.0	100.0	277.0	0.0	0.0	W1
f	1.33	Org2	6	100.0	100.0	506.0	0.0	0.0	W1
g	1.33	Org3	7	100.0	100.0	775.0	0.0	0.0	W1
h	1.33								
i	1.33								

GSTABL7 FSmin=1.32
Safety Factors Are Calculated By The Modified Bishop Method



2610-002*1C, Section B-24-23, Existing Grades w/ Imp River Mud w/ 5ft Reg Fill

F:\MTAREP~1\2500-2-1\2610-0-1.OFNISLOPES-1\MPRMU-1.PL2 Run By: Prasanna Rachakatta 9/28/2011 10:12AM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion (psf)	Friction Angle (deg)	Piez. Surface No.
a	1.21	RiverMud	1	95.0	125.0	200.0	0.0	W1
b	1.21	ExFill	2	125.0	100.0	0.0	34.0	W1
c	1.21	NewCCF	3	100.0	100.0	0.0	36.0	W1
d	1.22	Sands	4	135.0	100.0	0.0	36.0	W1
e	1.22	Org1	5	100.0	100.0	277.0	0.0	W1
f	1.22	Org2	6	100.0	100.0	506.0	0.0	W1
g	1.22	Org3	7	100.0	100.0	775.0	0.0	W1

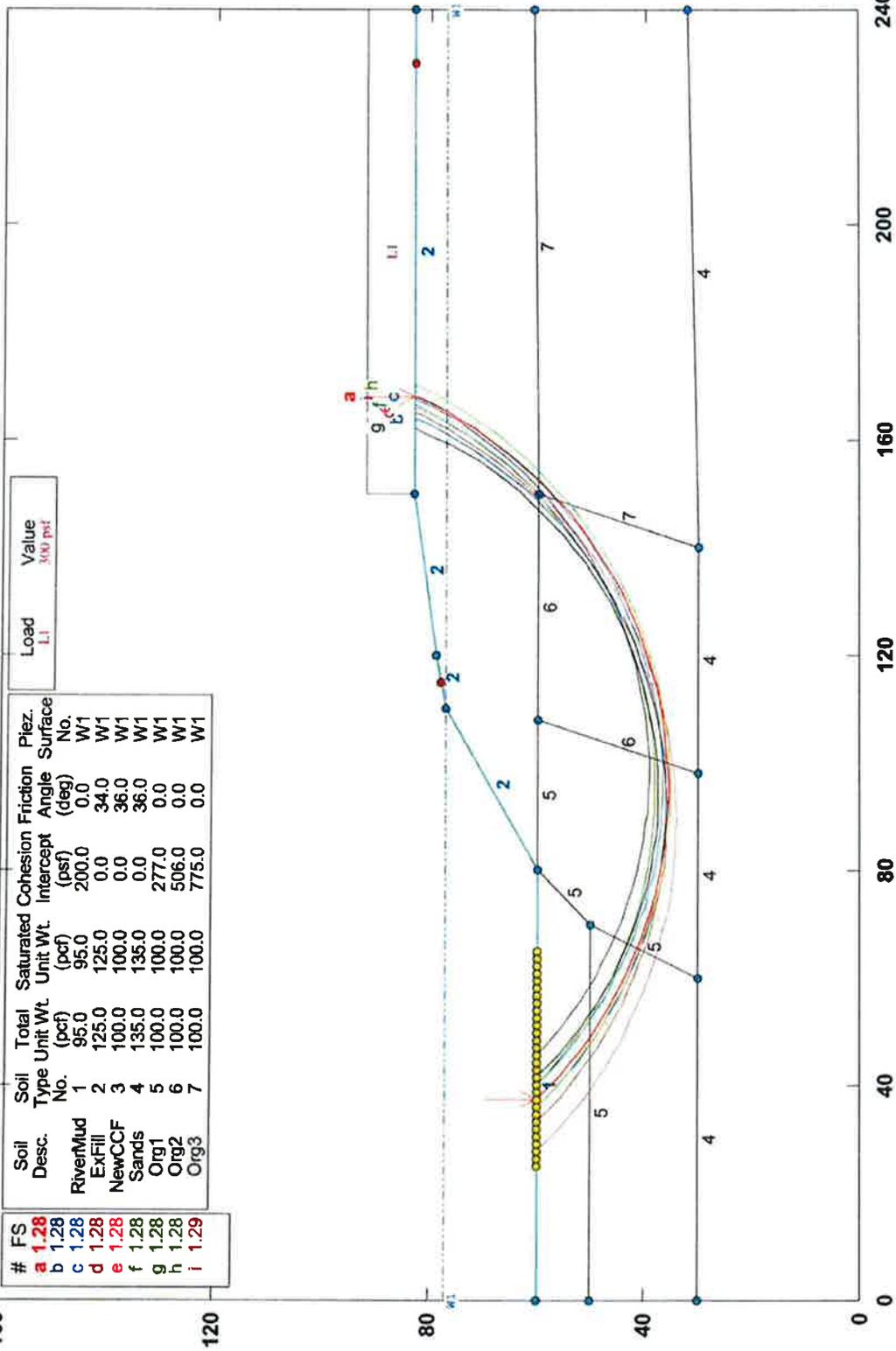
Load	Value
L1	62.5 psf

GSTABL7 FSmin=1.21
Safety Factors Are Calculated By The Modified Bishop Method



2610-002*1C, Section B-24-23, Existing Grades w/ 5ft Lwt Fill, Imp River Mud

F:\MTAREP-1\2500-2-1\2610-0-1.OFN\SLOPES-1\IMPRMU-1.PL2 Run By: Prasanna Rachakalla 9/28/2011 8:43AM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion (psf)	Friction Angle (deg)	Piez. Surface No.
a	1.28	RiverMud	1	95.0	95.0	200.0	0.0	W1
b	1.28	ExFill	2	125.0	125.0	0.0	34.0	W1
c	1.28	NewCCF	3	100.0	100.0	0.0	36.0	W1
d	1.28	Sands	4	135.0	135.0	0.0	36.0	W1
e	1.28	Org1	5	100.0	100.0	277.0	0.0	W1
f	1.28	Org2	6	100.0	100.0	506.0	0.0	W1
g	1.28	Org3	7	100.0	100.0	775.0	0.0	W1
h	1.28							
i	1.29							

Load	Value
L1	300 psf

GSTABL7 FSmin=1.28
Safety Factors Are Calculated By The Modified Bishop Method



**APPENDIX – III
LIMITATIONS**

APPENDIX - III

Limitations

A. Subsurface Information

Locations: The locations of the explorations previously performed at the site were approximately determined by tape measurement from existing surface features at that time. Elevations of the explorations were approximately determined by interpolation between contours shown on previous topographic plans available to us. The locations and elevations of the previous explorations were transferred by approximation onto the topographic plans of the proposed Waterfront Park provided to us by RSC Architects and should be considered accurate only to the degree implied by the method used.

Interface of Strata: The stratification lines shown on the individual logs of the subsurface explorations represent the approximate boundaries between soil types, and the transitions may be gradual.

Field Logs/Final Logs: A field log was prepared for each exploration by a member of our staff. The field log contains factual information and interpretation of the soil conditions between samples. Our recommendations are based on the final logs as shown in this report and the information contained therein, and not on the field logs. The final logs represent our interpretation of the contents of the field logs, and the results of the laboratory observations and/or tests of the field samples.

Water Levels: Water level readings were made in the explorations at times and under conditions stated on the individual logs. These data have been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater will occur due to variations in rainfall, tides, temperature, and other factors.

Pollution/Contamination: Unless specifically indicated to the contrary in this report, the scope of our services was limited only to investigation and evaluation of the geotechnical engineering aspects of the site conditions, and did not include any consideration of potential site pollution or contamination resulting from the presence of chemicals, metals, radioactive elements, etc. This report offers no facts or opinions related to potential pollution/contamination of the site.

Environmental Considerations: Unless specifically indicated to the contrary in this report, this report does not address environmental considerations which may affect the site development, e.g., wetlands determinations, flora and fauna, wildlife, etc. The conclusions and recommendations of this report are not intended to supersede any environmental conditions which should be reflected in the site planning.

B. Applicability of Report

This report has been prepared in accordance with generally accepted soils and foundation engineering practices for the exclusive use of RSC Architects for specific application to the design of the proposed Waterfront Park in North Bergen Township, New Jersey. No other warranty, expressed or implied, is made.

This report may be referred to in the project specifications for general information purposes only, but should not be used as the technical specifications for the work, as it was prepared for design purposes exclusively.

C. Reinterpretation of Recommendations

Change in Location or Nature of Facilities: In the event that any changes in the nature, design or location of the building and facilities are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

Changed Conditions During Construction: The analyses and recommendations submitted in this report are based in part upon the data obtained from nine widely-spaced test borings previously performed at the site. No explorations were specifically performed for this study. The nature and extent of variations between the explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

Changes in State-of-the-Art: The conclusions and recommendations contained in this report are based upon the applicable standards of our profession at the time this report was prepared.

D. Use of Report by Prospective Bidders

This soil and foundation engineering report was prepared for the project by Melick-Tully and Associates, P.C. for design purposes and may not be sufficient to prepare an accurate bid. Contractors utilizing the information in the report should do so with the express understanding that its scope was developed to address design considerations. Prospective bidders should obtain the owner's permission to perform whatever additional explorations or data gathering they deem necessary to prepare their bid accurately.

E. Construction Observation

We recommend that Melick-Tully and Associates, P.C. be retained to provide on-site soils engineering services during the earthwork construction and foundation phases of the work. This is to observe compliance with the design concepts and to allow changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.