

APPENDIX "L"

**MIAMI-DADE
WATER AND SEWER DEPARTMENT
GEOTECHNICAL INVESTIGATION**

(33 Pages)

September 18, 2008



Consulting Engineers & Scientists
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Corzo Castella Carballo Thompson Salman, P.A.
901 Ponce de Leon Boulevard
Suite 900
Coral Gables, Florida 33134

Attn: Mr. Ian John, E.I.

Re: Exfiltration Test Results
City of Miami – Glenroyal Drainage and Roadway Improvements
Dolphin Expressway and NW 17th Avenue
Miami, Miami-Dade County, Florida
Terracon Job No. 34085037

Dear Mr. John:

As proposed we have completed 29 exfiltration tests for the above referenced project. The following is a brief description of the test procedures and an overview of the results. Also included in the attachments are Exfiltration Sheets containing the test data and an Exfiltration Test Location Diagram showing the approximate location of the tests.

Twenty-nine exfiltration tests (EX-1 through EX-29) were performed at the site in general accordance with the South Florida Water Management District (SFWMD) procedures for the "Usual Open-Hole Constant Head Condition" Percolation Tests. The test was performed in an 8-inch diameter borehole advanced by means of a PVC casing to a depth of 15 feet below the existing ground surface. A 6-inch diameter perforated PVC pipe was placed in the borehole prior to retrieving the casing. Water was then pumped into the borehole in order to raise the water level in the borehole to near the ground surface. Once the inflow stabilized with the outflow rate, the average pumping rate and the elevation of the water obtained with this stabilized flow rate were recorded.

Material encountered at the exfiltration test site was identified in the field from cuttings brought to the surface by the augering process. Upon completion of the drilling and following groundwater stabilization, the distance from the existing ground surface to the water table was recorded. The rate of water flow required to maintain a constant hydraulic head was then recorded. The hydraulic conductivity value was determined from the test results and is presented in the Exfiltration Test Sheets attachment in this memo. The hydraulic conductivity value is reported in units of cubic feet per second per square foot of seepage area per foot of head (cfs/ft²-ft head).

The exfiltration test locations generally encountered approximately 4 to 5 feet of fill material consisting of fine sand with limerock underlain by limestone with sand to the test depth of 15 feet below grade.

Asphalt core samples were recovered from the roadway at the exfiltration test locations by U.S. Precision Drilling, Inc. A total of twenty-nine (29) 4-inch diameter cores were taken. Once the cores were extracted, they were transported to our laboratory in Sunrise, Florida.

A summary of the test results and asphalt core thicknesses are presented in the following table. More detailed test information can be found in the attachments included with this letter.

TABLE 1: Exfiltration Test Results

Test Location	Hydraulic Conductivity (cfs/ft ² ft.head)	Asphalt Thickness (in.)	Test Location	Hydraulic Conductivity (cfs/ft ² ft.head)	Asphalt Thickness (in.)
EX-1	1.19 x 10 ⁻⁴	9.27	EX-16	1.96 x 10 ⁻³	2.90
EX-2	4.32 x 10 ⁻⁵	3.05	EX-17	3.81 x 10 ⁻⁴	2.92
EX-3	2.79 x 10 ⁻⁴	4.75	EX-18	2.25 x 10 ⁻⁵	3.27
EX-4	4.16 x 10 ⁻³	2.20	EX-19	1.24 x 10 ⁻⁴	2.75
EX-5	1.21 x 10 ⁻³	4.62	EX-20	2.58 x 10 ⁻⁴	2.92
EX-6	2.71 x 10 ⁻⁴	1.95	EX-21	6.37 x 10 ⁻⁴	2.48
EX-7	1.65 x 10 ⁻³	3.97	EX-22	2.70 x 10 ⁻⁴	2.39
EX-8	1.28 x 10 ⁻⁴	0.75	EX-23	4.29 x 10 ⁻⁴	1.40
EX-9	5.11 x 10 ⁻⁴	3.50	EX-24	8.69 x 10 ⁻⁴	4.10
EX-10	3.03 x 10 ⁻⁴	2.92	EX-25	2.81 x 10 ⁻³	4.50
EX-11	1.76 x 10 ⁻⁴	2.42	EX-26	2.86 x 10 ⁻⁴	3.82
EX-12	4.78 x 10 ⁻⁵	5.43	EX-27	1.65 x 10 ⁻⁴	3.10
EX-13	5.27 x 10 ⁻⁵	4.38	EX-28	7.44 x 10 ⁻³	2.40
EX-14	4.60 x 10 ⁻⁴	4.21	EX-29	5.57 x 10 ⁻⁴	6.60
EX-15	1.24 x 10 ⁻³	2.60	-	-	-

City of Miami – Glenroyal Drainage and Roadway Improvements
Terracon Job No. 34085037
September 18, 2008

Terracon

If we may be of further assistance, or if you have any questions regarding information contained in this letter, please do not hesitate to contact us.

Sincerely,
Terracon
Certificate of Authorization Number 8830



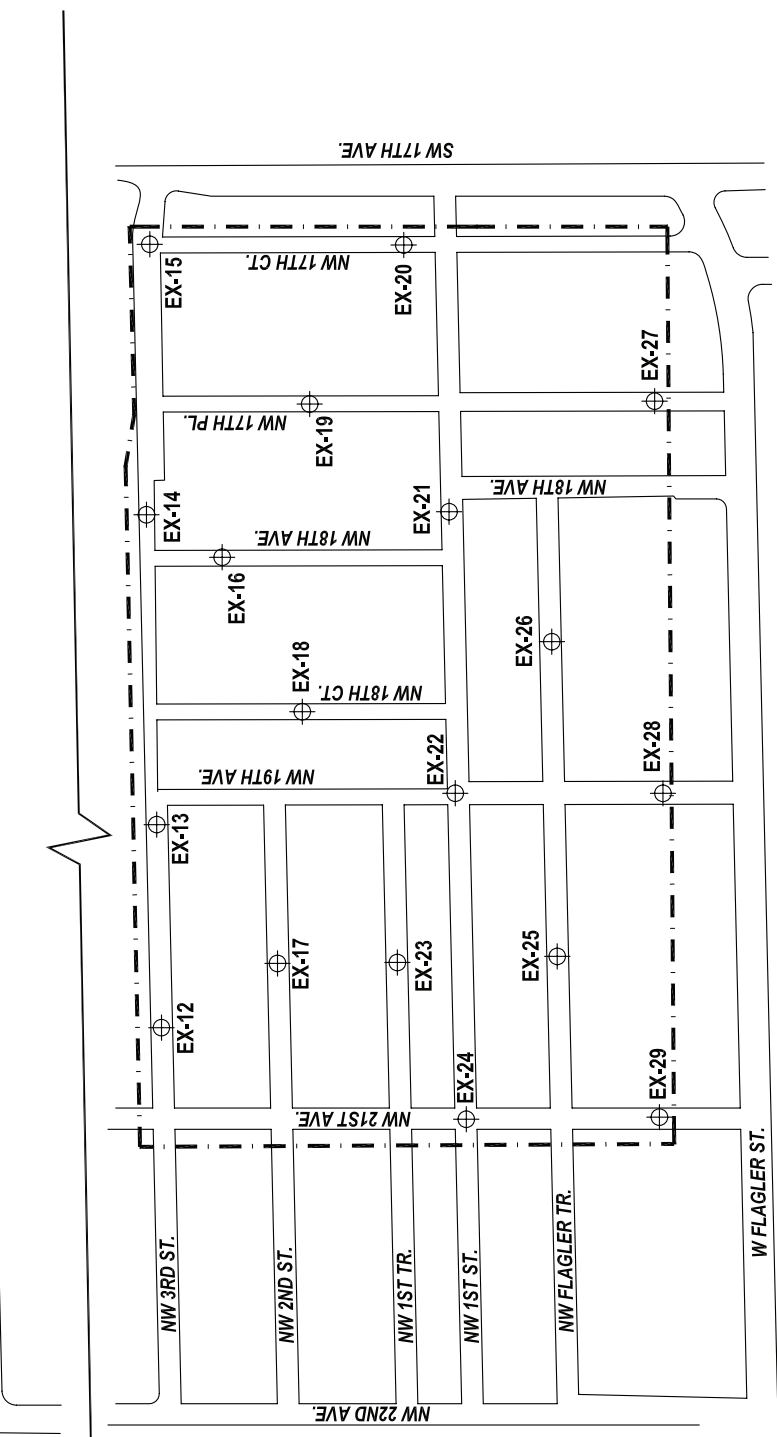
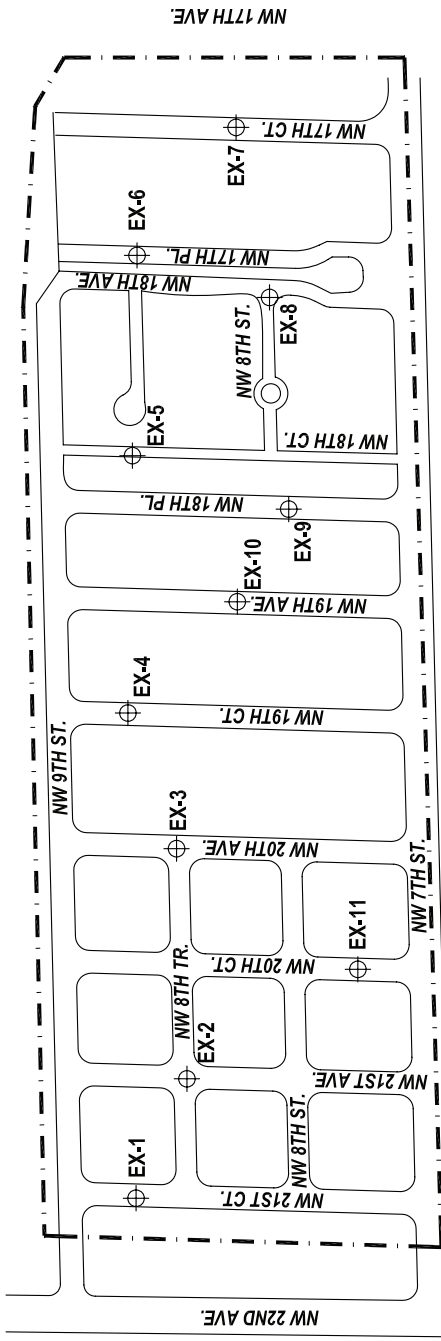
Travis P. Iverson, E.I.
Project Engineer



Alex R. Montenegro, P.E.
South Florida Office Manager
Florida PE # 59426

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Copies To: Addressee (3)

Attachments: *Exfiltration Test Location Diagram*
 Exfiltration Test Logs (EX-1 to EX-29)



NOT TO SCALE

LEGEND

- - - - - SUBJECT SITE
- ⊕ APPROXIMATE EXFILTRATION TEST LOCATION

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mgr:	TPI
Drawn By:	DWD
Checked By:	TPI/MRF
Approved By:	ARM

Project No.	34085037
Scale:	AS SHOWN
File No.	34085037-1
Date:	SEPT. 2008

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EXFILTRATION TEST LOCATION DIAGRAM
 GEOTECHNICAL ENGINEERING REPORT
 CITY OF MIAMI - GLENROYAL DRAINAGE AND ROADWAY IMPROVEMENTS
 DOLPHIN EXPRESSWAY AND NW 17TH AVENUE
 MIAMI, MIAMI-DADE COUNTY, FL

FIG. No. **1**



EXFILTRATION TEST LOG - EX-1

Client: C3TS Job # 34085037
 Site: Dolphin Expressway and NW 17th Avenue Test # 1
 Project: City of Miami - Glenroyal Drainage and Roadway Improv. Date: 9/4/2008
 Test: Usual Type Open Hole Exfiltration Test

Surface Elevation: Ground Surface Water table from ground surface: 3.58
 (ft)

Auger Diameter: 8 inches

Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	5.0
2	4.0
3	4.0
4	4.0
5	4.0
6	4.0
7	3.0
8	4.0
9	4.0
10	4.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
	9 1/4-INCH ASPHALT
1.0 - 2.0	FILL-SAND , with limerock, fine, brown
2.0 - 4.0	SAND , with limestone fragments, fine, brown
4.0 - 10.0	LIMESTONE , with sand, brown
10.0 - 15.0	SAND , fine, brown

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q = Average Stabilized Rate: 4.0 Gal/Min
 H = Depth to Groundwater Level: 3.58 Ft
 D_s = Saturated Depth: 11.4 Ft
 d = Diameter of Test Hole: 6 Inches
 D = Depth of Hole: 15 Ft
 K = Hydraulic Conductivity **K = 1.19E-04 cfs/ft²ft.head**



EXFILTRATION TEST LOG - EX-2

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>2</u>
Project:	<u>City of Miami - Glenroyal Drainage and Roadway Improv.</u>	Date:	<u>9/4/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	4.00
		(ft)	
Auger Diameter:	<u>8</u> inches		
Tube Depth:	<u>15</u> Ft		

One Minute Increment	Pumping Rate in Gal/Min
1	3.0
2	3.0
3	2.0
4	1.0
5	1.0
6	1.0
7	2.0
8	1.0
9	1.0
10	1.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0.0 - 3.5	FILL-SAND , with limerock, fine, brown
3.5 - 8.0	SAND , fine, brown
8.0 - 15.0	SAND , fine, brown

$$K = \frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	1.6 Gal/Min
H =	Depth to Groundwater Level:	4 Ft
Ds =	Saturated Depth:	11 Ft
d =	Diameter of Test Hole:	6 Inches
D =	Depth of Hole:	15 Ft
K =	Hydraulic Conductivity	K = 4.32E-05 cfs/ft².ft.head



EXFILTRATION TEST LOG - EX-3

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>3</u>
Project:	<u>City of Miami - Glenroayal Drainage and Roadway Improv.</u>	Date:	<u>9/5/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	3.50
		(ft)	

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	10.0
2	10.0
3	9.0
4	9.0
5	9.0
6	9.0
7	9.0
8	9.0
9	9.0
10	9.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
	4 3/4-INCH ASPHALT
0.0 - 4.0	FILL-SAND , with limerock, fine, gray
4.0 - 15.0	SAND , with limestone fragments, fine, brown

$$K = \frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \times \frac{1}{448.83}$$

(Conversion Factor gpm to csf)

Q =	Average Stabilized Rate:	9.2 Gal/Min	
H =	Depth to Groundwater Level:	3.5 Ft	
Ds =	Saturated Depth:	11.5 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	15 Ft	
K =	Hydraulic Conductivity	K = 2.79E-04	cfs/ft².ft.head



EXFILTRATION TEST LOG - EX-4

Client: C3TS Job # 34085037
 Site: Dolphin Expressway and NW 17th Avenue Test # 4
 Project: City of Miami - Glenroyal Drainage and Roadway Improv. Date: 9/5/2008
 Test: Usual Type Open Hole Exfiltration Test

Surface Elevation: Ground Surface Water table from ground surface: 2.00
 (ft)

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	40.0
2	40.0
3	40.0
4	40.0
5	40.0
6	40.0
7	40.0
8	40.0
9	40.0
10	40.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 3.0	FILL-SAND , with limerock, fine, gray
3.0 - 4.0	SAND , with organics, fine, dark brown
4.0 - 15.0	LIMESTONE , with sand, tan

$$K = \frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q = Average Stabilized Rate: 40.0 Gal/Min
 H = Depth to Groundwater Level: 1 Ft
 Ds = Saturated Depth: 13 Ft
 d = Diameter of Test Hole: 6 Inches
 D = Depth of Hole: 14 Ft
 K = Hydraulic Conductivity **K = 4.16E-03 cfs/ft²ft.head**

Values adjusted since groundwater was not able to be raised to the surface.



EXFILTRATION TEST LOG - EX-5

Client: C3TS Job # 34085037
 Site: Dolphin Expressway and NW 17th Avenue Test # 5
 Project: City of Miami - Glenroayal Drainage and Roadway Improv. Date: 9/5/2008
 Test: Usual Type Open Hole Exfiltration Test
 Surface Elevation: Ground Surface Water table from ground surface: 3.00
 (ft)

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	38.0
2	35.0
3	35.0
4	35.0
5	35.0
6	35.0
7	35.0
8	34.0
9	34.0
10	34.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 5.0	4 1/2-INCH ASPHALT
5.0 - 6.0	FILL-SAND , with limerock, fine, gray
6.0 - 15.0	SAND , fine, dark brown
	LIMESTONE , with sand, tan

$$K = \frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \times \frac{1}{448.83}$$

(Conversion Factor gpm to csf)

Q = Average Stabilized Rate: 35.0 Gal/Min
 H = Depth to Groundwater Level: 3 Ft
 Ds = Saturated Depth: 12 Ft
 d = Diameter of Test Hole: 6 Inches
 D = Depth of Hole: 15 Ft
 K = Hydraulic Conductivity **K = 1.21E-03 cfs/ft²ft.head**



EXFILTRATION TEST LOG - EX-6

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>6</u>
Project:	<u>City of Miami - Glenroayal Drainage and Roadway Improv.</u>	Date:	<u>9/5/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	3.17
		(ft)	

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	9.0
2	9.0
3	8.0
4	8.0
5	8.0
6	8.0
7	8.0
8	8.0
9	8.0
10	8.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
	2-INCH ASPHALT
0 - 5.0	FILL-SAND , with limerock, fine, brown to gray
5.0 - 6.0	SAND , fine, dark brown
6.0 - 15.0	SAND , trace limestone fragments, fine, dark brown

$$K = \frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \times \frac{1}{448.83}$$

(Conversion Factor gpm to csf)

Q =	Average Stabilized Rate:	8.2 Gal/Min	
H =	Depth to Groundwater Level:	3.17 Ft	
Ds =	Saturated Depth:	11.8 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	15 Ft	
K =	Hydraulic Conductivity	K = 2.71E-04	cfs/ft².ft.head



EXFILTRATION TEST LOG - EX-7

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>7</u>
Project:	<u>City of Miami - Glenroayal Drainage and Roadway Improv.</u>	Date:	<u>9/7/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	1.67
		(ft)	

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	41.0
2	41.0
3	33.0
4	27.0
5	25.0
6	22.0
7	22.0
8	22.0
9	22.0
10	22.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 3.0	4-INCH ASPHALT
0 - 3.0	FILL-SAND , with limerock, fine, brown
3.0 - 7.0	SAND , with limestone fragments, trace organic, fine, brown
7.0 - 15.0	LIMESTONE , with sand, tan

$$K = \frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \times \frac{1}{448.83}$$

(Conversion Factor gpm to csf)

Q =	Average Stabilized Rate:	27.7 Gal/Min	
H =	Depth to Groundwater Level:	1.67 Ft	
Ds =	Saturated Depth:	13.3 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	15 Ft	
K =	Hydraulic Conductivity	K = 1.65E-03	csf/ft².head



EXFILTRATION TEST LOG - EX-8

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>8</u>
Project:	<u>City of Miami - Glenroyal Drainage and Roadway Improv.</u>	Date:	<u>9/6/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	3.00
		(ft)	
Auger Diameter:	<u>8</u> inches		
Tube Depth:	<u>15</u> Ft		

One Minute Increment	Pumping Rate in Gal/Min
1	5.0
2	5.0
3	4.0
4	4.0
5	4.0
6	3.0
7	3.0
8	3.0
9	3.0
10	3.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
	3/4-INCH ASPHALT
0 - 1.0	FILL-SAND , with limerock, fine, brown
1.0 - 3.0	SILTY SAND , trace limestone fragments, fine, brown
3.0 - 14.0	LIMESTONE , with sand, tan
14.0 - 15.0	SAND , fine, brown

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	3.7 Gal/Min	
H =	Depth to Groundwater Level:	3 Ft	
Ds =	Saturated Depth:	12 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	15 Ft	
K =	Hydraulic Conductivity	K = 1.28E-04	cfs/ft².ft.head



EXFILTRATION TEST LOG - EX-9

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>9</u>
Project:	<u>City of Miami - Glenrooyal Drainage and Roadway Improv.</u>	Date:	<u>9/5/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	3.08
		(ft)	
Auger Diameter:	<u>8</u> inches		
Tube Depth:	<u>15</u> Ft		

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 4.0	3 1/2-INCH ASPHALT
4.0 - 15.0	FILL-SAND , with limerock, fine, brown
	LIMESTONE , with sand, tan

One Minute Increment	Pumping Rate in Gal/Min
1	19.0
2	18.0
3	15.0
4	15.0
5	14.0
6	15.0
7	13.0
8	14.0
9	14.0
10	14.0

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	15.1 Gal/Min
H =	Depth to Groundwater Level:	3.08 Ft
Ds =	Saturated Depth:	11.9 Ft
d =	Diameter of Test Hole:	6 Inches
D =	Depth of Hole:	15 Ft
K =	Hydraulic Conductivity	K = 5.11E-04 cfs/ft²ft.head



EXFILTRATION TEST LOG - EX-10

Client: C3TS Job # 34085037
Site: Dolphin Expressway and NW 17th Avenue Test # 10
Project: City of Miami - Glenrooyal Drainage and Roadway Improv. Date: 9/7/2008
Test: Usual Type Open Hole Exfiltration Test
Surface Elevation: Ground Surface Water table from ground surface: 4.00
(ft)

Auger Diameter: 8 inches
Tube Depth: 15 Ft

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 4.0	FILL-SAND , with limerock, fine, brown
4.0 - 15.0	LIMESTONE , with sand, tan

One Minute Increment	Pumping Rate in Gal/Min
1	12.0
2	12.0
3	11.0
4	11.0
5	11.0
6	11.0
7	11.0
8	11.0
9	11.0
10	11.0

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad (\text{Conversion Factor gpm to csf})$$

Q = Average Stabilized Rate: 11.2 Gal/Min
H = Depth to Groundwater Level: 4 Ft
D_s = Saturated Depth: 11 Ft
d = Diameter of Test Hole: 6 Inches
D = Depth of Hole: 15 Ft
K = Hydraulic Conductivity **K = 3.03E-04 cfs/ft²ft.head**



EXFILTRATION TEST LOG - EX-11

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>11</u>
Project:	<u>City of Miami - Glenrooyal Drainage and Roadway Improv.</u>	Date:	<u>9/7/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	4.00
		(ft)	
Auger Diameter:	<u>8</u> inches		
Tube Depth:	<u>15</u> Ft		

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
	2 1/2-INCH ASPHALT
0 - 5.0	FILL-SAND , with limerock, fine, brown
5.0 - 15.0	LIMESTONE , with sand, tan

One Minute Increment	Pumping Rate in Gal/Min
1	8.0
2	8.0
3	7.0
4	6.0
5	6.0
6	6.0
7	6.0
8	6.0
9	6.0
10	6.0

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad (\text{Conversion Factor gpm to csf})$$

Q =	Average Stabilized Rate:	6.5 Gal/Min
H =	Depth to Groundwater Level:	4 Ft
Ds =	Saturated Depth:	11 Ft
d =	Diameter of Test Hole:	6 Inches
D =	Depth of Hole:	15 Ft
K =	Hydraulic Conductivity	K = 1.76E-04 cfs/ft²ft.head



EXFILTRATION TEST LOG - EX-12

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>12</u>
Project:	<u>City of Miami - Glenrooyal Drainage and Roadway Improv.</u>	Date:	<u>9/11/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	8.00
		(ft)	
Auger Diameter:	<u>8</u> inches		
Tube Depth:	<u>15</u> Ft		

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 6.0	5 1/2-INCH ASPHALT
6.0 - 15.0	FILL-SAND , with limerock, fine, brown
	LIMESTONE , with sand, tan

One Minute Increment	Pumping Rate in Gal/Min
1	3.0
2	3.0
3	3.0
4	3.0
5	3.0
6	3.0
7	3.0
8	3.0
9	3.0
10	3.0

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	3.0 Gal/Min
H =	Depth to Groundwater Level:	8 Ft
Ds =	Saturated Depth:	7 Ft
d =	Diameter of Test Hole:	6 Inches
D =	Depth of Hole:	15 Ft
K =	Hydraulic Conductivity	K = 4.78E-05 cfs/ft²ft.head



EXFILTRATION TEST LOG - EX-13

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>13</u>
Project:	<u>City of Miami - Glenrooyal Drainage and Roadway Improv.</u>	Date:	<u>9/12/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	7.25
		(ft)	
Auger Diameter:	<u>8</u> inches		
Tube Depth:	<u>15</u> Ft		

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 5.0	4 1/4-INCH ASPHALT
5.0 - 7.5	FILL-SAND , with limerock, fine, brown
7.5 - 15.0	LIMESTONE , with sand, tan

One Minute Increment	Pumping Rate in Gal/Min
1	4.0
2	3.0
3	3.0
4	3.0
5	3.0
6	3.0
7	3.0
8	3.0
9	3.0
10	3.0

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad (\text{Conversion Factor gpm to csf})$$

Q =	Average Stabilized Rate:	3.1 Gal/Min	
H =	Depth to Groundwater Level:	7.25 Ft	
Ds =	Saturated Depth:	7.75 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	15 Ft	
K =	Hydraulic Conductivity	K = 5.27E-05	cfs/ft²ft.head



EXFILTRATION TEST LOG - EX-14

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>14</u>
Project:	<u>City of Miami - Glenrooyal Drainage and Roadway Improv.</u>	Date:	<u>9/10/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	<u>Ground Surface</u>	Water table from ground surface:	<u>8.25</u>
		(ft)	
Auger Diameter:	<u>8</u> inches		
Tube Depth:	<u>15</u> Ft		

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 5.0	FILL-SAND , with limerock, fine, brown
5.0 - 15.0	LIMESTONE , with sand, tan

One Minute Increment	Pumping Rate in Gal/Min
1	30.0
2	30.0
3	30.0
4	30.0
5	29.0
6	29.0
7	29.0
8	29.0
9	29.0
10	29.0

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	29.4 Gal/Min
H =	Depth to Groundwater Level:	8.25 Ft
Ds =	Saturated Depth:	6.75 Ft
d =	Diameter of Test Hole:	6 Inches
D =	Depth of Hole:	15 Ft
K =	Hydraulic Conductivity	K = 4.60E-04 cfs/ft²ft.head



EXFILTRATION TEST LOG - EX-15

Client: C3TS Job # 34085037
 Site: Dolphin Expressway and NW 17th Avenue Test # 15
 Project: City of Miami - Glenroayal Drainage and Roadway Improv. Date: 9/10/2008
 Test: Usual Type Open Hole Exfiltration Test
 Surface Elevation: Ground Surface Water table from ground surface: 8.00
 (ft)

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	40.0
2	40.0
3	40.0
4	40.0
5	40.0
6	40.0
7	40.0
8	40.0
9	40.0
10	40.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
	2 1/2-INCH ASPHALT
0 - 4.0	FILL-SAND , with limerock, fine, brown
4.0 - 8.0	SAND , with limestone fragments, fine, brown
5.0 - 15.0	LIMESTONE , with sand, tan

$$K = \frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q = Average Stabilized Rate: 40.0 Gal/Min
 H = Depth to Groundwater Level: 4.8 Ft
 Ds = Saturated Depth: 7 Ft
 d = Diameter of Test Hole: 6 Inches
 D = Depth of Hole: 11.8 Ft
 K = Hydraulic Conductivity **K = 1.24E-03 cfs/ft²ft.head**

Values adjusted since groundwater was not able to be raised to the surface.



EXFILTRATION TEST LOG - EX-16

Client: C3TS
Site: Dolphin Expressway and NW 17th Avenue
Project: City of Miami - Glenroayal Drainage and Roadway Improv.
Test: Usual Type Open Hole Exfiltration Test

Job # 34085037
Test # 16
Date: 9/12/2008

Surface Elevation: Ground Surface Water table from ground surface: 7.00 (ft)

Auger Diameter: 8 inches
Tube Depth: 15 Ft

Table with 2 columns: One Minute Increment, Pumping Rate in Gal/Min. Rows 1-10 show a constant pumping rate of 40.0 Gal/Min.

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft) Soil Description
0 - 3.0 3-INCH ASPHALT
3.0 - 13.0 FILL-SAND, with limerock, fine, brown
13.0 - 15.0 SAND, fine, brown
13.0 - 15.0 LIMESTONE, with sand, tan

K = (4Q) / (pi*d*(2H^2 + 4HDs + dH)) * (1/448.83) (Conversion Factor gpm to csf)

Q = Average Stabilized Rate: 40.0 Gal/Min
H = Depth to Groundwater Level: 3 Ft
Ds = Saturated Depth: 8 Ft
d = Diameter of Test Hole: 6 Inches
D = Depth of Hole: 11 Ft
K = Hydraulic Conductivity

K = 1.96E-03 cfs/ft^2ft.head

Values adjusted since groundwater was not able to be raised to the surface.



EXFILTRATION TEST LOG - EX-19

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>19</u>
Project:	<u>City of Miami - Glenroayal Drainage and Roadway Improv.</u>	Date:	<u>-</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	<u>Ground Surface</u>	Water table from ground surface:	<u>8.00</u>
		(ft)	

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	8.0
2	8.0
3	8.0
4	7.0
5	7.0
6	8.0
7	8.0
8	8.0
9	8.0
10	8.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
	2 3/4-INCH ASPHALT
0 - 8.0	FILL-SAND , with limerock, fine, brown
8.0 - 15.0	LIMESTONE , with sand, tan

$$K = \frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	7.8 Gal/Min	
H =	Depth to Groundwater Level:	8 Ft	
Ds =	Saturated Depth:	7 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	15 Ft	
K =	Hydraulic Conductivity	K = 1.24E-04	cfs/ft²ft.head



EXFILTRATION TEST LOG - EX-20

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>20</u>
Project:	<u>City of Miami - Glenroayal Drainage and Roadway Improv.</u>	Date:	<u>9/14/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	7.50
		(ft)	

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	18.0
2	16.0
3	16.0
4	15.0
5	15.0
6	15.0
7	15.0
8	15.0
9	15.0
10	15.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 4.0	3-INCH ASPHALT
0 - 4.0	FILL-SAND , with limerock, fine, brown
4.0 - 15.0	LIMESTONE , with sand, tan

$$K = \frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	15.5 Gal/Min	
H =	Depth to Groundwater Level:	7.5 Ft	
Ds =	Saturated Depth:	7.5 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	15 Ft	
K =	Hydraulic Conductivity	K = 2.58E-04	csf/ft²ft.head



EXFILTRATION TEST LOG - EX-21

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>21</u>
Project:	<u>City of Miami - Glenroayal Drainage and Roadway Improv.</u>	Date:	<u>9/14/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	8.00
		(ft)	
Auger Diameter:	<u>8</u> inches		
Tube Depth:	<u>15</u> Ft		

One Minute Increment	Pumping Rate in Gal/Min
1	40.0
2	40.0
3	40.0
4	40.0
5	40.0
6	40.0
7	40.0
8	40.0
9	40.0
10	40.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 1.0	2 1/2-INCH ASPHALT
1.0 - 7.0	FILL-SAND , with limerock, fine, brown
7.0 - 15.0	SAND , fine, gray
	LIMESTONE , with sand, tan

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	40.0 Gal/Min	
H =	Depth to Groundwater Level:	8 Ft	
Ds =	Saturated Depth:	7 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	15 Ft	
K =	Hydraulic Conductivity	K = 6.37E-04	cfs/ft².ft.head



EXFILTRATION TEST LOG - EX-22

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>22</u>
Project:	<u>City of Miami - Glenroayal Drainage and Roadway Improv.</u>	Date:	<u>9/9/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	7.00
		(ft)	

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	18.0
2	17.0
3	15.0
4	15.0
5	15.0
6	15.0
7	15.0
8	15.0
9	15.0
10	15.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 2.0	2 1/2-INCH ASPHALT
2.0 - 6.0	SAND , fine, gray
6.0 - 15.0	SAND , with limestone fragments, fine, gray
	LIMESTONE , with sand, brown

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83}$$

(Conversion Factor gpm to csf)

Q =	Average Stabilized Rate:	15.5 Gal/Min	
H =	Depth to Groundwater Level:	7 Ft	
Ds =	Saturated Depth:	8 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	15 Ft	
K =	Hydraulic Conductivity	K = 2.70E-04	csf/ft².head



EXFILTRATION TEST LOG - EX-23

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>23</u>
Project:	<u>City of Miami - Glenroayal Drainage and Roadway Improv.</u>	Date:	<u>9/14/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	7.33
		(ft)	

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	28.0
2	26.0
3	25.0
4	25.0
5	25.0
6	25.0
7	25.0
8	25.0
9	25.0
10	25.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 1.0	1 1/2-INCH ASPHALT
1.0 - 5.0	FILL-SAND , with limerock, fine, brown
5.0 - 15.0	SAND , fine, brown
	LIMESTONE , with sand, tan

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	25.4 Gal/Min	
H =	Depth to Groundwater Level:	7.33 Ft	
D _s =	Saturated Depth:	7.67 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	15 Ft	
K =	Hydraulic Conductivity	K = 4.29E-04	cfs/ft²ft.head



EXFILTRATION TEST LOG - EX-24

Client: C3TS
 Site: Dolphin Expressway and NW 17th Avenue
 Project: City of Miami - Glenroayal Drainage and Roadway Improv.
 Test: Usual Type Open Hole Exfiltration Test

Job # 34085037
 Test # 24
 Date: 9/14/2008

Surface Elevation: Ground Surface Water table from ground surface: 8.67
 (ft)

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	40.0
2	40.0
3	40.0
4	40.0
5	40.0
6	40.0
7	40.0
8	40.0
9	40.0
10	40.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 6.0	4-INCH ASPHALT
6.0 - 12.0	FILL-SAND , with limerock, fine, brown
12.0 - 15.0	SAND , with limestone fragments, fine, brown
	LIMESTONE , with sand, tan

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q = Average Stabilized Rate: 40.0 Gal/Min
 H = Depth to Groundwater Level: 6.67 Ft
 D_s = Saturated Depth: 6.33 Ft
 d = Diameter of Test Hole: 6 Inches
 D = Depth of Hole: 13 Ft
 K = Hydraulic Conductivity **K = 8.69E-04 cfs/ft²ft.head**

Values adjusted since groundwater was not able to be raised to the surface.



EXFILTRATION TEST LOG - EX-25

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>25</u>
Project:	<u>City of Miami - Glenroayal Drainage and Roadway Improv.</u>	Date:	<u>9/11/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	8.58
		(ft)	

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	40.0
2	40.0
3	40.0
4	40.0
5	40.0
6	40.0
7	40.0
8	40.0
9	40.0
10	40.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 6.0	4 1/2-INCH ASPHALT
6.0 - 8.0	FILL-SAND , with limerock, fine, brown
8.0 - 15.0	SAND , fine, gray
	LIMESTONE , with sand, tan

$$K = \frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	40.0 Gal/Min	
H =	Depth to Groundwater Level:	2.58 Ft	
Ds =	Saturated Depth:	6.42 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	9 Ft	
K =	Hydraulic Conductivity	K = 2.81E-03	cfs/ft².ft.head

Values adjusted since groundwater was not able to be raised to the surface.



EXFILTRATION TEST LOG - EX-26

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>26</u>
Project:	<u>City of Miami - Glenroyal Drainage and Roadway Improv.</u>	Date:	<u>9/11/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	8.33
		(ft)	
Auger Diameter:	<u>8</u> inches		
Tube Depth:	<u>15</u> Ft		

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 2.0	3 3/4-INCH ASPHALT
2.0 - 8.0	FILL-SAND , with limerock, fine, brown
8.0 - 15.0	SAND , fine, brown
	LIMESTONE , with sand, tan

One Minute Increment	Pumping Rate in Gal/Min
1	20.0
2	20.0
3	18.0
4	18.0
5	18.0
6	18.0
7	18.0
8	18.0
9	18.0
10	18.0

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	18.4 Gal/Min
H =	Depth to Groundwater Level:	8.33 Ft
Ds =	Saturated Depth:	6.67 Ft
d =	Diameter of Test Hole:	6 Inches
D =	Depth of Hole:	15 Ft
K =	Hydraulic Conductivity	K = 2.86E-04 cfs/ft²ft.head



EXFILTRATION TEST LOG - EX-27

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>27</u>
Project:	<u>City of Miami - Glenroyal Drainage and Roadway Improv.</u>	Date:	<u>9/15/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	7.83
		(ft)	
Auger Diameter:	<u>8</u> inches		
Tube Depth:	<u>15</u> Ft		

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
	3-INCH ASPHALT
0 - 1.0	FILL-SAND , with limerock, fine, brown
1.0 - 5.0	SAND , fine, gray
5.0 - 15.0	SAND , with limestone fragments, fine, brown

One Minute Increment	Pumping Rate in Gal/Min
1	12.0
2	10.0
3	10.0
4	10.0
5	10.0
6	10.0
7	10.0
8	10.0
9	10.0
10	10.0

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	10.2 Gal/Min
H =	Depth to Groundwater Level:	7.83 Ft
Ds =	Saturated Depth:	7.17 Ft
d =	Diameter of Test Hole:	6 Inches
D =	Depth of Hole:	15 Ft
K =	Hydraulic Conductivity	K = 1.65E-04 cfs/ft²ft.head



EXFILTRATION TEST LOG - EX-28

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>28</u>
Project:	<u>City of Miami - Glenroayal Drainage and Roadway Improv.</u>	Date:	<u>9/14/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	8.00
		(ft)	

Auger Diameter: 8 inches
 Tube Depth: 15 Ft

One Minute Increment	Pumping Rate in Gal/Min
1	40.0
2	40.0
3	40.0
4	40.0
5	40.0
6	40.0
7	40.0
8	40.0
9	40.0
10	40.0

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
0 - 5.0	2 1/2-INCH ASPHALT
5.0 - 15.0	FILL-SAND , with limerock, fine, brown
	LIMESTONE , with sand, tan

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	40.0 Gal/Min	
H =	Depth to Groundwater Level:	1 Ft	
Ds =	Saturated Depth:	7 Ft	
d =	Diameter of Test Hole:	6 Inches	
D =	Depth of Hole:	8 Ft	
K =	Hydraulic Conductivity	K = 7.44E-03	csf/ft².ft.head



EXFILTRATION TEST LOG - EX-29

Client:	<u>C3TS</u>	Job #	<u>34085037</u>
Site:	<u>Dolphin Expressway and NW 17th Avenue</u>	Test #	<u>29</u>
Project:	<u>City of Miami - Glenroyal Drainage and Roadway Improv.</u>	Date:	<u>9/14/2008</u>
Test:	<u>Usual Type Open Hole Exfiltration Test</u>		
Surface Elevation:	Ground Surface	Water table from ground surface:	8.17
		(ft)	
Auger Diameter:	<u>8</u> inches		
Tube Depth:	<u>15</u> Ft		

Sample Location: As shown on Boring Location Diagram

Subsurface Profile:

Depth (ft)	Soil Description
	6 1/2-INCH ASPHALT
0 - 5.0	FILL-SAND , with limerock, fine, brown
5.0 - 15.0	LIMESTONE , with sand, tan

One Minute Increment	Pumping Rate in Gal/Min
1	35.0
2	35.0
3	35.0
4	36.0
5	36.0
6	36.0
7	36.0
8	35.0
9	35.0
10	35.0

$$K = \frac{4Q}{\pi d(2H^2 + 4HD_s + dH)} \times \frac{1}{448.83} \quad \text{(Conversion Factor gpm to csf)}$$

Q =	Average Stabilized Rate:	35.4 Gal/Min
H =	Depth to Groundwater Level:	8.17 Ft
Ds =	Saturated Depth:	6.83 Ft
d =	Diameter of Test Hole:	6 Inches
D =	Depth of Hole:	15 Ft
K =	Hydraulic Conductivity	K = 5.57E-04 cfs/ft²ft.head