DRAINAGE DESIGN DOCUMENTATION
HOMESTEAD ROAD WIDENING
LEE COUNTY

From South of Sunrise Blvd. to
North of Alabama Rd.

PROJECT NO. 5063

Prepared For:

LEE COUNTY

Prepared By:

HDR

200 W. Forsyth St. Suite 800
Jacksonville, FL 32202

FBPE CERTIFICATE OF AUTHORIZATION NO. 4213

90% QC SUBMITTAL

September 2008

.

HOMESTEAD ROAD WIDENING
DRAINAGE DESIGN DOCUMENTATION
90% SUBMITTAL

TABLE OF CONTENTS

SECTION	TITLE	PAGE
	TABLE OF CONTENTS	i
1	**OVERALL PROJECT NARRATIVE**	**1**
2	**TREATMENT VOLUME CALCULATIONS**	**3**
3	**LIVEOAK CANAL (DRY POND) DOCUMENTATION**	
	a. USGS GROUND WATER DATA	**7**
	b. WATER PERMIT DATA	**10**
	c. POND MODEL DATA	**14**
4	**SOUTH BASIN DESIGN DOCUMENTATION**	
	a. SPREAD CALCULATIONS	**33**
	b. EDGE OF PAVEMENT CALCULATIONS	**36**
	c. STORM DRAIN CALCULATIONS	**39**
5	**CENTRAL BASIN DESIGN DOCUMENTATION**	
	d. SPREAD CALCULATIONS	**42**
	e. EDGE OF PAVEMENT CALCULATIONS	**44**
	f. STORM DRAIN CALCULATIONS	**46**
6	**NORTH BASIN DESIGN DOCUMENTATION**	
	g. SPREAD CALCULATIONS	**47**
	h. EDGE OF PAVEMENT CALCULATIONS	**50**
	i. STORM DRAIN CALCULATIONS	**53**
7	**400 BASIN DESIGN DOCUMENTATION**	
	j. SPREAD CALCULATIONS	**56**
	k. EDGE OF PAVEMENT CALCULATIONS	**58**
	l. STORM DRAIN CALCULATIONS	**60**

ATTACHMENT

PERMITTING AGENCIES MEETING MINUTES

APPENDIX

ARDAMAN & ASSOCIATES: PRELIMINARY ROADWAY SOIL SURVEY

ARDAMAN & ASSOCIATES: GEOTECHNICAL ENGINEERING SERVICES

OVERALL PROJECT NARRATIVE

HOMESTEAD ROAD PROJECT

Project Overview

The proposed project consists of roadway and associated drainage improvements for a 2.3-mile section of Homestead Road within Lehigh Acres, Lee County, Florida. The existing roadway consists of a primarily rural section with two lanes and roadside swales. The proposed section will be a 4-lane urban section with curb and gutter, sidewalk and closed stormwater collection systems. Currently the roadway drains into swales, which in turn drains into the existing canals within the East County Water Control District (ECWCD). The proposed stormwater systems will also discharge into the canal system.

Roadway Improvements

The general existing conditions consist of 24-ft of paved roadway with grassed shoulders and swales within an average of 94-ft right-of-way width. There is sidewalk along a small portion of the project. The proposed typical section will have four 11-ft travel lanes and 4-ft paved shoulder, 2-ft curb and gutter and 6-ft sidewalk on each side of the roadway.

Canal System

The ECWCD controls a canal system that was originally designed to serve as stormwater drainage for the Lehigh Acres area. However, development within this area and the pumping of ground water for water supply has caused a significant drop in the natural groundwater level. This is a concern since most homes in the area are served by individual well and septic system for utilities. Several studies have promoted the concept that the drainage canals could potentially act as dry retention areas, allowing for increased groundwater recharge through percolation of stormwater runoff held within the canals until recovery. Because the primary nature of the system is to provide drainage throughout the area, it is imperative that the control structures be carefully designed to maintain the balance between stormwater recharge and flood protection.

Stormwater treatment within the canal system is proposed for two specific areas. The first treatment area would consist of approximately 1200 LF of existing Liveoak Canal, located west of Homestead Road and south of Arthur Avenue; the second stormwater treatment system is located along the southern limits of the project. All stormwater treatment being proposed for this project is dry treatment.

Stormwater Basins

The project area has been divided into five stormwater basins. The southern most basin runs from the beginning of the project at Sta. 513+40 to Sta. 523+30. This rural portion of the road is transitioning back to the existing roadway. It consists of unpaved shoulders and roadside swales. Roadway improvements on the right side of the roadway will be drained and maintained by a series of dry detention swales located on the right side of the road. These dry detention areas are also designed to overcompensate in treatment and attenuation for roadway improvements on the left side of the road.

The South Basin is a storm sewer system located in an urban section between Sta. 523+30 to approximately Sta. 570+80. This basin discharges to Canal 57-4-6 near the 90-degree bend east of Homestead Road. A weir at elevation 25.5 NGVD controls this portion of the canal system.

The Central Basin is located between Sta. 570+80 and Sta. 599+50. This storm sewer system discharges to Canal 57-5-3 via a proposed doubled box culvert extension at approximately Sta. 592+50 east of Homestead Road.

The North Basin lies between Sta. 599+50 and Sta. 625+50. The storm sewer system discharges into Canal 57-5-5 via a double cross drain extension on the right side of the road at approximately Sta. 603+10.

The 400-series Basin encompasses an area between Sta. 625+50 to the end of the project at Sta. 632+95.95. Part of the basin area lies west of Homestead Road on Alabama Road and another on the east on Leeland Road. Some offsite drainage area through existing swale systems also contribute to the overall basin drainage boundary. This basin discharges directly into an existing 30-in pipe west of Homestead Road near Sta. 628+50 and ultimately outfall into Canal 47-31-9.

All stormwater treatment for the proposed improvements between Sta. 523+30 through 632+95 is being provided in the Liveoak Canal/Dry Pond. This 1200 LF section of canal is being separated from its connection to the Yellowtail drainage basin and is being connected to the Spur A basin via the proposed 6'x4' box culvert. This canal will also provide dry stormwater retention for 0.70 ac-ft of treatment volume between elevations 20.0 and 20.4 ft NGVD.

Cross Drains

An existing double pipe cross drain located at Sta. 526+45 is proposed to be replaced due to the road widening. The current cross drain connects the roadside swale to an existing water body to the east. The ditch primarily collects roadway runoff and limited offsite drainage. The proposed improvements will direct all roadside drainage into closed pipe drainage system. The flat terrain of the offsite area makes it difficult to clearly identify how much offsite drainage, if any, actually traverses the cross drain. The cross drain is being replaced in the same size and inverts so as not to disrupt flow during larger storm events.

The next cross drain will be an extension of the existing double 7-ft by 5-ft box culvert at approximately Sta. 592+00. Its extension is on a northeast angle from Homestead Road. This cross drain is part of the canal system controlled by East County Water Control District.

As part of a compensatory effort with the ECWCD, the District has requested that a segment of the 57-5-2 Canal (Liveoak Canal) be redirected to flow southeast and merge to Canal 47-32-4 via a proposed 6-ft by 4-ft concrete box culvert. The rerouting will alleviate current flooding conditions in the adjacent community. The box culvert is designed to extend west perpendicular to Homestead Road, then run parallel south to outfall into the proposed double 53-in by 34-in pipe cross drain extension at approximately Sta. 603+20. This existing cross drain location will also need to be extended both east and west of Homestead Road.

TREATMENT VOLUME CALCULATIONS

L. PHILLIPS
6/30/2008

TREATMENT VOLUME CALCULATIONS
HOMESTEAD RD

ROADWAY

Beginning Sta.	513+40.00	(SOUTHERN UN-CURBED SECTION)
Ending Sta.	523+20.00	
LENGTH =	980 LF	
Avg R/W	104 LF	
TOTAL R/W	2.34 Acres	



EXISTING IMPERVIOUS	0.54 AC
NEW IMPERVIOUS	0.30 AC

a.	1" OVER AREA	=(TOTAL AREA)*(1 INCH)/(12 IN/FT)	**0.04 AC-FT**
b.	2.5" * IMPERVIOUS AREA	=(IMPERVIOUS AREA)*(2.5 IN)/(12 IN/FT)	**0.06 AC-FT**

REQUIRED TREATMENT VOLUME **0.06 AC-FT**

PROPOSED TREATMENT VOLUME IS TO BE PROVIDED BY SHALLOW DRY SWALES LOACTED EAST OF THE ROADWAY BETWEEN STA. 513+40 AND 523+20. EACH DRY SWALE IS APPROXIMATELY 1-FT DEEP

SWALE A LOCATED BETWEEN STA 513+40 AND STA. 515+70

APPROXIMATE AREA = 2,055 CF

ESTIMATED DEPTH = 1 FT

TREATMENT VOLUME AND STORAGE PROVIDED = 0.05 AC-FT

SWALE B LOCATED BETWEEN STA 515+70 AND STA 523+20

APPROXIMATE AREA = 3,000 CF

ESTIMATED DEPTH = 1 FT

TREATMENT VOLUME AND STORAGE PROVIDED = 0.07 AC-FT

ESTIMATED TREATMENT VOLUME PROVIDED = 0.12 AC-FT

L. PHILLIPS
5/21/2008

TREATMENT VOLUME CALCULATIONS
HOMESTEAD RD

ROADWAY

Beginning Sta	523+30.00	(CURBED SECTION)
Ending Sta.	632+96.00	
LENGTH =	10,966 LF	

Avg R/W 24 LF

TOTAL R/W 6.04 Acres

Treatment volume required for additional roadway is:

a.	1" OVER AREA	=(TOTAL AREA)*(1 INCH)/(12 IN/FT)	**0.50 AC-FT**
b.	2.5" * IMPERVIOUS AREA	=(IMPERVIOUS AREA)*(2.5 IN)/(12 IN/FT)	**1.26 AC-FT**

TREATMENT METHOD IS DRY RETENTION (50% REDUCTION)

REQUIRED TREATMENT VOLUME **0.63 AC-FT**

SOUTH TREATMENT CANAL

CONTROL STRUCTURE IN CANAL 57-4-6 DIRECTLY SOUTH OF ITS CONNECTION TO CANAL 57-4-3

APPROXIMATE LENGTH = 6967 LF

AVERAGE WIDTH = 15 FT

ESTIMATED DEPTH = 2 FT

TREATMENT VOLUME AND STORAGE PROVIDED 4.80 AC-FT

NORTH TREATMENT CANAL

CONTROL STRUCTURE PROPOSED IN SPUR A CANAL (47-32-4) DIRECTLY SOUTH OF ITS CONNECTION TO 47-32-1 (Abel Canal)

APPROXIMATE LENGTH = 23142

AVERAGE WIDTH = 15 FT

ESTIMATED DEPTH = 2 FT

TREATMENT VOLUME AND STORAGE PROVIDED 15.94 AC-FT

ESTIMATED TREATMENT VOLUME PROVIDED = 20.74 AC-FT

Homestead Road Improvements Prepared by: LSP Date: 5/12/08
Lee County, Florida Checked by: LSP Date:

TREATMENT VOLUME CALCULATION

Pond: DRY POND

DRAINAGE BASIN: Add'l Pav't	**6.06 ac**
TOTAL IMP. AREA	**6.06 ac**
TOTAL PERV. AREA:	**0.00 ac**
TOTAL PROJECT AREA	**6.69 ac**

A) RUNOFF FROM ONE INCH OF RAINFALL THE DRAINAGE AREA

(TV=DRAINAGE AREA*(1.0/12))

DRAIN. AREA	TV
6.06 ac	**0.51 ac-ft**

B) 2.5 INCHES OF RUNOFF FROM THE IMPERIOUS AREA

(TV=IMP. AREA*(2.50/12))

IMPERV. AREA	TV
6.06 ac	**1.26 ac-ft**

DRY RETENTION VOLUME PROVIDED SHALL BE 50% OF WET RETENTION VOLUME

DRAIN. AREA	TV
6.06 ac	**0.63 ac-ft**

THEREFORE, REQUIRED TV:	**0.63 ac-ft**	**27,497.25 CF**	
PROVIDED TV:	**0.70 ac-ft**	**30,324.73 CF**	**OK**

THE PROPOSED DRY RETENTION LAKE SYSTEM HAS THE FOLLOWING STAGE-STORAGE RELATIONSHIP:

	ACRE	STAGE		STORAGE
		(FT)	(ELEVATION)	(AC-FT)
BOTTOM	**0.01**	0.00	**19.50**	0.00
	1.51	0.50	**20.00**	0.38
	1.58	2.50	**22.00**	3.47
	1.96	4.50	**24.00**	7.00
TOB	**2.21**	5.50	**25.00**	9.08

AT WEIR	
VOLUME	AREA
(AC-FT)	(AC)
0.70	0.37

SET WEIR ELEVATION

MIN. WEIR ELEVATION = $= \frac{[\text{TOB(EL)}-\text{BOT(EL)}]*(\text{TV(AC-FT)})}{[\text{STORAGE(TOB)}-\text{STORAGE(BOT)}]} + \text{BOT(EL)}$ = 20.36 FT

SET WEIR ELEVATION = 20.40 FT

TREATMENT VOLUME PROVIDED: 0.70 AC-FT

Homestead Road Improvements Prepared by: LSP Date: 5/12/08
Lee County, Florida Checked by: LSP Date:

RETENTION BASIN RECOVERY

According to Applicant Handbook: Regulation of Stormwter Management Systems Chapter 40C-42, F.A.C.Chapter 26.3 Accepted Methodologies and Design Procedures for Retention Basin Recovery

DRY RETENTION BASIN: **DRYPOND**

TREATMENT VOLUME (PROV.)	30324.73 CF
	0.70 AC-FT
f = FILLABLE POROSITY (0.2-0.4)	0.3
Permeability* (30ft/day/2) =K(vs)	10.00 FT/DAY
BASIN BOTTOM ELEV.	19.50 FT
SHGWT	18.00 FT
HARDPAN	2.00 FT
BASIN BOTTOM LENGTH	1300.00 FT
BASIN BOTTOM WIDTH	50.00 FT

* Please see attached geotechnical report K(vs) = 30 ft/day

BASIN STAGE STORAGE

STAGE FT	AREA AC	SF	INCR. STORAGE CF	CUMUL. STORAGE CF
19.5	0.01	500	0	0
20	1.51	65,776	16,569	16,569
22	1.58	68,607	134,383	150,951.50
24	1.96	85,290	153,897	304,848.98
25	2.21	96,268	90,779	395,628.02
** WEIR ELEV. =		20.40 FT		

STAGE 1 FLOW (VERTICAL):

h(b) = POND BOTTOM--SHGWT	=	1.50 FT
V(u) = TV* h(b) * f	=	225.00 CF
K(vu) = 2/3 * K(vs)	=	6.67 FT/DAY
I(d) = K(vu)/2	=	3.33 FT/DAY
t(Stage 1) = f * h(b) / I(d)	=	0.14 DAY(S)
	=	3.24 HOURS

STAGE 2 FLOW (HORIZONTAL):

V(Saturated Flow) = TV-V(u)	=	30099.73 CF
TV Elev at Start of Sat. Flow: h (Sat. Flow)	=	19.92 FT
hc = h(b)	=	1.50 FT
h2 = h(Sat. Flow) - Pond Bottom	=	0.42 FT
H(T) = h(b) + h2	=	1.92 FT
Fy = hc/H(T)	=	0.78 FT
D(t) = (Avg Aquifer Thickness) = H+ hc/2	=	16.75 FT
Fx = Figure 26-7 (L/W=7)	=	4.50 FT
t(Stage 2) = ((W^2)/(4 * K(vs) * D * Fx^2))	=	0.18 DAY(S)
		4.42 HOURS

TOTAL VOLUME DRAWDOWN TIME = 7.66 HOURS

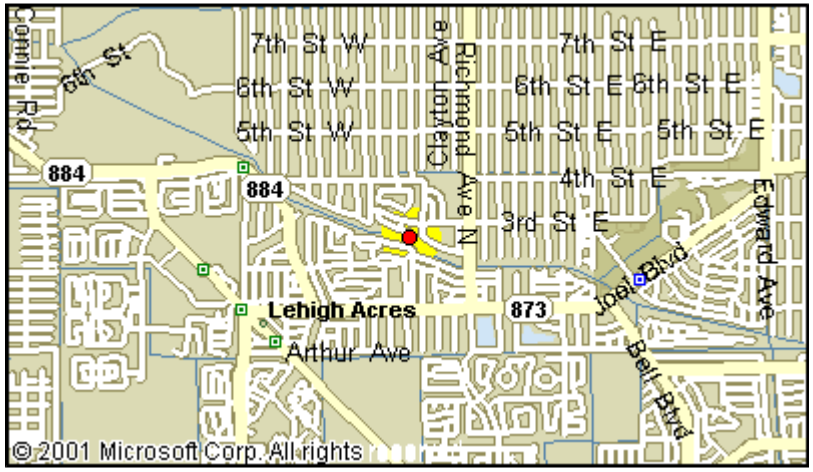
LIVEOAK CANAL

USGS GROUND WATER DATA

USGS science for a changing world

Ground-Water Watch

Site Number: 263630081375301 - L -1418



Ground-Water Watch Help Page

LOCATION

Latitude 26°36'31", Longitude 81°37'51" NAD27
Lee County, Florida, Hydrologic Unit 03090205

DESCRIPTION

Well depth: 62 feet
Land surface altitude: 23.7 feet above sea level NGVD29.
Well completed in "Intermediate aquifer system" (S500INTRMD) national aquifer.
Well completed in "SANDSTONE AQUIFER" (122SNDS) local aquifer

AVAILABLE DATA FROM NWISWeb:

Field ground-water-level measurements
Field/Lab water-quality samples

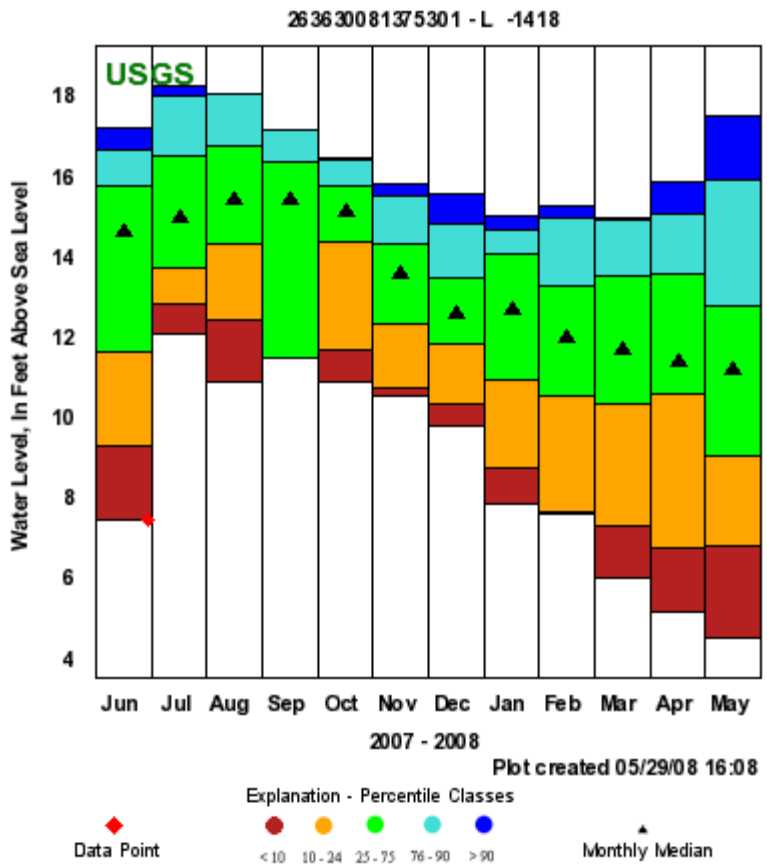
OPERATION:

Record for this site is maintained by the USGS Florida - Miami Office Water Science Center
Email questions about this site to Florida Water-Data Inquiries

Site Statistics

Most recent data value: 7.47 on 6/29/2007
Period of Record Monthly Statistics for 263630081375301
Elevation above NGVD 1929, feet
All Approved Continuous & Periodic Data Used In Analysis
Note: Bold values in the table indicate closest statistic to the most recent data value.

Month	Lowest Level	10th %ile	25th %ile	50th %ile	75th %ile	90th %ile	Highest Level	Number of Years
Jan	7.85	8.76	10.95	12.71	14.11	14.70	15.05	14
Feb	7.60	7.68	10.57	11.99	13.28	14.98	15.29	15



Mar	6.04	7.32	10.35	11.69	13.53	14.94	15.00	15
Apr	5.19	6.78	10.62	11.38	13.57	15.11	15.88	20
May	4.53	6.80	9.07	11.18	12.81	15.95	17.54	18
Jun	**7.47**	9.29	11.65	14.64	15.79	16.67	17.21	17
Jul	12.11	12.86	13.73	14.98	16.55	18.04	18.27	15
Aug	10.89	12.43	14.36	15.41	16.76	18.06	18.08	14
Sep	11.49	-	-	-	-	-	17.18	5
Oct	10.92	11.70	14.40	15.13	15.76	16.41	16.48	17
Nov	10.56	10.77	12.36	13.58	14.32	15.54	15.84	13
Dec	9.79	10.36	11.86	12.61	13.49	14.86	15.60	15

Statistics Options

View month/year statistics

Periodic Ground-Water Data

Summary Statistics for Period of Record Periodic Water Levels

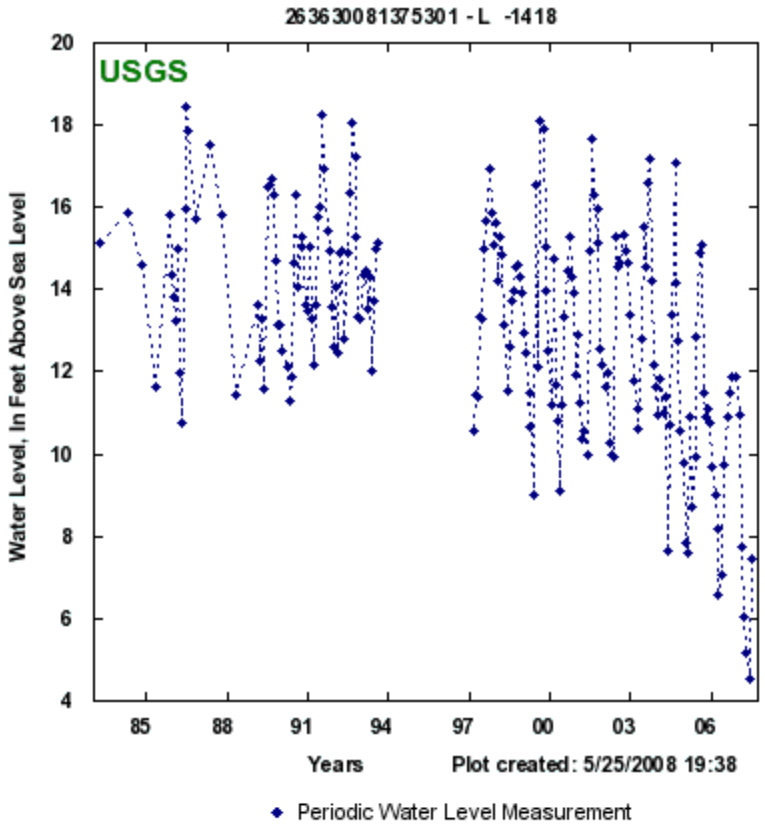
Elevation above NGVD 1929, feet

Approved Periodic Water Level Values

Begin Date	End Date	Number of Values
04/21/83	06/29/07	194

Lowest WL	Date of Lowest WL	Highest WL	Date of Highest WL
4.53	05/30/07	18.43	06/26/86

Ground-Water Levels Options



View NWISWeb ground-water levels page

View annual monthly statistics for all data types

Download ground-water levels in text format

Return to County Page | Return to State Page | Return to National Page

Accessibility FOIA Privacy Policies and Notices

U.S. Department of the Interior | U.S. Geological Survey
URL: http://groundwaterwatch.usgs.gov/AWLSites.asp
Page Contact Information: OGW Webmaster
Last update: Wednesday, May 07, 2008 at 12:03

WATER PERMIT DATA

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

BACK-UP MATERIAL

PERMIT NUMBER:

36-00166-W

APPLICATION NUMBER:

030521-21

6. Impact Analysis

The modeling results of the four (4) scenarios described above are presented in **Figures 10 through 13. Figures 10 and 11** are FWS withdrawals only and **Figures 12 and 13** are the cumulative simulations. Model output for each scenario is included in **Appendix H** (CD in Pocket).

The projected drawdown from FWS as permitted (see **Figure 10**) indicates the drawdown range from about 30 feet at the existing well field to about 7 feet at the proposed permitted well field (C-1 through C-8). When the withdrawals are shifted to the new well field and increased from 0.41 MGD to 1.5 MGD, the projected drawdown within the existing well field increase by 2 feet. The drawdown within the new well field area increase from 7 feet to 18 feet (see **Figure 11**). Because the previous proposed wells were spaced over about 3 miles, the drawdown changes to that area are minimal.

Discussion

The USGS has many monitoring wells throughout Lee County. The period of record for each of the following wells was used to determine the maximum drawdown that could occur using the highest water level and the lowest water level: L727, L1418, L1625, L1963, L1965, L1968, L1998, L2215, and HE559. In most cases, these two extremes did not occur in the same year. However, most of the lowest levels occurred during the 1999-2001 drought. **Figure 14** shows the general location of these wells and the calculated difference between the extreme high and low water levels (maximum drawdown). This information was used to compare the modeling effort to real data. The model over predicts the amount of drawdown at all the monitoring wells except L1998. Well L1998 is located adjacent to production wells within the Green Meadows Well field. It appears that the modeling presented here is very conservative in predicting drawdown impacts.

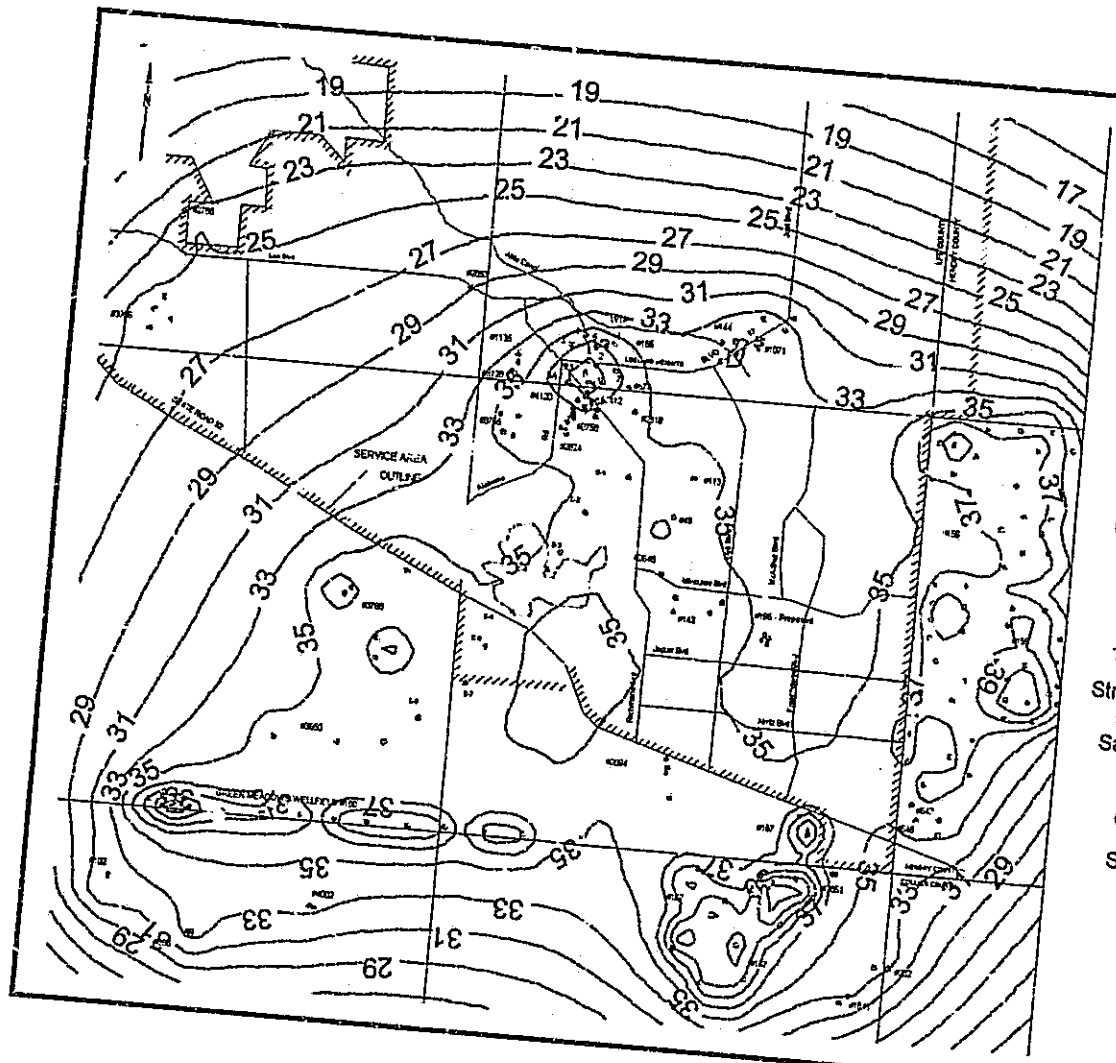


Figure 12

Projected Cumulative Sandstone Aquifer Drawdown: Permitted Users

Florida Water Services

FWS/Lehigh

Maximum Withdrawals Currently Permitted with SSU @ 3.1 MGD

100 days with no Recharge

Strictly a drawdown model with starting heads @ 0.0 and Sandstone withdrawals only.

Contour lines in feet of drawdown, 2 ft intervals

SCALE: 1 inch = 2 miles

Prepared by: GLM 3/11/03

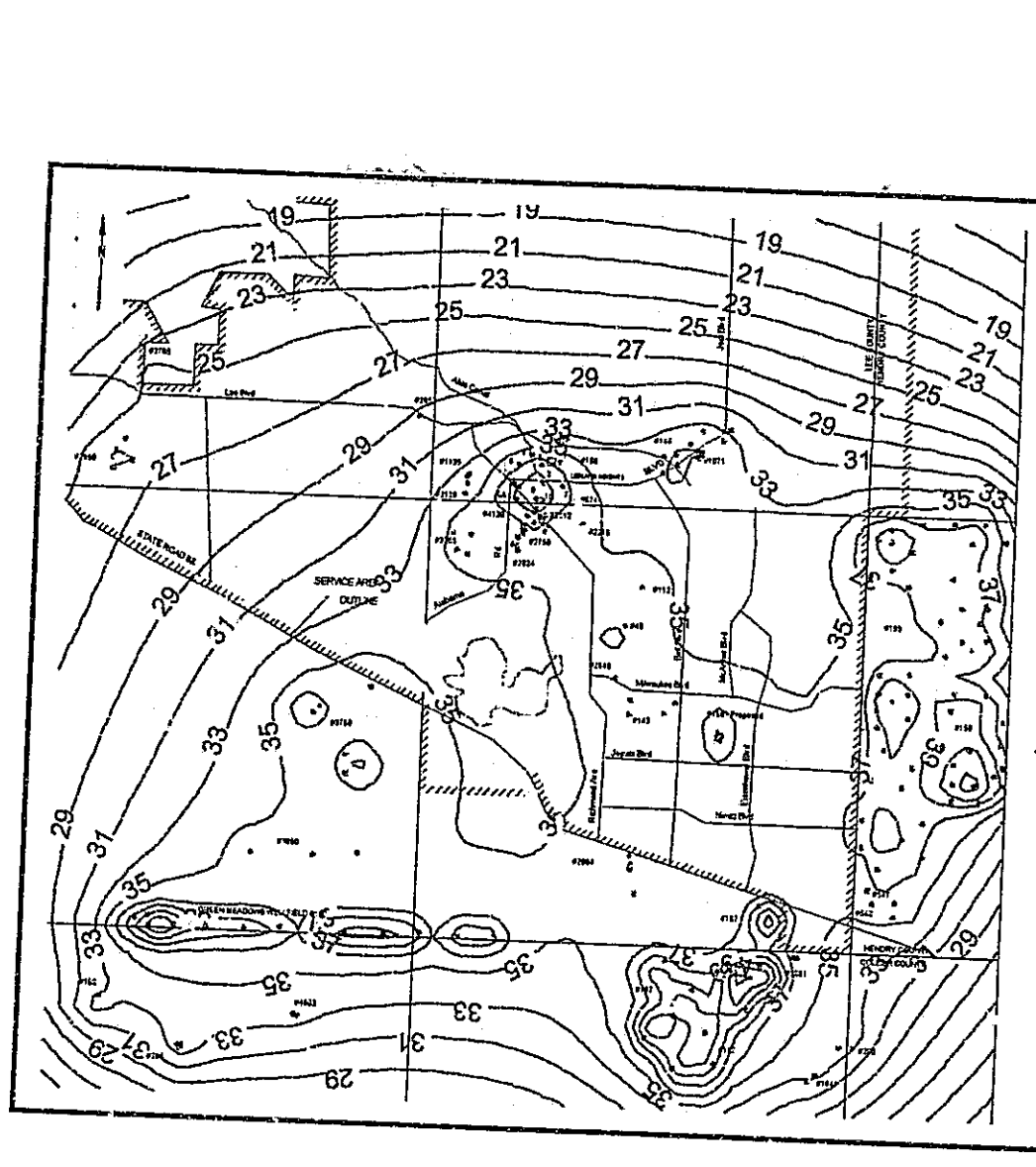


Figure 13

Projected Cumulative Sandstone Aquifer Drawdown: Permitted Users Plus FWS 1.1 MGD Increase

Florida Water Services

FWS/Lehigh

Maximum Withdrawals Currently Permitted with SSU @ 4.2 MGD

100 days with no Recharge

Strictly a drawdown model with starting heads @ 0.0 and Sandstone withdrawals only.

Contour lines in feet of drawdown, 2 ft intervals

SCALE: 1 inch = 2 miles

Prepared by: GLM 3/11/03

POND MODEL DATA

Davie Basin
SFWMD 25 YR-72HrSF event

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
Canal	BASE	25YR-72HR-SF	60.66	23.184	26.500	-0.0050	78484	60.17	79.823	60.63	47.694
outbox	BASE	25YR-72HR-SF	60.67	22.978	29.000	0.0050	5213	60.63	47.694	60.67	47.627
outfall	BASE	25YR-72HR-SF	60.00	20.500	24.000	-2.0000	5100	60.67	47.627	0.00	0.000

Pond: LIVEOAK CANAL
SFWMD 25 YR-72Hr event

Name	Group	Simulation	Max Time Flow hrs	Max Flow cfs	Max Delta Q cfs	Max Time US Stage hrs	Max US Stage ft	Max Time DS Stage hrs	Max DS Stage ft
out1	BASE	25YR-72HR-SF	60.67	47.627	-0.151	60.67	22.978	12.00	20.500
weir	BASE	25YR-72HR-SF	60.63	47.694	0.578	60.66	23.184	60.67	22.978

Interconnected Channel and Pond Routing Model (ICPR) ©2002 Streamline Technologies, Inc.

```
            Basin Name: Davie Basin
            Group Name: BASE
            Simulation: 25YR-72HR-SFW
             Node Name: canal
            Basin Type: SCS Unit Hydrograph

       Unit Hydrograph: Uh256
         Peaking Fator: 256.0
  Spec Time Inc (min): 2.67
  Comp Time Inc (min): 2.67
        Rainfall File: Sfwmd72
 Rainfall Amount (in): 11.300
 Storm Duration (hrs): 72.00
               Status: Onsite
   Time of Conc (min): 20.00
     Time Shift (hrs): 0.00
            Area (ac): 17.700
 Vol of Unit Hyd (in): 1.000
         Curve Number: 79.000
             DCIA (%): 0.000

       Time Max (hrs): 60.09
       Flow Max (cfs): 62.579
   Runoff Volume (in): 8.633
  Runoff Volume (ft3): 554703.382


--------------------------------------------------------------------------------

            Basin Name: Homestead rd
            Group Name: BASE
            Simulation: 25YR-72HR-SFW
             Node Name: Canal
            Basin Type: SCS Unit Hydrograph

       Unit Hydrograph: Uh484
         Peaking Fator: 484.0
  Spec Time Inc (min): 6.76
  Comp Time Inc (min): 6.76
        Rainfall File: Sfwmd72
 Rainfall Amount (in): 11.300
 Storm Duration (hrs): 72.00
               Status: Onsite
   Time of Conc (min): 50.70
     Time Shift (hrs): 0.00
            Area (ac): 6.050
 Vol of Unit Hyd (in): 1.001
         Curve Number: 95.000
             DCIA (%): 0.000

       Time Max (hrs): 60.28
       Flow Max (cfs): 22.188
   Runoff Volume (in): 10.677
  Runoff Volume (ft3): 234484.517
```

==========
==== Basins ====
==========

Name: Davie Basin Node: canal Status: Onsite
Group: BASE Type: SCS Unit Hydrograph

Unit Hydrograph: Uh256 Peaking Factor: 256.0
Rainfall File: Storm Duration(hrs): 0.00
Rainfall Amount(in): 0.000 Time of Conc(min): 20.00
Area(ac): 17.700 Time Shift(hrs): 0.00
Curve Number: 79.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: Homestead rd Node: Canal Status: Onsite
Group: BASE Type: SCS Unit Hydrograph

Unit Hydrograph: Uh484 Peaking Factor: 484.0
Rainfall File: Storm Duration(hrs): 0.00
Rainfall Amount(in): 0.000 Time of Conc(min): 50.70
Area(ac): 6.050 Time Shift(hrs): 0.00
Curve Number: 95.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

==========
==== Nodes ====
==========

Name: Canal Base Flow(cfs): 0.000 Init Stage(ft): 20.000
Group: BASE Warn Stage(ft): 26.500
Type: Stage/Area

Stage(ft)	Area(ac)
19.500	0.0050
20.000	1.1970
22.000	1.5750
24.000	1.9580
25.000	2.1330
26.000	2.2700

Name: outbox Base Flow(cfs): 0.000 Init Stage(ft): 20.000
Group: BASE Warn Stage(ft): 29.000
Type: Stage/Area

Stage(ft)	Area(ac)
20.000	0.0005
23.000	0.0010
29.000	0.0050

Name: outfall Base Flow(cfs): 0.000 Init Stage(ft): 22.000
Group: BASE Warn Stage(ft): 24.000
Type: Time/Stage

Time(hrs)	Stage(ft)
0.00	20.000
12.00	20.500
24.00	20.000
48.00	20.000
60.00	20.500
65.00	20.000
72.00	20.000

Pipes

Name: out1 | From Node: outbox | Length(ft): 1700.00
Group: BASE | To Node: outfall | Count: 1
Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Entrance Loss Coef: 0.00
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Rectangular	Rectangular
Span(in):	72.00	72.00
Rise(in):	48.00	48.00
Invert(ft):	21.000	19.000
Manning's N:	0.001200	0.001200
Top Clip(in):	0.000	0.000
Bot Clip(in):	0.000	0.000

Upstream FHWA Inlet Edge Description:
Rectangular Box: 30° to 75° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 30° to 75° wingwall flares

Channels

Name: | From Node: | Length(ft): 0.00
Group: BASE | To Node: | Count: 1
Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Contraction Coef: 0.000
Expansion Coef: 0.000
Entrance Loss Coef: 0.000
Exit Loss Coef: 0.000
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Trapezoidal	Trapezoidal
Invert(ft):	0.000	0.000
TClpInitZ(ft):	9999.000	9999.000
Manning's N:	0.000000	0.000000
Top Clip(ft):	0.000	0.000
Bot Clip(ft):	0.000	0.000
Main XSec:		
AuxElev1(ft):		
Aux XSec1:		
AuxElev2(ft):		
Aux XSec2:		
Top Width(ft):		
Depth(ft):		
Bot Width(ft):	0.000	0.000
LtSdSlp(h/v):	0.00	0.00
RtSdSlp(h/v):	0.00	0.00

Weirs

Name: weir | From Node: Canal
Group: BASE | To Node: outbox

```
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                   Span(in): 72.00
                   Rise(in): 9999999.00
                 Invert(ft): 20.400
       Control Elevation(ft): 20.400
                                          TABLE
              Bottom Clip(in): 0.000
                 Top Clip(in): 0.000
           Weir Discharge Coef: 3.200
        Orifice Discharge Coef: 0.600

30 ft wide

================================================================================
==== Hydrology Simulations =====================================================
================================================================================

         Name: 10YR-24HR
     Filename: P:\_PROJECTS\Homestead\ICPR\10YR-24HR.R32

       Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Fdot-24
    Rainfall Amount(in): 7.44

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          10.00

--------------------------------------------------------------------------------------------------------
         Name: 25YR-72HR
     Filename: P:\_PROJECTS\Homestead\ICPR\25YR-72HR.R32

       Override Defaults: Yes
    Storm Duration(hrs): 72.00
          Rainfall File: Fdot-72
    Rainfall Amount(in): 11.00

Time(hrs)       Print Inc(min)
--------------- ---------------
72.000          10.00

--------------------------------------------------------------------------------------------------------
         Name: 25YR-72HR-SFW
     Filename: P:\_PROJECTS\Homestead\ICPR\25YR-72HR-SFWMD.R32

       Override Defaults: Yes
    Storm Duration(hrs): 72.00
          Rainfall File: Sfwmd72
    Rainfall Amount(in): 11.30

Time(hrs)       Print Inc(min)
--------------- ---------------
72.000          10.00

================================================================================
==== Routing Simulations =======================================================
================================================================================

         Name: 10YR-24HR           Hydrology Sim: 10YR-24HR
     Filename: P:\_PROJECTS\Homestead\ICPR\10YR-24HR.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
```

Start Time(hrs): 0.000 End Time(hrs): 24.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
24.000	10.000

Group	Run
BASE	Yes

Name: 25YR-72HR Hydrology Sim: 25YR-72HR
Filename: P:_PROJECTS\Homestead\ICPR\25YR-72HR.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 72.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
72.000	10.000

Group	Run
BASE	Yes

Name: 25YR-72HR-SF Hydrology Sim: 25YR-72HR-SFW
Filename: P:_PROJECTS\Homestead\ICPR\25YR-72HR-SFW.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 360.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
72.000	30.000
360.000	30.000

Group	Run
BASE	Yes

Boundary Conditions

Mass Balance

Simulation	Time hrs	Inflow Volume ft3	Outflow Volume ft3	Change in Sys Storage ft3	Difference ft3	Error %
25YR-72HR-SF	0.00	0.0	0.0	0.0	0.0	0.00
25YR-72HR-SF	0.50	0.0	0.0	0.0	0.0	0.00
25YR-72HR-SF	1.02	0.0	0.0	0.0	0.0	0.00
25YR-72HR-SF	1.52	0.0	0.0	0.0	0.0	0.00
25YR-72HR-SF	2.02	0.0	0.0	0.0	0.0	0.00
25YR-72HR-SF	2.52	1.1	0.0	1.1	0.0	0.00
25YR-72HR-SF	3.02	17.7	0.0	17.7	0.0	0.00
25YR-72HR-SF	3.52	70.5	0.0	70.5	0.0	0.00
25YR-72HR-SF	4.02	163.6	0.0	163.6	0.0	0.00
25YR-72HR-SF	4.52	294.3	0.0	294.3	0.0	0.00
25YR-72HR-SF	5.02	458.5	0.0	458.5	0.0	0.00
25YR-72HR-SF	5.52	652.4	0.0	652.4	-0.0	-0.00
25YR-72HR-SF	6.02	872.7	0.0	872.7	-0.0	-0.00
25YR-72HR-SF	6.52	1116.7	0.0	1116.7	-0.0	-0.00
25YR-72HR-SF	7.02	1381.8	0.0	1381.8	-0.0	-0.00
25YR-72HR-SF	7.52	1666.1	0.0	1666.1	-0.0	-0.00
25YR-72HR-SF	8.02	1967.7	0.0	1967.7	-0.0	-0.00
25YR-72HR-SF	8.52	2285.0	0.0	2285.0	-0.0	-0.00
25YR-72HR-SF	9.02	2616.5	0.0	2616.5	-0.0	-0.00
25YR-72HR-SF	9.52	2961.0	0.0	2961.0	0.0	0.00
25YR-72HR-SF	10.02	3317.4	0.0	3317.4	0.0	0.00
25YR-72HR-SF	10.52	3684.7	0.0	3684.7	0.0	0.00
25YR-72HR-SF	11.02	4064.9	0.0	4064.9	0.0	0.00
25YR-72HR-SF	11.52	4471.1	0.0	4471.1	0.0	0.00
25YR-72HR-SF	12.02	4911.3	0.0	4911.3	0.0	0.00
25YR-72HR-SF	12.52	5387.6	0.0	5387.6	0.0	0.00
25YR-72HR-SF	13.02	5899.6	0.0	5899.6	0.0	0.00
25YR-72HR-SF	13.52	6446.0	0.0	6446.0	0.0	0.00
25YR-72HR-SF	14.02	7025.7	0.0	7025.7	0.0	0.00
25YR-72HR-SF	14.52	7637.5	0.0	7637.5	0.0	0.00
25YR-72HR-SF	15.02	8280.4	0.0	8280.4	0.0	0.00
25YR-72HR-SF	15.52	8953.2	0.0	8953.2	0.0	0.00
25YR-72HR-SF	16.02	9655.1	0.0	9655.1	0.0	0.00
25YR-72HR-SF	16.52	10385.0	0.0	10385.0	0.0	0.00
25YR-72HR-SF	17.02	11142.2	0.0	11142.2	0.0	0.00
25YR-72HR-SF	17.52	11925.7	0.0	11925.7	0.0	0.00
25YR-72HR-SF	18.02	12734.9	0.0	12734.9	0.0	0.00
25YR-72HR-SF	18.52	13568.8	0.0	13568.8	0.0	0.00
25YR-72HR-SF	19.02	14426.9	0.0	14426.9	0.0	0.00
25YR-72HR-SF	19.52	15308.3	0.0	15308.3	0.0	0.00
25YR-72HR-SF	20.02	16212.5	0.0	16212.5	0.0	0.00
25YR-72HR-SF	20.52	17138.8	0.0	17138.8	0.0	0.00
25YR-72HR-SF	21.02	18086.5	0.0	18086.5	0.0	0.00
25YR-72HR-SF	21.52	19055.2	0.0	19055.2	0.0	0.00
25YR-72HR-SF	22.02	20044.2	0.0	20044.2	0.0	0.00
25YR-72HR-SF	22.52	21053.0	0.0	21053.0	0.0	0.00
25YR-72HR-SF	23.02	22081.0	0.0	22081.0	0.0	0.00
25YR-72HR-SF	23.52	23127.9	0.0	23127.9	0.0	0.00
25YR-72HR-SF	24.01	24180.2	0.0	24180.2	0.0	0.00
25YR-72HR-SF	24.50	25350.7	0.0	25350.7	0.0	0.00
25YR-72HR-SF	25.01	26841.5	0.0	26841.5	0.0	0.00
25YR-72HR-SF	25.51	28442.4	0.0	28442.4	0.0	0.00
25YR-72HR-SF	26.01	30108.2	0.0	30108.2	0.0	0.00
25YR-72HR-SF	26.51	31812.7	0.0	31812.7	0.0	0.00
25YR-72HR-SF	27.01	33549.5	0.0	33549.5	0.0	0.00
25YR-72HR-SF	27.51	35317.1	0.0	35317.1	0.0	0.00
25YR-72HR-SF	28.01	37114.4	0.0	37114.4	0.0	0.00
25YR-72HR-SF	28.51	38940.5	0.0	38940.5	0.0	0.00
25YR-72HR-SF	29.01	40794.5	0.0	40794.5	0.0	0.00
25YR-72HR-SF	29.51	42675.4	0.0	42675.4	0.0	0.00
25YR-72HR-SF	30.01	44582.5	0.0	44582.5	0.0	0.00
25YR-72HR-SF	30.51	46514.9	0.0	46514.9	0.0	0.00
25YR-72HR-SF	31.01	48461.3	0.0	48461.3	0.0	0.00
25YR-72HR-SF	31.51	50444.5	0.0	50444.5	0.0	0.00
25YR-72HR-SF	32.00	52429.1	0.0	52429.1	0.0	0.00
25YR-72HR-SF	32.51	54487.0	0.0	54487.0	0.0	0.00
25YR-72HR-SF	33.01	56513.0	0.0	56513.0	0.0	0.00
25YR-72HR-SF	33.51	58587.4	7.9	58579.4	0.0	0.00

Mass Balance

Simulation	Time hrs	Inflow Volume ft3	Outflow Volume ft3	Change in Sys Storage ft3	Difference ft3	Error %
25YR-72HR-SF	34.00	60662.8	160.7	60502.1	0.0	0.00
25YR-72HR-SF	34.50	62772.0	575.5	62196.5	0.0	0.00
25YR-72HR-SF	35.00	64900.5	1273.8	63626.7	0.0	0.00
25YR-72HR-SF	35.50	67047.9	2240.9	64807.0	0.0	0.00
25YR-72HR-SF	36.00	69213.6	3448.0	65765.6	0.0	0.00
25YR-72HR-SF	36.50	71402.4	4860.1	66542.3	0.0	0.00
25YR-72HR-SF	37.00	73619.6	6446.3	67173.3	0.0	0.00
25YR-72HR-SF	37.50	75858.5	8177.5	67681.0	0.0	0.00
25YR-72HR-SF	38.00	78115.7	10028.0	68087.7	0.0	0.00
25YR-72HR-SF	38.50	80389.5	11975.7	68413.8	0.0	0.00
25YR-72HR-SF	39.00	82679.1	14002.3	68676.8	0.0	0.00
25YR-72HR-SF	39.50	84984.2	16093.8	68890.4	0.0	0.00
25YR-72HR-SF	40.00	87304.4	18238.6	69065.9	0.0	0.00
25YR-72HR-SF	40.50	89639.3	20427.6	69211.7	0.0	0.00
25YR-72HR-SF	41.00	91988.5	22653.6	69334.9	0.0	0.00
25YR-72HR-SF	41.50	94351.7	24911.5	69440.2	0.0	0.00
25YR-72HR-SF	42.00	96728.4	27196.8	69531.6	0.0	0.00
25YR-72HR-SF	42.50	99118.5	29505.8	69612.7	0.0	0.00
25YR-72HR-SF	43.00	101521.5	31836.3	69685.2	0.0	0.00
25YR-72HR-SF	43.50	103937.2	34186.3	69750.9	0.0	0.00
25YR-72HR-SF	44.00	106365.2	36554.1	69811.1	0.0	0.00
25YR-72HR-SF	44.50	108805.2	38938.3	69866.9	0.0	0.00
25YR-72HR-SF	45.00	111257.0	41337.8	69919.2	0.0	0.00
25YR-72HR-SF	45.50	113720.3	43751.8	69968.6	0.0	0.00
25YR-72HR-SF	46.00	116194.9	46179.5	70015.3	0.0	0.00
25YR-72HR-SF	46.50	118680.3	48620.3	70060.1	0.0	0.00
25YR-72HR-SF	47.00	121176.5	51073.6	70103.0	0.0	0.00
25YR-72HR-SF	47.50	123683.2	53538.8	70144.4	0.0	0.00
25YR-72HR-SF	48.00	126200.2	56015.9	70184.3	0.0	0.00
25YR-72HR-SF	48.50	128794.2	58509.3	70284.9	0.0	0.00
25YR-72HR-SF	49.00	131534.2	61048.2	70486.0	0.0	0.00
25YR-72HR-SF	49.50	134357.3	63649.0	70708.3	0.0	0.00
25YR-72HR-SF	50.00	137239.4	66314.6	70924.8	0.0	0.00
25YR-72HR-SF	50.50	140278.2	69049.8	71228.3	0.0	0.00
25YR-72HR-SF	51.00	143586.3	71901.4	71684.9	0.0	0.00
25YR-72HR-SF	51.50	147094.1	74896.9	72197.2	-0.0	-0.00
25YR-72HR-SF	52.00	150803.2	78057.4	72745.8	-0.0	-0.00
25YR-72HR-SF	52.50	154882.6	81402.1	73480.5	-0.0	-0.00
25YR-72HR-SF	53.00	159557.7	85036.6	74521.1	-0.0	-0.00
25YR-72HR-SF	53.50	164782.6	89029.3	75753.3	-0.0	-0.00
25YR-72HR-SF	54.00	170672.9	93479.8	77193.1	-0.0	-0.00
25YR-72HR-SF	54.50	177148.7	98429.3	78719.4	-0.0	-0.00
25YR-72HR-SF	55.00	184330.5	103956.6	80373.9	-0.0	-0.00
25YR-72HR-SF	55.50	192123.2	110079.7	82043.5	-0.0	-0.00
25YR-72HR-SF	56.00	200643.7	116858.9	83784.8	-0.0	-0.00
25YR-72HR-SF	56.50	209853.5	124298.8	85554.6	-0.0	-0.00
25YR-72HR-SF	57.00	219934.4	132483.3	87451.1	-0.0	-0.00
25YR-72HR-SF	57.50	230880.2	141434.3	89445.9	-0.0	-0.00
25YR-72HR-SF	58.00	243214.0	151316.4	91897.7	-0.0	-0.00
25YR-72HR-SF	58.50	256941.0	162307.6	94633.4	-0.0	-0.00
25YR-72HR-SF	59.00	273099.6	174669.2	98430.4	-0.0	-0.00
25YR-72HR-SF	59.50	295121.4	189409.3	105712.1	-0.0	-0.00
25YR-72HR-SF	60.00	370006.0	214711.5	155294.6	-0.0	-0.00
25YR-72HR-SF	60.50	498919.1	282297.4	216621.7	-0.0	-0.00
25YR-72HR-SF	61.01	577332.3	367105.5	210226.8	-0.0	-0.00
25YR-72HR-SF	61.50	619170.7	437125.9	182044.8	0.0	0.00
25YR-72HR-SF	62.00	643367.9	489328.8	154039.1	0.0	0.00
25YR-72HR-SF	62.50	659933.9	526325.6	133608.3	0.0	0.00
25YR-72HR-SF	63.00	672851.4	553809.5	119041.9	0.0	0.00
25YR-72HR-SF	63.51	684021.7	574854.8	109166.9	0.0	0.00
25YR-72HR-SF	64.01	694595.5	591811.7	102783.8	0.0	0.00
25YR-72HR-SF	64.51	703926.3	606091.4	97834.9	0.0	0.00
25YR-72HR-SF	65.01	711262.3	618132.9	93129.5	0.0	0.00
25YR-72HR-SF	65.51	717791.3	628326.7	89464.6	0.0	0.00
25YR-72HR-SF	66.01	724077.1	637204.6	86872.5	0.0	0.00
25YR-72HR-SF	66.51	730329.4	645203.7	85125.7	0.0	0.00
25YR-72HR-SF	67.01	736584.7	652628.7	83955.9	0.0	0.00
25YR-72HR-SF	67.51	742842.7	659674.0	83168.7	0.0	0.00

Mass Balance

Simulation	Time hrs	Inflow Volume ft3	Outflow Volume ft3	Change in Sys Storage ft3	Difference ft3	Error %
25YR-72HR-SF	68.01	749102.2	666466.8	82635.4	0.0	0.00
25YR-72HR-SF	68.51	754816.3	673034.4	81781.9	0.0	0.00
25YR-72HR-SF	69.01	759533.9	679159.4	80374.5	0.0	0.00
25YR-72HR-SF	69.51	763839.1	684773.8	79065.3	0.0	0.00
25YR-72HR-SF	70.01	768010.5	689965.9	78044.6	0.0	0.00
25YR-72HR-SF	70.51	772166.6	694849.6	77317.0	0.0	0.00
25YR-72HR-SF	71.01	776333.6	699520.6	76813.0	0.0	0.00
25YR-72HR-SF	71.51	780506.3	704045.2	76461.0	0.0	0.00
25YR-72HR-SF	72.01	784611.4	708468.2	76143.1	0.0	0.00
25YR-72HR-SF	72.51	784611.4	712210.4	72401.0	0.0	0.00
25YR-72HR-SF	73.01	784611.4	714951.5	69659.8	-0.0	-0.00
25YR-72HR-SF	73.51	784611.4	717012.3	67599.0	-0.0	-0.00
25YR-72HR-SF	74.01	784611.4	718596.8	66014.5	-0.0	-0.00
25YR-72HR-SF	74.51	784611.4	719838.8	64772.5	-0.0	-0.00
25YR-72HR-SF	75.01	784611.4	720828.5	63782.9	-0.0	-0.00
25YR-72HR-SF	75.51	784611.4	721629.5	62981.9	-0.0	-0.00
25YR-72HR-SF	76.01	784611.4	722286.2	62325.2	-0.0	-0.00
25YR-72HR-SF	76.51	784611.4	722830.7	61780.7	-0.0	-0.00
25YR-72HR-SF	77.01	784611.4	723286.7	61324.7	-0.0	-0.00
25YR-72HR-SF	77.51	784611.4	723672.4	60939.0	-0.0	-0.00
25YR-72HR-SF	78.01	784611.4	724001.3	60610.0	-0.0	-0.00
25YR-72HR-SF	78.51	784611.4	724283.9	60327.5	-0.0	-0.00
25YR-72HR-SF	79.01	784611.4	724528.5	60082.9	-0.0	-0.00
25YR-72HR-SF	79.51	784611.4	724741.5	59869.9	-0.0	-0.00
25YR-72HR-SF	80.01	784611.4	724928.1	59683.2	-0.0	-0.00
25YR-72HR-SF	80.51	784611.4	725092.5	59518.8	-0.0	-0.00
25YR-72HR-SF	81.01	784611.4	725238.1	59373.3	-0.0	-0.00
25YR-72HR-SF	81.51	784611.4	725367.4	59243.9	-0.0	-0.00
25YR-72HR-SF	82.01	784611.4	725483.0	59128.4	-0.0	-0.00
25YR-72HR-SF	82.51	784611.4	725586.4	59025.0	-0.0	-0.00
25YR-72HR-SF	83.01	784611.4	725679.4	58932.0	-0.0	-0.00
25YR-72HR-SF	83.51	784611.4	725763.3	58848.0	-0.0	-0.00
25YR-72HR-SF	84.01	784611.4	725839.4	58771.9	-0.0	-0.00
25YR-72HR-SF	84.51	784611.4	725908.6	58702.8	-0.0	-0.00
25YR-72HR-SF	85.01	784611.4	725971.6	58639.7	-0.0	-0.00
25YR-72HR-SF	85.51	784611.4	726029.3	58582.1	-0.0	-0.00
25YR-72HR-SF	86.01	784611.4	726082.1	58529.2	-0.0	-0.00
25YR-72HR-SF	86.51	784611.4	726130.7	58480.7	-0.0	-0.00
25YR-72HR-SF	87.01	784611.4	726175.3	58436.0	-0.0	-0.00
25YR-72HR-SF	87.51	784611.4	726216.6	58394.8	-0.0	-0.00
25YR-72HR-SF	88.01	784611.4	726254.7	58356.7	-0.0	-0.00
25YR-72HR-SF	88.51	784611.4	726290.0	58321.3	-0.0	-0.00
25YR-72HR-SF	89.01	784611.4	726322.7	58288.7	-0.0	-0.00
25YR-72HR-SF	89.51	784611.4	726353.0	58258.4	-0.0	-0.00
25YR-72HR-SF	90.01	784611.4	726381.1	58230.3	-0.0	-0.00
25YR-72HR-SF	90.51	784611.4	726407.4	58203.9	-0.0	-0.00
25YR-72HR-SF	91.01	784611.4	726432.0	58179.4	-0.0	-0.00
25YR-72HR-SF	91.51	784611.4	726455.0	58156.4	-0.0	-0.00
25YR-72HR-SF	92.01	784611.4	726476.6	58134.8	-0.0	-0.00
25YR-72HR-SF	92.51	784611.4	726496.8	58114.5	-0.0	-0.00
25YR-72HR-SF	93.01	784611.4	726515.9	58095.5	-0.0	-0.00
25YR-72HR-SF	93.51	784611.4	726533.8	58077.6	-0.0	-0.00
25YR-72HR-SF	94.01	784611.4	726550.5	58060.8	-0.0	-0.00
25YR-72HR-SF	94.51	784611.4	726566.3	58045.1	-0.0	-0.00
25YR-72HR-SF	95.01	784611.4	726581.0	58030.3	-0.0	-0.00
25YR-72HR-SF	95.51	784611.4	726594.9	58016.4	-0.0	-0.00
25YR-72HR-SF	96.01	784611.4	726608.1	58003.2	-0.0	-0.00
25YR-72HR-SF	96.51	784611.4	726620.6	57990.8	-0.0	-0.00
25YR-72HR-SF	97.01	784611.4	726632.4	57978.9	-0.0	-0.00
25YR-72HR-SF	97.51	784611.4	726643.6	57967.7	-0.0	-0.00
25YR-72HR-SF	98.01	784611.4	726654.3	57957.1	-0.0	-0.00
25YR-72HR-SF	98.51	784611.4	726664.4	57947.0	-0.0	-0.00
25YR-72HR-SF	99.01	784611.4	726674.0	57937.4	-0.0	-0.00
25YR-72HR-SF	99.51	784611.4	726683.1	57928.2	-0.0	-0.00
25YR-72HR-SF	100.01	784611.4	726691.9	57919.5	-0.0	-0.00
25YR-72HR-SF	100.51	784611.4	726700.2	57911.1	-0.0	-0.00
25YR-72HR-SF	101.01	784611.4	726708.2	57903.2	-0.0	-0.00
25YR-72HR-SF	101.51	784611.4	726715.8	57895.6	-0.0	-0.00

Mass Balance

Simulation	Time hrs	Inflow Volume ft3	Outflow Volume ft3	Change in Sys Storage ft3	Difference ft3	Error %
25YR-72HR-SF	102.01	784611.4	726723.1	57888.3	-0.0	-0.00
25YR-72HR-SF	102.51	784611.4	726730.1	57881.3	-0.0	-0.00
25YR-72HR-SF	103.01	784611.4	726736.7	57874.6	-0.0	-0.00
25YR-72HR-SF	103.51	784611.4	726743.1	57868.2	-0.0	-0.00
25YR-72HR-SF	104.01	784611.4	726749.2	57862.1	-0.0	-0.00
25YR-72HR-SF	104.51	784611.4	726755.1	57856.3	-0.0	-0.00
25YR-72HR-SF	105.01	784611.4	726760.7	57850.6	-0.0	-0.00
25YR-72HR-SF	105.51	784611.4	726766.1	57845.2	-0.0	-0.00
25YR-72HR-SF	106.01	784611.4	726771.3	57840.1	-0.0	-0.00
25YR-72HR-SF	106.51	784611.4	726776.2	57835.1	-0.0	-0.00
25YR-72HR-SF	107.01	784611.4	726781.0	57830.4	-0.0	-0.00
25YR-72HR-SF	107.51	784611.4	726785.6	57825.8	-0.0	-0.00
25YR-72HR-SF	108.01	784611.4	726790.0	57821.4	-0.0	-0.00
25YR-72HR-SF	108.51	784611.4	726794.2	57817.2	-0.0	-0.00
25YR-72HR-SF	109.01	784611.4	726798.3	57813.1	-0.0	-0.00
25YR-72HR-SF	109.51	784611.4	726801.3	57810.1	-0.0	-0.00
25YR-72HR-SF	110.01	784611.4	726803.3	57808.0	-0.0	-0.00
25YR-72HR-SF	110.51	784611.4	726805.3	57806.1	-0.0	-0.00
25YR-72HR-SF	111.00	784611.4	726807.6	57803.8	-0.0	-0.00
25YR-72HR-SF	111.50	784611.4	726810.9	57800.4	-0.0	-0.00
25YR-72HR-SF	112.01	784611.4	726814.4	57797.0	-0.0	-0.00
25YR-72HR-SF	112.51	784611.4	726817.8	57793.6	-0.0	-0.00
25YR-72HR-SF	113.01	784611.4	726821.2	57790.2	-0.0	-0.00
25YR-72HR-SF	113.51	784611.4	726824.3	57787.0	-0.0	-0.00
25YR-72HR-SF	114.00	784611.4	726827.3	57784.1	-0.0	-0.00
25YR-72HR-SF	114.50	784611.4	726830.3	57781.0	-0.0	-0.00
25YR-72HR-SF	115.00	784611.4	726833.5	57777.9	-0.0	-0.00
25YR-72HR-SF	115.50	784611.4	726836.3	57775.0	-0.0	-0.00
25YR-72HR-SF	116.01	784611.4	726838.8	57772.6	-0.0	-0.00
25YR-72HR-SF	116.50	784611.4	726841.1	57770.3	-0.0	-0.00
25YR-72HR-SF	117.01	784611.4	726843.6	57767.7	-0.0	-0.00
25YR-72HR-SF	117.51	784611.4	726846.1	57765.3	-0.0	-0.00
25YR-72HR-SF	118.00	784611.4	726848.1	57763.2	-0.0	-0.00
25YR-72HR-SF	118.51	784611.4	726850.1	57761.3	-0.0	-0.00
25YR-72HR-SF	119.01	784611.4	726852.3	57759.0	-0.0	-0.00
25YR-72HR-SF	119.50	784611.4	726854.5	57756.9	-0.0	-0.00
25YR-72HR-SF	120.01	784611.4	726856.4	57755.0	-0.0	-0.00
25YR-72HR-SF	120.51	784611.4	726858.1	57753.3	-0.0	-0.00
25YR-72HR-SF	121.01	784611.4	726860.1	57751.3	-0.0	-0.00
25YR-72HR-SF	121.51	784611.4	726862.2	57749.2	-0.0	-0.00
25YR-72HR-SF	122.00	784611.4	726864.1	57747.3	-0.0	-0.00
25YR-72HR-SF	122.50	784611.4	726865.7	57745.7	-0.0	-0.00
25YR-72HR-SF	123.00	784611.4	726867.4	57744.0	-0.0	-0.00
25YR-72HR-SF	123.50	784611.4	726869.3	57742.1	-0.0	-0.00
25YR-72HR-SF	124.01	784611.4	726871.2	57740.2	-0.0	-0.00
25YR-72HR-SF	124.51	784611.4	726872.8	57738.6	-0.0	-0.00
25YR-72HR-SF	125.00	784611.4	726874.4	57737.0	-0.0	-0.00
25YR-72HR-SF	125.50	784611.4	726876.3	57735.1	-0.0	-0.00
25YR-72HR-SF	126.00	784611.4	726878.2	57733.2	-0.0	-0.00
25YR-72HR-SF	126.50	784611.4	726879.9	57731.5	-0.0	-0.00
25YR-72HR-SF	127.01	784611.4	726881.4	57729.9	-0.0	-0.00
25YR-72HR-SF	127.51	784611.4	726883.3	57728.1	-0.0	-0.00
25YR-72HR-SF	128.01	784611.4	726885.2	57726.1	-0.0	-0.00
25YR-72HR-SF	128.51	784611.4	726887.0	57724.4	-0.0	-0.00
25YR-72HR-SF	129.01	784611.4	726888.4	57722.9	-0.0	-0.00
25YR-72HR-SF	129.51	784611.4	726890.1	57721.2	-0.0	-0.00
25YR-72HR-SF	130.01	784611.4	726891.6	57719.7	-0.0	-0.00
25YR-72HR-SF	130.51	784611.4	726892.9	57718.5	-0.0	-0.00
25YR-72HR-SF	131.01	784611.4	726894.5	57716.9	-0.0	-0.00
25YR-72HR-SF	131.50	784611.4	726895.7	57715.7	-0.0	-0.00
25YR-72HR-SF	132.01	784611.4	726897.1	57714.3	-0.0	-0.00
25YR-72HR-SF	132.50	784611.4	726898.6	57712.8	-0.0	-0.00
25YR-72HR-SF	133.01	784611.4	726899.7	57711.7	-0.0	-0.00
25YR-72HR-SF	133.51	784611.4	726901.3	57710.1	-0.0	-0.00
25YR-72HR-SF	134.01	784611.4	726902.5	57708.8	-0.0	-0.00
25YR-72HR-SF	134.51	784611.4	726903.7	57707.6	-0.0	-0.00
25YR-72HR-SF	135.01	784611.4	726905.3	57706.1	-0.0	-0.00
25YR-72HR-SF	135.50	784611.4	726906.5	57704.9	-0.0	-0.00

Mass Balance

Simulation	Time hrs	Inflow Volume ft3	Outflow Volume ft3	Change in Sys Storage ft3	Difference ft3	Error %
25YR-72HR-SF	136.00	784611.4	726907.7	57703.6	-0.0	-0.00
25YR-72HR-SF	136.50	784611.4	726909.3	57702.1	-0.0	-0.00
25YR-72HR-SF	137.00	784611.4	726910.4	57701.0	-0.0	-0.00
25YR-72HR-SF	137.50	784611.4	726911.8	57699.6	-0.0	-0.00
25YR-72HR-SF	138.00	784611.4	726913.1	57698.2	-0.0	-0.00
25YR-72HR-SF	138.50	784611.4	726914.2	57697.1	-0.0	-0.00
25YR-72HR-SF	139.00	784611.4	726915.8	57695.6	-0.0	-0.00
25YR-72HR-SF	139.51	784611.4	726917.0	57694.4	-0.0	-0.00
25YR-72HR-SF	140.00	784611.4	726918.1	57693.2	-0.0	-0.00
25YR-72HR-SF	140.51	784611.4	726919.5	57691.8	-0.0	-0.00
25YR-72HR-SF	141.00	784611.4	726920.6	57690.8	-0.0	-0.00
25YR-72HR-SF	141.50	784611.4	726921.9	57689.4	-0.0	-0.00
25YR-72HR-SF	142.00	784611.4	726923.2	57688.2	-0.0	-0.00
25YR-72HR-SF	142.50	784611.4	726924.2	57687.2	-0.0	-0.00
25YR-72HR-SF	143.00	784611.4	726925.7	57685.6	-0.0	-0.00
25YR-72HR-SF	143.51	784611.4	726926.8	57684.6	-0.0	-0.00
25YR-72HR-SF	144.01	784611.4	726927.9	57683.4	-0.0	-0.00
25YR-72HR-SF	144.51	784611.4	726929.4	57682.0	-0.0	-0.00
25YR-72HR-SF	145.01	784611.4	726930.4	57680.9	-0.0	-0.00
25YR-72HR-SF	145.51	784611.4	726931.7	57679.6	-0.0	-0.00
25YR-72HR-SF	146.01	784611.4	726933.0	57678.3	-0.0	-0.00
25YR-72HR-SF	146.51	784611.4	726934.0	57677.3	-0.0	-0.00
25YR-72HR-SF	147.01	784611.4	726935.5	57675.8	-0.0	-0.00
25YR-72HR-SF	147.50	784611.4	726936.6	57674.7	-0.0	-0.00
25YR-72HR-SF	148.01	784611.4	726937.8	57673.6	-0.0	-0.00
25YR-72HR-SF	148.50	784611.4	726939.2	57672.1	-0.0	-0.00
25YR-72HR-SF	149.01	784611.4	726940.3	57671.1	-0.0	-0.00
25YR-72HR-SF	149.51	784611.4	726941.6	57669.8	-0.0	-0.00
25YR-72HR-SF	150.01	784611.4	726942.9	57668.5	-0.0	-0.00
25YR-72HR-SF	150.51	784611.4	726943.9	57667.5	-0.0	-0.00
25YR-72HR-SF	151.01	784611.4	726945.4	57666.0	-0.0	-0.00
25YR-72HR-SF	151.50	784611.4	726946.5	57664.9	-0.0	-0.00
25YR-72HR-SF	152.01	784611.4	726947.6	57663.7	-0.0	-0.00
25YR-72HR-SF	152.50	784611.4	726949.1	57662.3	-0.0	-0.00
25YR-72HR-SF	153.00	784611.4	726950.1	57661.3	-0.0	-0.00
25YR-72HR-SF	153.51	784611.4	726951.4	57659.9	-0.0	-0.00
25YR-72HR-SF	154.00	784611.4	726952.7	57658.7	-0.0	-0.00
25YR-72HR-SF	154.51	784611.4	726953.7	57657.6	-0.0	-0.00
25YR-72HR-SF	155.00	784611.4	726955.1	57656.2	-0.0	-0.00
25YR-72HR-SF	155.51	784611.4	726956.3	57655.0	-0.0	-0.00
25YR-72HR-SF	156.00	784611.4	726957.4	57654.0	-0.0	-0.00
25YR-72HR-SF	156.51	784611.4	726958.9	57652.5	-0.0	-0.00
25YR-72HR-SF	157.00	784611.4	726959.9	57651.4	-0.0	-0.00
25YR-72HR-SF	157.50	784611.4	726961.2	57650.2	-0.0	-0.00
25YR-72HR-SF	158.00	784611.4	726962.5	57648.8	-0.0	-0.00
25YR-72HR-SF	158.50	784611.4	726963.6	57647.8	-0.0	-0.00
25YR-72HR-SF	159.00	784611.4	726965.0	57646.4	-0.0	-0.00
25YR-72HR-SF	159.51	784611.4	726966.2	57645.2	-0.0	-0.00
25YR-72HR-SF	160.00	784611.4	726967.2	57644.1	-0.0	-0.00
25YR-72HR-SF	160.51	784611.4	726968.8	57642.6	-0.0	-0.00
25YR-72HR-SF	161.01	784611.4	726969.8	57641.6	-0.0	-0.00
25YR-72HR-SF	161.50	784611.4	726971.0	57640.4	-0.0	-0.00
25YR-72HR-SF	162.01	784611.4	726972.4	57639.0	-0.0	-0.00
25YR-72HR-SF	162.50	784611.4	726973.4	57638.0	-0.0	-0.00
25YR-72HR-SF	163.01	784611.4	726974.8	57636.5	-0.0	-0.00
25YR-72HR-SF	163.50	784611.4	726976.0	57635.4	-0.0	-0.00
25YR-72HR-SF	164.01	784611.4	726977.1	57634.3	-0.0	-0.00
25YR-72HR-SF	164.50	784611.4	726978.5	57632.8	-0.0	-0.00
25YR-72HR-SF	165.01	784611.4	726979.6	57631.7	-0.0	-0.00
25YR-72HR-SF	165.51	784611.4	726980.8	57630.5	-0.0	-0.00
25YR-72HR-SF	166.01	784611.4	726982.2	57629.2	-0.0	-0.00
25YR-72HR-SF	166.51	784611.4	726983.2	57628.1	-0.0	-0.00
25YR-72HR-SF	167.01	784611.4	726984.7	57626.7	-0.0	-0.00
25YR-72HR-SF	167.50	784611.4	726985.8	57625.6	-0.0	-0.00
25YR-72HR-SF	168.01	784611.4	726986.9	57624.4	-0.0	-0.00
25YR-72HR-SF	168.50	784611.4	726988.4	57623.0	-0.0	-0.00
25YR-72HR-SF	169.00	784611.4	726989.4	57621.9	-0.0	-0.00
25YR-72HR-SF	169.51	784611.4	726990.7	57620.7	-0.0	-0.00

Mass Balance

Simulation	Time hrs	Inflow Volume ft3	Outflow Volume ft3	Change in Sys Storage ft3	Difference ft3	Error %
25YR-72HR-SF	170.00	784611.4	726992.0	57619.4	-0.0	-0.00
25YR-72HR-SF	170.51	784611.4	726993.0	57618.3	-0.0	-0.00
25YR-72HR-SF	171.01	784611.4	726994.5	57616.9	-0.0	-0.00
25YR-72HR-SF	171.51	784611.4	726995.6	57615.7	-0.0	-0.00
25YR-72HR-SF	172.01	784611.4	726996.7	57614.6	-0.0	-0.00
25YR-72HR-SF	172.51	784611.4	726998.2	57613.1	-0.0	-0.00
25YR-72HR-SF	173.00	784611.4	726999.3	57612.1	-0.0	-0.00
25YR-72HR-SF	173.51	784611.4	727000.5	57610.9	-0.0	-0.00
25YR-72HR-SF	174.00	784611.4	727001.8	57609.5	-0.0	-0.00
25YR-72HR-SF	174.51	784611.4	727002.9	57608.5	-0.0	-0.00
25YR-72HR-SF	175.00	784611.4	727004.2	57607.2	-0.0	-0.00
25YR-72HR-SF	175.51	784611.4	727005.5	57605.9	-0.0	-0.00
25YR-72HR-SF	176.00	784611.4	727006.5	57604.9	-0.0	-0.00
25YR-72HR-SF	176.51	784611.4	727008.0	57603.3	-0.0	-0.00
25YR-72HR-SF	177.01	784611.4	727009.1	57602.3	-0.0	-0.00
25YR-72HR-SF	177.50	784611.4	727010.2	57601.1	-0.0	-0.00
25YR-72HR-SF	178.01	784611.4	727011.7	57599.7	-0.0	-0.00
25YR-72HR-SF	178.50	784611.4	727012.7	57598.6	-0.0	-0.00
25YR-72HR-SF	179.00	784611.4	727014.0	57597.3	-0.0	-0.00
25YR-72HR-SF	179.50	784611.4	727015.3	57596.0	-0.0	-0.00
25YR-72HR-SF	180.00	784611.4	727016.3	57595.0	-0.0	-0.00
25YR-72HR-SF	180.50	784611.4	727017.8	57593.5	-0.0	-0.00
25YR-72HR-SF	181.01	784611.4	727018.9	57592.4	-0.0	-0.00
25YR-72HR-SF	181.50	784611.4	727020.1	57591.3	-0.0	-0.00
25YR-72HR-SF	182.01	784611.4	727021.5	57589.8	-0.0	-0.00
25YR-72HR-SF	182.50	784611.4	727022.6	57588.8	-0.0	-0.00
25YR-72HR-SF	183.01	784611.4	727023.9	57587.5	-0.0	-0.00
25YR-72HR-SF	183.50	784611.4	727025.2	57586.2	-0.0	-0.00
25YR-72HR-SF	184.01	784611.4	727026.2	57585.2	-0.0	-0.00
25YR-72HR-SF	184.50	784611.4	727027.7	57583.7	-0.0	-0.00
25YR-72HR-SF	185.00	784611.4	727028.8	57582.6	-0.0	-0.00
25YR-72HR-SF	185.51	784611.4	727029.9	57581.4	-0.0	-0.00
25YR-72HR-SF	186.00	784611.4	727031.4	57580.0	-0.0	-0.00
25YR-72HR-SF	186.51	784611.4	727032.4	57579.0	-0.0	-0.00
25YR-72HR-SF	187.01	784611.4	727033.7	57577.6	-0.0	-0.00
25YR-72HR-SF	187.51	784611.4	727035.0	57576.4	-0.0	-0.00
25YR-72HR-SF	188.01	784611.4	727036.0	57575.3	-0.0	-0.00
25YR-72HR-SF	188.51	784611.4	727037.5	57573.9	-0.0	-0.00
25YR-72HR-SF	189.00	784611.4	727038.6	57572.8	-0.0	-0.00
25YR-72HR-SF	189.51	784611.4	727039.8	57571.6	-0.0	-0.00
25YR-72HR-SF	190.00	784611.4	727041.2	57570.2	-0.0	-0.00
25YR-72HR-SF	190.51	784611.4	727042.2	57569.1	-0.0	-0.00
25YR-72HR-SF	191.01	784611.4	727043.6	57567.8	-0.0	-0.00
25YR-72HR-SF	191.51	784611.4	727044.8	57566.5	-0.0	-0.00
25YR-72HR-SF	192.01	784611.4	727045.9	57565.5	-0.0	-0.00
25YR-72HR-SF	192.51	784611.4	727047.3	57564.0	-0.0	-0.00
25YR-72HR-SF	193.01	784611.4	727048.5	57562.9	-0.0	-0.00
25YR-72HR-SF	193.51	784611.4	727049.6	57561.8	-0.0	-0.00
25YR-72HR-SF	194.01	784611.4	727051.0	57560.4	-0.0	-0.00
25YR-72HR-SF	194.50	784611.4	727052.1	57559.3	-0.0	-0.00
25YR-72HR-SF	195.00	784611.4	727053.3	57558.1	-0.0	-0.00
25YR-72HR-SF	195.50	784611.4	727054.6	57556.7	-0.0	-0.00
25YR-72HR-SF	196.00	784611.4	727055.7	57555.7	-0.0	-0.00
25YR-72HR-SF	196.50	784611.4	727057.1	57554.2	-0.0	-0.00
25YR-72HR-SF	197.01	784611.4	727058.2	57553.1	-0.0	-0.00
25YR-72HR-SF	197.50	784611.4	727059.4	57552.0	-0.0	-0.00
25YR-72HR-SF	198.01	784611.4	727060.8	57550.5	-0.0	-0.00
25YR-72HR-SF	198.50	784611.4	727061.9	57549.5	-0.0	-0.00
25YR-72HR-SF	199.00	784611.4	727063.1	57548.2	-0.0	-0.00
25YR-72HR-SF	199.50	784611.4	727064.5	57546.9	-0.0	-0.00
25YR-72HR-SF	200.00	784611.4	727065.5	57545.9	-0.0	-0.00
25YR-72HR-SF	200.50	784611.4	727067.0	57544.4	-0.0	-0.00
25YR-72HR-SF	201.00	784611.4	727068.1	57543.3	-0.0	-0.00
25YR-72HR-SF	201.50	784611.4	727069.2	57542.2	-0.0	-0.00
25YR-72HR-SF	202.00	784611.4	727070.7	57540.7	-0.0	-0.00
25YR-72HR-SF	202.51	784611.4	727071.7	57539.7	-0.0	-0.00
25YR-72HR-SF	203.01	784611.4	727072.9	57538.4	-0.0	-0.00
25YR-72HR-SF	203.51	784611.4	727074.3	57537.1	-0.0	-0.00

Mass Balance

Simulation	Time hrs	Inflow Volume ft3	Outflow Volume ft3	Change in Sys Storage ft3	Difference ft3	Error %
25YR-72HR-SF	204.01	784611.4	727075.3	57536.0	-0.0	-0.00
25YR-72HR-SF	204.51	784611.4	727076.8	57534.6	-0.0	-0.00
25YR-72HR-SF	205.00	784611.4	727077.9	57533.4	-0.0	-0.00
25YR-72HR-SF	205.51	784611.4	727079.0	57532.3	-0.0	-0.00
25YR-72HR-SF	206.00	784611.4	727080.5	57530.9	-0.0	-0.00
25YR-72HR-SF	206.51	784611.4	727081.6	57529.8	-0.0	-0.00
25YR-72HR-SF	207.01	784611.4	727082.8	57528.6	-0.0	-0.00
25YR-72HR-SF	207.51	784611.4	727084.1	57527.2	-0.0	-0.00
25YR-72HR-SF	208.01	784611.4	727085.2	57526.2	-0.0	-0.00
25YR-72HR-SF	208.51	784611.4	727086.6	57524.8	-0.0	-0.00
25YR-72HR-SF	209.01	784611.4	727087.8	57523.6	-0.0	-0.00
25YR-72HR-SF	209.51	784611.4	727088.9	57522.5	-0.0	-0.00
25YR-72HR-SF	210.01	784611.4	727090.3	57521.0	-0.0	-0.00
25YR-72HR-SF	210.50	784611.4	727091.4	57520.0	-0.0	-0.00
25YR-72HR-SF	211.01	784611.4	727092.6	57518.7	-0.0	-0.00
25YR-72HR-SF	211.50	784611.4	727094.0	57517.4	-0.0	-0.00
25YR-72HR-SF	212.01	784611.4	727095.0	57516.3	-0.0	-0.00
25YR-72HR-SF	212.51	784611.4	727096.4	57514.9	-0.0	-0.00
25YR-72HR-SF	213.01	784611.4	727097.6	57513.8	-0.0	-0.00
25YR-72HR-SF	213.51	784611.4	727098.7	57512.7	-0.0	-0.00
25YR-72HR-SF	214.01	784611.4	727100.2	57511.2	-0.0	-0.00
25YR-72HR-SF	214.50	784611.4	727101.2	57510.1	-0.0	-0.00
25YR-72HR-SF	215.00	784611.4	727102.4	57509.0	-0.0	-0.00
25YR-72HR-SF	215.50	784611.4	727103.8	57507.5	-0.0	-0.00
25YR-72HR-SF	216.00	784611.4	727104.9	57506.5	-0.0	-0.00
25YR-72HR-SF	216.50	784611.4	727106.2	57505.2	-0.0	-0.00
25YR-72HR-SF	217.00	784611.4	727107.4	57503.9	-0.0	-0.00
25YR-72HR-SF	217.50	784611.4	727108.5	57502.9	-0.0	-0.00
25YR-72HR-SF	218.00	784611.4	727110.0	57501.4	-0.0	-0.00
25YR-72HR-SF	218.51	784611.4	727111.1	57500.3	-0.0	-0.00
25YR-72HR-SF	219.00	784611.4	727112.2	57499.1	-0.0	-0.00
25YR-72HR-SF	219.51	784611.4	727113.7	57497.7	-0.0	-0.00
25YR-72HR-SF	220.00	784611.4	727114.7	57496.7	-0.0	-0.00
25YR-72HR-SF	220.50	784611.4	727116.0	57495.4	-0.0	-0.00
25YR-72HR-SF	221.00	784611.4	727117.3	57494.1	-0.0	-0.00
25YR-72HR-SF	221.50	784611.4	727118.3	57493.0	-0.0	-0.00
25YR-72HR-SF	222.00	784611.4	727119.8	57491.6	-0.0	-0.00
25YR-72HR-SF	222.51	784611.4	727120.9	57490.5	-0.0	-0.00
25YR-72HR-SF	223.01	784611.4	727122.1	57489.3	-0.0	-0.00
25YR-72HR-SF	223.51	784611.4	727123.5	57487.9	-0.0	-0.00
25YR-72HR-SF	224.01	784611.4	727124.5	57486.8	-0.0	-0.00
25YR-72HR-SF	224.51	784611.4	727125.8	57485.5	-0.0	-0.00
25YR-72HR-SF	225.01	784611.4	727127.1	57484.3	-0.0	-0.00
25YR-72HR-SF	225.51	784611.4	727128.2	57483.2	-0.0	-0.00
25YR-72HR-SF	226.01	784611.4	727129.6	57481.7	-0.0	-0.00
25YR-72HR-SF	226.50	784611.4	727130.7	57480.7	-0.0	-0.00
25YR-72HR-SF	227.01	784611.4	727131.9	57479.5	-0.0	-0.00
25YR-72HR-SF	227.50	784611.4	727133.3	57478.1	-0.0	-0.00
25YR-72HR-SF	228.01	784611.4	727134.3	57477.0	-0.0	-0.00
25YR-72HR-SF	228.51	784611.4	727135.7	57475.7	-0.0	-0.00
25YR-72HR-SF	229.01	784611.4	727136.9	57474.4	-0.0	-0.00
25YR-72HR-SF	229.51	784611.4	727138.0	57473.4	-0.0	-0.00
25YR-72HR-SF	230.01	784611.4	727139.5	57471.9	-0.0	-0.00
25YR-72HR-SF	230.50	784611.4	727140.5	57470.8	-0.0	-0.00
25YR-72HR-SF	231.01	784611.4	727141.7	57469.7	-0.0	-0.00
25YR-72HR-SF	231.50	784611.4	727143.1	57468.2	-0.0	-0.00
25YR-72HR-SF	232.00	784611.4	727144.2	57467.2	-0.0	-0.00
25YR-72HR-SF	232.51	784611.4	727145.5	57465.9	-0.0	-0.00
25YR-72HR-SF	233.00	784611.4	727146.8	57464.6	-0.0	-0.00
25YR-72HR-SF	233.51	784611.4	727147.8	57463.6	-0.0	-0.00
25YR-72HR-SF	234.00	784611.4	727149.2	57462.2	-0.0	-0.00
25YR-72HR-SF	234.51	784611.4	727150.4	57461.0	-0.0	-0.00
25YR-72HR-SF	235.00	784611.4	727151.5	57459.9	-0.0	-0.00
25YR-72HR-SF	235.51	784611.4	727153.0	57458.4	-0.0	-0.00
25YR-72HR-SF	236.00	784611.4	727154.0	57457.4	-0.0	-0.00
25YR-72HR-SF	236.50	784611.4	727155.2	57456.1	-0.0	-0.00
25YR-72HR-SF	237.00	784611.4	727156.6	57454.8	-0.0	-0.00
25YR-72HR-SF	237.50	784611.4	727157.6	57453.7	-0.0	-0.00

Mass Balance

Simulation	Time hrs	Inflow Volume ft3	Outflow Volume ft3	Change in Sys Storage ft3	Difference ft3	Error %
25YR-72HR-SF	238.00	784611.4	727159.0	57452.3	-0.0	-0.00
25YR-72HR-SF	238.51	784611.4	727160.2	57451.1	-0.0	-0.00
25YR-72HR-SF	239.00	784611.4	727161.3	57450.1	-0.0	-0.00
25YR-72HR-SF	239.51	784611.4	727162.8	57448.5	-0.0	-0.00
25YR-72HR-SF	240.01	784611.4	727163.9	57447.5	-0.0	-0.00
25YR-72HR-SF	240.50	784611.4	727165.1	57446.3	-0.0	-0.00
25YR-72HR-SF	241.01	784611.4	727166.4	57444.9	-0.0	-0.00
25YR-72HR-SF	241.50	784611.4	727167.5	57443.9	-0.0	-0.00
25YR-72HR-SF	242.01	784611.4	727168.9	57442.5	-0.0	-0.00
25YR-72HR-SF	242.50	784611.4	727170.1	57441.3	-0.0	-0.00
25YR-72HR-SF	243.01	784611.4	727171.1	57440.2	-0.0	-0.00
25YR-72HR-SF	243.50	784611.4	727172.6	57438.7	-0.0	-0.00
25YR-72HR-SF	244.01	784611.4	727173.7	57437.7	-0.0	-0.00
25YR-72HR-SF	244.51	784611.4	727174.9	57436.4	-0.0	-0.00
25YR-72HR-SF	245.01	784611.4	727176.3	57435.1	-0.0	-0.00
25YR-72HR-SF	245.51	784611.4	727177.3	57434.1	-0.0	-0.00
25YR-72HR-SF	246.01	784611.4	727178.7	57432.6	-0.0	-0.00
25YR-72HR-SF	246.50	784611.4	727179.9	57431.5	-0.0	-0.00
25YR-72HR-SF	247.01	784611.4	727181.0	57430.4	-0.0	-0.00
25YR-72HR-SF	247.50	784611.4	727182.5	57428.9	-0.0	-0.00
25YR-72HR-SF	248.00	784611.4	727183.5	57427.8	-0.0	-0.00
25YR-72HR-SF	248.51	784611.4	727184.8	57426.6	-0.0	-0.00
25YR-72HR-SF	249.00	784611.4	727186.1	57425.2	-0.0	-0.00
25YR-72HR-SF	249.51	784611.4	727187.1	57424.2	-0.0	-0.00
25YR-72HR-SF	250.01	784611.4	727188.6	57422.8	-0.0	-0.00
25YR-72HR-SF	250.51	784611.4	727189.7	57421.6	-0.0	-0.00
25YR-72HR-SF	251.01	784611.4	727190.8	57420.5	-0.0	-0.00
25YR-72HR-SF	251.51	784611.4	727192.3	57419.1	-0.0	-0.00
25YR-72HR-SF	252.00	784611.4	727193.4	57418.0	-0.0	-0.00
25YR-72HR-SF	252.51	784611.4	727194.6	57416.8	-0.0	-0.00
25YR-72HR-SF	253.00	784611.4	727195.9	57415.4	-0.0	-0.00
25YR-72HR-SF	253.51	784611.4	727197.0	57414.4	-0.0	-0.00
25YR-72HR-SF	254.00	784611.4	727198.3	57413.1	-0.0	-0.00
25YR-72HR-SF	254.51	784611.4	727199.5	57411.8	-0.0	-0.00
25YR-72HR-SF	255.00	784611.4	727200.6	57410.7	-0.0	-0.00
25YR-72HR-SF	255.51	784611.4	727202.1	57409.2	-0.0	-0.00
25YR-72HR-SF	256.01	784611.4	727203.2	57408.2	-0.0	-0.00
25YR-72HR-SF	256.50	784611.4	727204.4	57407.0	-0.0	-0.00
25YR-72HR-SF	257.01	784611.4	727205.8	57405.6	-0.0	-0.00
25YR-72HR-SF	257.50	784611.4	727206.8	57404.6	-0.0	-0.00
25YR-72HR-SF	258.00	784611.4	727208.1	57403.2	-0.0	-0.00
25YR-72HR-SF	258.50	784611.4	727209.4	57402.0	-0.0	-0.00
25YR-72HR-SF	259.00	784611.4	727210.4	57401.0	-0.0	-0.00
25YR-72HR-SF	259.50	784611.4	727211.9	57399.4	-0.0	-0.00
25YR-72HR-SF	260.01	784611.4	727213.0	57398.4	-0.0	-0.00
25YR-72HR-SF	260.50	784611.4	727214.2	57397.2	-0.0	-0.00
25YR-72HR-SF	261.01	784611.4	727215.6	57395.8	-0.0	-0.00
25YR-72HR-SF	261.50	784611.4	727216.6	57394.7	-0.0	-0.00
25YR-72HR-SF	262.01	784611.4	727217.9	57393.4	-0.0	-0.00
25YR-72HR-SF	262.50	784611.4	727219.2	57392.1	-0.0	-0.00
25YR-72HR-SF	263.01	784611.4	727220.2	57391.1	-0.0	-0.00
25YR-72HR-SF	263.50	784611.4	727221.7	57389.6	-0.0	-0.00
25YR-72HR-SF	264.00	784611.4	727222.8	57388.5	-0.0	-0.00
25YR-72HR-SF	264.51	784611.4	727224.0	57387.4	-0.0	-0.00
25YR-72HR-SF	265.00	784611.4	727225.4	57385.9	-0.0	-0.00
25YR-72HR-SF	265.51	784611.4	727226.5	57384.9	-0.0	-0.00
25YR-72HR-SF	266.01	784611.4	727227.8	57383.6	-0.0	-0.00
25YR-72HR-SF	266.51	784611.4	727229.1	57382.3	-0.0	-0.00
25YR-72HR-SF	267.01	784611.4	727230.1	57381.3	-0.0	-0.00
25YR-72HR-SF	267.51	784611.4	727231.6	57379.8	-0.0	-0.00
25YR-72HR-SF	268.00	784611.4	727232.7	57378.7	-0.0	-0.00
25YR-72HR-SF	268.51	784611.4	727233.8	57377.5	-0.0	-0.00
25YR-72HR-SF	269.00	784611.4	727235.3	57376.1	-0.0	-0.00
25YR-72HR-SF	269.51	784611.4	727236.3	57375.1	-0.0	-0.00
25YR-72HR-SF	270.01	784611.4	727237.6	57373.7	-0.0	-0.00
25YR-72HR-SF	270.51	784611.4	727238.9	57372.5	-0.0	-0.00
25YR-72HR-SF	271.01	784611.4	727239.9	57371.4	-0.0	-0.00
25YR-72HR-SF	271.51	784611.4	727241.4	57370.0	-0.0	-0.00

Mass Balance

Simulation	Time hrs	Inflow Volume ft3	Outflow Volume ft3	Change in Sys Storage ft3	Difference ft3	Error %
25YR-72HR-SF	272.01	784611.4	727242.5	57368.8	-0.0	-0.00
25YR-72HR-SF	272.51	784611.4	727243.7	57367.7	-0.0	-0.00
25YR-72HR-SF	273.01	784611.4	727245.1	57366.2	-0.0	-0.00
25YR-72HR-SF	273.50	784611.4	727246.1	57365.2	-0.0	-0.00
25YR-72HR-SF	274.00	784611.4	727247.4	57364.0	-0.0	-0.00
25YR-72HR-SF	274.50	784611.4	727248.7	57362.6	-0.0	-0.00
25YR-72HR-SF	275.00	784611.4	727249.8	57361.6	-0.0	-0.00
25YR-72HR-SF	275.50	784611.4	727251.2	57360.2	-0.0	-0.00
25YR-72HR-SF	276.01	784611.4	727252.4	57359.0	-0.0	-0.00
25YR-72HR-SF	276.50	784611.4	727253.4	57357.9	-0.0	-0.00
25YR-72HR-SF	277.01	784611.4	727255.0	57356.4	-0.0	-0.00
25YR-72HR-SF	277.50	784611.4	727256.0	57355.4	-0.0	-0.00
25YR-72HR-SF	278.00	784611.4	727257.2	57354.2	-0.0	-0.00
25YR-72HR-SF	278.50	784611.4	727258.6	57352.8	-0.0	-0.00
25YR-72HR-SF	279.00	784611.4	727259.6	57351.8	-0.0	-0.00
25YR-72HR-SF	279.50	784611.4	727261.0	57350.3	-0.0	-0.00
25YR-72HR-SF	280.00	784611.4	727262.2	57349.2	-0.0	-0.00
25YR-72HR-SF	280.50	784611.4	727263.3	57348.1	-0.0	-0.00
25YR-72HR-SF	281.00	784611.4	727264.8	57346.6	-0.0	-0.00
25YR-72HR-SF	281.51	784611.4	727265.8	57345.5	-0.0	-0.00
25YR-72HR-SF	282.01	784611.4	727267.0	57344.3	-0.0	-0.00
25YR-72HR-SF	282.51	784611.4	727268.4	57343.0	-0.0	-0.00
25YR-72HR-SF	283.01	784611.4	727269.4	57341.9	-0.0	-0.00
25YR-72HR-SF	283.51	784611.4	727270.9	57340.5	-0.0	-0.00
25YR-72HR-SF	284.00	784611.4	727272.0	57339.4	-0.0	-0.00
25YR-72HR-SF	284.51	784611.4	727273.1	57338.2	-0.0	-0.00
25YR-72HR-SF	285.00	784611.4	727274.6	57336.8	-0.0	-0.00
25YR-72HR-SF	285.51	784611.4	727275.6	57335.7	-0.0	-0.00
25YR-72HR-SF	286.01	784611.4	727276.9	57334.5	-0.0	-0.00
25YR-72HR-SF	286.51	784611.4	727278.2	57333.1	-0.0	-0.00
25YR-72HR-SF	287.01	784611.4	727279.2	57332.1	-0.0	-0.00
25YR-72HR-SF	287.51	784611.4	727280.7	57330.7	-0.0	-0.00
25YR-72HR-SF	288.01	784611.4	727281.8	57329.5	-0.0	-0.00
25YR-72HR-SF	288.51	784611.4	727282.9	57328.4	-0.0	-0.00
25YR-72HR-SF	289.01	784611.4	727284.4	57326.9	-0.0	-0.00
25YR-72HR-SF	289.50	784611.4	727285.5	57325.9	-0.0	-0.00
25YR-72HR-SF	290.01	784611.4	727286.7	57324.7	-0.0	-0.00
25YR-72HR-SF	290.50	784611.4	727288.1	57323.3	-0.0	-0.00
25YR-72HR-SF	291.01	784611.4	727289.1	57322.3	-0.0	-0.00
25YR-72HR-SF	291.51	784611.4	727290.5	57320.9	-0.0	-0.00
25YR-72HR-SF	292.01	784611.4	727291.7	57319.7	-0.0	-0.00
25YR-72HR-SF	292.51	784611.4	727292.8	57318.6	-0.0	-0.00
25YR-72HR-SF	293.01	784611.4	727294.2	57317.1	-0.0	-0.00
25YR-72HR-SF	293.50	784611.4	727295.3	57316.1	-0.0	-0.00
25YR-72HR-SF	294.00	784611.4	727296.4	57314.9	-0.0	-0.00
25YR-72HR-SF	294.50	784611.4	727297.9	57313.5	-0.0	-0.00
25YR-72HR-SF	295.00	784611.4	727298.9	57312.4	-0.0	-0.00
25YR-72HR-SF	295.50	784611.4	727300.2	57311.1	-0.0	-0.00
25YR-72HR-SF	296.00	784611.4	727301.5	57309.8	-0.0	-0.00
25YR-72HR-SF	296.50	784611.4	727302.5	57308.8	-0.0	-0.00
25YR-72HR-SF	297.00	784611.4	727304.0	57307.3	-0.0	-0.00
25YR-72HR-SF	297.51	784611.4	727305.1	57306.2	-0.0	-0.00
25YR-72HR-SF	298.00	784611.4	727306.3	57305.1	-0.0	-0.00
25YR-72HR-SF	298.51	784611.4	727307.7	57303.6	-0.0	-0.00
25YR-72HR-SF	299.00	784611.4	727308.8	57302.6	-0.0	-0.00
25YR-72HR-SF	299.50	784611.4	727310.1	57301.3	-0.0	-0.00
25YR-72HR-SF	300.00	784611.4	727311.4	57300.0	-0.0	-0.00
25YR-72HR-SF	300.50	784611.4	727312.4	57299.0	-0.0	-0.00
25YR-72HR-SF	301.00	784611.4	727313.9	57297.5	-0.0	-0.00
25YR-72HR-SF	301.51	784611.4	727315.0	57296.4	-0.0	-0.00
25YR-72HR-SF	302.01	784611.4	727316.1	57295.2	-0.0	-0.00
25YR-72HR-SF	302.51	784611.4	727317.6	57293.8	-0.0	-0.00
25YR-72HR-SF	303.01	784611.4	727318.6	57292.8	-0.0	-0.00
25YR-72HR-SF	303.51	784611.4	727319.9	57291.4	-0.0	-0.00
25YR-72HR-SF	304.01	784611.4	727321.2	57290.2	-0.0	-0.00
25YR-72HR-SF	304.51	784611.4	727322.2	57289.1	-0.0	-0.00
25YR-72HR-SF	305.01	784611.4	727323.7	57287.7	-0.0	-0.00
25YR-72HR-SF	305.50	784611.4	727324.8	57286.5	-0.0	-0.00

Mass Balance

Simulation	Time hrs	Inflow Volume ft3	Outflow Volume ft3	Change in Sys Storage ft3	Difference ft3	Error %
25YR-72HR-SF	306.01	784611.4	727326.0	57285.4	-0.0	-0.00
25YR-72HR-SF	306.50	784611.4	727327.4	57283.9	-0.0	-0.00
25YR-72HR-SF	307.01	784611.4	727328.4	57282.9	-0.0	-0.00
25YR-72HR-SF	307.51	784611.4	727329.8	57281.6	-0.0	-0.00
25YR-72HR-SF	308.01	784611.4	727331.0	57280.3	-0.0	-0.00
25YR-72HR-SF	308.51	784611.4	727332.1	57279.3	-0.0	-0.00
25YR-72HR-SF	309.01	784611.4	727333.5	57277.8	-0.0	-0.00
25YR-72HR-SF	309.50	784611.4	727334.7	57276.7	-0.0	-0.00
25YR-72HR-SF	310.01	784611.4	727335.8	57275.6	-0.0	-0.00
25YR-72HR-SF	310.50	784611.4	727337.2	57274.2	-0.0	-0.00
25YR-72HR-SF	311.00	784611.4	727338.3	57273.1	-0.0	-0.00
25YR-72HR-SF	311.51	784611.4	727339.6	57271.8	-0.0	-0.00
25YR-72HR-SF	312.00	784611.4	727340.8	57270.5	-0.0	-0.00
25YR-72HR-SF	312.51	784611.4	727341.9	57269.5	-0.0	-0.00
25YR-72HR-SF	313.00	784611.4	727343.3	57268.0	-0.0	-0.00
25YR-72HR-SF	313.51	784611.4	727344.5	57266.9	-0.0	-0.00
25YR-72HR-SF	314.00	784611.4	727345.6	57265.8	-0.0	-0.00
25YR-72HR-SF	314.51	784611.4	727347.0	57264.3	-0.0	-0.00
25YR-72HR-SF	315.00	784611.4	727348.1	57263.3	-0.0	-0.00
25YR-72HR-SF	315.50	784611.4	727349.3	57262.0	-0.0	-0.00
25YR-72HR-SF	316.00	784611.4	727350.7	57260.7	-0.0	-0.00
25YR-72HR-SF	316.50	784611.4	727351.7	57259.7	-0.0	-0.00
25YR-72HR-SF	317.00	784611.4	727353.2	57258.2	-0.0	-0.00
25YR-72HR-SF	317.51	784611.4	727354.3	57257.1	-0.0	-0.00
25YR-72HR-SF	318.00	784611.4	727355.4	57256.0	-0.0	-0.00
25YR-72HR-SF	318.51	784611.4	727356.9	57254.5	-0.0	-0.00
25YR-72HR-SF	319.01	784611.4	727357.9	57253.4	-0.0	-0.00
25YR-72HR-SF	319.50	784611.4	727359.1	57252.2	-0.0	-0.00
25YR-72HR-SF	320.01	784611.4	727360.5	57250.9	-0.0	-0.00
25YR-72HR-SF	320.50	784611.4	727361.5	57249.8	-0.0	-0.00
25YR-72HR-SF	321.01	784611.4	727363.0	57248.4	-0.0	-0.00
25YR-72HR-SF	321.50	784611.4	727364.1	57247.2	-0.0	-0.00
25YR-72HR-SF	322.01	784611.4	727365.2	57246.1	-0.0	-0.00
25YR-72HR-SF	322.50	784611.4	727366.7	57244.7	-0.0	-0.00
25YR-72HR-SF	323.01	784611.4	727367.8	57243.6	-0.0	-0.00
25YR-72HR-SF	323.51	784611.4	727369.0	57242.4	-0.0	-0.00
25YR-72HR-SF	324.01	784611.4	727370.4	57241.0	-0.0	-0.00
25YR-72HR-SF	324.51	784611.4	727371.4	57240.0	-0.0	-0.00
25YR-72HR-SF	325.01	784611.4	727372.8	57238.6	-0.0	-0.00
25YR-72HR-SF	325.50	784611.4	727374.0	57237.4	-0.0	-0.00
25YR-72HR-SF	326.01	784611.4	727375.1	57236.3	-0.0	-0.00
25YR-72HR-SF	326.50	784611.4	727376.5	57234.8	-0.0	-0.00
25YR-72HR-SF	327.00	784611.4	727377.6	57233.8	-0.0	-0.00
25YR-72HR-SF	327.51	784611.4	727378.8	57232.5	-0.0	-0.00
25YR-72HR-SF	328.00	784611.4	727380.2	57231.2	-0.0	-0.00
25YR-72HR-SF	328.51	784611.4	727381.2	57230.1	-0.0	-0.00
25YR-72HR-SF	329.01	784611.4	727382.6	57228.7	-0.0	-0.00
25YR-72HR-SF	329.51	784611.4	727383.8	57227.5	-0.0	-0.00
25YR-72HR-SF	330.01	784611.4	727384.9	57226.5	-0.0	-0.00
25YR-72HR-SF	330.51	784611.4	727386.4	57225.0	-0.0	-0.00
25YR-72HR-SF	331.00	784611.4	727387.4	57223.9	-0.0	-0.00
25YR-72HR-SF	331.51	784611.4	727388.7	57222.7	-0.0	-0.00
25YR-72HR-SF	332.00	784611.4	727390.0	57221.3	-0.0	-0.00
25YR-72HR-SF	332.51	784611.4	727391.1	57220.3	-0.0	-0.00
25YR-72HR-SF	333.00	784611.4	727392.4	57219.0	-0.0	-0.00
25YR-72HR-SF	333.51	784611.4	727393.7	57217.7	-0.0	-0.00
25YR-72HR-SF	334.00	784611.4	727394.7	57216.7	-0.0	-0.00
25YR-72HR-SF	334.51	784611.4	727396.2	57215.2	-0.0	-0.00
25YR-72HR-SF	335.01	784611.4	727397.3	57214.1	-0.0	-0.00
25YR-72HR-SF	335.50	784611.4	727398.4	57212.9	-0.0	-0.00
25YR-72HR-SF	336.01	784611.4	727399.9	57211.5	-0.0	-0.00
25YR-72HR-SF	336.50	784611.4	727400.9	57210.5	-0.0	-0.00
25YR-72HR-SF	337.00	784611.4	727402.2	57209.1	-0.0	-0.00
25YR-72HR-SF	337.50	784611.4	727403.5	57207.9	-0.0	-0.00
25YR-72HR-SF	338.00	784611.4	727404.5	57206.8	-0.0	-0.00
25YR-72HR-SF	338.50	784611.4	727406.0	57205.4	-0.0	-0.00
25YR-72HR-SF	339.01	784611.4	727407.1	57204.2	-0.0	-0.00
25YR-72HR-SF	339.50	784611.4	727408.3	57203.1	-0.0	-0.00

Mass Balance

Simulation	Time hrs	Inflow Volume ft3	Outflow Volume ft3	Change in Sys Storage ft3	Difference ft3	Error %
25YR-72HR-SF	340.01	784611.4	727409.7	57201.7	-0.0	-0.00
25YR-72HR-SF	340.50	784611.4	727410.7	57200.6	-0.0	-0.00
25YR-72HR-SF	341.01	784611.4	727412.1	57199.3	-0.0	-0.00
25YR-72HR-SF	341.50	784611.4	727413.3	57198.1	-0.0	-0.00
25YR-72HR-SF	342.01	784611.4	727414.4	57197.0	-0.0	-0.00
25YR-72HR-SF	342.50	784611.4	727415.8	57195.5	-0.0	-0.00
25YR-72HR-SF	343.00	784611.4	727416.9	57194.5	-0.0	-0.00
25YR-72HR-SF	343.51	784611.4	727418.1	57193.3	-0.0	-0.00
25YR-72HR-SF	344.00	784611.4	727419.5	57191.9	-0.0	-0.00
25YR-72HR-SF	344.51	784611.4	727420.5	57190.8	-0.0	-0.00
25YR-72HR-SF	345.01	784611.4	727421.9	57189.5	-0.0	-0.00
25YR-72HR-SF	345.51	784611.4	727423.1	57188.2	-0.0	-0.00
25YR-72HR-SF	346.01	784611.4	727424.2	57187.2	-0.0	-0.00
25YR-72HR-SF	346.51	784611.4	727425.7	57185.7	-0.0	-0.00
25YR-72HR-SF	347.00	784611.4	727426.7	57184.6	-0.0	-0.00
25YR-72HR-SF	347.51	784611.4	727427.9	57183.5	-0.0	-0.00
25YR-72HR-SF	348.00	784611.4	727429.3	57182.0	-0.0	-0.00
25YR-72HR-SF	348.51	784611.4	727430.4	57181.0	-0.0	-0.00
25YR-72HR-SF	349.01	784611.4	727431.7	57179.7	-0.0	-0.00
25YR-72HR-SF	349.51	784611.4	727433.0	57178.4	-0.0	-0.00
25YR-72HR-SF	350.01	784611.4	727434.0	57177.4	-0.0	-0.00
25YR-72HR-SF	350.51	784611.4	727435.5	57175.9	-0.0	-0.00
25YR-72HR-SF	351.01	784611.4	727436.6	57174.8	-0.0	-0.00
25YR-72HR-SF	351.51	784611.4	727437.7	57173.6	-0.0	-0.00
25YR-72HR-SF	352.01	784611.4	727439.2	57172.2	-0.0	-0.00
25YR-72HR-SF	352.50	784611.4	727440.2	57171.1	-0.0	-0.00
25YR-72HR-SF	353.00	784611.4	727441.4	57169.9	-0.0	-0.00
25YR-72HR-SF	353.50	784611.4	727442.8	57168.6	-0.0	-0.00
25YR-72HR-SF	354.00	784611.4	727443.8	57167.5	-0.0	-0.00
25YR-72HR-SF	354.50	784611.4	727445.3	57166.1	-0.0	-0.00
25YR-72HR-SF	355.01	784611.4	727446.4	57164.9	-0.0	-0.00
25YR-72HR-SF	355.50	784611.4	727447.5	57163.8	-0.0	-0.00
25YR-72HR-SF	356.01	784611.4	727449.0	57162.3	-0.0	-0.00
25YR-72HR-SF	356.50	784611.4	727450.1	57161.3	-0.0	-0.00
25YR-72HR-SF	357.00	784611.4	727451.3	57160.1	-0.0	-0.00
25YR-72HR-SF	357.50	784611.4	727452.6	57158.7	-0.0	-0.00
25YR-72HR-SF	358.00	784611.4	727453.7	57157.7	-0.0	-0.00
25YR-72HR-SF	358.50	784611.4	727455.1	57156.3	-0.0	-0.00
25YR-72HR-SF	359.00	784611.4	727456.3	57155.1	-0.0	-0.00
25YR-72HR-SF	359.50	784611.4	727457.4	57154.0	-0.0	-0.00
25YR-72HR-SF	360.00	784611.4	727458.8	57152.5	-0.0	-0.00
25YR-72HR-SF	360.01	784611.4	727458.8	57152.5	-0.0	-0.00

Basin Maximum Report

Simulation	Basin	Group	Time Max hrs	Flow Max cfs	Volume in	Volume ft3
25YR-72HR-SFW	Davie Basin	BASE	60.09	62.579	8.633	554703.382

SOUTH BASIN DESIGN DOCUMENTATION

FLORIDA DEPARTMENT OF TRANSPORTATION
SPREAD CALCULATIONS

Financial Project ID No. N/A County: LEE UNITS: ( ) Metric (SI) Prepared by: MAR Date: 9/9/08
Description HOMESTEAD (X) US Customary Checked by: Date:
HDR Project No. 69627

ALLOWABLE SPREAD (MAIN LINE1) = 9 RAINFALL INTENSITY = 4 inches per hour
ALLOWABLE SPREAD (MAIN LINE2) = 7

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	DRAINAGE AREA (ac) C = 0.95 C = 0.20 C = INCRE-MENT	SUBTOTAL C X A	TOTAL C X A	OVERLAND RUNOFF (cubic feet per second)	BYPASS RUNOFF (cubic feet per second)	TOTAL RUNOFF (cubic feet per second)	CROSS SLOPE (ft/ft)	LONGITUDAL SLOPE (%)	**SPREAD (ft)**	INTERCEPTED FLOW (cubic feet per second)	BYPASS FLOW (cubic feet per second)	BYPASS FLOW TO INLET NUMBER	**INLET LOCATION MAIN =1, OTHER=2**
HOMESTEAD					0.42	0.40											
525+50.00	38.25	LT	**S-106**	P 6	0.12	0.02	0.42	1.68		**1.68**	0.02	0.3	**5.49**	1.68	NONE		**1**
HOMESTEAD					0.42	0.40											
525+50.00	38.25	RT	**S-107**	P 6	0.12	0.02	0.42	1.68		**1.68**	0.02	0.3	**5.49**	1.68	NONE		**1**
HOMESTEAD					0.00												
527+00.00	27.50	LT	**S-107A**	MH 8	0.00								**N/A**				
HOMESTEAD					0.11	0.10											
529+45.00	38.25	LT	**S-108**	P 5	0.03	0.01	0.11	0.44		**0.44**	0.02	0.4	**6.29**	0.44	NONE		**1**
HOMESTEAD					0.10	0.09											
529+45.00	9.75	RT	**S-109**	P 5	0.03	0.01	0.10	0.40		**0.18**	0.01	0.4	**6.94**	0.18	0.22	**S-111**	**1**
HOMESTEAD					0.31	0.29											
530+80.00	38.25	LT	**S-110**	P 6	0.08	0.02	0.31	1.24		**1.24**	0.05	0.3	**2.87**	1.24	NONE		**1**
HOMESTEAD					0.30	0.29											
530+80.00	9.75	RT	**S-111**	P 6	0.09	0.02	0.31	1.24	**0.22**	**1.46**	0.04	0.3	**3.38**	1.46	NONE		**1**
HOMESTEAD					0.12	0.11											
533+00.00	38.25	LT	**S-112**	J 5	0.04	0.01	0.12	0.48		**0.48**	0.05	0.3	**3.87**	0.48	NONE		**1**
HOMESTEAD					0.13	0.12											
533+00.00	9.75	RT	**S-113**	P 5	0.04	0.01	0.13	0.52		**0.52**	0.05	0.3	**3.99**	0.52	NONE		**1**
HOMESTEAD					0.03	0.03											
534+80.00	38.25	LT	**S-114**	P 5	0.00	0.00	0.03	0.12		**0.12**	0.05	0.3	**2.30**	0.12	NONE		**1**
HOMESTEAD					0.14	0.13											
536+20.00	38.25	LT	**S-115**	J 5	0.01	0.00	0.13	0.52		**0.52**	0.05	0.3	**3.99**	0.52	NONE		**1**
HOMESTEAD					0.15	0.14											
536+20.00	9.75	RT	**S-116**	P 5	0.04	0.01	0.15	0.60		**0.60**	0.04	0.3	**4.69**	0.60	NONE		**1**
HOMESTEAD					0.58	0.55											
539+00.00	38.25	LT	**S-117**	J 6	0.02	0.00	0.55	2.20		**2.20**	0.02	0.3	**6.07**	2.20	NONE		**1**

FLORIDA DEPARTMENT OF TRANSPORTATION
SPREAD CALCULATIONS

Financial Project ID No. N/A County: LEE UNITS: ( ) Metric (SI) Prepared by: MAR Date: 9/9/08
Description HOMESTEAD (X) US Customary Checked by: Date:
HDR Project No. 69627

ALLOWABLE SPREAD (MAIN LINE1) = 9 RAINFALL INTENSITY = 4 inches per hour
ALLOWABLE SPREAD (MAIN LINE2) = 7

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	DRAINAGE AREA (ac) C = 0.95 C = 0.20 C = INCRE-MENT	SUBTOTAL C X A	TOTAL C X A	OVERLAND RUNOFF (cubic feet per second)	BYPASS RUNOFF (cubic feet per second)	TOTAL RUNOFF (cubic feet per second)	CROSS SLOPE (ft/ft)	LONGITUDAL SLOPE (%)	SPREAD (ft)	INTERCEPTED FLOW (cubic feet per second)	BYPASS FLOW (cubic feet per second)	BYPASS FLOW TO INLET NUMBER	INLET LOCATION MAIN =1, OTHER=2
HOMESTEAD					0.70	0.67											
539+00.00	38.25	RT	**S-118**	P 6	0.03	0.01	0.68	2.72		**2.72**	0.01	0.3	**8.60**	2.72	NONE		**1**
HOMESTEAD					0.12	0.11											
541+79.78	38.25	LT	**S-118A**	J 5	0.01	0.00	0.11	0.44		**0.44**	0.02	0.3	**3.32**	0.44	NONE		**1**
HOMESTEAD					0.16	0.15											
543+00.00	38.25	LT	**S-119**	J 5	0.01	0.00	0.15	0.60		**0.60**	0.02	0.3	**7.46**	0.60	NONE		**1**
HOMESTEAD					0.15	0.14											
543+00.00	38.25	RT	**S-120**	P 5	0.01	0.00	0.14	0.56		**0.56**	0.02	0.3	**7.27**	0.56	NONE		**1**
HOMESTEAD					0.16	0.15											
544+50.00	38.25	LT	**S-121**	J 5	0.01	0.00	0.15	0.60		**0.60**	0.02	0.3	**7.46**	0.60	NONE		**1**
HOMESTEAD					0.16	0.15											
544+50.00	38.25	RT	**S-122**	P 5	0.01	0.00	0.15	0.60		**0.60**	0.02	0.3	**7.46**	0.60	NONE		**1**
HOMESTEAD					0.00												
548+00.00	47.00	LT	**S-122A**	MH 8	0.00								**N/A**				
HOMESTEAD					0.60	0.57											
549+50.00	38.25	LT	**S-123**	J 6	0.06	0.01	0.58	2.32		**2.32**	0.02	0.3	**6.19**	2.32	NONE		**1**
HOMESTEAD					0.75	0.71											
549+50.00	38.25	RT	**S-124**	J 6	0.02	0.00	0.71	2.84		**2.84**	0.02	0.3	**6.68**	2.84	NONE		**1**
HOMESTEAD					0.00												
551+80.00	27.17	RT	**S-125**	MH 8	0.00								**N/A**				
HOMESTEAD					0.77	0.73											
556+50.00	38.25	LT	**S-126**	P 6	0.06	0.01	0.74	2.96		**2.96**	0.02	0.3	**6.79**	2.96	NONE		**1**
HOMESTEAD					0.77	0.73											
556+50.00	38.25	RT	**S-127**	J 6	0.03	0.01	0.74	2.96		**2.96**	0.02	0.3	**6.79**	2.96	NONE		**1**
HOMESTEAD					0.01	0.01											
559+40.00	38.25	LT	**S-128**	P 5	0.00	0.00	0.01	0.04		**0.04**	0.02	0.3	**1.35**	0.04	NONE		**1**

FLORIDA DEPARTMENT OF TRANSPORTATION
SPREAD CALCULATIONS

Financial Project ID No. N/A County: LEE UNITS: ( ) Metric (SI) Prepared by: MAR Date: 12.13.07
Description HOMESTEAD (X) US Customary Checked by: Date:
HDR Project No. 69627

ALLOWABLE SPREAD (MAIN LINE1) = 9 RAINFALL INTENSITY = 4 inches per hour
ALLOWABLE SPREAD (MAIN LINE2) = 7

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	DRAINAGE AREA (ac) C = 0.95 C = 0.20 C = INCRE-MENT	SUBTOTAL C X A	TOTAL C X A	OVERLAND RUNOFF (cubic feet per second)	BYPASS RUNOFF (cubic feet per second)	TOTAL RUNOFF (cubic feet per second)	CROSS SLOPE (ft/ft)	LONGITUDAL SLOPE (%)	SPREAD (ft)	INTERCEPTED FLOW (cubic feet per second)	BYPASS FLOW (cubic feet per second)	BYPASS FLOW TO INLET NUMBER	INLET LOCATION MAIN =1, OTHER=2
HOMESTEAD					0.01	0.01											
559+40.00	38.25	RT	**S-128A**	J 5	0.00	0.00	0.01	0.04		**0.04**	0.02	0.3	**1.35**	0.04	NONE		**1**
HOMESTEAD					0.21	0.20											
562+00.00	38.25	LT	**S-129**	P 5	0.06	0.01	0.21	0.84		**0.84**	0.02	0.3	**8.46**	0.84	NONE		**1**
HOMESTEAD					0.21	0.20											
562+00.00	38.25	RT	**S-130**	J 5	0.06	0.01	0.21	0.84		**0.84**	0.02	0.3	**8.46**	0.84	NONE		**1**
HOMESTEAD					0.21	0.20											
564+50.00	38.25	LT	**S-131**	P 5	0.06	0.01	0.21	0.84		**0.84**	0.02	0.3	**8.46**	0.84	NONE		**1**
HOMESTEAD					0.21	0.20											
564+50.00	38.25	RT	**S-132**	J 5	0.06	0.01	0.21	0.84		**0.84**	0.02	0.3	**8.46**	0.84	NONE		**1**
HOMESTEAD					0.54	0.51											
568+00.00	38.25	LT	**S-133**	J 6	0.13	0.03	0.54	2.16		**2.16**	0.02	0.3	**6.03**	2.16	NONE		**1**
HOMESTEAD					0.57	0.54											
568+00.00	38.25	RT	**S-134**	J 6	0.10	0.02	0.56	2.24		**2.24**	0.02	0.3	**6.11**	2.24	NONE		**1**
SUNRISE					0.00												
010+69.31	48.38	LT	**S-136**	DBI MOD C	1.98								**N/A**				
SUNRISE					0.41												
010+69.31	45.38	RT	**S-137**	DBI C	0.00								**N/A**				
HOMESTEAD					0.04	0.04											
546+14.76	42.88	RT	**S-138**	P 5	0.00	0.00	0.04	0.16		**0.16**	0.01	0.4	**3.32**	0.16	NONE		**1**

E.O.P. ELEVATIONS, THEORETICAL GUTTER ELEVATIONS, MIN. INVERTS

County: Lee
Description Homestead

UNIT ( ) Metric (SI)
(X) US Customary

Prepared by: MAR Date: 9/8/2008
Checked by: Date:
HDR Project No. 69627

LOCATION OF INLET			INLET NUMBER	TYPE OF STRUCTURE	PGL ELEVATION	E.O.P. ELEVATION	THEO / GRATE / RIM INLET ELEVATION	MINIMUM INVERT ELEVATION							
STATION	DISTANCE (ft)	SIDE						18"	24"	30"	36"	42"	48"	54"	60"
HOMESTEAD															
525+50.00	38.25	LT	**S-106**	P 6	29.55	**29.03**	28.91	24.9	24.3	23.8	22.6	22.0	21.5	20.9	20.4
HOMESTEAD															
525+50.00	38.25	RT	**S-107**	P 6	29.55	**29.03**	28.91	24.9	24.3	23.8	22.6	22.0	21.5	20.9	20.4
HOMESTEAD															
527+00.00	27.50	LT	**S-107A**	MH 8	30.00	**N/A**	29.67	25.7	25.1	24.6	23.4	22.8	22.3	21.7	21.2
HOMESTEAD															
529+45.00	38.25	LT	**S-108**	P 5	29.93	**29.41**	29.29	25.3	24.7	24.2	23.0	22.4	21.9	21.3	20.8
HOMESTEAD															
529+45.00	9.75	RT	**S-109**	P 5	29.93	**29.93**	29.81	25.8	25.2	24.7	23.5	22.9	22.4	21.8	21.3
HOMESTEAD															
530+80.00	38.25	LT	**S-110**	P 6	29.39	**28.17**	28.04	24.0	23.4	22.9	21.7	21.1	20.6	20.0	19.5
HOMESTEAD															
530+80.00	9.75	RT	**S-111**	P 6	29.39	**29.39**	29.27	25.3	24.7	24.2	23.0	22.4	21.9	21.3	20.8
HOMESTEAD															
533+00.00	38.25	LT	**S-112**	J 5	30.05	**28.75**	28.63	24.6	24.0	23.5	22.3	21.7	21.2	20.6	20.1
HOMESTEAD															
533+00.00	9.75	RT	**S-113**	P 5	30.05	**30.05**	29.93	25.9	25.3	24.8	23.6	23.0	22.5	21.9	21.4
HOMESTEAD															
534+80.00	38.25	LT	**S-114**	P 5	30.41	**29.11**	29.52	25.5	24.9	24.4	23.2	22.6	22.1	21.5	21.0
HOMESTEAD															
536+20.00	38.25	LT	**S-115**	J 5	29.99	**28.69**	28.57	24.6	24.0	23.5	22.3	21.7	21.2	20.6	20.1
HOMESTEAD															
536+20.00	9.75	RT	**S-116**	P 5	29.99	**29.99**	29.87	25.9	25.3	24.8	23.6	23.0	22.5	21.9	21.4
HOMESTEAD															
539+00.00	38.25	LT	**S-117**	J 6	29.15	**28.63**	28.51	24.5	23.9	23.4	22.2	21.6	21.1	20.5	20.0

E.O.P. ELEVATIONS, THEORETICAL GUTTER ELEVATIONS, MIN. INVERTS

County: Lee
Description Homestead

UNIT ( ) Metric (SI)
(X) US Customary

Prepared by: MAR Date: 9/8/2008
Checked by: Date:
HDR Project No. 69627

LOCATION OF INLET			INLET NUMBER	TYPE OF STRUCTURE	PGL ELEVATION	E.O.P. ELEVATION	THEO / GRATE / RIM INLET ELEVATION	MINIMUM INVERT ELEVATION							
STATION	DISTANCE (ft)	SIDE						18"	24"	30"	36"	42"	48"	54"	60"
HOMESTEAD															
539+00.00	38.25	RT	S-118	P 6	29.15	**28.81**	28.69	24.7	24.1	23.6	22.4	21.8	21.3	20.7	20.2
HOMESTEAD															
541+79.78	38.25	LT	S-118A	J 5	29.99	**29.47**	29.66	25.7	25.1	24.6	23.4	22.8	22.3	21.7	21.2
HOMESTEAD															
543+00.00	38.25	LT	S-119	J 5	30.35	**29.83**	29.71	25.7	25.1	24.6	23.4	22.8	22.3	21.7	21.2
HOMESTEAD															
543+00.00	38.25	RT	S-120	P 5	30.35	**29.83**	29.71	25.7	25.1	24.6	23.4	22.8	22.3	21.7	21.2
HOMESTEAD															
544+50.00	38.25	LT	S-121	J 5	30.80	**30.28**	30.16	26.2	25.6	25.1	23.9	23.3	22.8	22.2	21.7
HOMESTEAD															
544+50.00	38.25	RT	S-122	P 5	30.80	**30.28**	30.16	26.2	25.6	25.1	23.9	23.3	22.8	22.2	21.7
HOMESTEAD															
548+00.00	47.00	LT	S-122A	MH 8	30.65	**N/A**	30.25	26.3	25.7	25.2	24.0	23.4	22.9	22.3	21.8
HOMESTEAD															
549+50.00	38.25	LT	S-123	J 6	30.20	**29.68**	29.56	25.6	25.0	24.5	23.3	22.7	22.2	21.6	21.1
HOMESTEAD															
549+50.00	38.25	RT	S-124	J 6	30.20	**29.68**	29.56	25.6	25.0	24.5	23.3	22.7	22.2	21.6	21.1
HOMESTEAD															
551+80.00	27.17	RT	S-125	MH 8	30.89	**N/A**	30.56	26.6	26.0	25.5	24.3	23.7	23.2	22.6	22.1
HOMESTEAD															
556+50.00	38.25	LT	S-126	P 6	29.15	**28.63**	28.51	24.5	23.9	23.4	22.2	21.6	21.1	20.5	20.0
HOMESTEAD															
556+50.00	38.25	RT	S-127	J 6	29.15	**28.63**	28.51	24.5	23.9	23.4	22.2	21.6	21.1	20.5	20.0
HOMESTEAD															
559+40.00	38.25	LT	S-128	P 5	30.02	**29.50**	29.66	25.7	25.1	24.6	23.4	22.8	22.3	21.7	21.2

E.O.P. ELEVATIONS, THEORETICAL GUTTER ELEVATIONS, MIN. INVERTS

County: Lee
Description Homestead

UNIT ( ) Metric (SI)
(X) US Customary

Prepared by: MAR Date: 9/8/2008
Checked by: Date:
HDR Project No. 69627

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	PGL ELEVATION	E.O.P. ELEVATION	THEO / GRATE / RIM INLET ELEVATION	MINIMUM INVERT ELEVATION 18"	24"	30"	36"	42"	48"	54"	60"
HOMESTEAD															
559+40.00	38.25	RT	**S-128A**	J 5	30.02	**29.50**	29.69	25.7	25.1	24.6	23.4	22.8	22.3	21.7	21.2
HOMESTEAD															
562+00.00	38.25	LT	**S-129**	P 5	29.30	**28.78**	28.66	24.7	24.1	23.6	22.4	21.8	21.3	20.7	20.2
HOMESTEAD															
562+00.00	38.25	RT	**S-130**	J 5	29.30	**28.78**	28.66	24.7	24.1	23.6	22.4	21.8	21.3	20.7	20.2
HOMESTEAD															
564+50.00	38.25	LT	**S-131**	P 5	28.55	**28.03**	27.91	23.9	23.3	22.8	21.6	21.0	20.5	19.9	19.4
HOMESTEAD															
564+50.00	38.25	RT	**S-132**	J 5	28.55	**28.03**	27.91	23.9	23.3	22.8	21.6	21.0	20.5	19.9	19.4
HOMESTEAD															
568+00.00	38.25	LT	**S-133**	J 6	27.50	**26.98**	26.86	22.9	22.3	21.8	20.6	20.0	19.5	18.9	18.4
HOMESTEAD															
568+00.00	38.25	RT	**S-134**	J 6	27.50	**26.98**	26.86	22.9	22.3	21.8	20.6	20.0	19.5	18.9	18.4
SUNRISE															
010+69.31	48.38	LT	**S-136**	DBI MOD C		**N/A**	28.07	24.1	23.5	23.0	21.8	21.2	20.7	20.1	19.6
SUNRISE															
010+69.31	45.38	RT	**S-137**	DBI C		**N/A**	27.30	23.3	22.7	22.2	21.0	20.4	19.9	19.3	18.8
HOMESTEAD															
546+14.76	42.88	RT	**S-138**	P 5	31.21	**30.91**	30.78	26.8	26.2	25.7	24.5	23.9	23.4	22.8	22.3

FLORIDA DEPARTMENT OF TRANSPORTATION

STORM DRAIN TABULATION FORM (8/00)

Financial Project ID No. | County: LEE | UNITS: ( ) Metric [SI] (X) US customary | Revised by: LSP Date: 6/5/08 | Checked by: MAR Date: 9/9/08 | HDR Project No.

Description: HOMESTEAD ROAD

LOCATION OF UPPER END STATION	DISTANCE (ft)	SIDE	UPPER / LOWER STRUCTURE NUMBER	INLET TYPE	TYPE OF STRUCTURE	TYPE OF LINE	LENGTH (ft)	Drainage Area (ac) C= 0.95 C= 0.20 C= 0.60 Increment	SUB Total	SUB Total (CA)	Tc (min)	Time in Section (min)	Intensity (in/hr)	TOTAL C x A	TOTAL RUNOFF (cfs)	Manhole, Inlet & Gutter Elev. (ft)	HYD. GRADIENT Crown EL. Upper	Flow Line EL. Lower	^FALL (feet)	Diam. (in.)	HYD. GRAD. Physical Min. Phys. Slope (%)	Velocity (fps)	ZONE or COUNTY: LEE FREQUENCY: 10-YEAR NOTES: Manning's n = 0.012 USING TW= 25 REMARKS	EDGE OF PAVEMENT, GRATE OR MH ELEVATION	CHECKS
HOMESTEAD			**S-107**	**CI**	**P** 6	S	76.5	0.42	0.42	0.40							26.2	26.1	0.04		0.06				INLET - HGL 2.64 K= 0.00
525+50.00	38.25	RT						0.12	0.12	0.02	15.0	0.8	6.49	0.42	**2.74**	28.8	26.0	25.8	0.20	18	0.26	1.55		29.03	Partial Flow? NO LOSS = 0.00
			S-106							*0.00*							24.5	24.3			0.15				COVER = 2.82 Calc d/D
HOMESTEAD			**S-106**	**CI**	**P** 6	M	150.4	0.42	0.84	0.80							26.1	25.8	0.33		0.22		INV 12" WM = 23.93		INLET - HGL 2.68 K= 0.00
525+50.00	38.25	LT						0.12	0.24	0.05	15.8	0.8	6.36	0.85	**5.38**	28.8	25.8	25.5	0.30	18	0.20	3.05		29.03	Partial Flow? NO LOSS = 0.00
			S-107A							*0.00*							24.3	24.0			0.15				COVER = 3.02 Calc d/D
HOMESTEAD			**S-107A**	**MH**	**P** 8	M	245.2	0.00	0.84	0.80							26.3	25.7	0.52		0.21				INLET - HGL 3.41 K= 0.00
527+00.00	27.50	LT						0.00	0.24	0.05	16.6	1.4	6.25	0.85	**5.29**	29.7	25.5	25.1	0.40	18	0.16	2.99		29.67	Partial Flow? NO LOSS = 0.00
			S-108							*0.00*							24.0	23.6			0.15				COVER = 4.17 Calc d/D
HOMESTEAD			**S-109**	**CI**	**P** 5	S	48.0	0.10	0.10	0.10							25.8	25.8	0.00		0.00				INLET - HGL 3.91 K= 0.00
529+45.00	9.75	RT						0.03	0.03	0.01	10.0	1.9	7.45	0.10	**0.75**	29.7	25.3	25.1	0.20	18	0.42	0.43		29.93	Partial Flow? NO LOSS = 0.00
			S-108							*0.00*							23.8	23.6			0.15				COVER = 4.42 Calc d/D
HOMESTEAD			**S-108**	**CI**	**P** 5	M	135.0	0.11	1.05	1.00							25.8	25.7	0.09		0.07		INV 12" WM = 24.11		INLET - HGL 3.40 K= 0.00
529+45.00	38.25	LT						0.03	0.30	0.06	18.0	1.1	6.05	1.06	**6.40**	29.2	25.6	25.4	0.20	24	0.15	2.04		29.41	Partial Flow? NO LOSS = 0.00
			S-110							*0.00*							23.6	23.4			0.10				COVER = 3.60 Calc d/D
HOMESTEAD			**S-111**	**CI**	**P** 6	S	48.0	0.30	0.30	0.29							25.7	25.7	0.02		0.04				INLET - HGL 3.45 K= 0.00
530+80.00	9.75	RT						0.09	0.09	0.02	10.0	0.6	7.45	0.30	**2.26**	29.2	25.0	24.9	0.10	18	0.21	1.28		29.39	Partial Flow? NO LOSS = 0.00
			S-110							*0.00*							23.5	23.4			0.15				COVER = 4.18 Calc d/D
HOMESTEAD			**S-110**	**CI**	**P** 6	M	207.2	0.31	1.66	1.58							25.7	25.6	0.10		0.05		INV 12" WM = 23.86		INLET - HGL 2.25 K= 0.00
530+80.00	38.25	LT						0.08	0.47	0.09	19.1	1.7	5.91	1.67	**9.88**	28.0	24.8	24.5	0.30	30	0.14	2.01		28.17	Partial Flow? NO LOSS = 0.00
			S-112							*0.00*							22.3	22.0			0.08				COVER = 3.16 Calc d/D
HOMESTEAD			**S-113**	**CI**	**P** 5	S	48.0	0.13	0.13	0.12							25.6	25.6	0.00		0.01				INLET - HGL 4.23 K= 0.00
533+00.00	9.75	RT						0.04	0.04	0.01	10.0	1.4	7.45	0.13	**0.98**	29.8	24.0	23.5	0.50	18	1.04	0.55		30.05	Partial Flow? NO LOSS = 0.00
			S-112							*0.00*							22.5	22.0			0.15				COVER = 5.84 Calc d/D
HOMESTEAD			**S-112**	**CI**	**J** 5	M	169.6	0.12	1.91	1.81							25.6	25.5	0.10		0.06				INLET - HGL 2.93 K= 0.00
533+00.00	38.25	LT						0.04	0.55	0.11	20.8	1.3	5.71	1.92	**10.99**	28.5	24.5	24.3	0.20	30	0.12	2.24		28.75	Partial Flow? NO LOSS = 0.00
			S-114							*0.00*							22.0	21.8			0.08				COVER = 4.04 Calc d/D
HOMESTEAD			**S-114**	**CI**	**P** 5	M	132.1	0.03	1.94	1.84							25.5	25.4	0.08		0.06				INLET - HGL 3.33 K= 0.00
534+80.00	38.25	LT						0.00	0.59	0.12	22.1	1.0	5.57	1.96	**10.92**	28.8	24.3	24.1	0.20	30	0.15	2.22		29.05	Partial Flow? NO LOSS = 0.00
			S-115							*0.00*							21.8	21.6			0.08				COVER = 4.54 Calc d/D
HOMESTEAD			**S-116**	**CI**	**P** 5	S	48.0	0.15	0.15	0.14							25.4	25.4	0.00		0.01				INLET - HGL 4.35 K= 0.00
536+20.00	9.75	RT						0.04	0.04	0.01	10.0	1.3	7.45	0.15	**1.12**	29.8	23.5	23.1	0.40	18	0.83	0.63		29.99	Partial Flow? NO LOSS = 0.00
			S-115							*0.00*							22.0	21.6			0.15				COVER = 6.28 Calc d/D
HOMESTEAD			**S-115**	**CI**	**J** 5	M	279.3	0.14	2.23	2.12							25.4	25.3	0.08		0.03		INV 12" WM = 23.38		INLET - HGL 3.05 K= 0.00
536+20.00	38.25	LT						0.01	0.64	0.13	23.1	2.7	5.46	2.25	**12.27**	28.5	24.6	24.3	0.30	36	0.11	1.74		28.69	Partial Flow? NO LOSS = 0.00
			S-117							*0.00*							21.6	21.3			0.06				COVER = 3.88 Calc d/D
HOMESTEAD			**S-118**	**CI**	**P** 6	S	76.5	0.70	0.70	0.67							25.5	25.3	0.17		0.22		INV 16" FM = 24.05		INLET - HGL 3.09 K= 0.00
539+00.00	38.25	RT						0.03	0.26	0.05	10.0	0.4	7.45	0.72	**5.34**	28.6	23.7	22.5	0.90	18	1.18	3.02		28.81	Partial Flow? NO LOSS = 0.00
			S-117							*0.00*							22.2	21.3			0.15				COVER = 4.90 Calc d/D
HOMESTEAD			**S-117**	**CI**	**J** 6	M	279.8	0.58	3.51	3.33							25.3	25.2	0.18		0.06		INV 12" FM = 23.76		INLET - HGL 3.07 K= 0.00
539+00.00	38.25	LT						0.02	0.92	0.18	25.8	1.8	5.20	3.52	**18.31**	28.4	24.3	24.0	0.30	36	0.11	2.59		28.63	Partial Flow? NO LOSS = 0.00
			S-118A							*0.00*							21.3	21.0			0.06				COVER = 4.12 Calc d/D
HOMESTEAD			**EXIST. INLET**	**DBI**	C	S	14.3	0.43	0.43	0.41							**29.1**	25.6	1.54		10.76		Offsite Drainage		INLET - HGL 0.67 V(norm)= 16.20 K= 0.00
541+79.70	53.35	LT						0.00	0.00	0.00	10.0	0.0	7.45	0.41	**3.04**	29.7	29.1	26.3	2.75	12	19.20	16.20	DA adjusted to match peak (	29.72	Partial Flow? **YES** d/D = 1.00 LOSS = 0.00
			S-118A							*0.00*							28.1	25.3			0.26		Qmax = 3 cfs		COVER = **0.67** Qfull = 16.96 Calc d/D 0.27
HOMESTEAD			**S-118A**	**CI**	**J** 5	M	120.2	0.12	0.55	0.52							25.5	25.5	0.00		0.00		Connect to exist 12" RCP		INLET - HGL 3.78 K= 0.00
541+79.78	38.25	LT						0.01	0.01	0.00	27.6	5.4	5.05	0.52	**2.65**	29.3	24.0	23.9	0.10	36	0.08	0.37		29.47	Partial Flow? NO LOSS = 0.00
			S-119							*0.00*							21.0	20.9			0.06				COVER = 5.26 Calc d/D

FLORIDA DEPARTMENT OF TRANSPORTATION

STORM DRAIN TABULATION FORM (8/00)

Financial Project ID No. | County: LEE | UNITS: ( ) Metric [SI] (X) US customary | Revised by: LSP Date: 6/5/08 | Checked by: MAR Date: 9/9/08

Description: HOMESTEAD ROAD | HDR Project No.

LOCATION OF UPPER END STATION	DISTANCE (ft)	SIDE	UPPER/LOWER STRUCTURE NUMBER	INLET TYPE	TYPE OF STRUCTURE	TYPE OF LINE	LENGTH (ft)	Drainage Area (ac) C= 0.95 C= 0.20 C= 0.60 Increment	SUB Total	SUB Total (CA)	Tc (min)	Time in Section (min)	Intensity (in/hr)	TOTAL C x A	TOTAL RUNOFF (cfs)	Manhole, Inlet & Gutter Elev. (ft)	HYD. GRADIENT Crown EL. / Flow Line EL. Upper	Lower	^FALL (feet)	Diam. (in.)	HYD. GRAD. Physical Min. Phys. Slope (%)	Velocity (fps)	ZONE or COUNTY: LEE / FREQUENCY: 10-YEAR / NOTES: Manning's n = 0.012 / USING TW= 25 REMARKS	EDGE OF PAVEMENT, GRATE OR MH ELEVATION	CHECKS
HOMESTEAD			**S-120**	**CI**	**P** 5	S	76.5	0.16	0.16	0.15	10.0	2.0	7.45	0.15	**1.15**	29.6	25.2	25.2	0.01	18	0.01	0.65		29.83	INLET - HGL 4.44 K= 0.00
543+00.00	38.25	RT						0.01	0.01	0.00							23.8	23.5	0.30		0.39				Partial Flow? NO LOSS = 0.00
			S-119							*0.00*							22.3	22.0			0.15				COVER = 5.82 Calc d/D
HOMESTEAD			**S-119**	**CI**	**J** 5	M	150.0	0.15	0.86	0.82	33.0	4.6	4.63	0.82	**3.81**	29.6	25.2	25.2	0.00	36	0.00	0.54	INV 16" FM = 25.01	29.83	INLET - HGL 4.45 K= 0.00
543+00.00	38.25	LT						0.01	0.03	0.01							23.9	23.7	0.20		0.13				Partial Flow? NO LOSS = 0.00
			S-121							*0.00*							20.9	20.7			0.06				COVER = 5.72 Calc d/D
SUNRISE			**S-136**	**DBI**	**MOD** C	S	93.8	0.00	0.00	0.00	37.6	1.6	4.34	0.40	**1.72**	28.1	25.7	25.7	0.02	14x23		0.95	INV 16" FM = 24.28	28.07	INLET - HGL 2.40 K= 0.00
010+69.31	48.38	LT						1.98	1.98	0.40							24.8	24.6	0.20		0.21				Partial Flow? NO LOSS = 0.00
			S-137							*0.00*							23.6	23.4			0.15				COVER = Calc d/D
SUNRISE			**S-137**	**DBI**	C	S	25.9	0.41	0.41	0.39	39.2	0.2	4.25	0.79	**3.33**	27.3	25.7	25.6	0.02	18	0.09	1.89	INV 12" WM = 23.00	27.30	INLET - HGL 1.65 K= 0.00
010+69.31	45.38	RT						0.00	1.98	0.40							24.9	24.8	0.10		0.39				Partial Flow? NO LOSS = 0.00
			S-138							*0.00*							23.4	23.3			0.15				COVER = Calc d/D
HOMESTEAD			**S-138**	**CI**	**P** 5	S	164.8	0.04	0.45	0.43	39.4	1.4	4.23	0.82	**3.49**	30.7	25.6	25.5	0.15	18	0.09	1.97		30.95	INLET - HGL 5.11 K= 0.00
546+14.76	42.88	RT						0.00	1.98	0.40							24.8	24.5	0.30		0.18				Partial Flow? NO LOSS = 0.00
			S-122							*0.00*							23.3	23.0			0.15				COVER = OK Calc d/D
HOMESTEAD			**S-122**	**CI**	**P** 5	S	76.5	0.16	0.61	0.58	10.0	0.3	7.45	0.98	**7.28**	30.1	25.5	25.2	0.31	18	0.41	4.12		30.28	INLET - HGL 4.59 K= 0.00
544+50.00	38.25	RT						0.01	1.99	0.40							23.5	23.0	0.50		0.65				Partial Flow? NO LOSS = 0.00
			S-121							*0.00*							22.0	21.5			0.15				COVER = 6.57 Calc d/D
HOMESTEAD			**S-121**	**CI**	**J** 5	M	350.8	0.16	1.63	1.55	37.6	4.9	4.34	1.95	**8.48**	30.1	25.2	25.1	0.05	36	0.01	1.20		30.28	INLET - HGL 4.90 K= 0.00
544+50.00	38.25	LT						0.01	2.03	0.41							23.7	23.5	0.20		**0.06**				Partial Flow? NO LOSS = 0.00
			S-122A							*0.00*							20.7	20.5			0.06				COVER = 6.37 Calc d/D
HOMESTEAD			**S-122A**	**MH**	**J** 8	M	150.2	0.00	1.63	1.55	42.5	2.2	4.07	1.95	**7.95**	30.3	25.1	25.1	0.02	36	0.01	1.12		30.25	INLET - HGL 5.13 K= 0.00
548+00.00	47.00	LT						0.00	2.03	0.41							23.5	23.4	0.10		0.07				Partial Flow? NO LOSS = 0.00
			S-123							*0.00*							20.5	20.4			0.06				COVER = 6.75 Calc d/D
HOMESTEAD			**S-123**	**CI**	**J** 6	M	76.5	0.60	2.23	2.12	44.7	0.9	3.95	2.54	**10.03**	29.5	25.1	25.1	0.01	36	0.02	1.42	INV 16" FM = 23.82	29.68	INLET - HGL 4.37 K= 0.00
549+50.00	38.25	LT						0.06	2.09	0.42							23.4	23.3	0.10		0.13				Partial Flow? NO LOSS = 0.00
			S-124							*0.00*							20.4	20.3			0.06				COVER = 6.07 Calc d/D
HOMESTEAD			**S-124**	**CI**	**J** 6	M	230.7	0.75	2.98	2.83	45.6	2.1	3.91	3.25	**12.72**	29.5	25.1	25.0	0.07	36	0.03	1.80		29.68	INLET - HGL 4.39 K= 0.00
549+50.00	38.25	RT						0.02	2.11	0.42							23.3	23.1	0.20		0.09				Partial Flow? NO LOSS = 0.00
			S-125							*0.00*							20.3	20.1			0.06				COVER = 6.17 Calc d/D

FLORIDA DEPARTMENT OF TRANSPORTATION

STORM DRAIN TABULATION FORM (8/00)

Financial Project ID No. | County: LEE | UNITS: ( ) Metric [SI] (X) US customary | Revised by: LSP Date: 6/5/08 | Checked by: MAR Date: 9/9/08

Description: HOMESTEAD ROAD | HDR Project No.

LOCATION OF UPPER END			UPPER / LOWER STRUCTURE NUMBER	INLET TYPE	TYPE OF STRUCTURE	TYPE OF LINE	LENGTH (ft)	Drainage Area (ac) C= 0.95 / C= 0.20 / C= 0.60			Tc (min)	Time in Section (min)	Intensity (in/hr)	TOTAL C x A	TOTAL RUNOFF (cfs)	Manhole, Inlet & Gutter Elev. (ft)	HYD. GRADIENT Crown EL. / Flow Line EL.			Diam. (in.)	HYD. GRAD. Physical	Velocity (fps)	ZONE or COUNTY: LEE / FREQUENCY: 10-YEAR / NOTES: Manning's n = 0.012 / USING TW= 25	EDGE OF PAVEMENT, GRATE OR MH ELEVATION	CHECKS
STATION	DISTANCE (ft)	SIDE						Increment	SUB Total	SUB Total (CA)							Upper	Lower	^FALL (feet)		Min. Phys. Slope (%)		REMARKS	
HOMESTEAD			**S-133**	**CI**	**J** 6	S	76.5	0.54	0.54	0.51	10.0	1.0	7.45	0.54	**4.01**	26.8	25.3	25.3	0.02	19x30	0.02	1.22	INV 6" FM = 24.52	26.98	INLET - HGL 1.45 K= 0.00
568+00.00	38.25	LT						0.13	0.13	0.03							23.4	23.2	0.20		0.26				Partial Flow? NO LOSS = 0.00
			S-134							*0.00*							21.8	21.6			0.10				COVER = 3.39 Calc d/D
HOMESTEAD			**S-134**	**CI**	**J** 6	M	350.0	0.57	1.11	1.05	11.0	3.7	7.22	1.10	**7.95**	26.8	25.3	25.2	0.11	24x38	0.03	1.56	INV 12" WM = 23.86	26.98	INLET - HGL 1.47 K= 0.00
568+00.00	38.25	RT						0.10	0.23	0.05							23.6	23.3	0.30		0.09				Partial Flow? NO LOSS = 0.00
			S-132							*0.00*							21.6	21.3			0.08				COVER = 3.17 Calc d/D
HOMESTEAD			**S-131**	**CI**	**P** 5	S	250.0	0.21	0.21	0.20	10.0	4.7	7.45	0.21	**1.57**	27.8	25.7	25.6	0.05	18	0.02	0.89		28.03	INLET - HGL 2.13 K= 0.00
564+50.00	38.25	LT						0.06	0.06	0.01							24.5	24.0	0.50		0.20				Partial Flow? NO LOSS = 0.00
			S-129							*0.00*							23.0	22.5			0.15				COVER = 3.32 Calc d/D
HOMESTEAD			**S-132**	**CI**	**J** 5	M	250.0	0.21	1.32	1.25	14.7	3.4	6.54	1.31	**8.58**	27.8	25.2	25.2	0.03	36	0.01	1.21		28.03	INLET - HGL 2.63 K= 0.00
564+50.00	38.25	RT						0.06	0.29	0.06							24.3	23.9	0.40		0.16				Partial Flow? NO LOSS = 0.00
			S-130							*0.00*							21.3	20.9			0.06				COVER = 3.52 Calc d/D
HOMESTEAD			**S-129**	**CI**	**P** 5	S	260.0	0.21	0.42	0.40	14.7	2.8	6.54	0.42	**2.76**	28.6	25.6	25.5	0.15	18	0.06	1.56		28.78	INLET - HGL 2.93 K= 0.00
562+00.00	38.25	LT						0.06	0.12	0.02							24.0	23.6	0.40		0.15				Partial Flow? NO LOSS = 0.00
			S-128							*0.00*							22.5	22.1			0.15				COVER = 4.57 Calc d/D
HOMESTEAD			**S-128**	**CI**	**P** 5	S	290.0	0.01	0.43	0.41	18.1	3.3	6.04	0.43	**2.61**	29.3	25.5	25.3	0.15	18	0.05	1.48		29.50	INLET - HGL 3.80 K= 0.00
559+40.00	38.25	LT						0.00	0.12	0.02							23.5	23.0	0.50		0.17				Partial Flow? NO LOSS = 0.00
			S-126							*0.00*							22.0	21.5			0.15				COVER = 5.79 Calc d/D
HOMESTEAD			**S-130**	**CI**	**J** 5	M	260.0	0.21	1.53	1.45	18.1	3.3	6.04	1.52	**9.20**	28.6	25.2	25.1	0.04	36	0.02	1.30		28.78	INLET - HGL 3.41 K= 0.00
562+00.00	38.25	RT						0.06	0.35	0.07							23.9	23.6	0.30		0.12				Partial Flow? NO LOSS = 0.00
			S-128A							*0.00*							20.9	20.6			0.06				COVER = 4.67 Calc d/D
HOMESTEAD			**S-128A**	**CI**	**J** 5	M	290.0	0.01	1.54	1.46	21.4	3.9	5.64	1.53	**8.65**	29.3	25.1	25.1	0.04	36	0.01	1.22		29.50	INLET - HGL 4.17 K= 0.00
559+40.00	38.25	RT						0.00	0.35	0.07							23.6	23.3	0.30		0.10				Partial Flow? NO LOSS = 0.00
			S-127							*0.00*							20.6	20.3			0.06				COVER = 5.69 Calc d/D
HOMESTEAD			**S-126**	**CI**	**P** 6	S	76.5	0.77	1.20	1.14	21.4	0.3	5.64	1.18	**6.64**	28.4	25.3	25.1	0.26	18	0.34	3.76		28.63	INLET - HGL 3.09 K= 0.00
556+50.00	38.25	LT						0.06	0.18	0.04							23.0	22.8	0.20		0.26				Partial Flow? NO LOSS = 0.00
			S-127							*0.00*							21.5	21.3			0.15				COVER = 5.42 Calc d/D
HOMESTEAD			**S-127**	**CI**	**J** 6	M	470.1	0.77	3.51	3.33	25.3	5.4	5.25	3.45	**18.10**	28.4	25.1	25.0	0.06	48	0.01	1.44		28.63	INLET - HGL 3.34 K= 0.00
556+50.00	38.25	RT						0.03	0.56	0.11							24.3	24.1	0.20		0.04				Partial Flow? NO LOSS = 0.00
			S-125							*0.00*							20.3	20.1			0.04				COVER = 4.12 Calc d/D
HOMESTEAD			**S-125**	**MH**	**J** 8	M	55.6	0.00	6.49	6.17	47.7	0.5	3.81	6.70	**25.55**	30.6	25.0	25.0	0.01	48	0.03	2.03		30.56	INLET - HGL 5.55 K= 0.00
551+80.00	27.17	RT						0.00	2.67	0.53							24.1	24.0	0.10		0.18				Partial Flow? NO LOSS = 0.00
			CANAL							*0.00*							20.1	20.0			0.04				COVER = 6.46 Calc d/D

CENTRAL BASIN DESIGN DOCUMENTATION

FLORIDA DEPARTMENT OF TRANSPORTATION

SPREAD CALCULATIONS

Financial Project ID No. N/A County: LEE UNITS: ( ) Metric (SI) Prepared by: MAR Date: 9/3/08
Description HOMESTEAD (X) US Customary Checked by: Date:
HDR Project No. 69627

ALLOWABLE SPREAD (MAIN LINE1) = 9 RAINFALL INTENSITY = 4 inches per hour
ALLOWABLE SPREAD (MAIN LINE2) = 7

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	DRAINAGE AREA (ac) C = 0.95 C = 0.20 C = INCRE-MENT	SUBTOTAL C X A	TOTAL C X A	OVERLAND RUNOFF (cubic feet per second)	BYPASS RUNOFF (cubic feet per second)	TOTAL RUNOFF (cubic feet per second)	CROSS SLOPE (ft/ft)	LONGITUDAL SLOPE (%)	**SPREAD (ft)**	INTERCEPTED FLOW (cubic feet per second)	BYPASS FLOW (cubic feet per second)	BYPASS FLOW TO INLET NUMBER	**INLET LOCATION MAIN =1, OTHER=2**
HOMESTEAD					0.49	0.47											
573+00.00	38.25	LT	**S-200**	P 6	0.08	0.02	0.49	1.96		**1.96**	0.02	0.3	**5.81**	1.96	NONE		**1**
HOMESTEAD					0.47	0.45											
573+00.00	38.25	RT	**S-201**	P 6	0.11	0.02	0.47	1.88		**1.88**	0.02	0.3	**5.72**	1.88	NONE		**1**
HOMESTEAD					0.00												
576+00.00	27.50	RT	**S-202**	MH 8	0.00								**N/A**				
HOMESTEAD					0.23	0.22											
579+00.00	38.25	LT	**S-204**	J 5	0.07	0.01	0.23	0.92		**0.92**	0.02	0.3	**8.76**	0.92	NONE		**1**
HOMESTEAD					0.23	0.22											
579+00.00	38.25	RT	**S-205**	P 5	0.07	0.01	0.23	0.92		**0.92**	0.02	0.3	**8.76**	0.92	NONE		**1**
HOMESTEAD					0.57	0.54											
582+00.00	38.25	LT	**S-206**	J 6	0.16	0.03	0.57	2.28		**2.28**	0.02	0.3	**6.15**	2.28	NONE		**1**
HOMESTEAD					0.46	0.44											
582+00.00	38.25	RT	**S-207**	P 6	0.14	0.03	0.47	1.88		**1.88**	0.02	0.3	**5.72**	1.88	NONE		**1**
HOMESTEAD					0.15	0.14											
585+00.00	38.25	LT	**S-208**	J 5	0.01	0.00	0.14	0.56		**0.56**	0.02	0.3	**7.27**	0.56	NONE		**1**
HOMESTEAD					0.05	0.05											
586+00.00	38.25	RT	**S-208A**	P 5	0.01	0.00	0.05	0.20		**0.20**	0.02	0.3	**4.94**	0.20	NONE		**1**
HOMESTEAD					0.52	0.49											
588+62.26	38.25	LT	**S-210**	J 6	0.04	0.01	0.50	2.00		**2.00**	0.02	0.4	**5.55**	2.00	NONE		**1**
HOMESTEAD					0.48	0.46											
588+62.26	38.25	RT	**S-211**	J 6	0.07	0.01	0.47	1.88		**1.88**	0.02	0.4	**5.42**	1.88	NONE		**1**
HOMESTEAD					0.22	0.21											
594+20.00	33.25	LT	**S-213**	P 5	0.01	0.00	0.21	0.84		**0.84**	0.02	0.3	**8.46**	0.84	NONE		**1**
HOMESTEAD					0.22	0.21											
594+20.00	33.25	RT	**S-214**	P 5	0.01	0.00	0.21	0.84		**0.84**	0.02	0.3	**8.46**	0.84	NONE		**1**

FLORIDA DEPARTMENT OF TRANSPORTATION
SPREAD CALCULATIONS

Financial Project ID No. N/A County: LEE UNITS: ( ) Metric (SI) Prepared by: MAR Date: 9/3/08
Description HOMESTEAD (X) US Customary Checked by: Date:
HDR Project No. 69627

ALLOWABLE SPREAD (MAIN LINE1) = 9 RAINFALL INTENSITY = 4 inches per hour
ALLOWABLE SPREAD (MAIN LINE2) = 7

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	DRAINAGE AREA (ac) C = 0.95 / C = 0.20 / C = INCREMENT	DRAINAGE AREA (ac) SUBTOTAL C X A	TOTAL C X A	OVERLAND RUNOFF (cubic feet per second)	BYPASS RUNOFF (cubic feet per second)	TOTAL RUNOFF (cubic feet per second)	CROSS SLOPE (ft/ft)	LONGITUDAL SLOPE (%)	**SPREAD (ft)**	INTERCEPTED FLOW (cubic feet per second)	BYPASS FLOW (cubic feet per second)	BYPASS FLOW TO INLET NUMBER	**INLET LOCATION MAIN =1, OTHER=2**
HOMESTEAD					0.49	0.46											
597+00.00	33.25	LT	**S-215**	P 6	0.02	0.00	0.46	1.84		**1.84**	0.02	0.3	**5.68**	1.84	NONE		**1**
HOMESTEAD					0.49	0.47											
597+00.00	33.25	RT	**S-216**	P 6	0.02	0.00	0.47	1.88		**1.88**	0.02	0.3	**5.72**	1.88	NONE		**1**

E.O.P. ELEVATIONS, THEORETICAL GUTTER ELEVATIONS, MIN. INVERTS

County: Lee
Description Homestead

UNIT ( ) Metric (SI)
(X) US Customary

Prepared by: MAR Date: 9/2/2008
Checked by: Date:
HDR Project No. 69627

LOCATION OF INLET			INLET NUMBER	TYPE OF STRUCTURE	PGL ELEVATION	E.O.P. ELEVATION	THEO / GRATE / RIM INLET ELEVATION	Note:							
STATION	DISTANCE (ft)	SIDE						MINIMUM INVERT ELEVATION							
								18"	24"	30"	36"	42"	48"	54"	60"
HOMESTEAD															
573+00.00	38.25	LT	S-200	P 6	27.75	**27.23**	27.11	23.1	22.5	22.0	20.8	20.2	19.7	19.1	18.6
HOMESTEAD															
573+00.00	38.25	RT	S-201	P 6	27.75	**27.23**	27.11	23.1	22.5	22.0	20.8	20.2	19.7	19.1	18.6
HOMESTEAD															
576+00.00	27.50	RT	S-202	MH 8	28.88	**N/A**	28.55	24.6	24.0	23.5	22.3	21.7	21.2	20.6	20.1
HOMESTEAD															
579+00.00	38.25	LT	S-204	J 5	28.15	**27.63**	27.51	23.5	22.9	22.4	21.2	20.6	20.1	19.5	19.0
HOMESTEAD															
579+00.00	38.25	RT	S-205	P 5	28.15	**27.63**	27.51	23.5	22.9	22.4	21.2	20.6	20.1	19.5	19.0
HOMESTEAD															
582+00.00	38.25	LT	S-206	J 6	27.25	**26.73**	26.61	22.6	22.0	21.5	20.3	19.7	19.2	18.6	18.1
HOMESTEAD															
582+00.00	38.25	RT	S-207	P 6	27.25	**26.73**	26.61	22.6	22.0	21.5	20.3	19.7	19.2	18.6	18.1
HOMESTEAD															
585+00.00	38.25	LT	S-208	J 5	28.15	**27.63**	27.51	23.5	22.9	22.4	21.2	20.6	20.1	19.5	19.0
HOMESTEAD															
586+00.00	38.25	RT	S-208A	P 5	28.45	**27.93**	27.81	23.8	23.2	22.7	21.5	20.9	20.4	19.8	19.3
HOMESTEAD															
588+62.26	38.25	LT	S-210	J 6	27.83	**27.31**	27.19	23.2	22.6	22.1	20.9	20.3	19.8	19.2	18.7
HOMESTEAD															
588+62.26	38.25	RT	S-211	J 6	27.83	**27.31**	27.19	23.2	22.6	22.1	20.9	20.3	19.8	19.2	18.7
HOMESTEAD															
594+20.00	33.25	LT	S-213	P 5	28.79	**28.27**	28.15	24.1	23.5	23.0	21.8	21.2	20.7	20.1	19.6
HOMESTEAD															
594+20.00	33.25	RT	S-214	P 5	28.79	**28.27**	28.15	24.1	23.5	23.0	21.8	21.2	20.7	20.1	19.6

E.O.P. ELEVATIONS, THEORETICAL GUTTER ELEVATIONS, MIN. INVERTS

County: Lee
Description Homestead

UNIT ( ) Metric (SI)
(X) US Customary

Prepared by: MAR Date: 9/2/2008
Checked by: Date:
HDR Project No. 69627

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	PGL ELEVATION	E.O.P. ELEVATION	THEO / GRATE / RIM INLET ELEVATION	Note: MINIMUM INVERT ELEVATION 18"	24"	30"	36"	42"	48"	54"	60"
HOMESTEAD 597+00.00	33.25	LT	**S-215**	P 6	27.91	**27.39**	27.27	23.3	22.7	22.2	21.0	20.4	19.9	19.3	18.8
HOMESTEAD 597+00.00	33.25	RT	**S-216**	P 6	27.91	**27.39**	27.27	23.3	22.7	22.2	21.0	20.4	19.9	19.3	18.8

FLORIDA DEPARTMENT OF TRANSPORTATION

STORM DRAIN TABULATION FORM (8/00)

Financial Project ID No. | County: LEE
Description: HOMESTEAD ROAD

UNITS: ( ) Metric [SI] (X) US customary

Revised by: MAR Date: 12.21.07
Checked by: MAR Date: 9/8/08
HDR Project No.

LOCATION OF UPPER END			UPPER / LOWER STRUCTURE NUMBER	INLET TYPE	TYPE OF STRUCTURE	TYPE OF LINE	LENGTH (ft)	Drainage Area (ac) C= 0.95 / C= 0.20 / C= 0.60		SUB Total (CA)	Tc (min)	Time in Section (min)	Intensity (in/hr)	TOTAL C x A	TOTAL RUNOFF (cfs)	Manhole, Inlet & Gutter Elev. (ft)	HYD. GRADIENT Crown EL. / Flow Line EL.			Diam. (in.)	HYD. GRAD. Physical Min. Phys. Slope (%)	Velocity (fps)	ZONE or COUNTY: LEE / FREQUENCY: 10-YEAR / NOTES: / Manning's n = 0.012 / USING TW= 23	EDGE OF PAVEMENT, GRATE OR MH ELEVATION	CHECKS
STATION	DISTANCE (ft)	SIDE						Increment	SUB Total								Upper	Lower	^FALL (feet)				REMARKS		
HOMESTEAD			**S-200**	**CI**	**P** 6	S	76.5	0.49	0.49	0.47	10.0	0.6	7.45	0.48	**3.58**	27.0	25.4	25.3	0.07	14x23	0.10	1.99	INV 6" FM = 24.22	27.23	INLET - HGL : 1.65 K= 0.00
573+00.00	38.25	LT						0.08	0.08	0.02							24.0	23.8	0.20		0.26				Partial Flow? NO LOSS = 0.00
			S-201							*0.00*							22.8	22.6			0.15				COVER = 3.06 Calc d/D
HOMESTEAD			**S-201**	**CI**	**P** 6	M	300.2	0.47	0.96	0.91	10.6	2.4	7.31	0.95	**6.94**	27.0	25.3	25.1	0.22	19x30	0.07	2.10	INV 12" WM = 23.65	27.23	INLET - HGL : 1.72 K= 0.00
573+00.00	38.25	RT						0.11	0.19	0.04							24.2	23.8	0.40		0.13				Partial Flow? NO LOSS = 0.00
			S-202							*0.00*							22.6	22.2			0.10				COVER = 2.84 Calc d/D
HOMESTEAD			**S-202**	**MH**	**P** 8	M	300.2	0.00	0.96	0.91	13.0	2.4	6.83	0.95	**6.49**	28.6	25.1	24.9	0.21	24	0.07	2.07		28.55	INLET - HGL : 3.48 K= 0.00
576+00.00	27.50	RT						0.00	0.19	0.04							24.2	23.9	0.30		**0.10**				Partial Flow? NO LOSS = 0.00
			S-205							*0.00*							22.2	21.9			0.10				COVER = 4.35 Calc d/D
HOMESTEAD			**S-205**	**CI**	**P** 5	M	300.0	0.23	1.19	1.13	15.4	2.1	6.43	1.18	**7.60**	27.4	24.9	24.6	0.29	24	0.10	2.42		27.63	INLET - HGL : 2.56 K= 0.00
579+00.00	38.25	RT						0.07	0.26	0.05							23.9	23.6	0.30		**0.10**				Partial Flow? NO LOSS = 0.00
			S-207							*0.00*							21.9	21.6			0.10				COVER = 3.52 Calc d/D
HOMESTEAD			**S-207**	**CI**	**P** 6	M	400.0	0.46	1.65	1.57	17.5	2.1	6.12	1.65	**10.09**	26.5	24.6	23.9	0.67	24	0.17	3.21		26.73	INLET - HGL : 1.94 K= 0.00
582+00.00	38.25	RT						0.14	0.40	0.08							23.6	23.2	0.40		0.10				Partial Flow? NO LOSS = 0.00
			S-208A							*0.00*							21.6	21.2			0.10				COVER = 2.92 Calc d/D
HOMESTEAD			**S-208A**	**CI**	**P** 5	M	261.6	0.05	1.70	1.62	19.6	2.2	5.85	1.70	**9.94**	27.7	23.9	23.8	0.13	30	0.05	2.02		27.93	INLET - HGL : 3.82 K= 0.00
586+00.00	38.25	RT						0.01	0.41	0.08							23.7	23.5	0.20		**0.08**				Partial Flow? NO LOSS = 0.00
			S-211							*0.00*							21.2	21.0			0.08				COVER = 4.02 Calc d/D
HOMESTEAD			**S-204**	**CI**	**J** 5	S	300.0	0.23	0.23	0.22	10.0	5.1	7.45	0.23	**1.73**	27.4	24.8	24.7	0.07	18	0.02	0.98		27.63	INLET - HGL : 2.65 K= 0.00
579+00.00	38.25	LT						0.07	0.07	0.01							24.1	23.6	0.50		0.17				Partial Flow? NO LOSS = 0.00
			S-206							*0.00*							22.6	22.1			0.15				COVER = 3.32 Calc d/D
HOMESTEAD			**S-206**	**CI**	**J** 6	S	300.0	0.57	0.80	0.76	15.1	1.7	6.47	0.81	**5.22**	26.5	24.7	24.1	0.62	18	0.21	2.95		26.73	INLET - HGL : 1.82 K= 0.00
582+00.00	38.25	LT						0.16	0.23	0.05							23.6	23.1	0.50		0.17				Partial Flow? NO LOSS = 0.00
			S-208							*0.00*							22.1	21.6			0.15				COVER = 2.92 Calc d/D
HOMESTEAD			**S-208**	**CI**	**J** 5	S	362.9	0.15	0.95	0.90	16.8	3.2	6.22	0.95	**5.91**	27.4	24.1	23.9	0.21	24	0.06	1.88		27.63	INLET - HGL : 3.35 K= 0.00
585+00.00	38.25	LT						0.01	0.24	0.05							23.6	23.2	0.40		0.11				Partial Flow? NO LOSS = 0.00
			S-210							*0.00*							21.6	21.2			0.10				COVER = 3.82 Calc d/D
HOMESTEAD			**S-210**	**CI**	**J** 6	S	76.5	0.52	1.47	1.40	20.0	0.5	5.80	1.45	**8.43**	27.1	23.9	23.8	0.09	24	0.12	2.68	INV 6" FM = 23.55	27.31	INLET - HGL : 3.24 K= 0.00
588+62.26	38.25	LT						0.04	0.28	0.06							23.2	23.0	0.20		0.26				Partial Flow? NO LOSS = 0.00
			S-211							*0.00*							21.2	21.0			0.10				COVER = 3.90 Calc d/D
HOMESTEAD			**S-211**	**CI**	**J** 6	M	375.5	0.48	3.65	3.47	21.8	1.5	5.60	3.62	**20.28**	27.1	23.8	23.0	0.78	30	0.21	4.13	INV 12" WM = 23.13	27.31	INLET - HGL : 3.33 K= 0.00
588+62.26	38.25	RT						0.07	0.76	0.15							23.5	23.2	0.30		**0.08**				Partial Flow? NO LOSS = 0.00
			S-212B							*0.00*							21.0	20.7			0.08				COVER = 3.60 Calc d/D
HOMESTEAD			**S-215**	**CI**	**P** 6	S	66.5	0.49	0.49	0.47	10.0	0.6	7.45	0.47	**3.50**	27.1	24.6	24.5	0.06	18	0.09	1.98		27.27	INLET - HGL : 2.49 K= 0.00
597+00.00	33.25	LT						0.02	0.02	0.00							24.0	23.5	0.50		0.75				Partial Flow? NO LOSS = 0.00
			S-216							*0.00*							22.5	22.0			0.15				COVER = 3.06 Calc d/D
HOMESTEAD			**S-216**	**CI**	**P** 6	M	280.0	0.49	0.98	0.93	10.6	1.2	7.31	0.94	**6.86**	27.1	24.5	23.5	1.01	18	0.36	3.88	INV 12" WM = 22.78	27.27	INLET - HGL : 2.55 K= 0.00
597+00.00	33.25	RT						0.02	0.04	0.01							23.5	23.0	0.50		0.18				Partial Flow? NO LOSS = 0.00
			S-214							*0.00*							22.0	21.5			0.15				COVER = 3.56 Calc d/D
HOMESTEAD			**S-213**	**CI**	**P** 5	S	66.5	0.22	0.22	0.21	10.0	1.3	7.45	0.21	**1.57**	27.9	23.5	23.5	0.01	14x23	0.02	0.87	INV 6" WM = 23.18	28.15	INLET - HGL : 4.43 K= 0.00
594+20.00	33.25	LT						0.01	0.01	0.00							22.9	22.7	0.20		0.30				Partial Flow? NO 1.00 LOSS = 0.00
			S-214							*0.00*							21.7	21.5			0.15				COVER = 5.08 Calc d/D
HOMESTEAD			**S-214**	**CI**	**P** 5	M	165.2	0.22	1.42	1.35	11.8	0.6	7.06	1.36	**9.60**	27.9	23.5	23.0	0.49	24	0.30	4.27	INV 12" WM = 22.79	28.15	INLET - HGL : 4.44 V(norm)= 4.27 K= 0.00
594+20.00	33.25	RT						0.01	0.06	0.01							23.5	23.1	0.40		0.24				Partial Flow? **YES** d/D = 1.00 LOSS = 0.00
			S-212D							*0.00*							21.5	21.1			0.10				COVER = 4.44 Qfull = 12.09 Calc d/D 0.67

NORTH BASIN DESIGN DOCUMENTATION

FLORIDA DEPARTMENT OF TRANSPORTATION
SPREAD CALCULATIONS

Financial Project ID No. N/A County: LEE UNITS: ( ) Metric (SI) Prepared by: MAR Date: 9/8/08
Description HOMESTEAD (X) US Customary Checked by: Date:
HDR Project No. 69627

ALLOWABLE SPREAD (MAIN LINE1) = 9 RAINFALL INTENSITY = 4 inches per hour
ALLOWABLE SPREAD (MAIN LINE2) = 7

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	DRAINAGE AREA (ac) C = 0.95 C = 0.20 C = INCRE-MENT	SUBTOTAL C X A	TOTAL C X A	OVERLAND RUNOFF (cubic feet per second)	BYPASS RUNOFF (cubic feet per second)	TOTAL RUNOFF (cubic feet per second)	CROSS SLOPE (ft/ft)	LONGITUDAL SLOPE (%)	**SPREAD (ft)**	INTERCEPTED FLOW (cubic feet per second)	BYPASS FLOW (cubic feet per second)	BYPASS FLOW TO INLET NUMBER	**INLET LOCATION MAIN =1, OTHER=2**
HOMESTEAD					0.46	0.44											
602+00.00	33.25	LT	**S-300**	P 6	0.02	0.00	0.44	1.76		**1.76**	0.02	0.3	**5.58**	1.76	NONE		**1**
HOMESTEAD					0.46	0.44											
602+00.00	33.25	RT	**S-301**	P 6	0.02	0.00	0.44	1.76		**1.76**	0.02	0.3	**5.58**	1.76	NONE		**1**
HOMESTEAD					0.00												
603+13.26	35.75	RT	**S-302**	JB 7	0.00								**N/A**				
HOMESTEAD					0.00												
603+06.39	35.75	LT	**S-302A**	JB 7	0.00								**N/A**				
LIVEOAK CANAL					0.00												
006+10.25	44.00	LT	**S-304**	MH 7	0.00								**N/A**				
LIVEOAK CANAL					0.00												
007+27.67	44.00	LT	**S-305**	MH 7	0.00								**N/A**				
LIVEOAK CANAL					0.00												
011+27.67	44.00	LT	**S-306**	MH 7	0.00								**N/A**				
LIVEOAK CANAL					0.00												
015+27.67	44.00	LT	**S-307**	MH 7	0.00								**N/A**				
HOMESTEAD					0.00												
606+92.72	43.00	LT	**S-308**	MH 7	0.00								**N/A**				
HOMESTEAD					0.45	0.43											
607+50.00	33.25	LT	**S-310**	J 6	0.01	0.00	0.43	1.72		**1.72**	0.02	0.3	**5.54**	1.72	NONE		**1**
HOMESTEAD					0.36	0.34											
607+50.00	33.25	RT	**S-311**	J 6	0.02	0.00	0.34	1.36		**1.36**	0.02	0.3	**5.07**	1.36	NONE		**1**
HOMESTEAD					0.11	0.10											
609+00.00	33.25	RT	**S-311A**	J 5	0.01	0.00	0.10	0.40		**0.40**	0.02	0.3	**3.20**	0.40	NONE		**1**
HOMESTEAD					0.12	0.11											
610+20.00	33.25	LT	**S-312**	J 5	0.01	0.00	0.11	0.44		**0.44**	0.02	0.3	**3.32**	0.44	NONE		**1**

FLORIDA DEPARTMENT OF TRANSPORTATION
SPREAD CALCULATIONS

Financial Project ID No. N/A County: LEE UNITS: ( ) Metric (SI) Prepared by: MAR Date: 9/8/08
Description HOMESTEAD (X) US Customary Checked by: Date:
HDR Project No. 69627

ALLOWABLE SPREAD (MAIN LINE1) = 9 RAINFALL INTENSITY = 4 inches per hour
ALLOWABLE SPREAD (MAIN LINE2) = 7

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	DRAINAGE AREA (ac) C = 0.95 C = 0.20 C = INCRE-MENT	SUBTOTAL C X A	TOTAL C X A	OVERLAND RUNOFF (cubic feet per second)	BYPASS RUNOFF (cubic feet per second)	TOTAL RUNOFF (cubic feet per second)	CROSS SLOPE (ft/ft)	LONGITUDAL SLOPE (%)	**SPREAD (ft)**	INTERCEPTED FLOW (cubic feet per second)	BYPASS FLOW (cubic feet per second)	BYPASS FLOW TO INLET NUMBER	**INLET LOCATION MAIN =1, OTHER=2**
HOMESTEAD					0.12	0.11											
610+20.00	33.25	RT	**S-313**	P 5	0.01	0.00	0.11	0.44		**0.44**	0.02	0.3	**3.32**	0.44	NONE		**1**
HOMESTEAD					0.00												
612+96.00	37.79	LT	**S-314**	DBI MOD C	0.03								**N/A**				
ADAMS					0.05												
008+90.00	18.00	RT	**S-314A**	DBI C	0.04								**N/A**				
HOMESTEAD					0.59	0.56											
615+00.00	33.25	LT	**S-315**	J 6	0.02	0.00	0.56	2.24		**2.24**	0.02	0.3	**6.11**	2.24	NONE		**1**
HOMESTEAD					0.00												
615+00.00	37.79	LT	**S-315A**	DBI MOD C	0.20								**N/A**				**1**
HOMESTEAD					0.59	0.56											
615+00.00	33.25	RT	**S-316**	P 6	0.02	0.00	0.56	2.24		**2.24**	0.02	0.3	**6.11**	2.24	NONE		**1**
HOMESTEAD					0.14	0.13											
618+00.00	33.25	LT	**S-317**	J 5	0.01	0.00	0.13	0.52		**0.52**	0.02	0.3	**7.07**	0.52	NONE		**1**
HOMESTEAD					0.00												
618+00.00	38.46	LT	**S-317A**	DBI MOD C	0.20								**N/A**				
HOMESTEAD					0.14	0.13											
618+00.00	33.25	RT	**S-318**	P 5	0.01	0.00	0.13	0.52		**0.52**	0.02	0.3	**3.53**	0.52	NONE		**1**
HOMESTEAD					0.53	0.50											
622+00.00	33.25	LT	**S-319**	J 6	0.02	0.00	0.50	2.00		**2.00**	0.02	0.3	**5.86**	2.00	NONE		**1**
HOMESTEAD					0.42	0.40											
622+00.00	33.25	RT	**S-320**	J 6	0.02	0.00	0.40	1.60		**1.60**	0.02	0.3	**5.39**	1.60	NONE		**1**
HOMESTEAD					0.11	0.10											
624+00.00	38.25	RT	**S-321**	P 5	0.00	0.00	0.10	0.40		**0.40**	0.02	0.3	**3.20**	0.40	NONE		**1**
LEELAND					0.00												
020+95.00	42.10	RT	**S-322**	MH 8	0.00								**N/A**				

FLORIDA DEPARTMENT OF TRANSPORTATION
SPREAD CALCULATIONS

Financial Project ID No. N/A County: LEE UNITS: ( ) Metric (SI) Prepared by: MAR Date: 9/8/08
Description HOMESTEAD (X) US Customary Checked by: Date:
HDR Project No. 69627

ALLOWABLE SPREAD (MAIN LINE1) = 9 RAINFALL INTENSITY = 4 inches per hour
ALLOWABLE SPREAD (MAIN LINE2) = 7

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	DRAINAGE AREA (ac) C = 0.95 C = 0.20 C = INCRE-MENT	SUBTOTAL C X A	TOTAL C X A	OVERLAND RUNOFF (cubic feet per second)	BYPASS RUNOFF (cubic feet per second)	TOTAL RUNOFF (cubic feet per second)	CROSS SLOPE (ft/ft)	LONGITUDAL SLOPE (%)	**SPREAD (ft)**	INTERCEPTED FLOW (cubic feet per second)	BYPASS FLOW (cubic feet per second)	BYPASS FLOW TO INLET NUMBER	**INLET LOCATION MAIN =1, OTHER=2**
LEELAND					0.03												
021+25.00	52.67	LT	**S-323**	DBI C	0.39								**N/A**				
LEELAND					0.20	0.19											
021+25.00	36.25	LT	**S-324**	J 6	0.00		0.19	0.76		**0.76**	0.02	0.3	**4.08**	0.76	NONE		**2**
LEELAND					0.23	0.22											
021+25.00	23.25	RT	**S-325**	P 6	0.10	0.10	0.32	1.28		**1.28**	0.02	0.3	**4.96**	1.28	NONE		**2**
LEELAND					0.02												
022+89.92	40.87	LT	**S-326**	DBI MOD C	0.09								**N/A**				
LEELAND					0.40	0.38											
022+89.92	36.25	LT	**S-327**	J 6	0.00		0.38	1.52		**1.52**	0.02	0.3	**5.28**	1.52	NONE		**2**
LEELAND					0.02												
023+56.00	40.79	LT	**S-328**	DBI C	0.18								**N/A**				
LEELAND					0.01												
024+70.00	40.79	LT	**S-329**	DBI C	0.10								**N/A**				

E.O.P. ELEVATIONS, THEORETICAL GUTTER ELEVATIONS, MIN. INVERTS

County: Lee
Description Homestead

UNIT ( ) Metric (SI)
(X) US Customary

Prepared by: MAR Date: 9/8/2008
Checked by: Date:
HDR Project No. 69627

LOCATION OF INLET			INLET NUMBER	TYPE OF STRUCTURE	PGL ELEVATION	E.O.P. ELEVATION	THEO / GRATE / RIM INLET ELEVATION	MINIMUM INVERT ELEVATION							
STATION	DISTANCE (ft)	SIDE						18"	24"	30"	36"	42"	48"	54"	60"
HOMESTEAD															
602+00.00	33.25	LT	S-300	P 6	27.91	**27.27**	27.15	23.1	22.5	22.0	20.8	20.2	19.7	19.1	18.6
HOMESTEAD															
602+00.00	33.25	RT	S-301	P 6	27.91	**27.27**	27.15	23.1	22.5	22.0	20.8	20.2	19.7	19.1	18.6
HOMESTEAD															
603+13.26	35.75	RT	S-302	JB 7		**N/A**	25.26	21.3	20.7	20.2	19.0	18.4	17.9	17.3	16.8
HOMESTEAD															
603+06.39	35.75	LT	S-302A	JB 7		**N/A**	25.04	21.0	20.4	19.9	18.7	18.1	17.6	17.0	16.5
LIVEOAK															
006+10.25	44.00	LT	S-304	MH 7		**N/A**	25.68	21.7	21.1	20.6	19.4	18.8	18.3	17.7	17.2
LIVEOAK															
007+27.67	44.00	LT	S-305	MH 7		**N/A**	25.86	21.9	21.3	20.8	19.6	19.0	18.5	17.9	17.4
LIVEOAK															
011+27.67	44.00	LT	S-306	MH 7		**N/A**	25.86	21.9	21.3	20.8	19.6	19.0	18.5	17.9	17.4
LIVEOAK															
015+27.67	44.00	LT	S-307	MH 7		**N/A**	26.50	22.5	21.9	21.4	20.2	19.6	19.1	18.5	18.0
HOMESTEAD															
606+92.72	43.00	LT	S-308	MH 7		**N/A**	27.87	23.9	23.3	22.8	21.6	21.0	20.5	19.9	19.4
HOMESTEAD															
607+50.00	33.25	LT	S-310	J 6	27.76	**27.12**	27.00	23.0	22.4	21.9	20.7	20.1	19.6	19.0	18.5
HOMESTEAD															
607+50.00	33.25	RT	S-311	P 6	27.76	**27.12**	27.00	23.0	22.4	21.9	20.7	20.1	19.6	19.0	18.5
HOMESTEAD															
609+00.00	33.25	RT	S-311A	J 5	28.21	**27.57**	27.45	23.4	22.8	22.3	21.1	20.5	20.0	19.4	18.9
HOMESTEAD															
610+20.00	33.25	LT	S-312	J 5	28.57	**27.93**	27.81	23.8	23.2	22.7	21.5	20.9	20.4	19.8	19.3

E.O.P. ELEVATIONS, THEORETICAL GUTTER ELEVATIONS, MIN. INVERTS

County: Lee
Description Homestead

UNIT ( ) Metric (SI)
(X) US Customary

Prepared by: MAR Date: 9/8/2008
Checked by: Date:
HDR Project No. 69627

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	PGL ELEVATION	E.O.P. ELEVATION	THEO / GRATE / RIM INLET ELEVATION	MINIMUM INVERT ELEVATION 18"	24"	30"	36"	42"	48"	54"	60"
HOMESTEAD 610+20.00	33.25	RT	**S-313**	J 5	28.57	**27.93**	27.81	23.8	23.2	22.7	21.5	20.9	20.4	19.8	19.3
HOMESTEAD 612+96.00	37.79	LT	**S-314**	DBI MOD C	28.38	**N/A**	26.65	22.7	22.1	21.6	20.4	19.8	19.3	18.7	18.2
ADAMS 008+90.00	18.00	RT	**S-314A**	DBI C	27.34	**N/A**	25.20	21.2	20.6	20.1	18.9	18.3	17.8	17.2	16.7
HOMESTEAD 615+00.00	33.25	LT	**S-315**	J 6	27.56	**26.92**	26.80	22.8	22.2	21.7	20.5	19.9	19.4	18.8	18.3
HOMESTEAD 615+00.00	37.79	LT	**S-315A**	DBI MOD C	27.56	**N/A**	27.27	23.3	22.7	22.2	21.0	20.4	19.9	19.3	18.8
HOMESTEAD 615+00.00	33.25	RT	**S-316**	P 6	27.56	**26.92**	26.80	22.8	22.2	21.7	20.5	19.9	19.4	18.8	18.3
HOMESTEAD 618+00.00	33.25	LT	**S-317**	J 5	28.46	**27.82**	27.70	23.7	23.1	22.6	21.4	20.8	20.3	19.7	19.2
HOMESTEAD 618+00.00	38.46	LT	**S-317A**	DBI MOD C	28.46	**N/A**	26.73	22.7	22.1	21.6	20.4	19.8	19.3	18.7	18.2
HOMESTEAD 618+00.00	33.25	RT	**S-318**	P 5	28.46	**27.82**	27.70	23.7	23.1	22.6	21.4	20.8	20.3	19.7	19.2
HOMESTEAD 622+00.00	33.25	LT	**S-319**	J 6	27.91	**27.27**	27.15	23.1	22.5	22.0	20.8	20.2	19.7	19.1	18.6
HOMESTEAD 622+00.00	33.25	RT	**S-320**	J 6	27.91	**27.27**	27.15	23.1	22.5	22.0	20.8	20.2	19.7	19.1	18.6
HOMESTEAD 624+00.00	38.25	RT	**S-321**	P 5	28.51	**27.87**	28.06	24.1	23.5	23.0	21.8	21.2	20.7	20.1	19.6
LEELAND 020+95.00	42.10	RT	**S-322**	MH 8	27.63	**N/A**	27.65	23.7	23.1	22.6	21.4	20.8	20.3	19.7	19.2

E.O.P. ELEVATIONS, THEORETICAL GUTTER ELEVATIONS, MIN. INVERTS

County: Lee
Description Homestead

UNIT ( ) Metric (SI)
(X) US Customary

Prepared by: MAR Date: 9/8/2008
Checked by: Date:
HDR Project No. 69627

LOCATION OF INLET			INLET NUMBER	TYPE OF STRUCTURE	PGL ELEVATION	E.O.P. ELEVATION	THEO / GRATE / RIM INLET ELEVATION	MINIMUM INVERT ELEVATION							
STATION	DISTANCE (ft)	SIDE						18"	24"	30"	36"	42"	48"	54"	60"
LEELAND															
021+25.00	52.67	LT	S-323	DBI C	27.54	N/A	25.28	21.3	20.7	20.2	19.0	18.4	17.9	17.3	16.8
LEELAND															
021+25.00	36.25	LT	S-324	J 6	27.54	27.76	27.64	23.6	23.0	22.5	21.3	20.7	20.2	19.6	19.1
LEELAND															
021+25.00	23.25	RT	S-325	P 6	27.54	27.10	26.98	23.0	22.4	21.9	20.7	20.1	19.6	19.0	18.5
LEELAND															
022+89.92	40.87	LT	S-326	DBI MOD C	27.74	N/A	25.99	22.0	21.4	20.9	19.7	19.1	18.6	18.0	17.5
LEELAND															
022+89.92	36.25	LT	S-327	J 6	27.74	27.08	26.96	23.0	22.4	21.9	20.7	20.1	19.6	19.0	18.5
LEELAND															
023+56.00	40.79	LT	S-328	DBI C	27.93	N/A	26.10	22.1	21.5	21.0	19.8	19.2	18.7	18.1	17.6
LEELAND															
024+70.00	40.79	LT	S-329	DBI C	28.28	N/A	26.50	22.5	21.9	21.4	20.2	19.6	19.1	18.5	18.0

FLORIDA DEPARTMENT OF TRANSPORTATION

STORM DRAIN TABULATION FORM (8/00)

Financial Project ID No. | County: LEE | UNITS: ( ) Metric [SI] | Revised by: LSP Date: 6/20/08
Description: HOMESTEAD ROAD | (X) US customary | Checked by: MAR Date: 9/9/08
HDR Project No.

LOCATION OF UPPER END			UPPER / LOWER STRUCTURE NUMBER	INLET TYPE	TYPE OF STRUCTURE	TYPE OF LINE	LENGTH (ft)	Drainage Area (ac) C= 0.95 / C= 0.20 / C= 0.60		SUB Total (CA)	Tc (min)	Time in Section (min)	Intensity (in/hr)	TOTAL C x A	TOTAL RUNOFF (cfs)	Manhole, Inlet & Gutter Elev. (ft)	HYD. GRADIENT Crown EL. / Flow Line EL.			Diam. (in.)	HYD. GRAD. Physical Min. Phys. Slope (%)	Velocity (fps)	ZONE or COUNTY: LEE / FREQUENCY: 10-YEAR / NOTES: Manning's n = 0.012 / USING TW= 24 / REMARKS	EDGE OF PAVEMENT, GRATE OR MH ELEVATION	CHECKS		
STATION	DISTANCE (ft)	SIDE						Increment	SUB Total								Upper	Lower	^FALL (feet)									
HOMESTEAD			**S-300**	**CI**	**P** 6	S	66.5	0.46	0.46	0.44	10.0	0.3	7.45	0.44	**3.28**	27.1	24.7	24.3	0.20	18	0.30	3.54		27.27	INLET - HGL : 2.36	V(norm)= 3.54	K= 0.00
602+00.00	33.25	LT						0.02	0.02	0.00							24.7	24.5			0.30				Partial Flow? **YES**	d/D = 1.00	LOSS = 0.00
			S-301							*0.00*							23.2	23.0	0.20		0.15				COVER = 2.36	Qfull = 6.26	Calc d/D 0.51
HOMESTEAD			**S-301**	**CI**	**P** 6	M	103.3	0.46	0.92	0.87	10.3	0.5	7.37	0.88	**6.50**	27.1	24.3	24.0	0.33	18	0.32	3.68		27.27	INLET - HGL : 2.73		K= 0.00
602+00.00	33.25	RT						0.02	0.04	0.01							24.0	22.7			1.26				Partial Flow? NO		LOSS = 0.00
			S-302							*0.00*							22.5	21.2	1.30		0.15				COVER = 3.06		Calc d/D
HOMESTEAD			**S-302**	**JB**	**J** 7	M	17.0	0.00	0.92	0.87	10.8	0.6	7.26	0.88	**6.41**	25.3	**24.0**	24.0	0.00	DBL 34X53	0.00	0.50	INV 12" WM = 22.32	25.26	INLET - HGL : 1.26		K= 0.00
603+13.26	35.75	RT						0.00	0.04	0.01							22.6	22.3			1.65				Partial Flow? NO		LOSS = 0.00
			CANAL							*0.00*							19.8	19.5	0.28		0.04				COVER = 2.65		Calc d/D
HOMESTEAD			**S-302A**	**JB**	**J** 7	S	17.0	0.00	0.00	0.00	11.4	#DIV/0!	7.14	0.00	**0.00**	25.0	**24.0**	24.0	0.00	DBL 34X53		0.00		25.04	INLET - HGL : 1.04		K= 0.00
603+06.39	35.75	LT						0.00	0.00	0.00							22.8	22.8			0.06				Partial Flow? NO	1.00	LOSS = 0.00
			MES							*0.00*							20.0	20.0	0.01		0.04				COVER = 2.20		Calc d/D
LEELAND			**S-329**	**DBI**	**MOD** C	S	114.0	0.01	0.01	0.01	10.0	1.6	7.45	0.03	**0.22**	26.5	25.0	24.8	0.04	18	0.04	1.22		26.50	INLET - HGL : 1.50	V(norm)= 1.22	K= 0.00
024+70.00	40.79	LT						0.10	0.10	0.02							25.0	24.8			0.18				Partial Flow? **YES**	d/D = 1.00	LOSS = 0.00
			S-328							*0.00*							23.5	23.3	0.20		0.15				COVER = 1.50	Qfull = 4.78	Calc d/D 0.12
LEELAND			**S-328**	**DBI**	**MOD** C	S	66.2	0.02	0.03	0.03	11.6	0.4	7.10	0.08	**0.60**	26.1	24.8	0.0	0.15	18	0.23	3.07		26.10	INLET - HGL : 1.30	V(norm)= 3.07	K= 0.00
023+56.00	40.79	LT						0.18	0.28	0.06							24.8	24.2			0.91				Partial Flow? **YES**	d/D = 1.00	LOSS = 0.00
			S-326							*0.00*							23.3	22.7	0.60		0.15				COVER = **1.30**	Qfull = 10.86	Calc d/D 0.14
LEELAND			**S-326**	**DBI**	**MOD** C	S	0.0	0.02	0.02	0.02	10.0	0.0				26.0					0.01		PARTIAL	25.99			
022+89.92	40.87	LT						0.09	0.09	0.02													12" FM ADJACENT TO STRUCT.				
			S-327							*0.00*							22.7	22.7									
LEELAND			**S-327**	**CI**	**J** 6	S	169.4	0.40	0.45	0.43	12.0	1.4	7.02	0.50	**3.52**	26.9	25.8	25.7	0.16	18	0.09	1.99		27.08	INLET - HGL : 1.03		K= 0.00
022+89.92	36.25	LT						0.00	0.37	0.07							24.2	23.8			0.24				Partial Flow? NO		LOSS = 0.00
			S-324							*0.00*							22.7	22.3	0.40		0.15				COVER = 2.67		Calc d/D
LEELAND			**EXIST. INLET**	**DBI**	C	M	194.9	0.13	0.13	0.12	13.4	1.8	6.76	0.14	**0.93**	27.0	25.7	25.6	0.10	24	0.05	1.78		26.95	INLET - HGL : 1.27		K= 0.00
023+24.43	23.24	RT						0.07	0.07	0.01							25.3	25.1			0.12		EXISTING INLET AND PIPE		Partial Flow? NO	1.00	LOSS = 0.00
			S-325							*0.00*							23.3	23.1	0.24		0.10		TO REMAIN		COVER = 1.65		Calc d/D
LEELAND			**S-323**	**DBI**	C	S	17.4	0.03	0.03	0.03	10.0	0.0	7.45	0.11	**0.79**	25.3	**25.7**	25.7	0.00	18	0.00	0.45		25.28	INLET - HGL : **-0.43**		K= 0.00
021+25.00	52.67	LT						0.39	0.39	0.08							23.9	23.8			0.57				Partial Flow? NO		LOSS = 0.00
			S-324							*0.00*							22.4	22.3	0.10		0.15				COVER = **1.38**		Calc d/D
LEELAND			**S-324**	**CI**	**J** 6	S	59.5	0.20	0.68	0.65	13.4	0.3	6.76	0.80	**5.39**	27.6	25.7	25.6	0.13	18	0.22	3.05		27.76	INLET - HGL : 1.84		K= 0.00
021+25.00	36.25	LT						0.00	0.76	0.15							23.8	23.6			0.34				Partial Flow? NO		LOSS = 0.00
			S-325							*0.00*							22.3	22.1	0.20		0.15				COVER = 3.75		Calc d/D
LEELAND			**S-325**	**CI**	**P** 6	M	32.4	0.23	1.04	0.99	15.2	0.2	6.46	1.17	**7.58**	26.9	25.6	25.5	0.03	24	0.09	2.41		27.10	INLET - HGL : 1.31		K= 0.00
021+25.00	23.25	RT						0.10	0.93	0.19							24.1	24.0			0.31				Partial Flow? NO		LOSS = 0.00
			S-322							*0.00*							22.1	22.0	0.10		0.10				COVER = 2.79		Calc d/D
LEELAND			**S-322**	**MH**	**P** 8	M	42.0	0.00	1.04	0.99	15.4	0.3	6.43	1.17	**7.54**	27.7	25.5	25.5	0.04	24	0.09	2.40		27.65	INLET - HGL : 2.10		K= 0.00
020+95.00	42.10	RT						0.00	0.93	0.19							24.0	23.9			0.24				Partial Flow? NO		LOSS = 0.00
			S-321							*0.00*							22.0	21.9	0.10		0.10				COVER = 3.65		Calc d/D
HOMESTEAD			**S-321**	**CI**	**P** 5	M	200.0	0.11	1.15	1.09	15.7	2.0	6.38	1.28	**8.16**	27.9	25.5	25.4	0.07	30	0.03	1.66		28.06	INLET - HGL : 2.34		K= 0.00
624+00.00	38.25	RT						0.00	0.93	0.19							24.4	24.1			0.15				Partial Flow? NO		LOSS = 0.00
			S-320							*0.00*							21.9	21.6	0.30		0.08				COVER = 3.45		Calc d/D

FLORIDA DEPARTMENT OF TRANSPORTATION
STORM DRAIN TABULATION FORM (8/00)

Financial Project ID No. | County: LEE | UNITS: ( ) Metric [SI] | Revised by: LSP Date: 6/20/08
Description: HOMESTEAD ROAD | (X) US customary | Checked by: MAR Date: 9/9/08
HDR Project No.

LOCATION OF UPPER END			UPPER / LOWER STRUCTURE NUMBER	INLET TYPE	TYPE OF STRUCTURE	TYPE OF LINE	LENGTH (ft)	Drainage Area (ac) C= 0.95 / C= 0.20 / C= 0.60			Tc (min)	Time in Section (min)	Intensity (in/hr)	TOTAL C x A	TOTAL RUNOFF (cfs)	Manhole, Inlet & Gutter Elev. (ft)	HYD. GRADIENT Crown EL. / Flow Line EL.			Diam. (in.)	HYD. GRAD. Physical Min. Phys. Slope (%)	Velocity (fps)	ZONE or COUNTY: LEE / FREQUENCY: 10-YEAR / NOTES: Manning's n = 0.012 / USING TW= 24 / REMARKS	EDGE OF PAVEMENT, GRATE OR MH ELEVATION	CHECKS
STATION	DISTANCE (ft)	SIDE						Increment	SUB Total	SUB Total (CA)							Upper	Lower	^FALL (feet)					
HOMESTEAD			**S-320**	**CI**	**J** 6	M	66.5	0.42	1.57	1.49							25.4	25.4	0.04		0.05				INLET - HGL : 1.62 K= 0.00
622+00.00	33.25	RT						0.02	0.95	0.19	17.7	0.5	6.09	1.68	**10.25**	27.1	24.1	23.9	0.20	30	0.30	2.09		27.27	Partial Flow? NO LOSS = 0.00
			S-319							*0.00*							21.6	21.4			0.08				COVER = 2.96 Calc d/D
HOMESTEAD			**S-319**	**CI**	**J** 6	M	400.0	0.53	2.10	2.00							25.4	25.3	0.13		0.03				INLET - HGL : 1.66 K= 0.00
622+00.00	33.25	LT						0.02	0.97	0.19	18.2	3.6	6.03	2.19	**13.20**	27.1	24.4	24.0	0.40	36	0.10	1.87		27.27	Partial Flow? NO LOSS = 0.00
			S-317							*0.00*							21.4	21.0			0.06				COVER = 2.66 Calc d/D
HOMESTEAD			**S-318**	**CI**	**P** 5	S	66.5	0.14	0.14	0.13							25.3	25.3	0.01		0.01				INLET - HGL : 2.33 K= 0.00
618+00.00	33.25	RT						0.01	0.01	0.00	10.0	1.9	7.45	0.14	**1.01**	27.6	24.5	24.0	0.50	18	0.75	0.57		27.82	Partial Flow? NO LOSS = 0.00
			S-317							*0.00*							23.0	22.5			0.15				COVER = 3.11 Calc d/D
HOMESTEAD			**S-317A**	**DBI**	**MOD** C	S	0.0	0.00	0.00	0.00							25.3	25.3	0.00		0.01		PARTIAL		
618+00.00	38.46	LT						0.20	0.20	0.04	10.0	0.0				26.7	21.0	21.0	0.00					26.73	
			S-317							*0.00*							21.0	21.0							
HOMESTEAD			**S-317**	**CI**	**J** 5	M	300.0	0.14	2.38	2.26							25.3	25.2	0.11		0.04				INLET - HGL : 2.34 K= 0.00
618+00.00	33.25	LT						0.01	1.19	0.24	21.8	2.5	5.60	2.50	**14.00**	27.6	24.0	23.7	0.30	36	0.10	1.98		27.82	Partial Flow? NO LOSS = 0.00
			S-315							*0.00*							21.0	20.7			0.06				COVER = 3.61 Calc d/D
HOMESTEAD			**S-316**	**CI**	**P** 6	S	66.5	0.59	0.59	0.56							25.3	25.2	0.09		0.14				INLET - HGL : 1.46 K= 0.00
615+00.00	33.25	RT						0.02	0.02	0.00	10.0	0.5	7.45	0.56	**4.20**	26.7	23.5	23.0	0.50	18	0.75	2.38		26.92	Partial Flow? NO LOSS = 0.00
			S-315							*0.00*							22.0	21.5			0.15				COVER = 3.21 Calc d/D
HOMESTEAD			**S-315A**	**DBI**	**MOD** C	S	0.0	0.00	0.00	0.00							25.2	25.2	0.00		0.01		PARTIAL		
615+00.00	37.79	LT						0.20	0.20	0.04	10.0	0.0				27.3	20.7	20.7	0.00					27.27	
			S-315							*0.00*							20.7	20.7							
HOMESTEAD			**S-315**	**CI**	**J** 6	M	204.1	0.59	3.56	3.38							25.2	25.0	0.15		0.07				INLET - HGL : 1.55 K= 0.00
615+00.00	33.25	LT						0.02	1.43	0.29	24.3	1.2	5.34	3.67	**19.61**	26.7	23.7	23.4	0.30	36	0.15	2.77		26.92	Partial Flow? NO LOSS = 0.00
			S-314							*0.00*							20.7	20.4			0.06				COVER = 3.01 Calc d/D
ADAMS			**S-314A**	**DBI**	C	S	79.9	0.05	0.05	0.05							25.0	25.0	0.00		0.00		critical inlet		INLET - HGL : **0.19** K= 0.00
008+90.00	18.00	RT						0.04	0.04	0.01	10.0	5.7	7.45	0.06	**0.41**	25.2	22.2	21.9	0.30	18	0.38	0.23	top of swale =26.25	25.20	Partial Flow? NO LOSS = 0.00
			S-314							*0.00*							20.7	20.4			0.15				COVER = 3.00 Calc d/D
HOMESTEAD			**S-314**	**DBI**	**MOD** C	M	276.0	0.00	3.61	3.43							25.0	24.8	0.20		0.07				INLET - HGL : 1.64 K= 0.00
612+96.00	37.79	LT						0.03	1.50	0.30	25.5	1.7	5.23	3.73	**19.51**	26.7	23.4	23.2	0.20	36	0.07	2.76		26.65	Partial Flow? NO LOSS = 0.00
			S-312							*0.00*							20.4	20.2			0.06				COVER = 3.25 Calc d/D
HOMESTEAD			**S-311A**	**CI**	**J** 5	S	120.6	0.11	0.11	0.10							24.8	24.8	0.01		0.00				INLET - HGL : 2.53 K= 0.00
609+00.00	33.25	RT						0.01	0.01	0.00	10.0	4.5	7.45	0.11	**0.79**	27.4	23.7	23.5	0.20	18	0.17	0.45		27.57	Partial Flow? NO LOSS = 0.00
			S-313							*0.00*							22.2	22.0			0.15				COVER = 3.66 Calc d/D
HOMESTEAD			**S-313**	**CI**	**J** 5	S	66.5	0.12	0.23	0.22							24.8	24.8	0.01		0.02				INLET - HGL : 2.90 K= 0.00
610+20.00	33.25	RT						0.01	0.02	0.00	14.5	1.3	6.57	0.22	**1.46**	27.7	23.5	23.2	0.30	18	0.45	0.83		27.93	Partial Flow? NO LOSS = 0.00
			S-312							*0.00*							22.0	21.7			0.15				COVER = 4.22 Calc d/D

FLORIDA DEPARTMENT OF TRANSPORTATION
STORM DRAIN TABULATION FORM (8/00)

Financial Project ID No. | County: LEE | UNITS: ( ) Metric [SI] | Revised by: LSP Date: 6/20/08
Description: HOMESTEAD ROAD | (X) US customary | Checked by: MAR Date: 9/9/08
HDR Project No.

LOCATION OF UPPER END			UPPER / LOWER STRUCTURE NUMBER	INLET TYPE	TYPE OF STRUCTURE	TYPE OF LINE	LENGTH (ft)	Drainage Area (ac) C= 0.95 / C= 0.20 / C= 0.60		SUB Total (CA)	Tc (min)	Time in Section (min)	Intensity (in/hr)	TOTAL C x A	TOTAL RUNOFF (cfs)	Manhole, Inlet & Gutter Elev. (ft)	HYD. GRADIENT Crown EL. / Flow Line EL.			Diam. (in.)	HYD. GRAD. Physical Min. Phys. Slope (%)	Velocity (fps)	ZONE or COUNTY: LEE / FREQUENCY: 10-YEAR / NOTES: Manning's n = 0.012 / USING TW= 24 / REMARKS	EDGE OF PAVEMENT, GRATE OR MH ELEVATION	CHECKS		
STATION	DISTANCE (ft)	SIDE						Increment	SUB Total								Upper	Lower	^FALL (feet)								
HOMESTEAD			**S-312**	**CI**	**J** 5	M	269.4	0.12	3.96	3.76	27.2	1.5	5.08	4.07	**20.67**	27.7	24.8	24.6	0.22	36	0.08	2.92		27.93	INLET - HGL : 2.91		K= 0.00
610+20.00	33.25	LT						0.01	1.53	0.31							23.2	23.0	0.20		0.07				Partial Flow? NO		LOSS = 0.00
			S-310							*0.00*							20.2	20.0			0.06				COVER = 4.52		Calc d/D
HOMESTEAD			**S-311**	**CI**	**P** 6	S	66.5	0.36	0.36	0.34	10.0	0.8	7.45	0.35	**2.58**	26.9	24.6	24.6	0.03	18	0.05	1.46		27.12	INLET - HGL : 2.29		K= 0.00
607+50.00	33.25	RT						0.02	0.02	0.00							24.0	23.5	0.50		0.75				Partial Flow? NO		LOSS = 0.00
			s-310							*0.00*							22.5	22.0			0.15				COVER = 2.91		Calc d/D
HOMESTEAD			**S-310**	**CI**	**J** 6	M	56.9	0.45	4.77	4.53	28.7	0.4	4.96	4.84	**24.01**	26.9	24.6	24.6	0.03	42	0.05	2.50		27.12	INLET - HGL : 2.32		K= 0.00
607+50.00	33.25	LT						0.01	1.56	0.31							23.5	23.3	0.20		0.35				Partial Flow? NO		LOSS = 0.00
			S-308							*0.00*							20.0	19.8			0.05				COVER = 3.41		Calc d/D
HOMESTEAD			**S-308**	**MH**	**J** 7	M	372.4	0.00	4.77	4.53	29.1	2.5	4.92	4.84	**23.85**	27.9	24.6	24.4	0.18	42	0.05	2.48		27.87	INLET - HGL : 3.30		K= 0.00
606+92.72	43.00	LT						0.00	1.56	0.31							23.3	23.1	0.20		0.05				Partial Flow? NO		LOSS = 0.00
			S-307							*0.00*							19.8	19.6			0.05				COVER = 4.57		Calc d/D
LIVEOAK CANAL			**S-307**	**MH**	**J** 7	M	400.0	0.00	4.77	4.53	31.6	2.8	4.73	4.84	**22.93**	26.5	24.4	24.2	0.18	42	0.04	2.38		26.50	INLET - HGL : 2.11		K= 0.00
015+27.67	44.00	LT						0.00	1.56	0.31							23.1	22.9	0.20		0.05				Partial Flow? NO		LOSS = 0.00
			S-306							*0.00*							19.6	19.4			0.05				COVER = 3.40		Calc d/D
LIVEOAK CANAL			**S-306**	**MH**	**J** 7	M	400.0	0.00	4.77	4.53	34.4	2.9	4.54	4.84	**21.99**	25.9	24.2	24.1	0.16	42	0.04	2.29		25.86	INLET - HGL : 1.65		K= 0.00
011+27.67	44.00	LT						0.00	1.56	0.31							22.9	22.7	0.20		**0.05**				Partial Flow? NO		LOSS = 0.00
			S-305							*0.00*							19.4	19.2			0.05				COVER = 2.96		Calc d/D
LIVEOAK CANAL			**S-305**	**MH**	**J** 7	M	117.4	0.00	4.77	4.53	37.3	0.9	4.36	4.84	**21.10**	25.9	24.1	24.0	0.04	42	0.04	2.19		25.86	INLET - HGL : 1.81		K= 0.00
007+27.67	44.00	LT						0.00	1.56	0.31							22.7	22.6	0.10		0.09				Partial Flow? NO		LOSS = 0.00
			S-304							*0.00*							19.2	19.1			0.05				COVER = 3.16		Calc d/D
LIVEOAK CANAL			**S-304**	**MH**	**J** 7	M	18.0	0.00	4.77	4.53	38.2	0.1	4.30	4.84	**20.84**	25.7	24.0	24.0	0.01	42	0.04	2.17	LIVEOAK	25.68	INLET - HGL : 1.67		K= 0.00
006+10.25	44.00	LT						0.00	1.56	0.31							22.6	22.5	0.10		0.56				Partial Flow? NO		LOSS = 0.00
			MES							*0.00*							19.1	19.0			0.05				COVER = 3.08		Calc d/D

400 BASIN DESIGN DOCUMENTATION

FLORIDA DEPARTMENT OF TRANSPORTATION
SPREAD CALCULATIONS

Financial Project ID No. N/A County: LEE UNITS: ( ) Metric (SI) Prepared by: MAR Date: 9/3/08
Description HOMESTEAD (X) US Customary Checked by: Date:
HDR Project No. 69627

ALLOWABLE SPREAD (MAIN LINE1) = 9 RAINFALL INTENSITY = 4 inches per hour
ALLOWABLE SPREAD (MAIN LINE2) = 7

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	DRAINAGE AREA (ac) C = 0.95 C = 0.20 C = INCRE-MENT	SUBTOTAL C X A	TOTAL C X A	OVERLAND RUNOFF (cubic feet per second)	BYPASS RUNOFF (cubic feet per second)	TOTAL RUNOFF (cubic feet per second)	CROSS SLOPE (ft/ft)	LONGITUDAL SLOPE (%)	SPREAD (ft)	INTERCEPTED FLOW (cubic feet per second)	BYPASS FLOW (cubic feet per second)	BYPASS FLOW TO INLET NUMBER	INLET LOCATION MAIN =1, OTHER=2
ALABAMA																	
16+28.24	22.93	LT	**S-400**	DBI MOD C	0.03 0.10								**N/A**				
ALABAMA					0.17	0.16											
16+28.24	18.39	LT	**S-401**	J 6	0.00	0.00	0.16	0.64		**0.64**	0.02	0.3	**3.82**	0.64	NONE		**2**
ALABAMA					0.21	0.20											
16+13.00	17.98	RT	**S-402**	P 6	0.01	0.00	0.20	0.80		**0.80**	0.02	0.3	**4.15**	0.80	NONE		**2**
ALABAMA					0.36												
17+20.00	32.26	LT	**S-403**	DBI MOD C	0.03								**N/A**				
ALABAMA					0.00												
018+50.00	43.00	LT	**S-404**	MH 8	0.00								**N/A**				
ALABAMA					0.00												
018+97.60	33.27	LT	**S-405**	DBI MOD C	0.10								**N/A**				
ALABAMA					0.42	0.40											
18+97.60	17.75	RT	**S-406**	P 6	0.02	0.00	0.40	1.60		**1.60**	0.02	0.4	**5.10**	1.60	NONE		**2**
HOMESTEAD					0.00												
626+40.00	39.79	LT	**S-407**	DBI MOD C	0.38								**N/A**				
HOMESTEAD					0.09	0.08											
626+40.00	35.25	RT	**S-408**	J 5	0.00	0.00	0.08	0.32		**0.32**	0.02	0.4	**5.58**	0.32	NONE		**2**
HOMESTEAD					0.01												
626+40.00	50.00	RT	**S-409**	DBI C	0.10								**N/A**				
HOMESTEAD					0.65	0.61											
628+00.00	35.25	LT	**S-410**	J 6	0.02	0.00	0.61	2.44		**2.44**	0.02	0.3	**6.31**	2.44	NONE		**2**
HOMESTEAD					0.50	0.48											
628+00.00	35.25	RT	**S-411**	P 6	0.02	0.00	0.48	1.92		**1.92**	0.02	0.3	**5.77**	1.92	NONE		**2**
HOMESTEAD					0.00												
628+52.43	24.50	LT	**S-412**	MH 8	0.00								**N/A**				

FLORIDA DEPARTMENT OF TRANSPORTATION

SPREAD CALCULATIONS

Financial Project ID No. N/A County: LEE UNITS: ( ) Metric (SI) Prepared by: MAR Date: 9/3/08
Description HOMESTEAD (X) US Customary Checked by: Date:
HDR Project No. 69627

ALLOWABLE SPREAD (MAIN LINE1) = 9 RAINFALL INTENSITY = 4 inches per hour
ALLOWABLE SPREAD (MAIN LINE2) = 7

LOCATION OF INLET STATION	DISTANCE (ft)	SIDE	INLET NUMBER	TYPE OF STRUCTURE	DRAINAGE AREA (ac) C = 0.95 C = 0.20 C = INCRE-MENT	SUBTOTAL C X A	TOTAL C X A	OVERLAND RUNOFF (cubic feet per second)	BYPASS RUNOFF (cubic feet per second)	TOTAL RUNOFF (cubic feet per second)	CROSS SLOPE (ft/ft)	LONGITUDAL SLOPE (%)	SPREAD (ft)	INTERCEPTED FLOW (cubic feet per second)	BYPASS FLOW (cubic feet per second)	BYPASS FLOW TO INLET NUMBER	INLET LOCATION MAIN =1, OTHER=2
HOMESTEAD					0.09												
629+00.00	39.79	RT	**S-413**	DBI MOD C	0.39								**N/A**				
HOMESTEAD					0.51												
630+44.00	34.04	LT	**S-414**	DBI MOD C	0.22								**N/A**				
HOMESTEAD					0.35												
631+20.00	37.63	RT	**S-415**	DBI MOD C	0.05								**N/A**				
HOMESTEAD					0.50												
631+56.41	39.86	RT	**S-417**	JB 7	1.24								**N/A**				

E.O.P. ELEVATIONS, THEORETICAL GUTTER ELEVATIONS, MIN. INVERTS

County: Lee
Description Homestead

UNIT ( ) Metric (SI)
(X) US Customary

Prepared by: MAR Date: 8/29/2008
Checked by: Date:
HDR Project No. 69627

LOCATION OF INLET			INLET NUMBER	TYPE OF STRUCTURE	PGL ELEVATION	E.O.P. ELEVATION	THEO / GRATE / RIM INLET ELEVATION	MINIMUM INVERT ELEVATION							
STATION	DISTANCE (ft)	SIDE						18"	24"	30"	36"	42"	48"	54"	60"
ALABAMA															
16+28.24	22.93	LT	S-400	DBI MOD C	28.14	N/A	27.22	23.2	22.6	22.1	20.9	20.3	19.8	19.2	18.7
ALABAMA															
16+28.24	18.39	LT	S-401	J 6	28.14	27.81	27.69	23.7	23.1	22.6	21.4	20.8	20.3	19.7	19.2
ALABAMA															
16+13.00	17.80	RT	S-402	P 6	28.09	27.76	27.63	23.6	23.0	22.5	21.3	20.7	20.2	19.6	19.1
ALABAMA															
17+20.00	32.26	LT	S-403	DBI MOD C	28.41	N/A	27.00	23.0	22.4	21.9	20.7	20.1	19.6	19.0	18.5
ALABAMA															
018+50.00	43.00	LT	S-404	MH 8	27.85	N/A	27.89	23.9	23.3	22.8	21.6	21.0	20.5	19.9	19.4
ALABAMA															
018+97.60	33.27	LT	S-405	DBI MOD C	27.71	N/A	27.42	23.4	22.8	22.3	21.1	20.5	20.0	19.4	18.9
ALABAMA															
18+97.60	17.75	RT	S-406	P 6	27.71	27.38	27.38	23.4	22.8	22.3	21.1	20.5	20.0	19.4	18.9
HOMESTEAD															
626+40.00	39.79	LT	S-407	DBI MOD C	28.60	N/A	26.93	22.9	22.3	21.8	20.6	20.0	19.5	18.9	18.4
HOMESTEAD															
626+40.00	35.25	RT	S-408	J 5	28.60	28.36	28.24	24.2	23.6	23.1	21.9	21.3	20.8	20.2	19.7
HOMESTEAD															
626+40.00	50.00	RT	S-409	DBI C	28.60	N/A	26.35	22.4	21.8	21.3	20.1	19.5	19.0	18.4	17.9
HOMESTEAD															
628+00.00	35.25	LT	S-410	J 6	27.96	27.28	27.16	23.2	22.6	22.1	20.9	20.3	19.8	19.2	18.7
HOMESTEAD															
628+00.00	35.25	RT	S-411	P 6	27.96	27.72	27.60	23.6	23.0	22.5	21.3	20.7	20.2	19.6	19.1
HOMESTEAD															
628+52.43	24.50	LT	S-412	MH 8	28.12	N/A	27.63	23.6	23.0	22.5	21.3	20.7	20.2	19.6	19.1

E.O.P. ELEVATIONS, THEORETICAL GUTTER ELEVATIONS, MIN. INVERTS

County: Lee
Description Homestead

UNIT ( ) Metric (SI)
(X) US Customary

Prepared by: MAR Date: 8/29/2008
Checked by: Date:
HDR Project No. 69627

LOCATION OF INLET			INLET NUMBER	TYPE OF STRUCTURE	PGL ELEVATION	E.O.P. ELEVATION	THEO / GRATE / RIM INLET ELEVATION	MINIMUM INVERT ELEVATION							
STATION	DISTANCE (ft)	SIDE						18"	24"	30"	36"	42"	48"	54"	60"
HOMESTEAD			S-413	DBI MOD C	28.26	N/A	26.93	22.9	22.3	21.8	20.6	20.0	19.5	18.9	18.4
629+00.00	39.79	RT													
HOMESTEAD			S-414	DBI MOD C	28.70	N/A	25.73	21.7	21.1	20.6	19.4	18.8	18.3	17.7	17.2
630+44.00	34.04	LT													
HOMESTEAD			S-415	DBI MOD C	28.43	N/A	27.13	23.1	22.5	22.0	20.8	20.2	19.7	19.1	18.6
631+20.00	37.63	RT													
HOMESTEAD			S-417	JB	28.29	N/A	27.29	23.3	22.7	22.2	21.0	20.4	19.9	19.3	18.8
631+56.41	39.86	RT													

FLORIDA DEPARTMENT OF TRANSPORTATION

STORM DRAIN TABULATION FORM (8/00)

Financial Project ID No. | County: LEE | UNITS: ( ) Metric [SI] (X) US customary | Revised by: MAR Date: 12.28.07 | Checked by: MAR Date: 9/8/08

Description: HOMESTEAD ROAD | HDR Project No.

LOCATION OF UPPER END STATION	DISTANCE (ft)	SIDE	UPPER/LOWER STRUCTURE NUMBER	INLET TYPE	TYPE OF STRUCTURE	TYPE OF LINE	LENGTH (ft)	Drainage Area (ac) C= 0.95 Increment	C= 0.20 SUB Total	C= 0.60 SUB Total (CA)	Tc (min)	Time in Section (min)	Intensity (in/hr)	TOTAL C x A	TOTAL RUNOFF (cfs)	Manhole, Inlet & Gutter Elev. (ft)	HYD. GRADIENT Crown EL. Upper	Crown EL. Lower	Flow Line EL. ^FALL (feet)	Diam. (in.)	HYD. GRAD. Physical Min. Phys. Slope (%)	Velocity (fps)	REMARKS	EDGE OF PAVEMENT, GRATE OR MH ELEVATION	CHECKS
																							ZONE or COUNTY: LEE		
																							FREQUENCY: 10-YEAR		
																							NOTES:		
																							Manning's n = 0.012		
																							USING TW= 22.7		
ALABAMA			**S-402**	**CI**	**P** 6	S	39.3	0.21	0.21	0.20	10.0	0.8	7.45	0.20	**1.50**	27.6	27.1	27.0	0.01	18	0.02	0.85		27.76	INLET - HGL 0.50 K= 0.00
016+13.00	17.98	RT						0.01	0.01	0.00							24.5	24.3	0.20		0.51				Partial Flow? NO LOSS = 0.00
			S-401							*0.00*							23.0	22.8			0.15				COVER = 3.05 Calc d/D
ALABAMA			**S-400**	**DBI**	**MOD** C	S	0.0	0.03	0.03	0.03	10.0	0.0				27.2	**27.0**	27.0	0.00		0.01		PARTIAL	27.22	INLET - HGL K= 0.00
016+28.24	22.93	LT						0.10	0.10	0.02							22.8	22.8	0.00						Partial Flow? LOSS = 0.00
			S-401							*0.00*							22.8	22.8							COVER = 4.42 Calc d/D
ALABAMA			**S-401**	**CI**	**J** 6	M	92.8	0.17	0.41	0.39	10.8	0.9	7.27	0.41	**2.99**	27.6	27.0	27.0	0.06	18	0.07	1.69		27.81	INLET - HGL 0.55 K= 0.00
016+28.24	18.39	LT						0.00	0.11	0.02							24.3	24.0	0.30		0.32				Partial Flow? NO LOSS = 0.00
			S-403							*0.00*							22.8	22.5			0.15				COVER = 3.30 Calc d/D
ALABAMA			**S-403**	**DBI**	**MOD** C	M	144.4	0.36	0.77	0.73	11.7	0.8	7.08	0.76	**5.38**	27.0	**27.0**	26.7	0.32	18	0.22	3.04		27.00	INLET - HGL 0.02 K= 0.00
017+20.00	32.26	LT						0.03	0.14	0.03							24.0	23.8	0.20		**0.14**				Partial Flow? NO LOSS = 0.00
			S-404							*0.00*							22.5	22.3			0.15				COVER = 3.00 Calc d/D
ALABAMA			**S-404**	**MH**	**P** 8	M	55.2	0.00	0.77	0.73	12.5	0.3	6.93	0.76	**5.26**	27.9	26.7	26.5	0.12	18	0.21	2.98		27.89	INLET - HGL 1.23 K= 0.00
018+50.00	43.00	LT						0.00	0.14	0.03							23.8	23.5	0.30		0.54				Partial Flow? NO LOSS = 0.00
			S-405							*0.00*							22.3	22.0			0.15				COVER = 4.09 Calc d/D
ALABAMA			**S-406**	**CI**	**P** 6	S	51.0	0.42	0.42	0.40	10.0	0.5	7.45	0.40	**3.00**	27.2	26.6	26.5	0.04	18	0.07	1.70	INV 6" FM = 23.83	27.38	INLET - HGL 0.59 K= 0.00
018+97.60	17.75	RT						0.02	0.02	0.00							24.0	23.5	0.50		0.98				Partial Flow? NO LOSS = 0.00
			S-405							*0.00*							22.5	22.0			0.15				COVER = 3.17 Calc d/D
ALABAMA			**S-405**	**DBI**	**MOD** C	M	137.0	0.00	1.19	1.13	12.8	0.5	6.87	1.18	**8.12**	27.4	26.5	25.9	0.69	18	0.51	4.60		27.42	INLET - HGL 0.87 K= 0.00
018+97.60	33.27	LT						0.10	0.26	0.05							23.5	23.3	0.20		**0.15**				Partial Flow? NO LOSS = 0.00
			S-407							*0.00*							22.0	21.8			0.15				COVER = 3.92 Calc d/D
HOMESTEAD			**S-407**	**DBI**	**MOD** C	M	160.1	0.00	1.19	1.13	13.3	0.6	6.78	1.26	**8.53**	26.9	25.9	25.0	0.89	18	0.56	4.83		26.93	INLET - HGL 1.08 K= 0.00
626+40.00	39.79	LT						0.38	0.64	0.13							23.3	22.9	0.40		0.25				Partial Flow? NO LOSS = 0.00
			S-410							*0.00*							21.8	21.4			0.15				COVER = 3.63 Calc d/D
HOMESTEAD			**S-409**	**DBI**	C	S	14.8	0.01	0.01	0.01	10.0	0.0	7.45	0.03	**0.22**	26.4	**25.3**	25.3	0.00	18	0.01	0.12		26.35	INLET - HGL 1.04 K= 0.00
626+40.00	50.00	RT						0.10	0.10	0.02							23.6	23.5	0.10		0.68				Partial Flow? NO LOSS = 0.00
			S-408						0.00	*0.00*							22.1	22.0			0.15				COVER = 2.75 Calc d/D
HOMESTEAD			**S-408**	**CI**	**J** 5	S	160.0	0.09	0.10	0.10	10.0	1.2	7.45	0.12	**0.86**	28.2	25.3	25.1	0.20	18	0.12	2.26		28.36	INLET - HGL 2.84 V(norm)=2.26 K= 0.00
626+40.00	35.25	RT						0.00	0.10	0.02							23.5	23.1	0.40		0.25				Partial Flow? **YES** d/D = 1.00 LOSS = 0.00
			S-411							*0.00*							22.0	21.6			0.15				COVER = 4.65 Qfull = 5.71 Calc d/D 0.25

FLORIDA DEPARTMENT OF TRANSPORTATION

STORM DRAIN TABULATION FORM (8/00)

Financial Project ID No. | County: LEE | UNITS: ( ) Metric [SI] (X) US customary | Revised by: MAR Date: 12.28.07 | Checked by: MAR Date: 9/8/08

Description: HOMESTEAD ROAD | HDR Project No.

LOCATION OF UPPER END STATION	DISTANCE (ft)	SIDE	UPPER/LOWER STRUCTURE NUMBER	INLET TYPE	TYPE OF STRUCTURE	TYPE OF LINE	LENGTH (ft)	Drainage Area (ac) C= 0.95 / C= 0.20 / C= 0.60 Increment	SUB Total	SUB Total (CA)	Tc (min)	Time in Section (min)	Intensity (in/hr)	TOTAL C x A	TOTAL RUNOFF (cfs)	Manhole, Inlet & Gutter Elev. (ft)	HYD. GRADIENT Crown EL. Upper	Crown EL. Lower	Flow Line EL. ^FALL (feet)	Diam. (in.)	HYD. GRAD. Physical Min. Phys. Slope (%)	Velocity (fps)	REMARKS	EDGE OF PAVEMENT, GRATE OR MH ELEVATION	CHECKS
																							ZONE or COUNTY: LEE		
																							FREQUENCY: 10-YEAR		
																							NOTES:		
																							Manning's n = 0.012		
																							USING TW= 22.7		
HOMESTEAD			S-417	JB	P 7	S	36.5	0.50	0.50	0.48	15.0	0.2	6.49	0.72	**4.69**		26.4	26.4	0.06	14X23	0.17	2.61	INCLUDES 0.84AC EXIST. PIPE	27.29	INLET - HGL ####### K= 0.00
631+56.41	39.86	RT						1.24	1.24	0.25							26.3	26.2	0.16		0.44		CONNECT TO EXIST, PIPE		Partial Flow? NO 0.56 LOSS = 0.00
			S-415							*0.00*							25.2	25.0			0.15		ADD JUNCTION BOX LID		COVER = ####### Calc d/D
HOMESTEAD			S-415	DBI	MOD C	S	220.1	0.35	0.85	0.81	15.2	0.9	6.46	1.07	**6.88**	27.1	**26.4**	25.6	0.80	18	0.36	3.89	INV 8" FM = 23.65	27.13	INLET - HGL 0.76 K= 0.00
631+20.00	37.63	RT						0.05	1.29	0.26							23.5	23.1	0.40		0.18				Partial Flow? NO LOSS = 0.00
			S-413							*0.00*							22.0	21.6			0.15				COVER = 3.63 Calc d/D
HOMESTEAD			S-413	DBI	MOD C	S	100.1	0.09	0.94	0.89	16.1	0.4	6.32	1.23	**7.77**	26.9	25.6	25.1	0.46	18	0.46	4.40		26.93	INLET - HGL 1.35 K= 0.00
629+00.00	39.79	RT						0.39	1.68	0.34							23.1	22.9	0.20		0.20				Partial Flow? NO LOSS = 0.00
			S-411							*0.00*							21.6	21.4			0.15				COVER = 3.83 Calc d/D
HOMESTEAD			S-411	CI	P 6	S	70.5	0.50	1.54	1.46	16.5	0.3	6.26	1.82	**11.41**	27.5	25.1	25.0	0.15	24	0.22	3.63	INV 8" WM = 23.84	27.72	INLET - HGL 2.40 K= 0.00
628+00.00	35.25	RT						0.02	1.80	0.36							23.4	23.2	0.20		0.28				Partial Flow? NO LOSS = 0.00
			S-410							*0.00*							21.4	21.2			0.10				COVER = 4.11 Calc d/D
HOMESTEAD			S-410	CI	J 6	M	52.9	0.65	3.38	3.21	16.8	0.1	6.22	3.70	**23.03**	27.1	25.0	24.5	0.46	24	0.88	7.33		27.28	INLET - HGL 2.11 K= 0.00
628+00.00	35.25	LT						0.02	2.46	0.49							23.2	23.1	0.10		0.19				Partial Flow? NO LOSS = 0.00
			S-412							*0.00*							21.2	21.1			0.10				COVER = 3.87 Calc d/D
HOMESTEAD			EXIST. INLET	DBI	B	S	5.9	1.17	1.17	1.11	18.0	0.0	6.05	1.16	**7.01**	26.6	**26.1**	26.0	0.06	12x18	0.93	5.39	INCLUDES 1.39AC FROM MALL	26.63	INLET - HGL 0.55 K= 0.00
631+71.78	30.57	LT						0.23	0.23	0.05							25.5	25.4	0.05		0.84		CONNECT TO EXIST. PIPE		Partial Flow? NO LOSS = 0.00
			S-414							*0.00*							**24.5**	24.4			0.03		AT INV = 24.4		COVER = **1.18** Calc d/D
HOMESTEAD			S-414	DBI	MOD C	S	191.7	0.51	1.68	1.60	18.0	0.6	6.05	1.69	**10.21**	25.7	**26.0**	24.5	1.53	18	0.80	5.78		25.73	INLET - HGL -0.30 K= 0.00
630+44.00	34.04	LT						0.22	0.45	0.09							24.5	24.0	0.50		0.26				Partial Flow? NO 1.00 LOSS = 0.00
			S-412							*0.00*							23.0	22.5			0.15				COVER = **1.23** Calc d/D
HOMESTEAD			S-412	MH	J 8	M	19.1	0.00	5.06	4.81	18.6	0.0	5.98	5.39	**32.21**	27.6	24.5	24.4	0.10	30	0.52	6.56	CONNECT TO EXISTING BOX	27.63	INLET - HGL 3.13 K= 0.00
628+52.43	24.50	LT						0.00	2.91	0.58							23.6	23.5	0.10		0.52				Partial Flow? NO 0.55 LOSS = 0.00
			EXIST. INLET							*0.00*							21.1	21.0			0.08				COVER = 4.03 Calc d/D
HOMESTEAD			EXIST. INLET	DBI	J H		300.0	0.41	5.47	5.20	18.6	1.1	5.98	5.82	**34.78**	27.7	24.4	22.7	0.43	48	0.14	4.72	EXISTING 48" CMP	27.74	INLET - HGL 3.34 V(norm)=4.72 K= 0.00
								0.20	3.11	0.62							24.4	24.0	0.40		0.13				Partial Flow? **YES** d/D = 1.00 LOSS = 0.00
			CANAL							*0.00*							**20.4**	20.0			0.04				COVER = 3.34 Qfull = 56.97 Calc d/D 0.56

ATTACHMENT

HDR | ONE COMPANY *Many Solutions*℠

Information Services – Advanced Technologies and Engineering

ECWCD Meeting
Minutes

November 6, 2007

2:00 pm

ECWCD Office
LeHigh Acres, FL

East County Water Control District

Stormwater Management

Meeting called by: HDR Engineering, Inc. **Type of meeting:** 2nd Pre-Application Meeting

Facilitator: **Note taker:** MAR

Timekeeper:

Attendees: See below.

Mike Cook – ECWCD
Kenneth Waugh – ECWCD
Sarah Clarke – Lee County DOT
Donnie Holcomb – HDR (Sarasota)
Brent Knezacek – HDR (Sarasota)
Laura Phillips – HDR (Jacksonville)
Mayling Reyes – HDR (Jacksonville)

Please read:

Please bring:

Minutes

Agenda item: ECWCD Stormwater Management System via Canals **Presenter:** Laura Phillips

Discussion: Use of existing stormwater system for Treatment and Attenuation for proposed roadway improvements.

General Discussions

Laura started off the discussion by presenting to the District an aerial view of the entire project. Stating that the project limits are from south of the bend on Homestead Road to north of Alabama Road.

The total required Treatment Volume will be approximately 6.5 acre-feet for the entire project length and from right-of-way to right-of-way; assuming 100% impervious and no credit for existing pavement.

Several options had been discussed between Roger Copp from ADA Engineering and Laura Phillips, regarding improvements to the system. She discussed previous phone conversations with Roger as to the anticipated points of stormwater discharge into the canal systems and control structure locations. There were a couple of possible locations he thought would benefit both the canal system by recharging and stormwater treatment and attenuation for the proposed roadway improvements.

Kenneth Waugh presented an ECWCD overall aerial map with weir locations. He identified the shaded areas on the map as not being part of the ECWCD stormwater management (canal) system. All canals are diked up so those areas do not flow into the canals.

Mike Cook made HDR aware that the south end of the project is an area that currently floods. Since the property is not part of the District, they have no discharge outlet into the ECWCD. HDR needs to maintain existing cross drains in this area and may consider other options to prevent flooding.

North Basin

From field observations just north of Alabama Road and west of Homestead Road, the existing drainage basin currently discharges through a 48 inch CMP directly into the Dave Canal (47-31-9). Since the north section of the project will have a certain amount of offsite drainage coming to it, it was proposed to use the existing 48 inch pipe as a point of discharge into the canal system. The proposed pipe systems will be upsized to have enough capacity to accept the additional runoff.

Mike Cook mentioned that it would not be an issue to discharge at said location since there are two site developments in the vicinity that will be extending the 48" discharge pipe. One development has already been permitted and they proposed to pipe the canal approximately 190 feet prior to final discharge at an invert of 20 feet. The other development not yet approved is also proposing to pipe the canal another 100 feet. It was requested that HDR look at this need so the developer pipes could be size correctly before being constructed.

Middle Basin

ECWCD recommended that a new control structure be considered. It was suggested to place a control structure far north of the project on Spur "A" Canal, south of its junction to Abel Canal (47-32-1). The structure has already been approved conceptually.

It was also recommended to redirect a portion of the Live Oak Canal (57-5-1) east of the box culvert on Alabama Road (RC-324427-12) to connect to Spur "A" Canal (57-5-5 & 57-5-4) at the junction of the double 36 inch RCP. The Live Oak Canal (57-5-1) structure under Alabama Road would be filled with flowable fill.

South Basin

A new control structure was recommended on 57-4-6 Canal, south of its junction to 57-4-3 Canal (east of Eaglemere Drive). It is assumed that the volume of water to be held by these control structures will be equal to or greater than the required Treatment Volume for the Homestead Road improvements. If the volume needed is not acquired by this new structure another option would be to reconfigure the canal.

General Discussions

Per discussions with Roger Copp, automated control structures may be used at proposed locations.

Kenneth Waugh to provide survey of the Spur "A" Canal (57-5-5- & 57-5-4) that is approximately 2 years old.

ECWCD will provide HDR with control structure typicals.

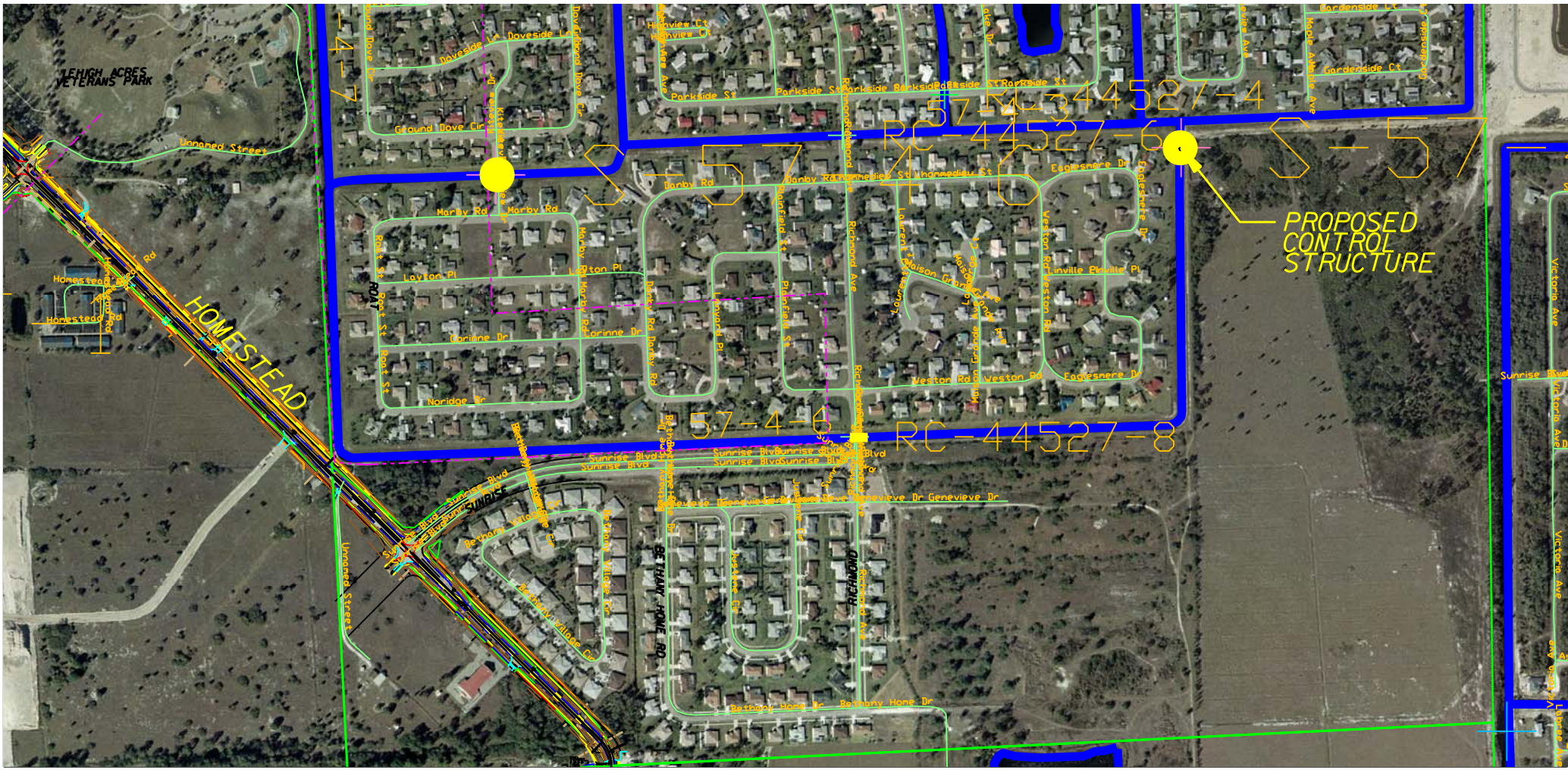
It was recommended that the permit be sent to the SFWMD and the ECWCD simultaneously for review.

It was discussed that ECWCD will provide a written statement that will waive the 100 foot minimum width for the wet detention pond criteria for treatment within the canal system.

*PLEASE SEE ATTACHED FIGURES FOR PROPOSED ECWCD STORMWATER IMPROVEMENT LOCATIONS.

Conclusions: Execute ECWCD suggestions to obtain an issued permit.

Action items	**Person responsible**	**Deadline**
✓ Contact Roger Copp to run model and calculate storage volume for canals and proposed control elevations.	Laura Phillips	11.20.07
✓ Create existing offsite system Stormwater Tabulations for north section of project to tie into 48" CMP into the Dave Canal. Proposed pipe size for the permitted development may need to be further upsized to accommodate offsite runoff coming to Homestead Road.	Laura Phillips/Mayling Reyes	"
✓ Obtain ECWCD Control Structure Typicals. ✓ Create a detail plan sheet to denote the blockage of the cross drain on north side of the project to prevent flooding on the adjacent development and design system to drain south and discharge into Bonefish Canal.	Laura Phillips/Mayling Reyes	"
✓ Obtain written statement from ECWCD to disregard the 100 foot width pond requirement.	Mayling Reyes	01.21.08
✓ Get additional survey for point-of-discharge connections into canals and control structure locations.	Brent Knezacek	TBD



...\TPA\dms60448\lsp-working.dgn 11/12/2007 11:43:28 AM



...\TPA\dms60448\lsp-working.dgn 11/12/2007 11:36:19 AM


PROPOSED PLUGGED CULVERT
HOMESTEAD
ADAMS
ARTHUR
ALCALA
CHEROKEE
PALM
NAVAJO
APACHE
WESTMINSTER ST W
BECKMAN HEIGHTS BLVD W
Fillmore Ave
Jackson Ln
Cleveland Ln
Buchanan Ave
Garfield Ave
Adams Ave
Arthur Ave
Alcala Ave
Cherokee Ave
Palm Blvd
Oregon Rd
Bougainvillea Rd
Loop Blvd
Broad St
Vineyard St
Wesley St
Westminster St
Vineyard Pl
Andorra St
Desert Cavern Ct
Desert Candle Ct
Dawn Flower Cir
Navajo Ave
Alcala Ct
Ferry Ave
Coral Amaral Ave
Willow St
Andreas St
Arizona Rd
Arkansas Rd
Iowa Rd
Georgia Rd
Florida Rd
California Rd
Idaho Rd
Colorado Rd
Connecticut Rd
Kentucky Rd
Louisiana Rd
Illinois Rd
Lois Way
Penn Rd
Oregon Rd
Unnamed Street
Akhlor Ave
Woodward Ct
Vineyard Rd Ct
57-6-7
57-6-4
57-6-1
57-5-1
RC-32442
RC-54527-1
RC-54527-2
32-4

HDR | ONE COMPANY *Many Solutions*℠

Information Services – Advanced Technologies and Engineering

SFWMD Meeting
Minutes

South Florida Water Management District

January 14, 2008

3:00 pm

SFWMD Office
Ft. Myers, FL

Meeting called by: HDR Engineering, Inc. **Type of meeting:** Pre-Application Meeting

Facilitator: **Note taker:** MAR

Timekeeper:

Attendees: See below.

Laura Layman – SFWMD
Pakorn Sutitarnnontr – SFWMD
Sarah Clarke – Lee County DOT
Sherri Swanson – HDR (Sarasota)
Donnie Holcomb – HDR (Sarasota)
Brent Knezacek – HDR (Sarasota)
Laura Phillips – HDR (Jacksonville)
Mayling Reyes – HDR (Jacksonville)

Please read:

Please bring:

Minutes

Agenda item: Pre-application discussion of Homestead Road Stormwater Management in the East County Water Control District Canal System **Presenter:** Laura Phillips

Discussion: ECWCD Canal System - Dry Detention versus Wet Detention Criteria

General Discussions

Laura opened up discussion with an overview of the project drainage design and a summary of the meeting held with the East County Water Control District back in November. Project is located on Homestead Road in Lee County and it involves over two miles of roadway widening. It is proposed that the storm sewer design take advantage of the existing ECWCD canal system as a means for treatment and attenuation.

The ECWCD is pursuing the modification of their canals to include gated control structures to reduce downstream flooding and promote local groundwater recharge. Lee County has negotiated with ECWCD to construct two of the automated control structures to provide the stormwater treatment and attenuation required for Homestead Road improvements. In addition to the gated control structures, the ECWCD has requested that the segment of the Dave Canal (47-31-9) be redirected to connect to the Spur A (47-32-4) to reduce some localized street flooding. This connection is to be a double 6-ft by 4-ft box culvert, constructed along Homestead Road.

The first treatment area would consist of approximately 6,967 LF of existing canal and a control structure located in Canal 57-4-6 directly south of its connection to Canal 57-4-3. Assuming that 2-ft can be held in this canal without adverse impact, a total treatment volume of 4.9 ac-ft would be available. The second proposed treatment area would consist of approximately 23,142 LF of canal with a control structure located in the Spur A Canal (47-32-4) just south of its connection to the Abel Canal (47-32-3). Again assuming a 2-ft depth in the canal, it allows a total treatment volume of 15.9 ac-ft. The overall stormwater treatment and attenuation volume proposed is 20.8 ac-ft. In taking further conservative design efforts, the project treatment area is assumed to be 100% impervious the entire length of the project and right-of-way width. Using the 2.5-in over the impervious area, the required treatment volume is 4.9 ac-ft.

Laura Layman had asked if control structures at given locations had already been permitted. And according to the ECWCD, the proposed automated control structure in Canal 57-4-6 has been designed and permitted and the other in Spur A Canal is in the process of being permitted.

Since the canal system, in its present state, is essentially a drainage collection and conveyance system and does not generally hold any permanent pool volume; we are considering the system primarily dry. The construction of the control systems will provide dry detention within the canal system.

Donnie Holcomb recalled from the first pre-application meeting with the District, that Bill Foley had agreed to consider stormwater treatment and attenuation within the canals on the basis of "net improvement to the overall system". The ECWCD has stated that they would write a letter accepting the water quality and attenuation design.

Donnie also stated that the 60% plans are complete and ready to submit to the District for permitting. That the purpose of the meeting was to confirm that discharging into the canals would not hinder current design.

Sarah Clarke added that construction is to take place in 2009 and that funds are currently available, but the project site has no area available to place a pond, otherwise, a commercial development would have to be bought out.

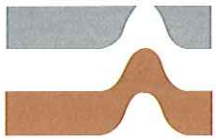
Sherri Swanson stated that approximately 0.05-ac of total wetland impacts associated to improvements are located mainly in the south portion of the project. And that there are enough credits available through the Lee County Island Park Regional Mitigation Area. To which Laura Layman concurred.

Conclusions: Obtain response from Bill Foley (SFWMD).

Action items	**Person responsible**	**Deadline**
✓ Obtain automated control structure details from ECWCD.	Laura Phillips	

APPENDIX

PRELIMINARY ROADWAY SOIL SURVEY
HOMESTEAD ROAD WIDENING FROM SOUTH OF
SUNRISE BOULEVARD TO ALABAMA ROAD
LEHIGH ACRES, LEE COUNTY, FLORIDA



Ardaman & Associates, Inc.

OFFICES

Orlando, 8008 S. Orange Avenue, Orlando, Florida 32809, Phone (407) 855-3860
Bartow, 1525 Centennial Drive, Bartow, Florida 33830, Phone (863) 533-0858
Cocoa, 1300 N. Cocoa Blvd., Cocoa, Florida 32922, Phone (321) 632-2503
Fort Myers, 9970 Bavaria Road, Fort Myers, Florida 33913, Phone (239) 768-6600
Miami, 2608 W. 84th Street, Hialeah, Florida 33016, Phone (305) 825-2683
Port Charlotte, 740 Tamiami Trail, Unit 3, Port Charlotte, Florida 33954, Phone (941) 624-3393
Port St. Lucie, 460 Concourse Place NW, Unit 1, Port St. Lucie, Florida 34986, Phone (772) 878-0072
Sarasota, 2500 Bee Ridge Road, Sarasota, Florida 34239, Phone (941) 922-3526
Tallahassee, 3175 West Tharpe Street, Tallahassee, Florida 32303, Phone (850) 576-6131
Tampa, 3925 Coconut Palm Drive, Suite 115, Tampa, Florida 33619, Phone (813) 620-3389
West Palm Beach, 2200 North Florida Mango Road, Suite 101, West Palm Beach, Florida 33409, Phone (561) 687-8200

MEMBERS:
A.S.F.E.
American Concrete Institute
American Society for Testing and Materials
Florida Institute of Consulting Engineers

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

August 27, 2007
Ardaman File No. 07-4550

HDR Engineering, Inc.
2601 Cattlemen Road, #102
Sarasota, Florida 34232

Attention: Mr. Donald R. Holcomb, P.E.

Subject: **Preliminary Roadway Soil Survey**
Homestead Road Widening from South of
Sunrise Boulevard to Alabama Road
Lehigh Acres, Lee County, Florida

Gentlemen:

As requested and authorized by **HDR Engineering, Inc.**, Ardaman & Associates, Inc. has completed the preliminary geotechnical exploration program for the subject project. The purpose of this program was to perform a roadway soils survey along the proposed route to define the characteristics of the soil profile for roadway design and construction.

This report documents the results of our field and laboratory testing programs, and presents our preliminary engineering recommendations. It has been prepared for specific application to the Homestead Road Widening project from south of Sunrise Boulevard to Alabama Road in Lehigh Acres, Lee County, Florida accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made. While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the subsurface materials of the region are anticipated and may be encountered. The nature and extent of the variations between the borings may not become evident until construction.

It has been a pleasure assisting you with this project. When we may be of further service to you, or if you have any questions about this report, please contact the undersigned.

Very truly yours,

ARDAMAN & ASSOCIATES, INC.
Florida Certificate of Authorization No. 00005950

8/27/07

Gary A. Drew, P.E.
Branch Manager/Vice President
Florida License No. 35504

G:\Emily\Gary\Homestead Road\Homestead Rd. Sunrise to Alabama RSS Report.doc

TABLE OF CONTENTS

1.0 PROJECT INFORMATION 2
1.1 Site Location and Project Description 2
1.2 Review of Soil Survey Maps 2
1.3 Review of USGS Quadrangle Map of Alva SW, Florida 5
1.4 Site Conditions and Limitations 5

2.0 SCOPE OF SERVICES 5
2.1 Purpose and Scope of Services 6

3.0 FIELD EXPLORATION PROGRAM 7
3.1 Auger Borings 7
3.2 Standard Penetration Test (SPT) Borings 7
3.3 Hydraulic Conductivity of Pond Site Soils 8
3.4 Muck Probes 8
3.5 Bulk Sampling for LBR 9
3.6 Measured Ground Levels 9

4.0 LABORATORY TESTING PROGRAM 9
4.1 Visual Examination, Natural Moisture Content, Organic Content, Sieve Analysis and Atterberg Limits 9
4.2 LBR Tests 9
4.3 Environmental Corrosion Tests 9

5.0 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS FOR ROADWAY SOIL SURVEY 10
5.1 General Soil Stratigraphy 10
5.2 On-Site Soil Suitability 10
5.3 Cap Rock 11
5.4 Limits of Unsuitable Materials 11
5.5 Seasonal High Groundwater Table (SHGWT) 11
5.6 Groundwater Control 11
5.7 Design LBR 11
5.8 Environmental Classification 12
5.9 Embankment Analysis 12

6.0 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS FOR STRUCTURES 12
6.1 General 12
6.2 Design Soil Parameters 12
6.3 Environmental Classification 13

7.0 REPORT LIMITATIONS 13

TABLE OF CONTENTS

8.0 TABLES(S) 14
TABLE NO. 1 - SUMMARY OF LAB TEST RESULTS–ROADWAY
TABLE NO. 2 - SUMMARY OF LAB TEST RESULTS–PONDS
TABLE NO. 3 - SUMMARY OF SOIL CORROSION TESTS
TABLE NO. 4 - 90% METHOD FOR DESIGN LBR
TABLE NO. 5 - ± 2% OF OPTIMUM METHOD FOR DESIGN LBR

9.0 FIGURE(S) 15
FIGURE 1 - USDA SOIL SURVEY MAP
FIGURE 2 - USGS QUADRANGLE MAP
FIGURE 3 - ROADWAY SOIL SURVEY SHEET
FIGURES 4 THROUGH 9 - ROADWAY BORING PROFILES
FIGURES 10 THROUGH 11 - POND BORING PROFILES
FIGURE 12 - MAST ARM BORING PROFILE
FIGURES 13 AND 14 - BOX CULVERT BORING PROFILES

APPENDIX A
LBR TEST REPORT SHEETS

APPENDIX B
GRAIN-SIZE ANALSIS SHEETS

APPENDIX C
SAMPLING AND TESTING METHODS SOIL CLASSIFICATION (AASHTO)
AND UNIFIED SOIL CLASSIFICATION SYSTEM ASTM D-2487

1.0 INTRODUCTION

1.1 Site Location and Project Description

Homestead Road will be improved to a four-lane divided roadway beginning 3,500 feet south of its intersection with Sunrise Boulevard and extending northward to its intersection with Alabama Road in Lehigh Acres, Lee County, Florida. The project begins with Station 511+44 centerline construction and ends with Station 634+01—a distance of 2.3 miles.

The typical design section will be a 4-lane divided roadway with curb and gutter. Approximately 1 to 2 feet of embankment will be required under the pavement section.

Two stormwater ponds are planned on the east side of the planned alignment.

No bridge structures are planned as part of this project. Box culverts extensions and mast arms are planned and geotechnical information about these structures is provided in this report.

1.2 Review of Soil Survey Maps

The United States Department of Agriculture Natural Resources Conservation Services, **Soil Survey of Lee County, Florida (1984)** was reviewed for major shallow soil types along the alignment. The Soil Survey identified seven major soil types described in the following paragraphs. **Figure No. 1** is an aerial photograph of the alignment showing the major soil map units.

Matlacha-Urban land complex (7). This complex consists of nearly level Matlacha gravelly fine sand and areas of Urban land. Typically, the surface layer of the Matlacha soil is about 40 inches of light gray, gray, very pale brown mixed gravelly fine sand and sandy material. The surface layer contains lenses of loamy sand and coated sandy fragments of a former subsoil and is about 25 percent coarse fragments of limestone and shell. Below the surface layer, to a depth of 80 inches or more, there is undisturbed fine sand. The upper 6 inches is dark gray and the rest is light gray with dark grayish brown stains and streaks along old root channels.

The depth to the water table varies with the amount of fill material and the extent of artificial drainage. However, in most years, the water table is 24 to 36 inches below the surface of the fill material for 2 to 4 months. It is below a depth of 60 inches during extended dry periods.

Immokalee sand (28). This is a nearly level, poorly drained soil in flatwoods areas. Slopes are smooth to convex and range from 0 to 2 percent.

Typically, the surface layer is black sand about 4 inches thick. The subsurface layer is dark gray sand in the upper 5 inches and light gray sand in the lower 27 inches. The subsoil is sand to a depth of 69 inches. The upper 14 inches is black and firm, the next 5 inches is dark reddish brown, and the lower 14 inches is dark yellowish brown. The substratum is very pale brown sand to a depth of 80 inches or more.

In most years, under natural conditions, the water table is within 10 inches of the surface for 1 to 3 months and 10 to 40 inches below the surface for 2 to 6 months. It recedes to a depth of more than 40 inches during extended dry periods.

Permeability is rapid in the surface and subsurface layers and moderate or moderately rapid in the subsoil.

Oldsmar sand (33). This is a nearly level poorly drained soil on low, broad flatwoods areas.

Typically, the surface layer is black sand about 3 inches thick. The subsurface layer is gray and light gray sands about 39 inches thick. The upper part of the subsoil is very dark gray sand about 5 inches thick. The lower part of the subsoil is yellowish brown and mixed light brownish gray and brown fine sandy loam about 11 inches thick. Pale brown sand extends to a depth of 80 inches or more.

In most years, under natural conditions, the water table at a depth of less than 10 inches of the surface for 1 to 3 months and stands above the surface for about 3 months. It is 10 to 40 inches below the surface for more than 6 months and it recedes to a depth of more than 40 inches during extended dry periods. Permeability is rapid in the surface and subsurface layers.

Malabar fine sand (34). This is a nearly level, poorly drained soil on sloughs. Typically, the surface layer is very dark gray fine sand about 5 inches think. The next 12 inches is light gray fine sand and very pale brown fine sand. Below this is a 16-inch layer of light yellowish brown fine sand with yellow mottles and a 9-inch layer of brownish yellow fine and. The subsoil layer is gray loamy fine sand about 9 inches thick with large yellowish brown mottles. The next 8 inches is gray fine sandy loam with large yellowish brown mottles. Below is light gray loamy fine sand with yellowish brown mottles to a depth of 80 inches. Some areas in the central-southeaster part of the county have limestone at a depth of 70 to 80 inches.

In most years, under natural conditions the water table is at a depth of less than 10 inches for 2 to 4 months. It is at a depth of 10 to 40 inches for more than 6 months, and it recedes to a depth of more than 40 inches during extended dry periods. During periods of high rainfall, the soil is covered by a shallow layer of slowly moving water for periods of about 7 to 30 days or more.

Anclote sand, depressional (40). This is a nearly level, very poorly drained soil in insolated depressions. Typically the surface layer is about 22 inches thick. The upper 8 inches is black sand, and the lower 14 inches is black sand with common light gray pockets and streaks throughout. The substratum is sand to a depth of 80 inches or more. The upper 18 inches is light brownish gray and the lower 40 inches is light gray.

In most years, under natural conditions, the soil is ponded for more than 6 months.

Urban Land (59). Urban Land consists of areas that are covered 75 percent or more with streets, buildings, parking lots, shopping centers, highways, industrial areas, airports and other urban structures. Small areas of undisturbed soils are mostly lawns, vacant lots, playgrounds

and green areas. The original soils in some areas have been altered by filling, grading and shaping. Urban land is nearly level except for some parking areas that are sloped to drain off water. Individual areas are usually rectangular in shape and range from 10 to 1200 acres. The slope is 0 to 2.

The depth of the water table varies with the amount of fill material and the extent of artificial drainage within any mapped area.

Malabar fine sand, high (63). This is a nearly level, poorly drained soil in the flatwoods.

Typically, the surface layer is very dark gray fine sand about 4 inches thick. The subsurface layer is light gray fine sand about 13 inches thick. The subsoil is fine sand and sandy clay loam about 51 inches thick. The upper 7 inches is very pale brown fine sand with brownish yellow mottles. The next 6 inches is brownish yellow fine sand with yellowish brown mottles. Next is yellow fine sand with yellowish brown mottles, light gray fine sand with yellowish brown stains along root channels. The lower 8 inches is greenish gray sandy clay loam. Below that and extending to a depth of about 80 inches or more is gray fine sand with about 60 percent shell fragments.

In most years, under natural conditions, the water table is 10 to 40 inches below the surface for 4 to 6 months. It recedes to more than 40 inches below the surface during extended dry periods. Permeability is rapid in the surface and subsurface layers and the sandy part of the subsoil and moderately slow in the lower, loamy part of the subsoil.

Note that none of the soil map units described mucky soil conditions near the surface.

Most of the soil map units described the seasonal high groundwater table as occurring within 10 inches of the surface, except (7) Matlacha-urban land complex, (59) Urban land, (40) Anclote sand depressional, and (63) Malabar fine sand.

For the Matlacha-urban land complex (7) and Urban Land (59) soil map units, the depth to the water table varies with the amount of fill material and the extent of artificial drainage. However, in most years, the water table is 24 to 36 inches below the surface of the fill material for 2 to 4 months.

Antclote sand depressional (40) are poorly drained soils in depressions and the soil is ponded for more than 6 months a year.

Malabar fine sand, high (63) has a seasonal high groundwater table that is 10 to 40 inches below the surface for 4 to 6 months of the year.

Selected soil and water features of each Soil Map Unit are summarized below.

USDA SOIL SURVEY SOIL AND GROUNDWATER FEATURES - LEE COUNTY						
Map Symbol	Soil Series	Risk of Corrosion		Seasonal High Water Table		Bedrock
		Steel	Concrete	Depth (ft.)	Months	Depth. (ft.)
7	Matlacha-urban land complex	high	low	2.0' - 3.0'	Jun - Oct	>5
40	Antclote sand, depressional	high	moderate	+2.0' - 0	Jun - Mar	>5
63	Malabar fine sand, high	high	low	0 - 1.0'	Jun - Oct	>5
28	Immokalee sand	high	high	0 - 1.0'	Jun - Nov	>5
33	Oldsmar sand	moderate	high	0 - 1.0'	Jun - Feb	>5
34	Malabar fine sand	high	low	0 - 1.0'	Jun - Nov	>5
59	Urban Land	n/a	n/a	n/a	n/a	n/a

1.3 Review of USGS Quadrangle Map of Alva SW, Florida

The USGS 7.5 minute quadrangle topographic map of Alva SW, Florida is presented as **Figure No. 2**. Based on review of this map, it appears that the project site elevations range from about +30 feet mean sea level near the project beginning to about +26 feet near the project end at Alabama Road. The roadway alignment will run northerly through Section 9, Township 45 South, Range 27 East then northwesterly through Section 5, Township 45 South, Range 27 East to Section 32, Township 44 South, Range 27 East in Lee County, Florida

1.4 Site Conditions and Limitations

Homestead Road exists as a two-lane rural road. From the project beginning northward about 8,000 feet, land use is mostly agricultural or vacant and then becomes more developed with residences and commercial businesses to the project end at Alabama Road. Three canals cross under Homestead Road.

We were able to locate our test borings where planned along most of the alignment. The more developed areas of the alignment in the northern third of the project required some minor movement of borings due to underground and above ground utilities and other obstructions.

2.0 SCOPE OF SERVICES

Our services for this project consisted of providing geotechnical engineering services in general accordance with the **Florida Department of Transportation (FDOT) "Soils and Foundation Handbook 2006"** and the scope of services as defined in the Subconsultant Agreement dated April 19, 2007.

2.1 Purpose and Scope of Services

The purpose of this report was to identify the subsurface conditions along the roadway alignment to develop design parameters and make preliminary engineering recommendations in each of the following areas:

1. General assessment of the area geology based on our past experience and study of available geological literature.

2. Soil stratigraphy at the boring locations. Development of a general soil profile along the roadway alignment and at the pond locations.

3. Assessment of the existing soil subgrade and groundwater conditions along the subject alignment for suitability of pavement support.

4. General location and description of the potential deleterious materials encountered in the borings that may interfere with construction progress or pavement performance, including existing fills or surficial organics.

5. Groundwater levels in the borings along the project alignment and estimate the normal seasonal high groundwater levels.

The scope of services from this Roadway Soil Survey project included the following

1. Conducted a general visual reconnaissance of the site and coordinated underground utility location services and maintenance of traffic.

2. Reviewed readily available published geologic and topographic information. Reviewed the "**Soil Survey of Lee County, Florida**" published by the United States Department of Agriculture (USDA) Soil Conservation Service (SCS) and the Alva SW, Florida Quadrangle Map published by the United States Geologic Survey (USGS).

3. Performed a roadway soil survey consisting of auger soil borings generally extending from 5 to 15 feet deep below the existing grade. The borings were generally performed at each station along the project alignment.

4. Performed a subsurface exploration consisting of Standard Penetration Test (SPT) borings within the areas of two proposed ponds, adjacent to the existing box culverts for proposed extensions, and at proposed mast arm locations at the intersection of Homestead Road with Alabama Road.

5. Visually examined and classified the sampled soils according to the American Association of State Highway and Transportation Officials (AASHTO) Soil Classification System for the auger and SPT borings performed along the roadway and in the ponds, and according to the Unified Soil Classification System for the SPT borings performed for the box culvert extensions and mast arms.

6. Conducted a limited laboratory testing program consisting of gradation analyses, Atterberg limit tests, organic content tests, corrosion series tests and natural moisture content tests to assist in classification and determine selected soil properties.

7. Performed seven limerock bearing ratio (LBR) tests to assist in the pavement design.

8. Measured the groundwater levels in the borings.

9. Prepared this roadway soil survey report summarizing the field and laboratory testing program results, and the subsurface soil and groundwater condition encountered. Developed engineering recommendations for the design and construction of the embankment and pavement for the proposed roadway improvements, and present our engineering evaluations and foundation design parameters.

3.0 FIELD EXPLORATION PROGRAM

3.1 Auger Borings

The field exploration program for the roadway soil survey consisted of performing a total of 132 hand and power auger borings. The borings were located on approximately 100-foot centers alternating typically 20 to 30 feet left or right of the centerline of existing Homestead Road. The locations of the individual borings are given on the **Soil Profile Sheet Nos. 4 through 9** included in Section 9.0 of this report. The borings were located in the field by measuring from the baseline of survey marks on the Homestead Road pavement. Station and offset information should be considered approximate. All borings were referenced to the baseline of survey of Homestead Road, which is its centerline.

Shallow hand auger borings were conducted using a hand-held bucket auger. The borings were advanced to a depth of 5 feet below the ground surface. Power auger borings were conducted on 500-foot centers and were advanced to a depth of 15 feet using a 4-inch diameter continuous flight auger powered by a CME 55 drill rig.

The results of the hand and power auger borings are summarized on soil profiles presented as **Sheet Nos. 4 through 9**. The stratum numbers are shown on **Sheet No. 3 - Cross Section Soil Survey for the Design of Roads**.

3.2 Standard Penetration Test (SPT) Borings

To evaluate the subsurface conditions for the proposed pond areas, box culvert extensions and mast arms, SPT borings were performed to approximate depths of 20 and 30 feet below the existing ground surface. The SPT borings were performed with the use of a truck-mounted CME-55 drill rig using bentonite mud drilling procedures. The soil sampling was performed in general accordance with ASTM test designation D-1586 titled Penetration Test and Split-Barrel Sampling of Soils. SPT resistance N-Values were taken continuously in the initial 10 feet and at intervals of 5 feet thereafter. Representative portions of these soil samples were sealed in glass jars, labeled and transferred to our Fort Myers laboratory for classification and analysis.

The results of the SPT borings for the ponds are presented as soil profiles presented as **Sheet Nos. 10 and 11**. The stratum numbers are the same as shown on **Sheet No. 3–Cross Section Soil Survey for the Design of Roads**. Pond locations are shown on the Boring Location Plan of each sheet, which are 2005 aerial photographs of the proposed pond sites from the Lee County Property Appraisers website.

The results of the SPT borings for the proposed box culvert extensions and mast arms are presented on **Sheet Nos. 12 through 14**. The boring locations are shown on each Boring Location Plan, which is a 2005 aerial photograph from the Lee County Property Appraisers website.

The SPT borings for the ponds, box culvert extensions and mast arms were located by existing site features shown on the aerial photograph and then referencing the location to station and offset of baseline of survey.

3.3 Hydraulic Conductivity of Pond Site Soils

We measured hydraulic conductivity of each pond site by performing in-situ permeability tests. Each horizontal permeability test consisted of inserting 5 feet of 2-inch diameter PVC screen and 3 feet of riser into a 4-inch diameter hole and then packing the annulus to above the screen section with silica sand. The remaining annulus was sealed to the ground surface. Each piezometer was inserted to a depth of 6 feet; therefore, the permeability test is a measure of the coefficient of horizontal hydraulic conductivity averaged over the surface soils from a depth of 1 to 6 feet. The constant head method was used to perform each test.

Each vertical permeability test consisted of augering a 4-1/2-inch diameter hole and inserting a 5-foot section of 4-inch diameter solid casing to a depth of 3 feet. The constant head method was used to perform each test.

A summary of each test along with information about soil types within the screened zone or test depth is presented on the following table. Permeability was only measured within the surficial sands from the ground surface to an average depth of 5 feet at each pond location. Below the surficial sands, there is a 2-foot thick clayey sand stratum that may tend to perch groundwater. The permeability of the clayey sand is estimated to be less than 0.01 ft. per day although the vertical permeability may be faster in some areas as roots create channels to the underlying sands. We did not perform permeability tests in the sands below depths of 7 to 8 feet.

SOIL PERMEABILITY VALUES					
Pond Location	**Borings**	**Depth Interval**	**Coefficient of Vertical Hydraulic Conductivity Kv**	**Coefficient of Horizontal Hydraulic Conductivity Kh**	**Soil Type**
1	P-4 & 5	From Ground Surface to 5' - 6'	27 ft/day	53 ft/day	Fine Sands (A-3)
		5' - 6' to 7' - 9'	<0.01 ft/day	<0.01 ft/day	Clayey Sands (A-2-6/A-6)
2	P-1, 2 & 3	From Ground Surface to 4' - 6'	18 ft/day	53 ft/day	Fine Sands (A-3)
		4' - 6' to 6' - 8'	<0.01 ft/day	<0.01 ft/day	Clayey Sands (A-2-6/A-6)

3.4 Muck Probes

No muck was found in any of the borings nor did literature review suggest any likely areas; therefore, no muck probes were performed.

3.5 Bulk Sampling for LBR

Bulk samples of the surficial soils were obtained at seven locations and returned to our laboratory for Limerock Bearing Ratio (LBR) tests. The samples were obtained at a depth of 12 inches below the existing ground surface. The LBR sample locations are stated on the test report sheets in **Appendix A.**

3.6 Measured Groundwater Levels

The groundwater level was measured in the boreholes after stabilization of the downhole water level on the same day that the holes were drilled. As shown on the soil profiles, the groundwater was encountered at depths ranging from 2 to 10 feet below the ground surface. Fluctuations in groundwater levels should be anticipated throughout the year primarily due to seasonal variations in rainfall and other factors that may vary from the time the borings were conducted.

4.0 LABORATORY TESTING PROGRAM

4.1 Visual Examination, Natural Moisture Content, Organic Content, Sieve Analysis and Atterberg Limits

Representative soil samples obtained during the field exploration program were packaged and transferred to our laboratory for further visual examination and testing. Natural moisture content, organic content, sieve analysis and Atterberg limits tests were performed on selected soil samples to aid in soil classification. Sieve analysis tests were performed in accordance with AASHTO T-88. Natural moisture content tests were performed in accordance with AASHTO T265. Atterberg limits were performed in accordance with AASHTO T-89 and AASHTO T-90. Organic content tests were performed in accordance with AASHTO T-267.

The test results are summarized in graphical form on **Tables 1 and 2. Sheet No. 3 Cross Section Soil Survey for the Design of Roads** is a summary of all the laboratory test data presented in table form corresponding to the generalized soil strata identified for this project. The gradation curve for each sieve analysis test is included in **Appendix B.** Soil descriptions were based on visual-manual procedures in accordance with local practice. Descriptions of these procedures are included in **Appendix C.**

4.2 LBR Tests

A total of seven LBR tests were performed on selected soil samples representing the surficial soils within the proposed right-of-way of the alignment. The location of the LBR sampling points are stated on the test report sheets relative to the station and offset of the baseline of survey Homestead Road included in **Appendix A.** LBR Tests were performed in accordance with Florida Method of Tests for LBR's, Designation FM 5-515. The test results are also summarized on **Tables 4 and 5.**

4.3 Environmental Corrosion Tests

Soil samples from the auger and SPT borings performed along the project alignment were selected for environmental corrosion tests consisting of soil pH (FM 5-550), resistivity (FM5-551), chlorides (FM5-552) and sulfates (FM5-553). Water samples were also obtained from each canal adjacent to the existing box culvert. Based on the laboratory test results and the 2007 FDOT Structures Design Guidelines, the

environmental classification of most soils ranged from slightly aggressive to extremely aggressive (because of soil pH). The results are presented in Table 3-Summary of Corrosion Test Results in **Section 8.** The results of corrosion testing on soil and groundwater samples from the structure borings for mast arms and box culvert extensions are presented on the **Profile Sheets nos. 12 through 14.**

5.0 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS FOR ROADWAY SOIL SURVEY

5.1 General Soil Stratigraphy

The soils encountered along the alignment are primarily sands. The results of the roadway auger borings are presented on **Sheet nos. 4 through 9** in the form of soil profiles, along with the profile legend and other pertinent information such as measured groundwater levels. Soil stratification is based on an examination of the recovered soil samples, the laboratory testing and interpretation of field boring logs by a geotechnical technician. The actual transition between strata may be gradual. In some cases, small variations in properties, not considered pertinent to the engineering evaluation, may have been abbreviated for clarity. The profiles represent the conditions at the boring locations only and variations may occur between the borings. In general, the auger borings performed along the roadway alignment encountered the following strata.

Soil Stratum Descriptions and AASHTO Classifications		
Stratum	**Soil Description**	**AASHTO Soil Classification**
1	Silty sandy gravel.	A-1-b/A-1-a
2	Fine sand.	A-3
3	Silty fine sand, trace to some gravel	A-2-4
4	Silty clayey fine sand	A-2-4
5	Clayey fine sand.	A-2-6
6	Sandy silt, trace gravel.	A-4

5.2 On-Site Soil Suitability

Based on the soil information obtained from the field exploration and laboratory testing program, and the engineering evaluations, a **Cross Section Soil Survey for Design of Roads** is presented as **Sheet No. 3**. Material use should be completed in accordance with FDOT Index Nos. 500 and 505. Materials directly beneath the base should be select materials. The following summarizes the generalized use or non-use of the soils and materials that will most likely be encountered during construction:

1. The material from Stratum No. 2 appears satisfactory for use in the embankment when utilized in accordance with INDEX 505.

2. The material from Strata Nos. 1, 3 and 4 appear satisfactory for use in the embankment when utilized in accordance with INDEX 505. However, these materials are likely to retain excess moisture and may be difficult to dry and compact. They should be used in the embankment above the water level existing at the time of construction.

3. The materials from Strata Nos. 5 and 6 are plastic A-2-6, A-6 and A-4 materials and may be placed above the existing water table (at the time of construction) to within 4 feet of the proposed base. They should be placed uniformly in the lower portion of the embankment for some distance along the project rather than full depth for shorter distances.

5.3 Cap Rock

The Soil Survey of Lee County, Florida did not identify any soil series as having rock at shallow depths (within 5 feet of the surface). No rock was encountered in the 5-foot deep hand augers or the 15-foot deep power augers.

5.4 Limits of Unsuitable Materials

Existing soil conditions are satisfactory for support of the low embankments and the various proposed small structures such as pipe culverts and drains. We do not anticipate that removal of the existing soils is required at any locations along the proposed alignment. Although the Roadway Soil Survey did not indicate presence of any muck within the alignment area–if encountered, it should be removed in accordance to Index 500. This index defines an organic material as any soil that has an average organic content greater than 5%, or an individual organic content test result that exceeds 7%. The index further states that an average organic content shall be determined from the test results from a minimum of three randomly selected samples from each stratum.

5.5 Seasonal High Groundwater Level

Groundwater was encountered in the test borings at depths ranging from 2 to 10 feet below the ground surface. The Lee County Soil Survey in our opinion does not accurately predict the seasonal high groundwater levels (SHGWT) along the alignment when it states that levels are generally about 12 inches below the natural ground surface. Based upon soil horizon layers (Spodic), we estimate the SHGWT is approximately 2 to 2-1/2 feet below the natural ground surface north of about Sunrise Boulevard. South of this point, the SHGWT will drop to approximately 2-1/2 to 3 feet.

The seasonal high groundwater table is the average over the wet months of June through November in most years.

The groundwater level can be expected to drop several feet through the dry winter and spring months of November through May. Groundwater levels typically drop 6 to 10 feet below the ground surface.

5.6 Groundwater Control

Depending upon groundwater levels at the time of construction, some form of dewatering may be required for cross-drain installation and to achieve the required compaction in the initial lifts of embankment. Sump pumping from shallow excavations is typically effective for lowering the water table a few feet. Well points area typically required for excavations extending several feet in depth.

5.7 Design LBR

We obtained seven samples of the surficial soils within the alignment and performed LBR tests. The design LBR Value by using the ±2 Percent of Optimum Method is 23 (**Table 5**). The design LBR Value by the 90% Method is 23 (**Table 4**).

It is our opinion that a Design LBR value of 23 is a fair representation of the surficial soils along the alignment and we recommend using this value for pavement design.

The corresponding Resilient Modulus, M_R, is 8,000 psi from Table 5.1 of the FDOT Flexible Pavement Design Manual (January 2005).

5.8 Environmental Classification

Corrosion tests were performed on random samples recovered from the roadway auger and Pond SPT borings. Test results obtained are presented on **Table 3** in **Section 7.0**. Based on the laboratory test results and the FDOT Structures Design Guidelines, the roadway subsurface environment is classified as slightly to moderately aggressive for concrete structures and extremely aggressive for steel structures because of low soil pH. One sample resulted in a soil pH of 4.3, which is extremely aggressive for both concrete and steel. Several samples resulted in soil pH values between 5 and 6, which are moderately aggressive for concrete and extremely aggressive for steel. The Environmental Classification should be considered moderately aggressive for concrete structures (because of low pH) and extremely aggressive for steel structures (because of low pH).

5.9 Embankment Analyses

New embankments for the roadway will typically be less than 3 feet in height. New embankment settlement will be less than 1-inch and most of the settlement should occur during embankment construction as loads are applied. Long-term settlements are estimated to be less than ½-inch.

The overall site preparation and soil compaction for the construction of the roadway should be in accordance with the FDOT Standard Specifications for Road and Bridge Construction and Standard Index requirements. No special provisions are required.

6.0 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS FOR STRUCTURES

6.1 General

Based on the results of the borings and experience with similar projects, the soils encountered are suitable for support of the proposed box culvert extensions after proper site preparation. If buried organic soils, debris or unsuitable fills are encountered during construction, that are not shown on the borings profiles, they should be removed and replaced with clean, compacted, sandy soils in accordance with the FDOT Standard Specifications for Road and Bridge Construction (SSRBC) and Standard Index 500. Site preparation and backfilling procedures should be in accordance with FDOT SSRBC Section 410 and Standard Index 505.

6.2 Design Soil Parameters

The soil properties, based on the samples obtained and the recorded N-values were averaged and are presented on the attached Mast Arm Borings and Box Culvert Boring Sheet Nos. 12 through 14. The soil properties presented include: The ultimate cohesive strength, c, in pounds per square foot (psf); the angle of internal friction, ø, in degrees; and the total and submerged unit weight, γt and γb, in pounds per cubic foot (pcf).

6.3 Environmental Classification

Based on the laboratory test results and the July 2007 FDOT Structures Design Guidelines, SDG 1.3, the soils at each structure location are classified as Slightly Aggressive and the water from the canals is classified as Moderately Aggressive because of the resistivity values ranging from 1700 to 1900 ohm-cm and sulfates ranging from 251 to 276 ppm.

7.0 REPORT LIMITATIONS

The evaluation and recommendations submitted in this report are based upon the anticipated construction and the data obtained from the soil borings performed at the locations indicated and does not reflect any variations that may occur between these borings. If any variations become evident during the course of construction, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. When final design plans and specifications are available, a general review by our office is made to check that the assumptions made in preparation of this report are correct and that the recommendations are properly interpreted and implemented.

8.0 TABLES(S)

TABLE NO. 1 - SUMMARY OF LAB TEST RESULTS–ROADWAY

TABLE NO. 2 - SUMMARY OF LAB TEST RESULTS–PONDS

TABLE NO. 3 - SUMMARY OF SOIL CORROSION TESTS

TABLE NO. 4 - 90% METHOD FOR DESIGN LBR

TABLE NO. 5 - ± 2% OF OPTIMUM METHOD FOR DESIGN LBR

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS—ROADWAY
HOMESTEAD ROAD WIDENING FROM SOUTH OF SUNRISE BOULEVARD TO ALABAMA ROAD
LEHIGH ACRES, LEE COUNTY, FLORIDA
Ardaman Project No. 07-4550

STATION	OFFSET FROM B/L SURVEY (Feet)	DEPTH (Feet)	STRATUM NO.	Percent Passing U.S. STANDARD SIEVES							ATTERBERG LIMITS		MOISTURE CONTENT (%)	AASHTO CLASS.	ORGANIC CONTENT (%)
				3/8-in.	#4	#10	#40	#60	#100	#200	LL	PI			
65+00	20' Lt.	2	2	---	---	100	79	30	12	3	NP	NP	14	A-3	---
79+00	20' Lt.	2	2	---	---	100	78	31	13	3	NP	NP	13	A-3	---
88+00	20' Rt.	2	2	---	---	100	79	30	12	2	NP	NP	15	A-3	---
100+40	25' Lt.	2	2	---	---	100	82	35	17	5	NP	NP	7	A-3	---
112+30	25' Rt.	2	2	---	---	100	79	30	12	3	NP	NP	2	A-3	---
129+50	40' Lt.	3	2	---	---	100	81	32	14	9	NP	NP	7	A-3	---
152+50	20' Rt.	2	2	---	---	100	80	30	13	3	NP	NP	2	A-3	---
156+30	20' Lt.	2	2	---	---	100	78	29	12	2	NP	NP	1	A-3	---
161+10	35' Lt.	4	2	---	---	---	---	---	---	---	NP	NP	7	A-3	3.3
90+00	20' Rt.	4.5	3	---	---	100	78	42	22	16	NP	NP	17	A-2-4	---
106+30	25' Lt.	4	3	---	---	100	83	44	21	12	NP	NP	12	A-2-4	---
131+50	50' Lt.	12	3	87	79	67	51	43	38	31	NP	NP	26	A-2-4	---
99+40	25' Lt.	6	4	---	---	---	---	---	---	---	20	6	---	A-2-4	---
142+30	20' Rt.	4	4	---	---	100	85	45	31	21	---	---	7	A-2-4	---
145+50	20' Rt.	9	4	---	---	---	---	---	---	---	20	5	---	A-2-4	---
160+10	20' Rt.	5	4	---	---	---	---	---	---	---	21	8	---	A-2-4	---
169+50	20' Rt.	8	5	---	---	100	86	57	43	32	---	---	17	A-2-6	---
107+30	25' Lt.	10	6	---	93	89	77	70	65	57	NP	NP	25	A-4	---

TABLE 2

SUMMARY OF LABORATORY TEST RESULTS—PONDS
HOMESTEAD ROAD WIDENING FROM SOUTH OF SUNRISE BOULEVARD TO ALABAMA ROAD
LEHIGH ACRES, LEE COUNTY, FLORIDA
Ardaman Project No. 07-4550

STATION	OFFSET FROM B/L SURVEY (Feet)	DEPTH (Feet)	STRATUM NO.	Percent Passing U.S. STANDARD SIEVES							ATTERBERG LIMITS		MOISTURE CONTENT (%)	AASHTO CLASS.	ORGANIC CONTENT (%)
				3/8-in.	#4	#10	#40	#60	#100	#200	LL	PI			
POND 1	300' Rt.	4	2	---	---	100	77	29	8	2	NP	NP	3	A-3	---
92+50		15	1	69	57	46	26	20	17	13	NP	NP	28	A-1-a	---
POND 1	125' Rt.	4	2	---	---	---	---	---	---	---	NP	NP	7	A-3	1.7
93+50		6	4	---	---	100	90	65	45	27	23	10	15	A-2-4	---
POND 2	115' Rt.	2.5	2	---	---	100	81	31	13	3	NP	NP	3	A-3	---
128+00															
POND 2	140' Rt.	7	5	---	---	100	86	61	48	40	36	24	20	A-6	---
126+50		10	1	64	56	47	33	28	24	18	NP	NP	34	A-1-b	---

TABLE 3 - SUMMARY OF SOIL CORROSION TESTS
Ardaman Project No. 07-4550

Boring No.	Station (Offset B/L)	Depth (ft.)	Stratum No.	pH	Resistivity ohm-cm	Cl (ppm)	SO_4 (ppm)	Environmental Classification (concrete)
---	77+00 (20' Lt.)	2'	2 (A-3)	7.4	9,100	45	0	Slightly Aggressive
---	84+00 (20' Rt.)	1'	2 (A-3)	7.7	8,100	45	0	Slightly Aggressive
---	94+40 (60' Rt.)	2'	2 (A-3)	5.8	49,000	30	25	Moderately Aggressive (concrete) Extremely Aggressive (steel)
---	97+40 (40' Rt.)	1'	2(A-3)	4.3	27,000	45	40	Extremely Aggressive (concrete and steel)
---	119+70 (30' L)	1'	2 (A-3)	5.1	25,000	30	60	Moderately Aggressive (concrete) Extremely Aggressive (steel)
---	128+50 (30' Rt.)	1'	2 (A-3)	5.0	59,000	45	40	Moderately Aggressive (concrete) Extremely Aggressive (steel)
---	138+10 (30' Rt.)	1'	2 (A-3)	6.1	7,200	45	64	Moderately Aggressive (concrete and steel)
---	155+30 (50' Lt.)	1'	2 (A-3)	6.3	12,000	45	20	Moderately Aggressive (concrete and steel)
---	140+00 (40' Rt.)	6'	4 (A-2-4)	7.7	4,800	45	30	Slightly Aggressive
---	150+00 (20' Rt.)	8'	4 (A-2-4)	7.3	5,900	60	79	Slightly Aggressive
P-1	128+00 (115' Rt.)	6'	5 (A-2-6)	6.0	3,400	30	5	Moderately Aggressive (concrete and steel)
P-4	92+50 (300' Rt.)	12'	6 (A-4)	7.2	4,100	45	44	Slightly Aggressive

TABLE 4
90% METHOD FOR DESIGN LBR

Ardaman file No.: 07-4550

Sample No.	Station	Maximum Dry Density (pcf)	Maximum LBR value	% Equal Or Greater Than
1	98+40	106	42	14.00%
2	156+30	113	28	84.00%
3	118+70	102	28	70.00%
4	137+10	118	16	100.00%
5	128+50	108	36	42.00%
6	60+00	105	35	56.00%
7	83+50	107	39	28.00%

Read off at 90%: **23**
Resilient Modulus (MR), psi: **8,000**

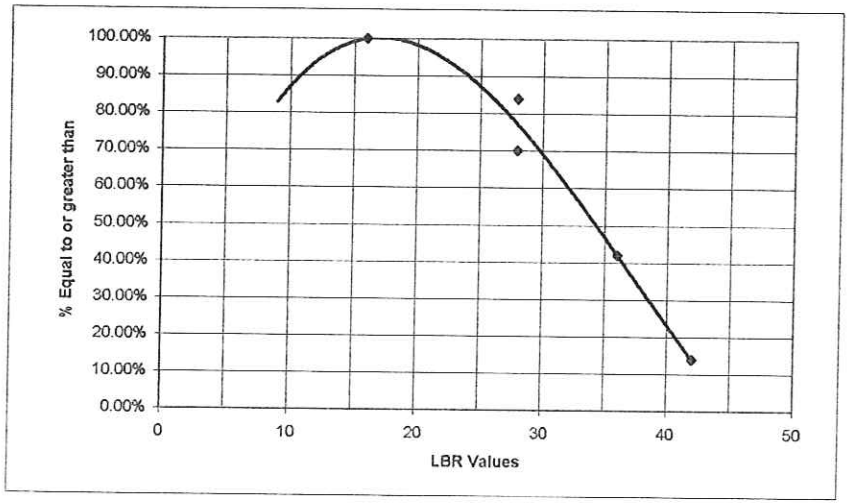


TABLE 5
+/- 2% OF OPTIMUM METHOD FOR DESIGN LBR

Ardaman file No.: 07-4550

Average **23.4**
Design LBR: **23**
Resilient Modulus (MR), psi : **8,000**

Sample No.	Station	Maximum Dry Density (pcf)	Maximum LBR value	LBR at Moisture contents (of Optimum LBR)	
				-2%	+2%
1	98+40	106	42	38	30
2	156+30	113	28	20	18
3	118+70	102	28	22	17
4	137+10	118	16	14	14
5	128+50	108	36	29	23
6	60+00	105	35	27	22
7	83+50	107	39	26	28
			Mean LBR Value:	**25.1**	**21.7**

9.0 FIGURE(S)

FIGURE 1 - USDA SOIL SURVEY MAP

FIGURE 2 - USGS QUADRANGLE MAP

FIGURE 3 - ROADWAY SOIL SURVEY SHEET

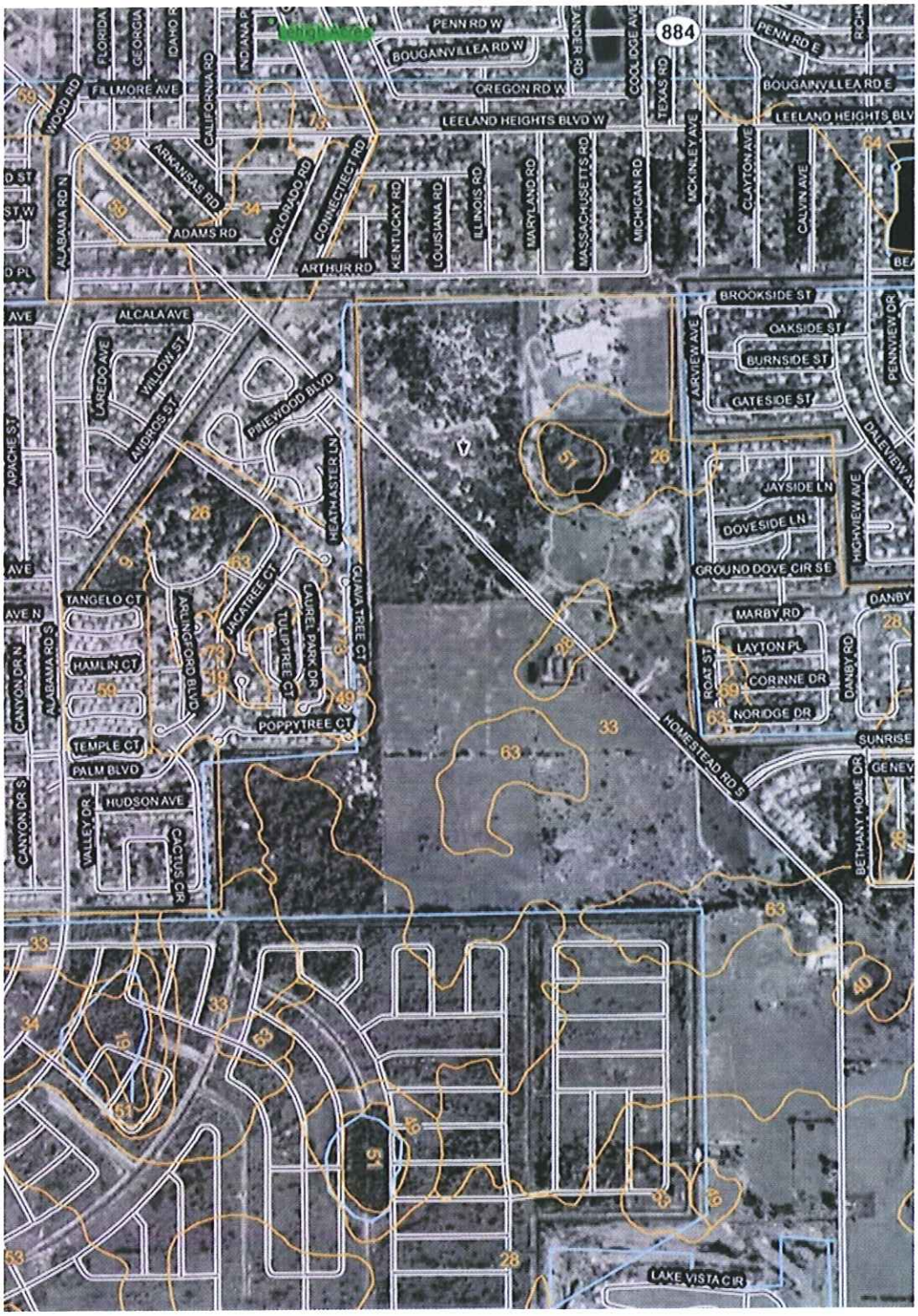
FIGURES 4 THROUGH 9 - ROADWAY BORING PROFILES

FIGURES 10 THROUGH 11 - POND BORING PROFILES

FIGURE 12 - MAST ARM BORING PROFILE

FIGURES 13 AND 14 - BOX CULVERT BORING PROFILES

Symbol	Map Unit Name
7	Matlacha-Urban land complex
9	EauGallie sand
11	Myakka fine sand
13	Boca fine sand
19	Gator muck
26	Pineda fine sand
28	Immokalee sand
33	Oldsmar sand
34	Malabar fine sand
40	Anclote sand, depressional
44	Malabar fine sand, depressional
45	Copeland sandy loam, depressional
49	Felda fine sand, depressional
51	Floridana sand, depressional
53	Myakka fine sand, depressional
59	Urban land
63	Malabar fine sand, high
64	Hallandale-Urban land complex
69	Matlacha gravelly fine sand
73	Pineda fine sand, depressional
77	Pineda fine sand, limestone substratum
99	Water



N

0 100 200 400 600 Meters

0 500 1,000 2,000 3,000 Feet

USDA Natural Resources Conservation Service

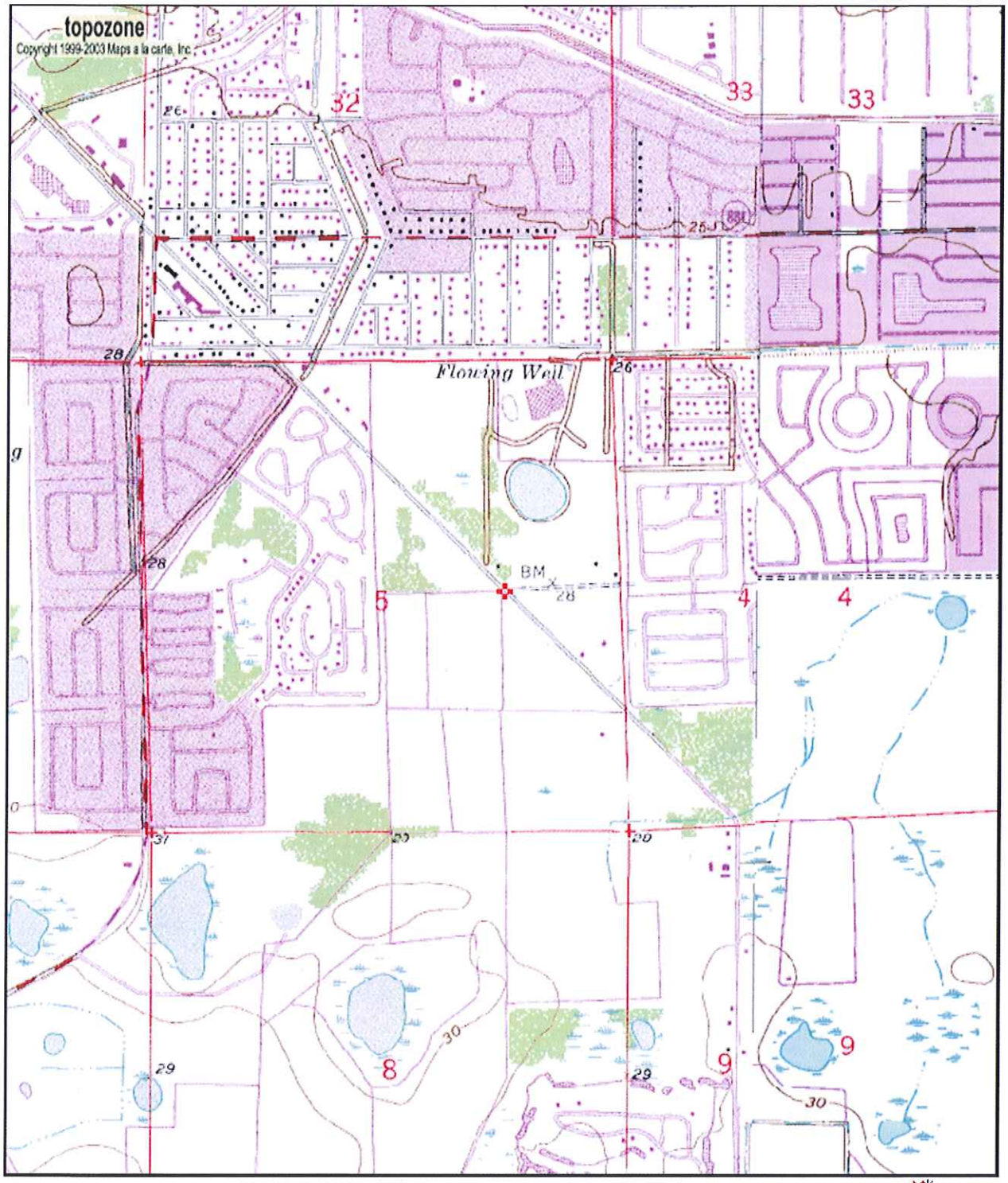
Web Soil Survey 2.0
National Cooperative Soil Survey

SOIL MAP

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HOMESTEAD ROAD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD.
Fort Myers, Lee County, Florida

Drawn By: JAR	Checked By: GAD	Date: 08/07
File No. 07-4550	Approved By: Gary A. Drew, P.E.	Figure No. 1



26° 35' 31"N, 81° 38' 00"W (NAD83/WGS84)

USGS Alva SW (FL) Quadrangle

Projection is UTM Zone 17 NAD83 Datum

TOPOGRAPHIC MAP

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HOMESTEAD ROAD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD.
Fort Myers, Lee County, Florida

Drawn By:	Checked By:	Date:
JAR	GAD	08/07

File No.	Approved By:	Figure No.
07-4550	Gary A. Drew, P.E.	2

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH

Date of Survey: Apr - Aug 2007

Survey Made By: Ardaman & Associates, Inc.

Submitted By: G.A. Drew, P.E.

Ardaman File No.: 07-4550

DISTRICT: ONE
ROAD NO.: N/A
COUNTY: LEE

PROJECT NO: CN #06-17

CROSS SECTION SOIL SURVEY FOR THE DESIGN OF ROADS

SURVEY BEGINS STA.: 58+00 — 178+00 B/L HOMESTEAD ROAD
14+50 — 18+50 C/L ALABAMA ROAD
21+50 — 27+50 C/L LEELAND HEIGHTS BLVD

SURVEY ENDS STA.

	ORGANIC CONTENT			SIEVE ANALYSIS RESULTS % PASS						ATTERBERG LIMITS					CORROSION TESTS RESULTS				
Stratum No.	*No. of Tests*	*% Organic*	*% Moisture Content*	*No. of Tests*	*10 Mesh*	*40 Mesh*	*60 Mesh*	*100 Mesh*	*200 Mesh*	*No. of Tests*	*Liquid Limit*	*Plastic Index*	*AASHTO Group*	*Description*	*No. of Tests*	*Resistivity ohm cm*	*Chlorides ppm*	*SO_4 ppm*	*pH*
1	---	---	10 - 15	2	46 - 47	26 - 33	20 - 28	17 - 24	13 - 18	---	NP	NP	A-1-a/A-1-b	Silty Sandy Gravel	---	---	---	---	---
2	2	1.7 - 3.3	1 - 7	11	100	77 - 82	29 - 35	8 - 17	2 - 9	---	NP	NP	A-3	Fine Sand	8	7,200 - 59,000	30 - 45	0 - 64	4.3 - 7.7
3	---	---	12 - 26	3	67 - 100	51 - 83	42 - 44	21 - 38	12 - 31	---	NP	NP	A-2-4	Silty Fine Sand, tr. to some Gravel	---	---	---	---	---
4	---	---	7 - 15	1	100	85 - 90	45 - 65	31 - 45	21 - 27	4	20 - 23	5 - 10	A-2-4	Silty Clayey Fine Sand	2	4,800 - 5,900	45 - 60	30 - 79	7.3 - 7.7
5	---	---	17 - 20	2	100	86	57 - 61	43 - 48	32 - 40	1	36	24	A-2-6/A-6	Clayey Fine Sand	1	3,400	30	5	6.0
6	---	---	25	1	93	89	77	65 - 70	57	---	NP	NP	A-4	Sandy Silt, trace Gravel	1	4,100	45	44	7.2

NOTES

(1) Strata boundaries are approximate - make final check after grading.

(2) ▽ Water table encountered.

(3) GNE - Groundwater not encountered.

(4) ---- unmeasured parameters

- The material from Stratum Number 2 appears satisfactory for use in the embankment when utilized in accordance with INDEX 505.
- The materials from Strata Numbers 1, 3 and 4 appear satisfactory for use in the embankment when utilized in accordance with INDEX 505. However, these materials are likely to retain excess moisture and may be difficult to dry and compact. They should be used in the embankment above the water level existing at the time of construction.
- The materials from Strata Numbers 5 and 6 are plastic A-2-6/A-6 and A-4 material and may be placed above the existing water table (at the time of construction) to within 4 feet of the proposed base. They should be placed uniformly in the lower portion of the embankment for some distance along the project rather than full depth for shorter distances.

REVISIONS					
Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	GBD	08/07
Checked by	GAD	08/07
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504

Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

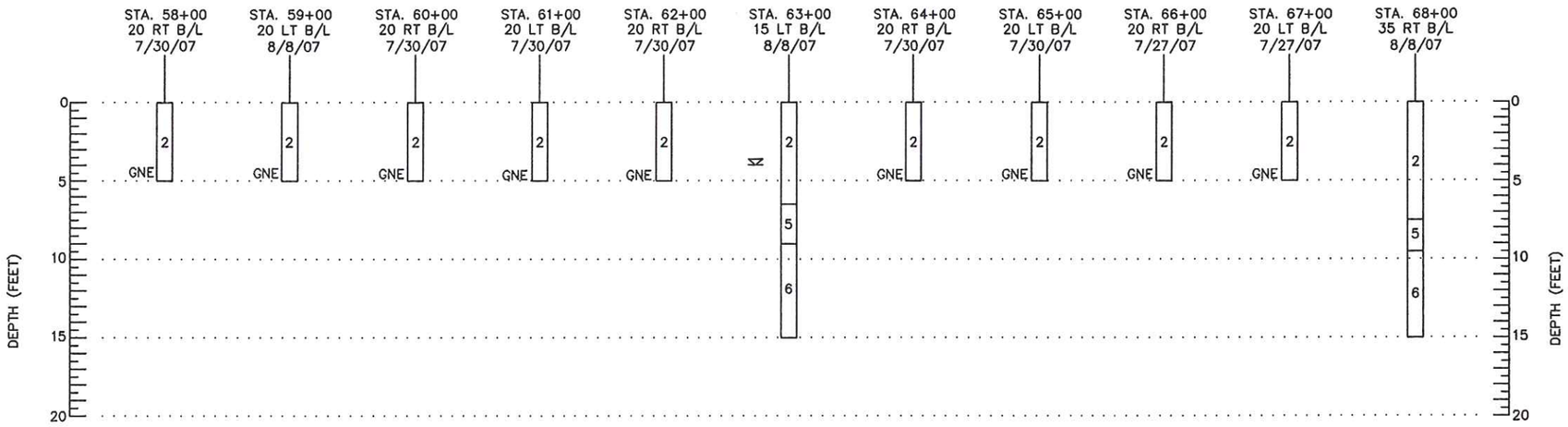
Ardaman & Associates, Inc.

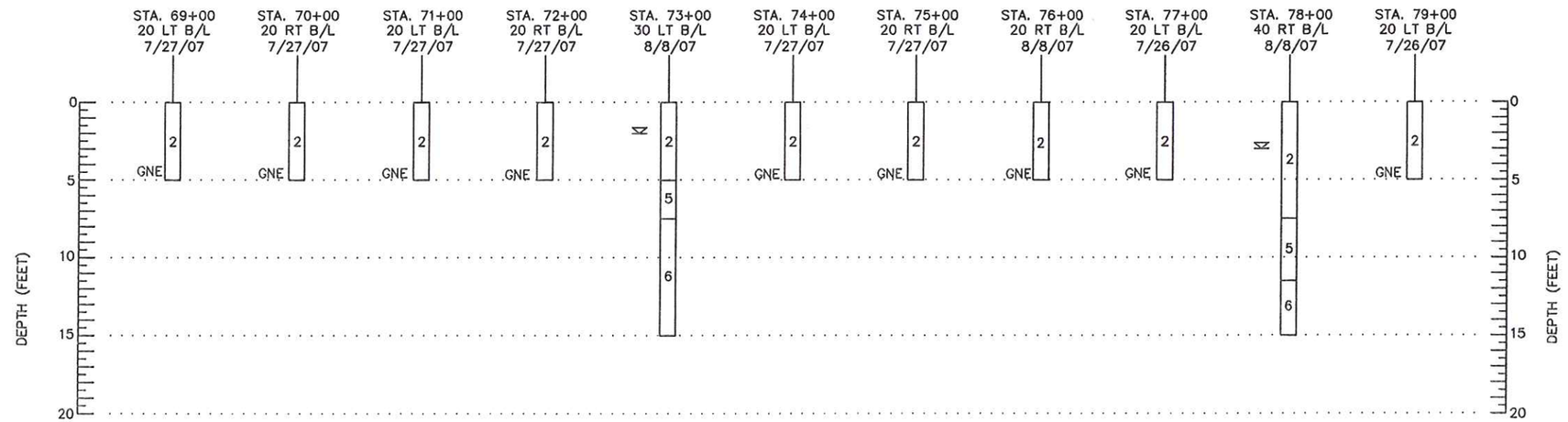
SEAL:
8/24/07

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROADWAY SOILS SURVEY
HOMESTEAD ROAD WIDENING -
SUNRISE BLVD TO ALABAMA RD

SHEET NO.
3





LEGEND

1 LIGHT GRAY SILTY SANDY GRAVEL (A-1-a/A-1-b)

2 GRAY TO DARK BROWN FINE SAND (A-3)

3 GRAY SILTY FINE SAND, TRACE TO SOME GRAVEL (A-2-4)

4 BROWN SILTY CLAYEY FINE SAND (A-2-4)

5 BROWN CLAYEY FINE SAND (A-2-6/A-6)

6 LIGHT GRAY SANDY SILT, TRACE GRAVEL (A-4)

A-3 AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW

▽ GROUNDWATER LEVEL, DATE OBSERVED

GNE GROUNDWATER NOT ENCOUNTERED

REVISIONS					
Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	GBD	05/07
Checked by	GAD	05/07
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504

Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

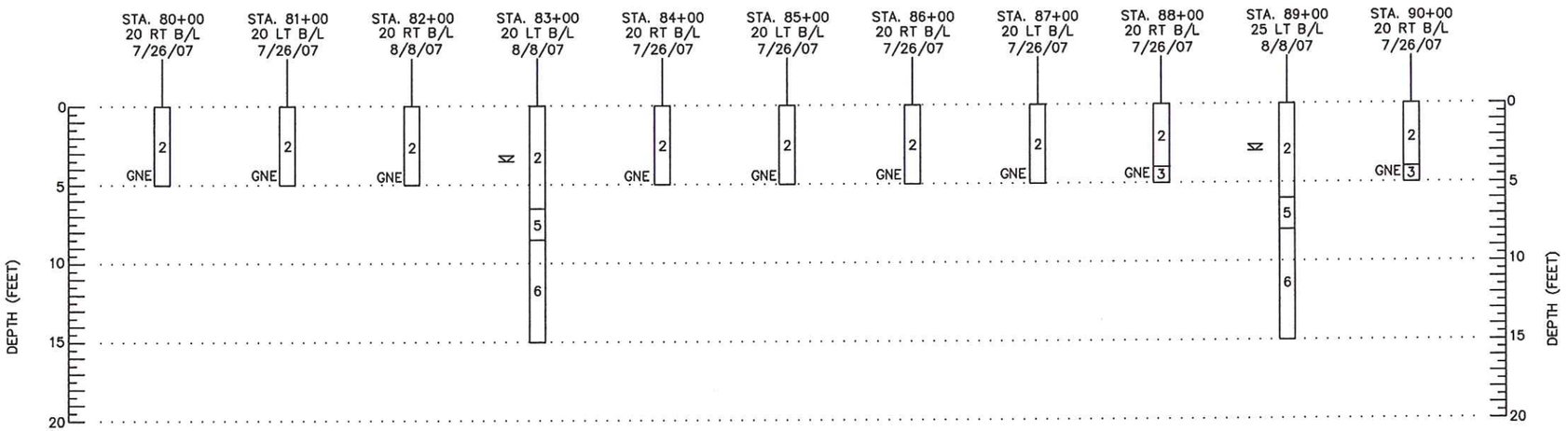
Ardaman & Associates, Inc.

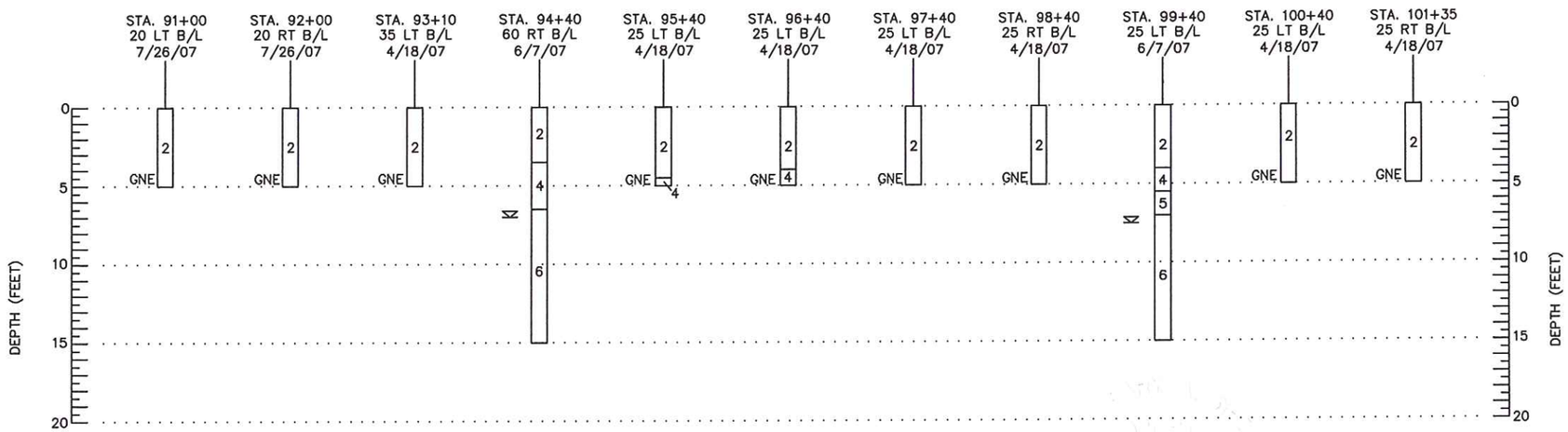
SEAL:
8/24/07

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROADWAY SOIL SURVEY
HOMESTEAD ROAD WIDENING - SUNRISE BLVD. TO ALABAMA RD.

SHEET NO. 4





LEGEND

1 LIGHT GRAY SILTY SANDY GRAVEL (A-1-a/A-1-b)

2 GRAY TO DARK BROWN FINE SAND (A-3)

3 GRAY SILTY FINE SAND, TRACE TO SOME GRAVEL (A-2-4)

4 BROWN SILTY CLAYEY FINE SAND (A-2-4)

5 BROWN CLAYEY FINE SAND (A-2-6/A-6)

6 LIGHT GRAY SANDY SILT, TRACE GRAVEL (A-4)

A-3 AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW

▽ GROUNDWATER LEVEL, DATE OBSERVED

GNE GROUNDWATER NOT ENCOUNTERED

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	GBD	05/07
Checked by	GAD	05/07
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504
Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

Ardaman & Associates, Inc.

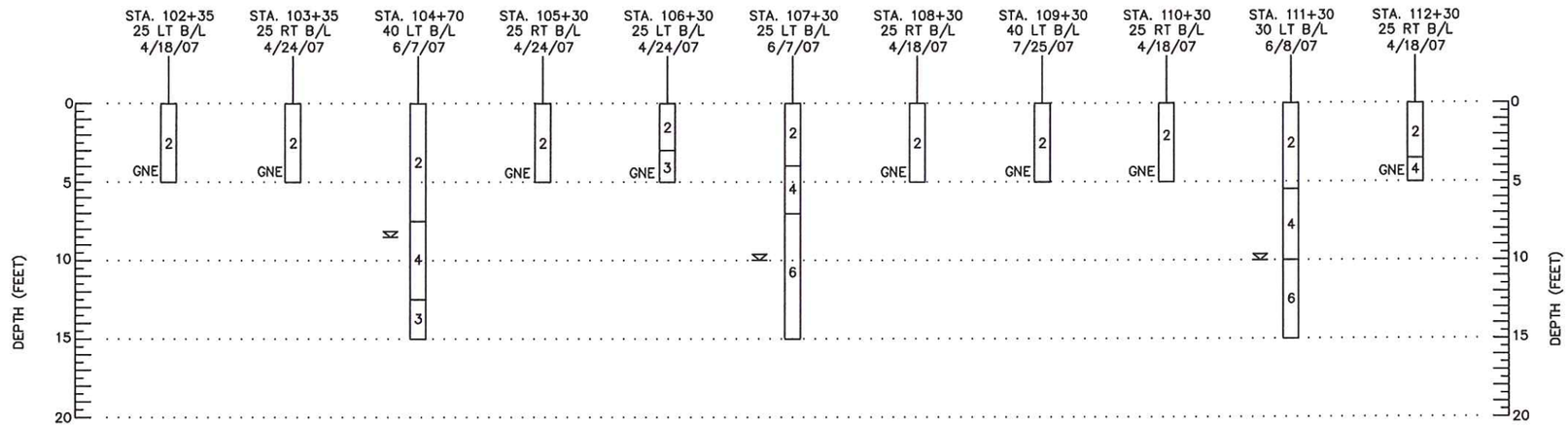
SEAL:

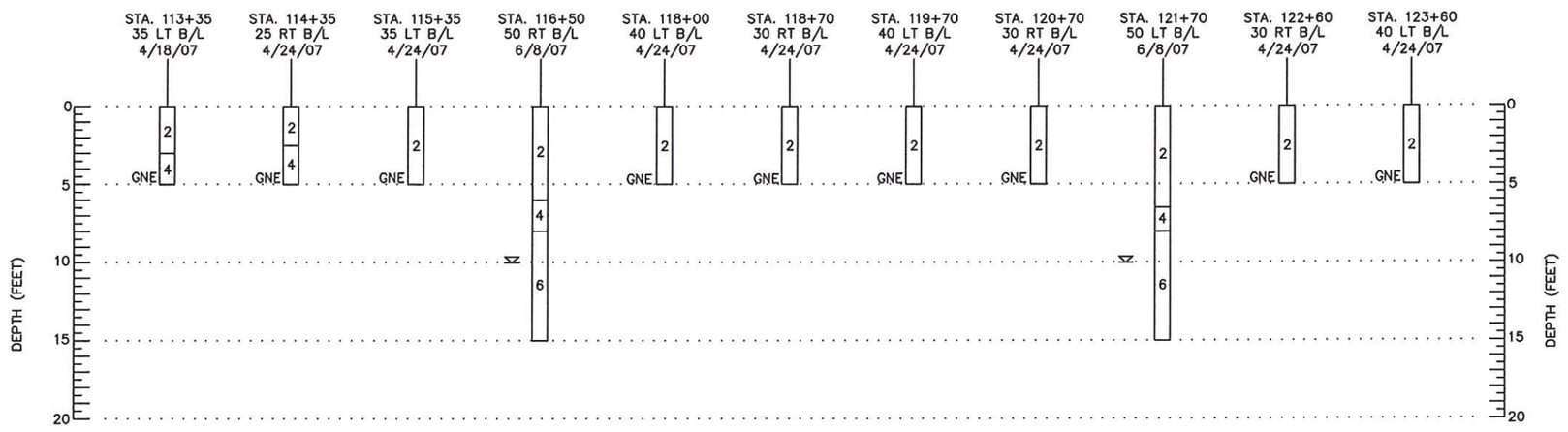
8/24/09

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROADWAY SOIL SURVEY
HOMESTEAD ROAD WIDENING - SUNRISE BLVD. TO ALABAMA RD.

SHEET NO. 5





LEGEND

1 LIGHT GRAY SILTY SANDY GRAVEL (A-1-a/A-1-b)

2 GRAY TO DARK BROWN FINE SAND (A-3)

3 GRAY SILTY FINE SAND, TRACE TO SOME GRAVEL (A-2-4)

4 BROWN SILTY CLAYEY FINE SAND (A-2-4)

5 BROWN CLAYEY FINE SAND (A-2-6/A-6)

6 LIGHT GRAY SANDY SILT, TRACE GRAVEL (A-4)

A-3 AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW

▽ GROUNDWATER LEVEL, DATE OBSERVED

GNE GROUNDWATER NOT ENCOUNTERED

REVISIONS					
Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	GBD	05/07
Checked by	GAD	05/07
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504

Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

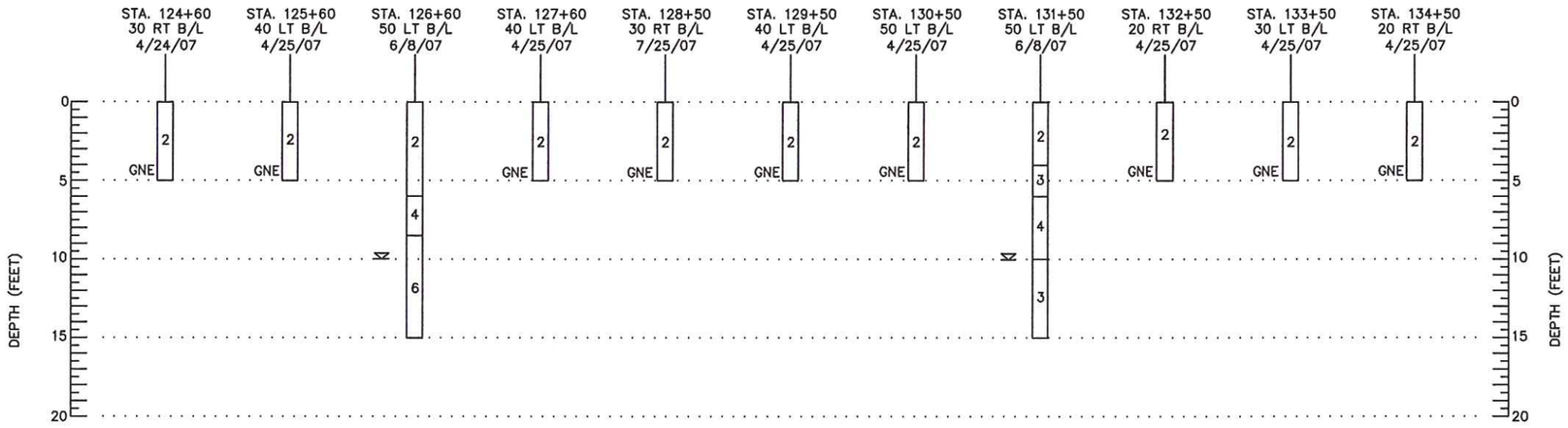
Ardaman & Associates, Inc.

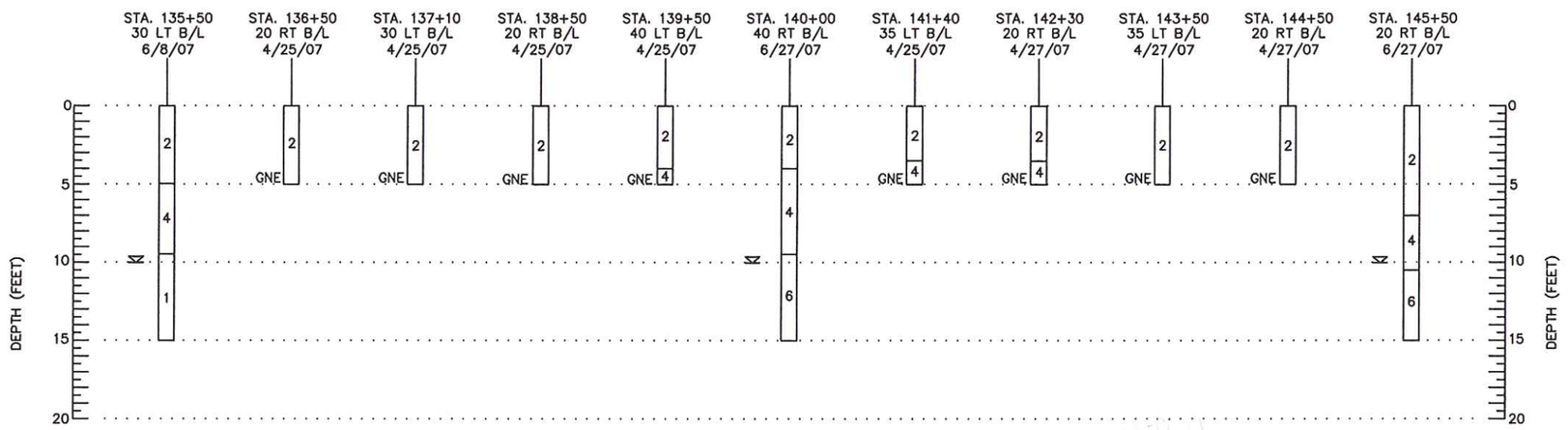
SEAL:
8/24/07

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROADWAY SOIL SURVEY
HOMESTEAD ROAD WIDENING - SUNRISE BLVD. TO ALABAMA RD.

SHEET NO. 6





LEGEND

1 LIGHT GRAY SILTY SANDY GRAVEL (A-1-a/A-1-b)

2 GRAY TO DARK BROWN FINE SAND (A-3)

3 GRAY SILTY FINE SAND, TRACE TO SOME GRAVEL (A-2-4)

4 BROWN SILTY CLAYEY FINE SAND (A-2-4)

5 BROWN CLAYEY FINE SAND (A-2-6/A-6)

6 LIGHT GRAY SANDY SILT, TRACE GRAVEL (A-4)

A-3 AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW

▽ GROUNDWATER LEVEL, DATE OBSERVED

GNE GROUNDWATER NOT ENCOUNTERED

REVISIONS					
Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	GBD	05/07
Checked by	GAD	05/07
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504

Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

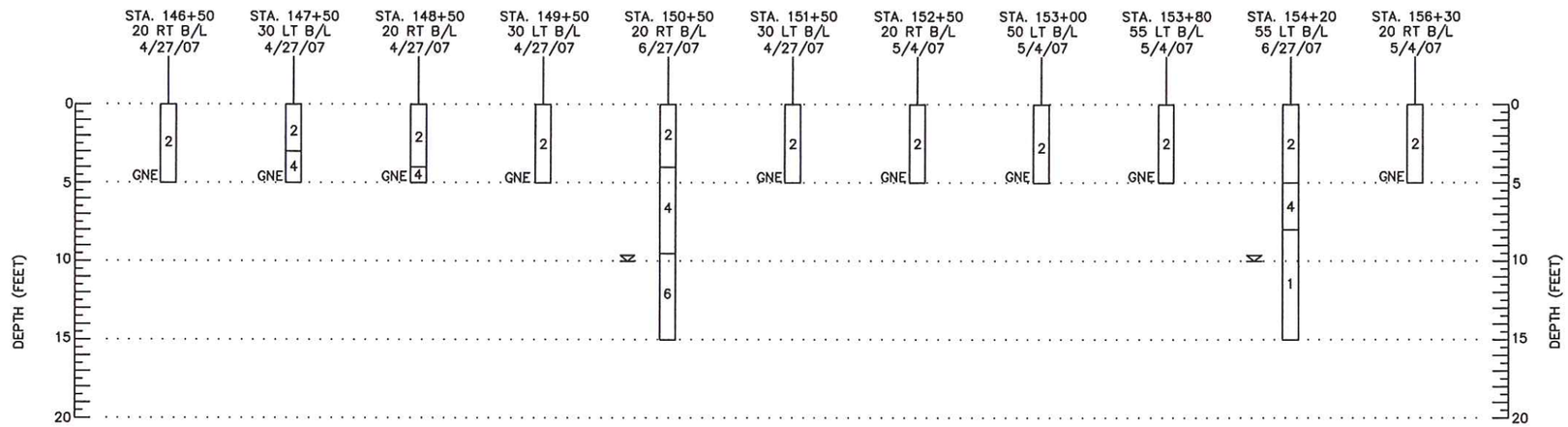
Ardaman & Associates, Inc.

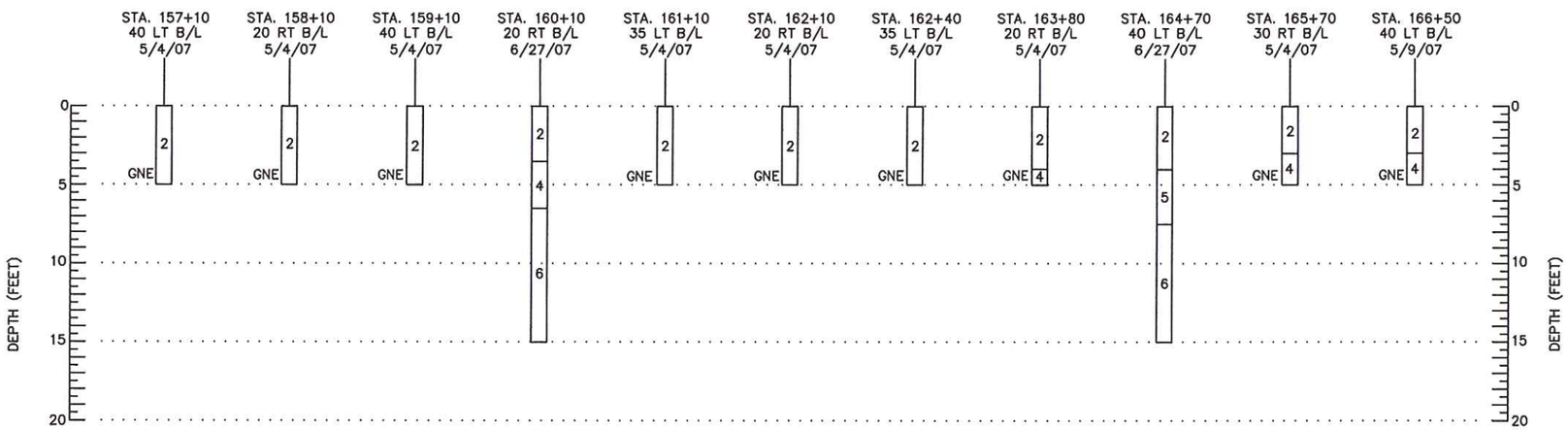
SEAL:
8/24/07

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROADWAY SOIL SURVEY
HOMESTEAD ROAD WIDENING - SUNRISE BLVD. TO ALABAMA RD.

SHEET NO. 7





LEGEND

1 LIGHT GRAY SILTY SANDY GRAVEL (A-1-a/A-1-b)

2 GRAY TO DARK BROWN FINE SAND (A-3)

3 GRAY SILTY FINE SAND, TRACE TO SOME GRAVEL (A-2-4)

4 BROWN SILTY CLAYEY FINE SAND (A-2-4)

5 BROWN CLAYEY FINE SAND (A-2-6/A-6)

6 LIGHT GRAY SANDY SILT, TRACE GRAVEL (A-4)

A-3 AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW

▽ GROUNDWATER LEVEL, DATE OBSERVED

GNE GROUNDWATER NOT ENCOUNTERED

REVISIONS					
Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	GBD	05/07
Checked by	GAD	05/07
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504
Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

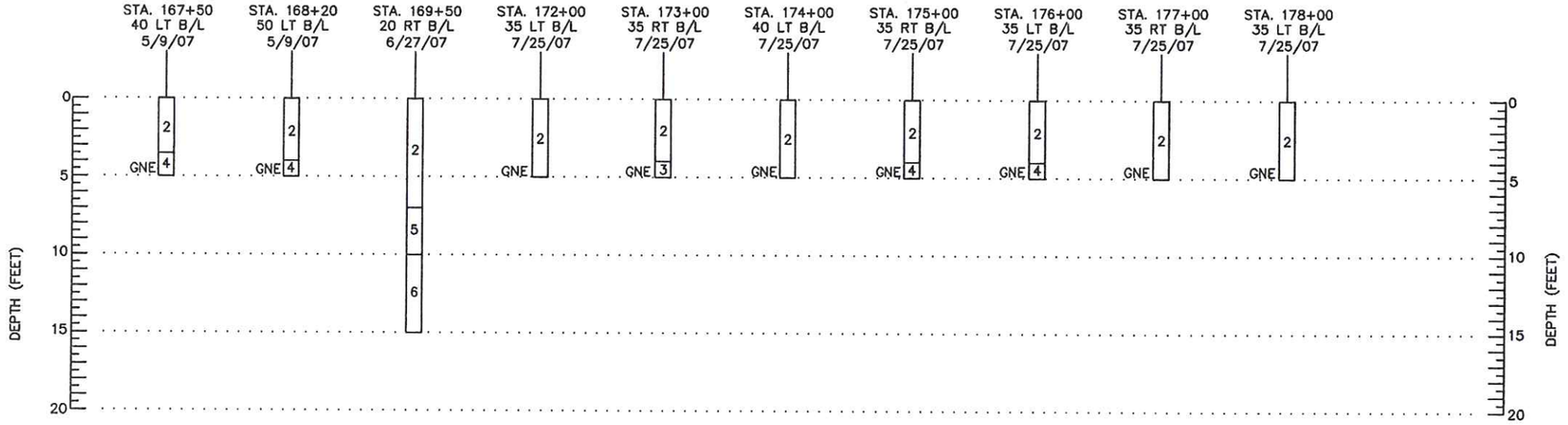
Ardaman & Associates, Inc.

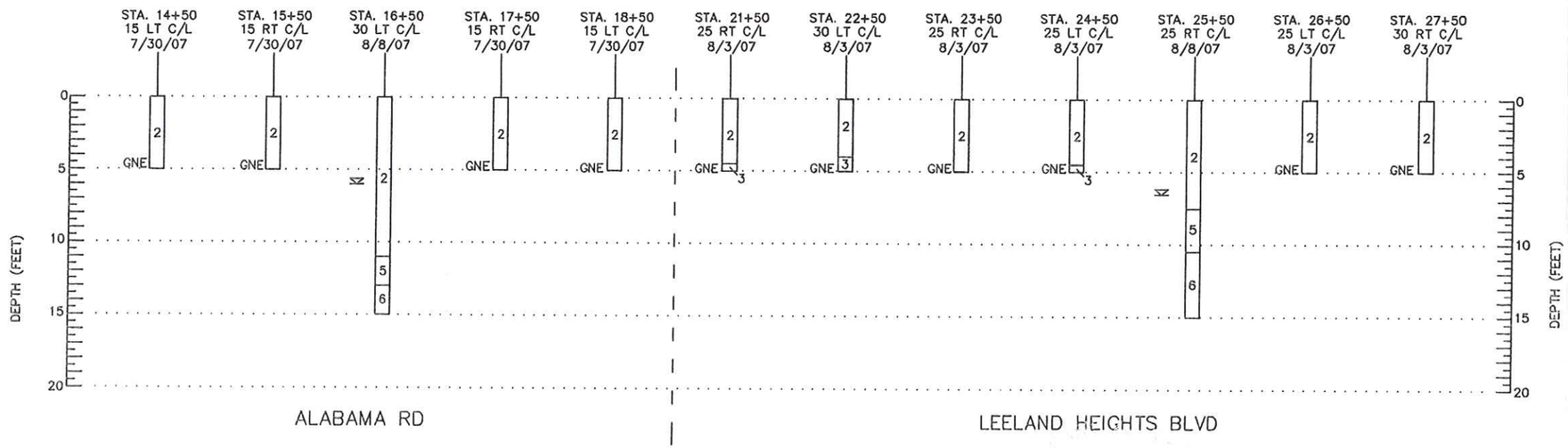
SEAL:
8/24/07

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROADWAY SOIL SURVEY
HOMESTEAD ROAD WIDENING - SUNRISE BLVD. TO ALABAMA RD.

SHEET NO.
8





LEGEND

1 LIGHT GRAY SILTY SANDY GRAVEL (A-1-a/A-1-b)

2 GRAY TO DARK BROWN FINE SAND (A-3)

3 GRAY SILTY FINE SAND, TRACE TO SOME GRAVEL (A-2-4)

4 BROWN SILTY CLAYEY FINE SAND (A-2-4)

5 BROWN CLAYEY FINE SAND (A-2-6/A-6)

6 LIGHT GRAY SANDY SILT, TRACE GRAVEL (A-4)

A-3 AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW

▽ GROUNDWATER LEVEL, DATE OBSERVED

GNE GROUNDWATER NOT ENCOUNTERED

REVISIONS					
Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	GBD	05/07
Checked by	GAD	05/07
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504

Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 3950

Ardaman & Associates, Inc.

SEAL:
8/24/07

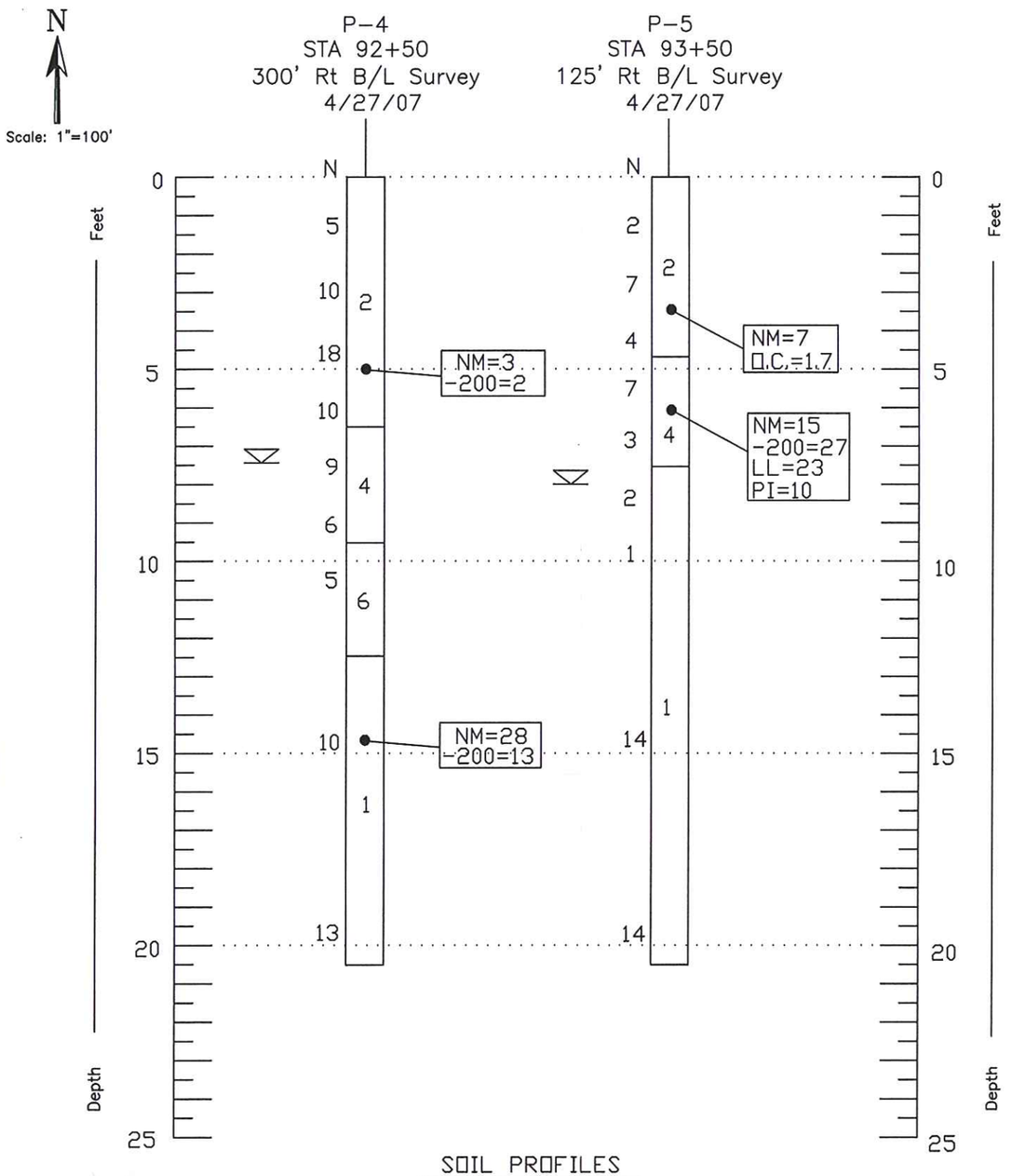
LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROADWAY SOIL SURVEY
HOMESTEAD ROAD WIDENING - SUNRISE BLVD. TO ALABAMA RD.

SHEET NO. 9



BORING LOCATION PLAN



SOIL PROFILES

LEGEND

1 LIGHT GRAY SILTY SANDY GRAVEL (A-1-a/A-1-b)

2 GRAY TO DARK BROWN FINE SAND (A-3)

3 GRAY SILTY FINE SAND, TRACE TO SOME GRAVEL (A-2-4)

4 BROWN SILTY CLAYEY FINE SAND (A-2-4)

5 BROWN CLAYEY FINE SAND (A-2-6/A-6)

6 LIGHT GRAY SANDY SILT, TRACE GRAVEL (A-4)

STANDARD PENETRATION TEST (SPT) BORING LOCATION

N - STANDARD PENETRATION TEST N-VALUE USING SAFETY HAMMER

A-3 AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW

GROUNDWATER LEVEL, DATE OBSERVED

-200 = PERCENT PASSING NO. 200 SIEVE SIZE (AASHTO T88)

NM = NATURAL MOISTURE CONTENT IN PERCENT (AASHTO T265)

LL = LIQUID LIMIT (AASHTO T89)

PI = PLASTICITY INDEX (AASHTO T90)

O.C. = ORGANIC CONTENT (FM1-T267)

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	GBD	05/07
Checked by	GAD	05/07
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504

Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

Ardaman & Associates, Inc.

SEAL:
8/24/07

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

POND 1 BORINGS
HOMESTEAD ROAD WIDENING - SUNRISE BLVD. TO ALABAMA RD.

SHEET NO.
10



BORING LOCATION PLAN

LEGEND

1 LIGHT GRAY SILTY SANDY GRAVEL (A-1-a/A-1-b)

2 GRAY TO DARK BROWN FINE SAND (A-3)

3 GRAY SILTY FINE SAND, TRACE TO SOME GRAVEL (A-2-4)

4 BROWN SILTY CLAYEY FINE SAND (A-2-4)

5 BROWN CLAYEY FINE SAND (A-2-6/A-6)

6 LIGHT GRAY SANDY SILT, TRACE GRAVEL (A-4)

STANDARD PENETRATION TEST (SPT) BORING LOCATION

N - STANDARD PENETRATION TEST N-VALUE USING SAFETY HAMMER

A-3 AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW

GROUNDWATER LEVEL, DATE OBSERVED

-200 = PERCENT PASSING NO. 200 SIEVE SIZE (AASHTO T88)

NM = NATURAL MOISTURE CONTENT IN PERCENT (AASHTO T265)

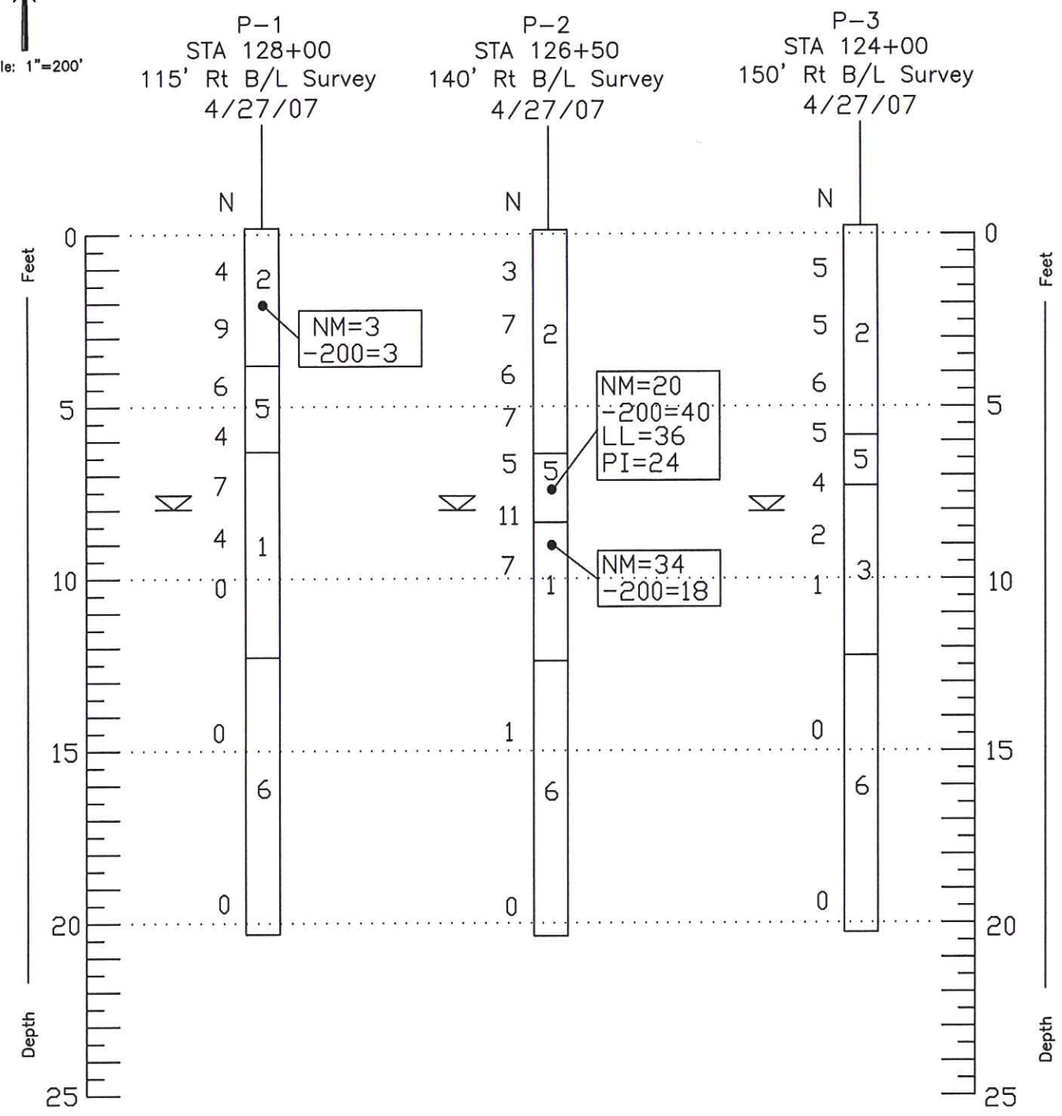
LL = LIQUID LIMIT (AASHTO T89)

PI = PLASTICITY INDEX (AASHTO T90)

O.C. = ORGANIC CONTENT (FM1-T267)

N

Scale: 1"=200'



SOIL PROFILES

REVISIONS						Names	Dates
Date	By	Description	Date	By	Description	Drawn by	GBD 05/07
						Checked by	GAB 05/07
						Designed by	
						Checked by	
						Approved by	

ENGINEER OF RECORD: G.A. DREW, P.E. FL. REG. NO. 35504

Ardaman & Associates, Inc. 9970 BAVARIA ROAD FT. MYERS, FL. 33913 PHONE (239) 768-6600 ENG. AUTH NO. 5950

Ardaman & Associates, Inc.

SEAL: 2/24/07

LEE COUNTY PUBLIC WORKS DEPARTMENT OF TRANSPORTATION

POND 2 BORINGS
HOMESTEAD ROAD WIDENING - SUNRISE BLVD. TO ALABAMA RD.

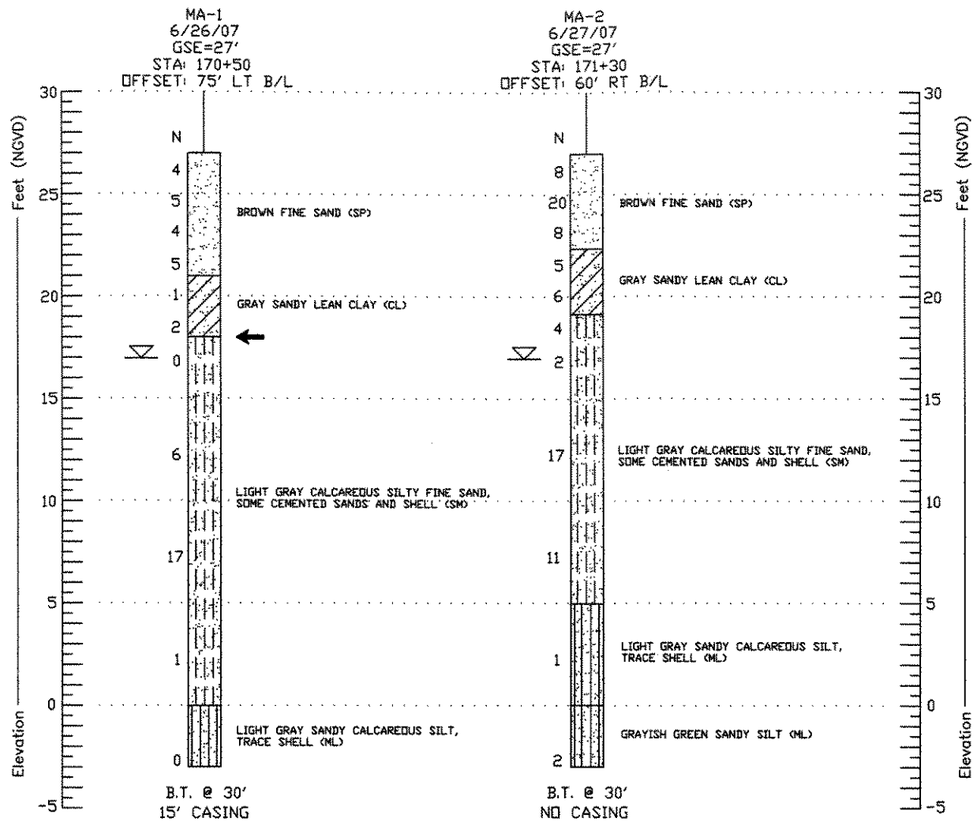
SHEET NO. 11



BORING LOCATION PLAN

N

SCALE: 1"=60'



SOIL PROFILES

CORROSION SERIES TEST RESULTS

	RESISTIVITY Ohms-cm	CHLORIDES ppm	SULFATES ppm	pH
MA-1/2	10,000	60	92	6.9

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: SLIGHTLY AGGRESSIVE
STEEL: SLIGHTLY AGGRESSIVE

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 6'-10'
AUTO 15'-30'

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

LEGEND

- FINE SAND
- SILTY FINE SAND
- SANDY SILT
- SANDY CLAY
- CLAYEY FINE SAND
- STANDARD PENETRATION TEST (SPT) BORING LOCATION
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
- GROUNDWATER LEVEL MEASURED ON DATE DRILLED
- GSE — GROUND SURFACE ELEVATION (FEET, NGVD)
- SP, SC-SM, ML, CH, CL — UNIFIED SOIL CLASSIFICATION SYSTEM
- LOSS OF DRILLING FLUID CIRCULATION
- B.T. — BORING TERMINATION DEPTH

SOIL DESIGN PARAMETERS FOR BORINGS MA-1 & MA-2

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γsat	γb			ACTIVE (Ka)	PASSIVE (Kp)
0-5	4-20	SP	112	50	30	0	0.33	3.00
5-8	1-6	CL	109	47	0	750	1	1
8-22	0-17	SM	112	50	30	0	0.33	3.00
22-30	0-2	ML	107	45	28	0	0.36	2.77

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	GBD	08/07
Checked by	GAB	08/07
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504

Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

Ardaman & Associates, Inc.

SEAL:
8/24/07

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

MAST ARM BORING MA-1 & 2
HOMESTEAD ROAD WIDENING - SUNRISE BLVD TO ALABAMA RD

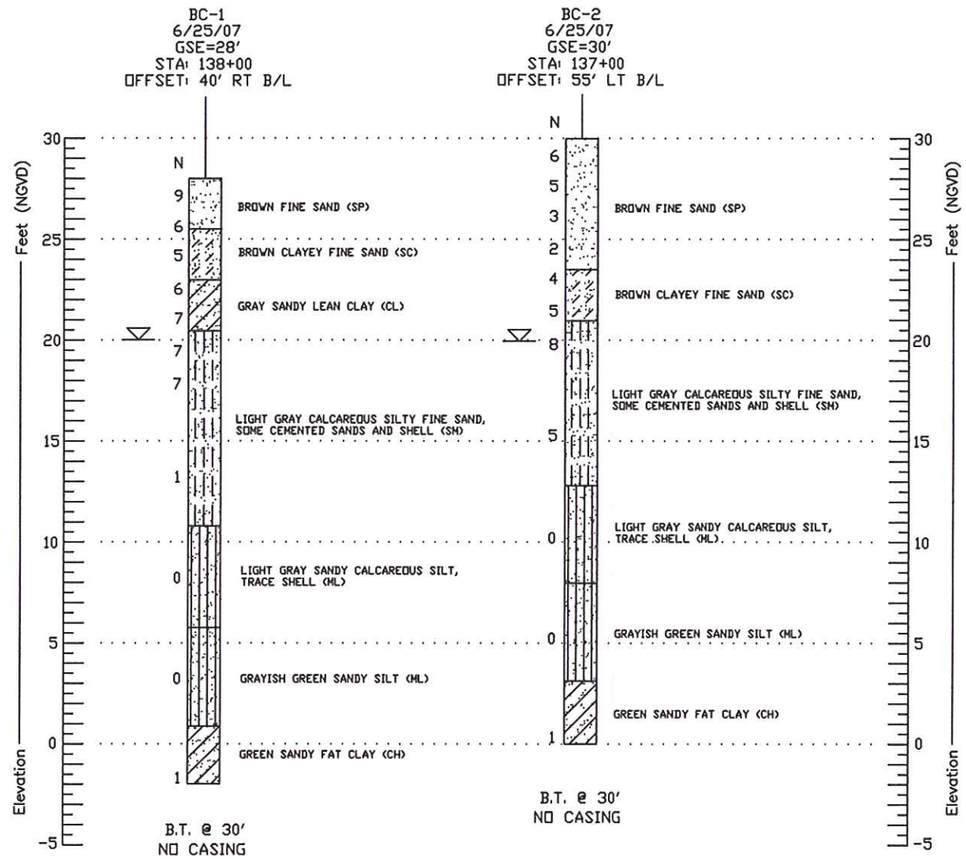
SHEET NO.
12



BORING LOCATION PLAN

N

N.T.S.
SCALE:1"=80'



SOIL PROFILES

CORROSION SERIES TEST RESULTS

	RESISTIVITY Ohms-cm	CHLORIDES ppm	SULFATES ppm	pH
BC 1/2	4600	75	55	6.8
CANAL WATER	1800	35	257	6.3

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: MODERATELY AGGRESSIVE
STEEL: MODERATELY AGGRESSIVE

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 0-10'
AUTO 15'-30'

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

LEGEND

- FINE SAND
- SILTY FINE SAND
- SANDY SILT
- SANDY CLAY
- CLAYEY FINE SAND
- STANDARD PENETRATION TEST (SPT) BORING LOCATION
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
- GROUNDWATER LEVEL MEASURED ON DATE DRILLED
- GSE — GROUND SURFACE ELEVATION (FEET, NGVD)
- SP, SC-SM, ML, CH, CL — UNIFIED SOIL CLASSIFICATION SYSTEM
- LOSS OF DRILLING FLUID CIRCULATION
- B.T. — BORING TERMINATION DEPTH

SOIL DESIGN PARAMETERS FOR BORINGS BC-1 & BC-2

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γ_{sat}	γ_b			ACTIVE (Ka)	PASSIVE (Kp)
0-4	2-9	SP	112	50	30	0	0.33	3.00
4-8	4-7	SC,CL	112	50	0	750	1	1
8-17	1-8	SM	112	50	30	0	0.33	3.00
17-27	0-1	ML	107	45	28	0	0.36	2.77
27-30	1	CH	107	45	0	500	1	1

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	GBD	08/07
Checked by	GAD	08/07
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504

Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

Ardaman & Associates, Inc.

SEAL:
8/24/07

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

BOX CULVERT BORINGS BC-1&2
HOMESTEAD ROAD WIDENING - SUNRISE BLVD TO ALABAMA RD

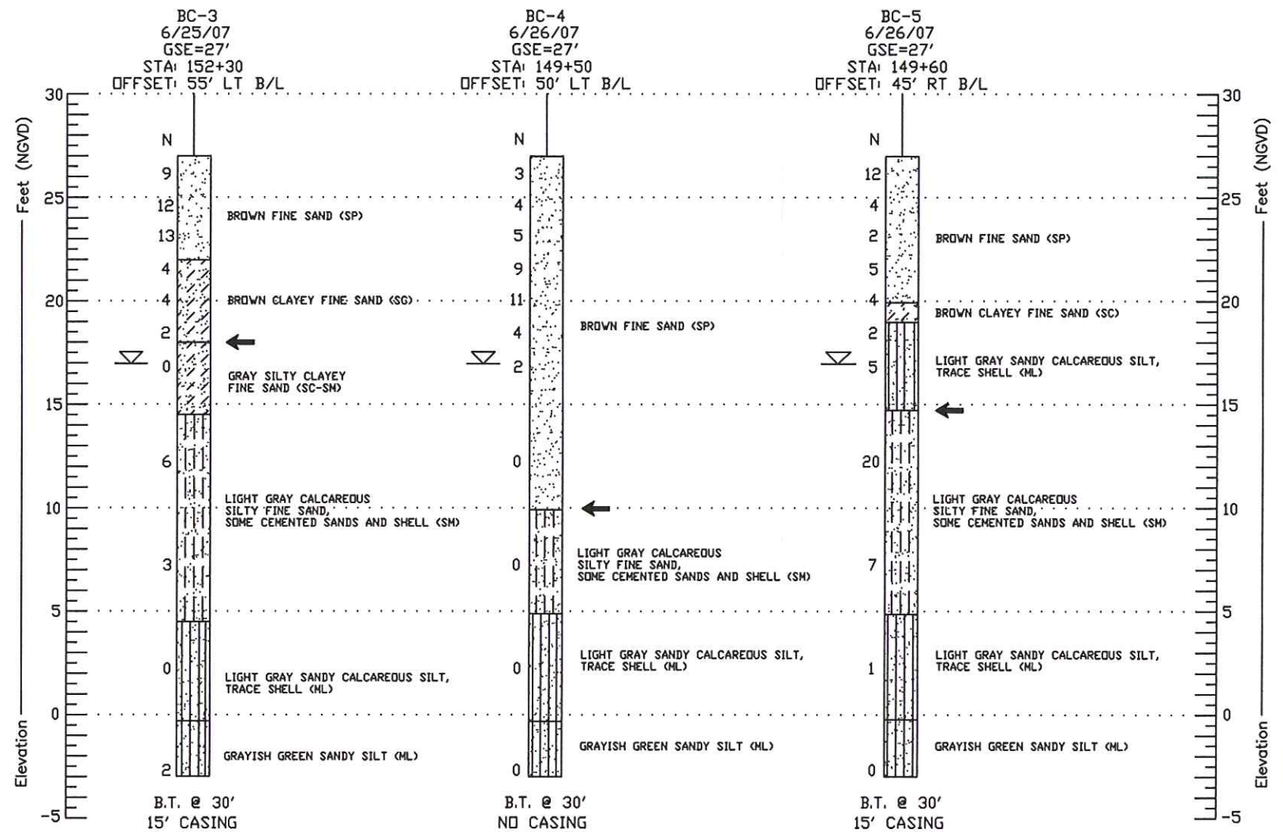
SHEET NO. 13



BORING LOCATION PLAN

N

SCALE:1"=100'



SOIL PROFILES

CORROSION SERIES TEST RESULTS

	RESISTIVITY Ohms-cm	CHLORIDES ppm	SULFATES ppm	pH
BC-3	6900	45	30	6.5
BC-4/5	11,000	60	68	7.1
CANAL WATER	1700	20	276	6.3

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: MODERATELY AGGRESSIVE
STEEL: MODERATELY AGGRESSIVE

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 0-10'
AUTO 15'-30'

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

LEGEND

- FINE SAND
- SILTY FINE SAND
- SANDY SILT
- SANDY CLAY
- CLAYEY FINE SAND
- STANDARD PENETRATION TEST (SPT) BORING LOCATION
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
- GROUNDWATER LEVEL MEASURED ON DATE DRILLED
- GSE — GROUND SURFACE ELEVATION (FEET, NGVD)
- SP, SC-SM, ML, CH, CL — UNIFIED SOIL CLASSIFICATION SYSTEM
- LOSS OF DRILLING FLUID CIRCULATION
- B.T. — BORING TERMINATION DEPTH

SOIL DESIGN PARAMETERS FOR BORINGS BC-3,4&5

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γsat	γb			ACTIVE (Ka)	PASSIVE (Kp)
0-6	2-13	SP	112	50	30	0	0.33	3.00
6-8	2-4	SC	112	50	0	750	1	1
8-22	0-20	SM w/gr	112	50	30	0	0.33	3.00
22-30	0-2	ML	107	45	28	0	0.36	2.77

REVISIONS						Names	Dates
Date	By	Description	Date	By	Description	Drawn by	GBD 08/07
						Checked by	GAD 08/07
						Designed by	
						Checked by	
						Approved by	

ENGINEER OF RECORD: G.A. DREW, P.E. FL. REG. NO. 33504
Ardaman & Associates, Inc. 9970 BAVARIA ROAD FT. MYERS, FL. 33913 PHONE (239) 768-6600 ENG. AUTH NO. 5950

Ardaman & Associates, Inc.

SEAL: 2/24/07

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

BOX CULVERT BORINGS BC-3,4&5
HOMESTEAD ROAD WIDENING - SUNRISE BLVD TO ALABAMA RD

SHEET NO. 14

APPENDIX A

LBR TEST REPORT SHEETS

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
(239)768-6600
Fax (239)768-0409

ACCREDITED CMEC LABORATORY

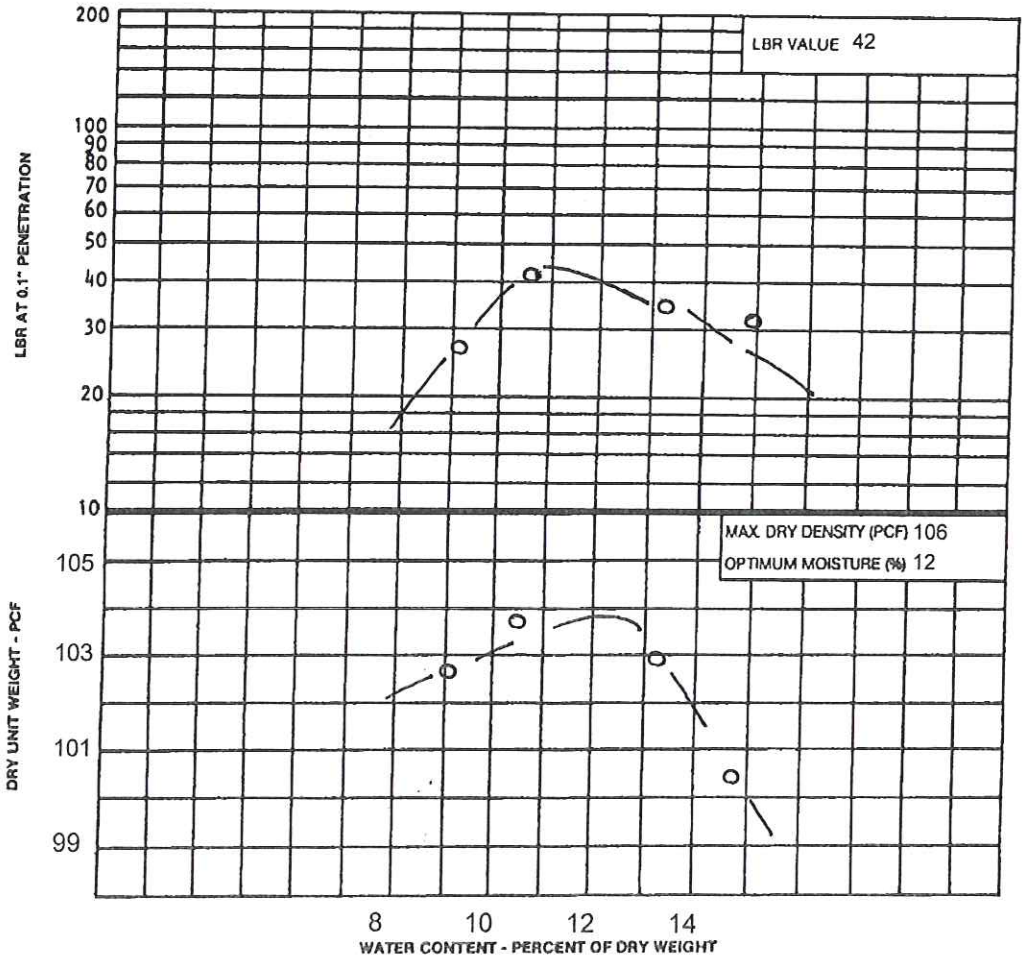
REPORT OF LIMEROCK BEARING RATIO DESIGNATION FM 5-515

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO.: 07-4550

CC.

REPORTED TO: HDR ENGINEERING INC



LBR

SAMPLE NO. 1 SAMPLE LOCATION STATION NO. 98+40, 40' R, B/L SURVEY

DESCRIPTION GRAYISH BROWN FINE SAND

PROPOSED USE EMBANKMENT DATE SAMPLED 5/2/07 BY: MS

REMARKS:

GARY A. DREW, P.E., BRANCH MANAGER
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
Phone (239)768-6600 Fax (239)768-0409
Florida Certificate of Authorization No. 00005950

REPORT OF SOIL CLASSIFICATION - ASTM D 2487

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO: 07-4550

REPORTED TO: HDR ENGINEERING INC

COPIES:

SIEVE ANALYSIS - ASTM C 136

SIEVE SIZE	PERCENT RETAINED	PERCENT PASSING	SPECIFIED RANGE
3 ½ inch			
3 inch			
1 inch			
¾ inch			
½ inch			
3/8 inch	0.0	100.0	
No. 4	0.1	99.9	
No. 8			
No. 10	0.3	99.7	
No. 16			
No. 30			
No. 40	20.2	79.8	
No. 50			
No. 60	72.8	27.2	
No. 100	90.1	9.9	
No. 200	98.6	1.4	

CLASSIFICATION

SOIL CHARACTERISTICS

LIQUID LIMIT: NP

PLASTICITY INDEX: NP
ASTM D 4318

% ORGANIC CONTENT (L.O.I): N/A
ASTM D 2974

REMARKS:

TOTAL DRY WEIGHT 308.9 grams

SAMPLE NO.: 1 SAMPLE LOCATION: STATION NO. 98+40, 40' R, B/L SURVEY

UNIFIED CLASS.: SP - POORLY GRADED SAND AASHTO CLASS.: A-3

DESCRIPTION: GRAYISH BROWN FINE SAND

PROPOSED USE: EMBANKMENT DATE SAMPLED: 5/2/07 BY: MS

ANDREW HIGH
CONSTRUCTION SERVICES MANAGER

GARY A. DREW, P.E., VICE PRESIDENT
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
(239)768-6600
Fax (239)768-0409

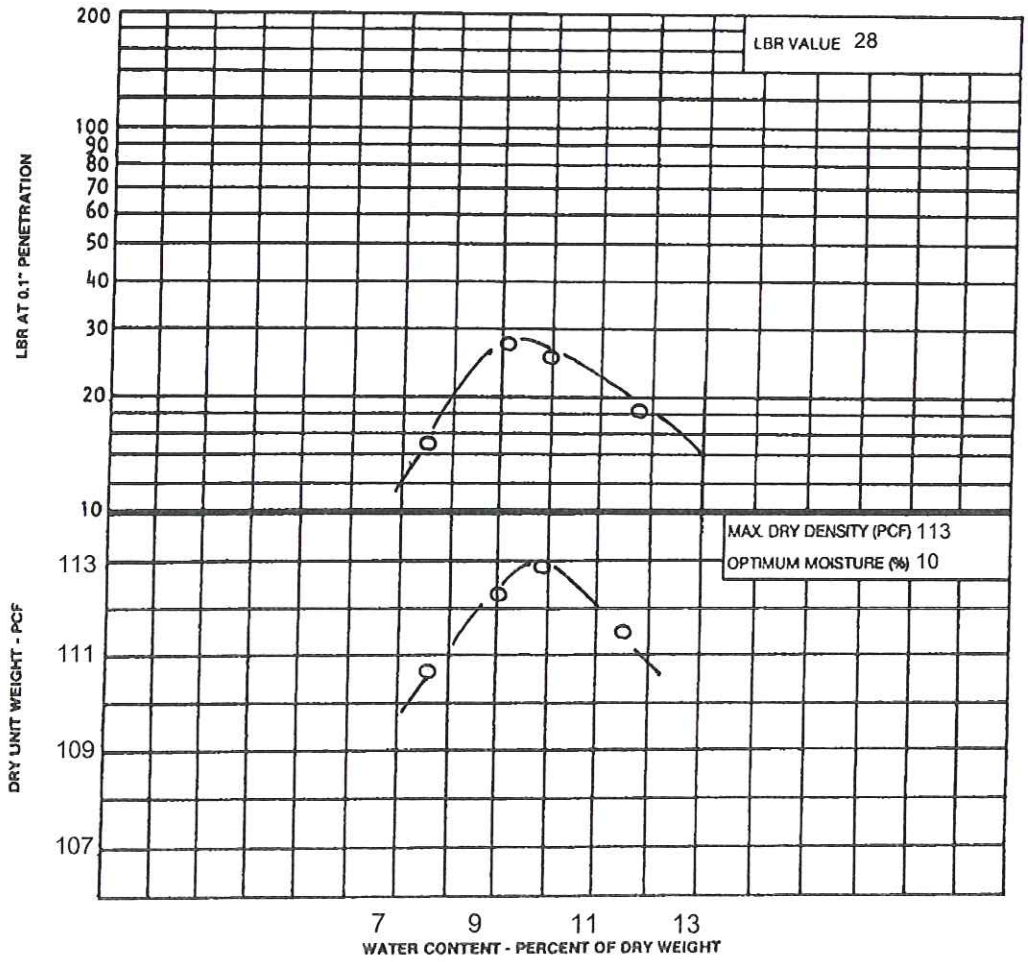
REPORT OF LIMEROCK BEARING RATIO DESIGNATION FM 5-515

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO.: 07-4550

CC.

REPORTED TO: HDR ENGINEERING INC



LBR

SAMPLE NO. 2 SAMPLE LOCATION STATION NO. 156+30, 50' L, B/L SURVEY

DESCRIPTION OLIVE BROWN SLIGHTLY SILTY FINE SAND

PROPOSED USE EMBANKMENT DATE SAMPLED 5/2/07 BY: MS

REMARKS:

GARY A. DREW, P.E., BRANCH MANAGER
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
Phone (239)768-6600 Fax (239)768-0409
Florida Certificate of Authorization No. 00005950

REPORT OF SOIL CLASSIFICATION - ASTM D 2487

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO: 07-4550

REPORTED TO: HDR ENGINEERING INC

COPIES:

SIEVE ANALYSIS - ASTM C 136

SIEVE SIZE	PERCENT RETAINED	PERCENT PASSING	SPECIFIED RANGE
3 ½ inch			
3 inch			
1 inch			
¾ inch			
½ inch			
3/8 inch	0.0	100.0	
No. 4	0.6	99.4	
No. 8			
No. 10	1.1	98.9	
No. 16			
No. 30			
No. 40	18.0	82.0	
No. 50			
No. 60	65.0	35.0	
No. 100	84.0	16.0	
No. 200	94.8	5.2	

CLASSIFICATION

SOIL CHARACTERISTICS

LIQUID LIMIT: NP

PLASTICITY INDEX: NP
ASTM D 4318

% ORGANIC CONTENT (L.O.I): N/A
ASTM D 2974

REMARKS:

TOTAL DRY WEIGHT 379.2 grams

SAMPLE NO.: 2 SAMPLE LOCATION: STATION NO. 156+30, 50' L, B/L SURVEY

UNIFIED CLASS.: SP-SM - POORLY GRADED SAND WITH SILT AASHTO CLASS.: A-3

DESCRIPTION: OLIVE BROWN SLIGHTLY SILTY FINE SAND

PROPOSED USE: EMBANKMENT DATE SAMPLED: 5/2/07 BY: MS

ANDREW HIGH
CONSTRUCTION SERVICES MANAGER

GARY A. DREW, P.E., VICE PRESIDENT
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
(239)768-6600
Fax (239)768-0409

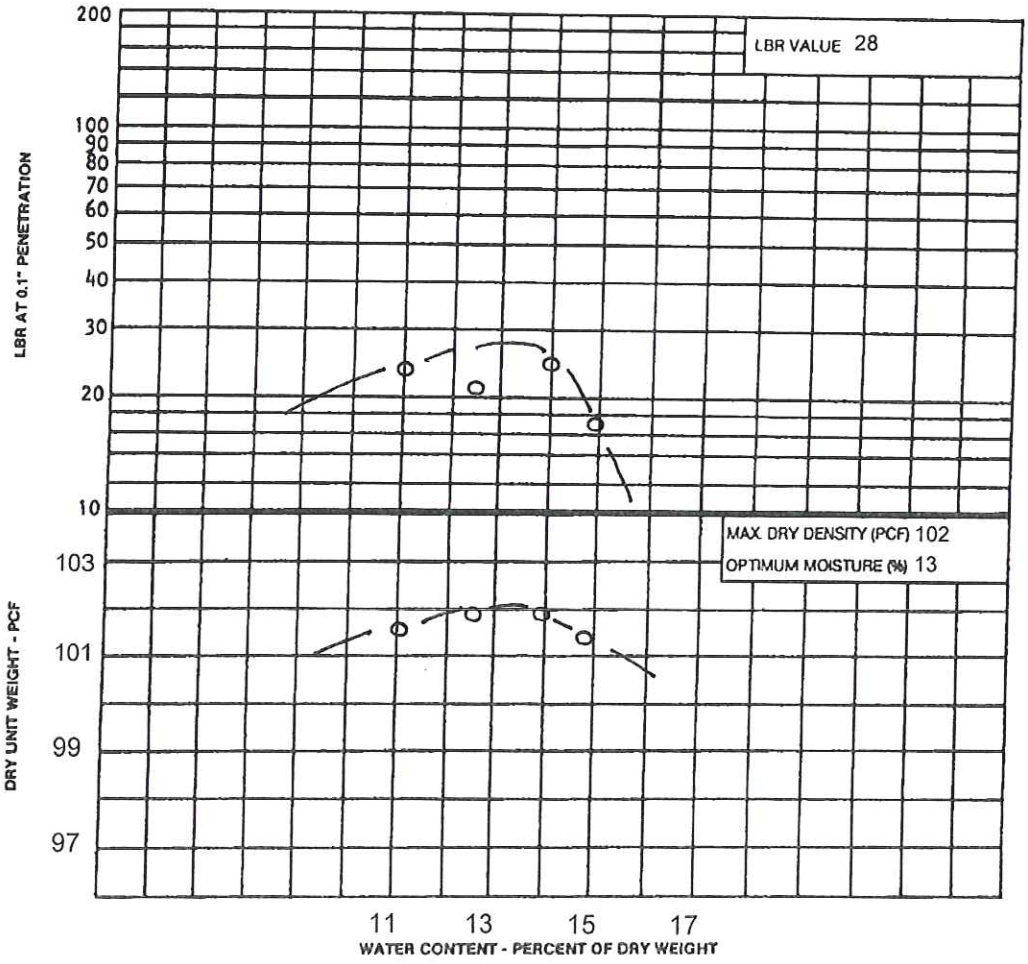
REPORT OF LIMEROCK BEARING RATIO DESIGNATION FM 5-515

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO.: 07-4550

CC.

REPORTED TO: HDR ENGINEERING INC



LBR

SAMPLE NO. 3 SAMPLE LOCATION STATION NO. 118+70, 30' L, B/L SURVEY

DESCRIPTION GRAYISH BROWN FINE SAND

PROPOSED USE EMBANKMENT DATE SAMPLED 5/2/07 BY: MS

REMARKS:

GARY A. DREW, P.E., BRANCH MANAGER
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
Phone (239)768-6600 Fax (239)768-0409
Florida Certificate of Authorization No. 00005950

REPORT OF SOIL CLASSIFICATION - ASTM D 2487

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO: 07-4550

REPORTED TO: HDR ENGINEERING INC

COPIES:

SIEVE ANALYSIS - ASTM C 136

SIEVE SIZE	PERCENT RETAINED	PERCENT PASSING	SPECIFIED RANGE
3 ½ inch			
3 inch			
1 inch			
¾ inch			
½ inch			
3/8 inch	0.0	100.0	
No. 4	0.1	99.9	
No. 8			
No. 10	0.3	99.7	
No. 16			
No. 30			
No. 40	19.2	80.8	
No. 50			
No. 60	69.8	30.2	
No. 100	89.0	11.0	
No. 200	98.0	2.0	

CLASSIFICATION

SOIL CHARACTERISTICS

LIQUID LIMIT: NP

PLASTICITY INDEX: NP
ASTM D 4318

% ORGANIC CONTENT (L.O.I): N/A
ASTM D 2974

REMARKS:

TOTAL DRY WEIGHT 273.4 grams

SAMPLE NO.: 3 SAMPLE LOCATION: STATION NO. 118+70, 30' L, B/L SURVEY

UNIFIED CLASS.: SP - POORLY GRADED SAND AASHTO CLASS.: A-3

DESCRIPTION: GRAYISH BROWN FINE SAND

PROPOSED USE: EMBANKMENT DATE SAMPLED: 5/2/07 BY: MS

ANDREW HIGH
CONSTRUCTION SERVICES MANAGER

GARY A. DREW, P.E., VICE PRESIDENT
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
(239)768-6600
Fax (239)768-0409

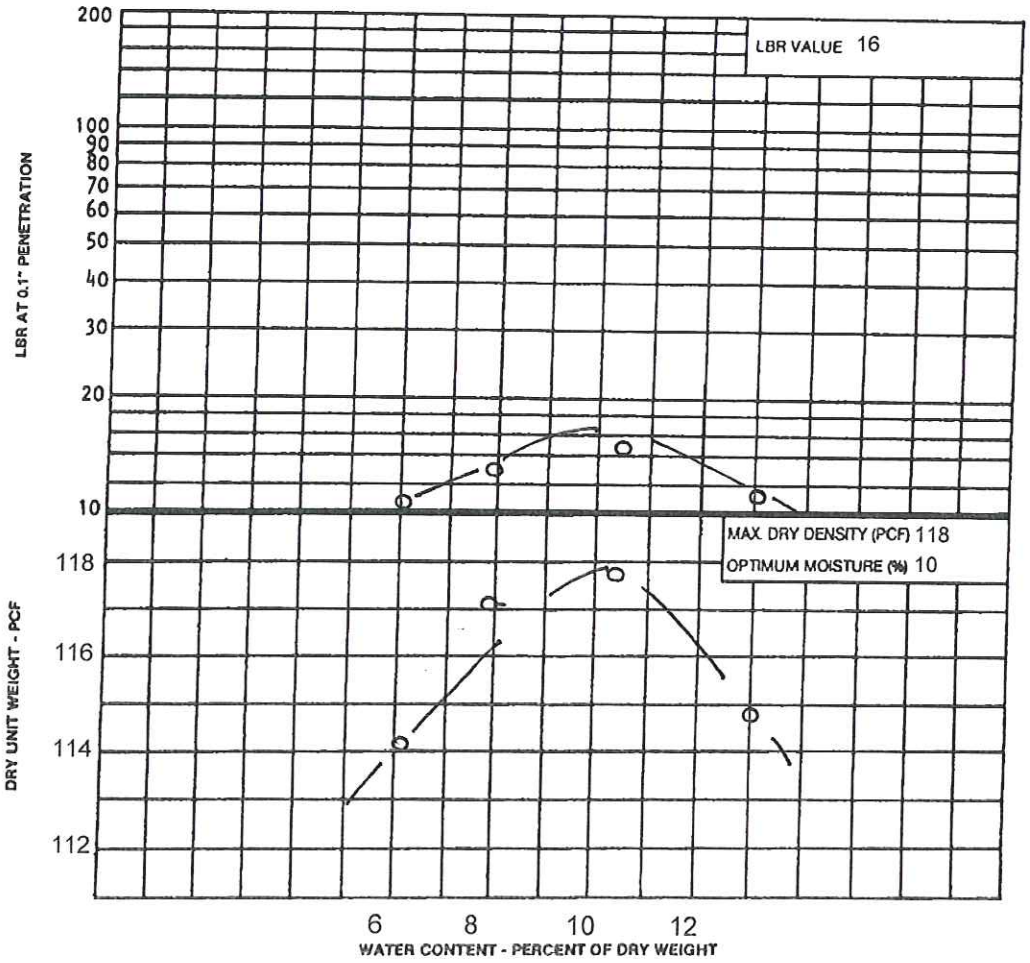
REPORT OF LIMEROCK BEARING RATIO DESIGNATION FM 5-515

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO.: 07-4550

CC.

REPORTED TO: HDR ENGINEERING INC



LBR

SAMPLE NO. 4 SAMPLE LOCATION STATION NO. 137+10, 30' R, B/L SURVEY

DESCRIPTION YELLOWISH BROWN SLIGHTLY SILTY FINE SAND

PROPOSED USE EMBANKMENT DATE SAMPLED 5/8/07 BY: MS

REMARKS:

GARY A. DREW, P.E., BRANCH MANAGER
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
Phone (239)768-6600 Fax (239)768-0409
Florida Certificate of Authorization No. 00005950

REPORT OF SOIL CLASSIFICATION - ASTM D 2487

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO: 07-4550

REPORTED TO: HDR ENGINEERING INC

COPIES:

SIEVE ANALYSIS - ASTM C 136

SIEVE SIZE	PERCENT RETAINED	PERCENT PASSING	SPECIFIED RANGE
3 ½ inch			
3 inch			
1 inch			
¾ inch	0.0	100.0	
½ inch	0.7	99.3	
3/8 inch	1.7	98.3	
No. 4	3.7	96.3	
No. 8			
No. 10	5.8	94.2	
No. 16			
No. 30			
No. 40	22.9	77.1	
No. 50			
No. 60	60.7	39.3	
No. 100	76.4	23.6	
No. 200	89.2	10.8	

CLASSIFICATION

SOIL CHARACTERISTICS

LIQUID LIMIT: NP

PLASTICITY INDEX: NP
ASTM D 4318

% ORGANIC CONTENT (L.O.I): N/A
ASTM D 2974

REMARKS:

TOTAL DRY WEIGHT 427.2 grams

SAMPLE NO.: 4 SAMPLE LOCATION: STATION NO. 137+10, 30' R, B/L SURVEY

UNIFIED CLASS.: SP-SM - POORLY GRADED SAND WITH SILT AASHTO CLASS.: A-2-4

DESCRIPTION: YELLOWISH BROWN SLIGHTLY SILTY FINE SAND

PROPOSED USE: EMBANKMENT DATE SAMPLED: 5/8/07 BY: MS

ANDREW HIGH
CONSTRUCTION SERVICES MANAGER

GARY A. DREW, P.E., VICE PRESIDENT
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
(239)768-6600
Fax (239)768-0409

ACCREDITED CMEC LABORATORY

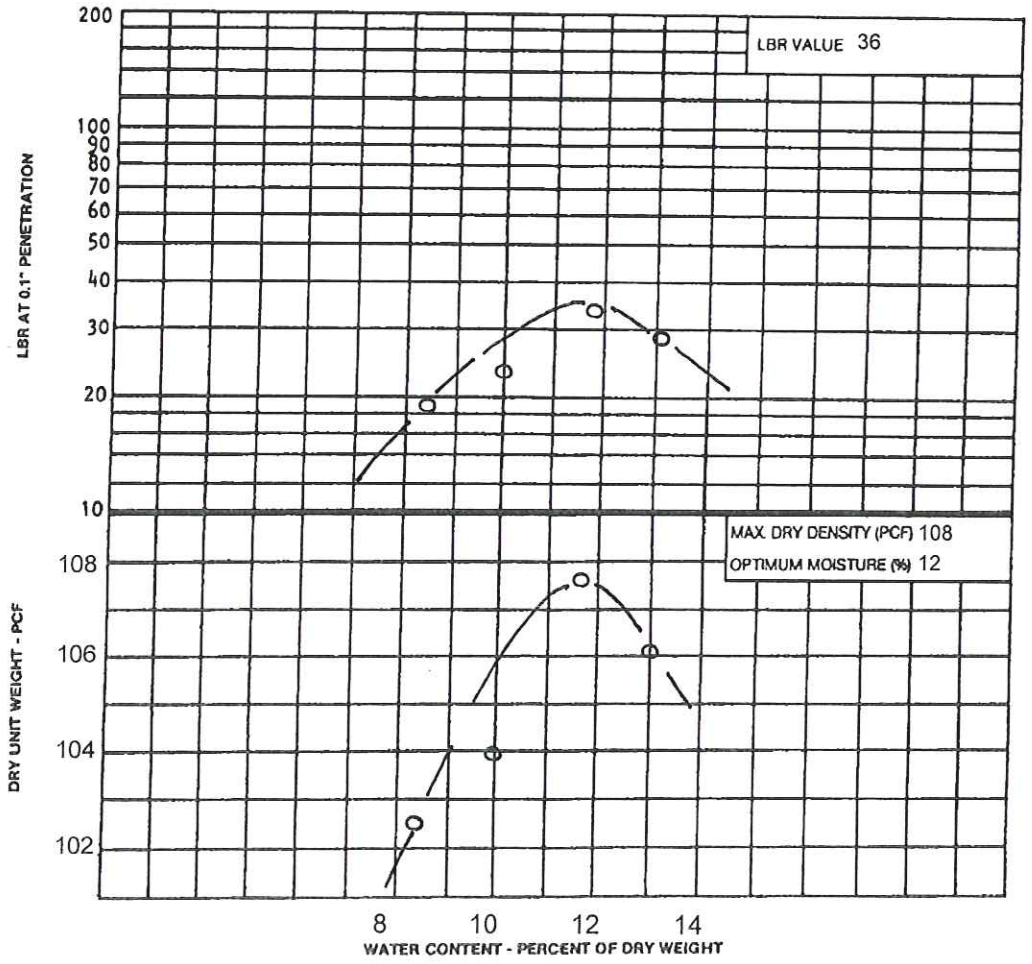
REPORT OF LIMEROCK BEARING RATIO DESIGNATION FM 5-515

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO.: 07-4550

CC.

REPORTED TO: HDR ENGINEERING INC



LBR

SAMPLE NO. 5 SAMPLE LOCATION STATION NO. 128+50, 30' R, B/L SURVEY

DESCRIPTION GRAYISH BROWN FINE SAND

PROPOSED USE EMBANKMENT DATE SAMPLED 5/8/07 BY: MS

REMARKS:

GARY A. DREW, P.E., BRANCH MANAGER
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
Phone (239)768-6600 Fax (239)768-0409
Florida Certificate of Authorization No. 00005950

REPORT OF SOIL CLASSIFICATION - ASTM D 2487

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO: 07-4550

REPORTED TO: HDR ENGINEERING INC

COPIES:

SIEVE ANALYSIS - ASTM C 136

SIEVE SIZE	PERCENT RETAINED	PERCENT PASSING	SPECIFIED RANGE
3 ½ inch			
3 inch			
1 inch			
¾ inch			
½ inch	0.0	100.0	
3/8 inch	0.1	99.9	
No. 4	0.1	99.9	
No. 8			
No. 10	0.2	99.8	
No. 16			
No. 30			
No. 40	17.8	82.2	
No. 50			
No. 60	67.7	32.3	
No. 100	86.3	13.7	
No. 200	97.2	2.8	

CLASSIFICATION

SOIL CHARACTERISTICS

LIQUID LIMIT: NP

PLASTICITY INDEX: NP
ASTM D 4318

% ORGANIC CONTENT (L.O.I): N/A
ASTM D 2974

REMARKS:

TOTAL DRY WEIGHT 267.7 grams

SAMPLE NO.: 5 SAMPLE LOCATION: STATION NO. 128+50, 30' R, B/L SURVEY

UNIFIED CLASS.: SP - POORLY GRADED SAND AASHTO CLASS.: A-3

DESCRIPTION: GRAYISH BROWN FINE SAND

PROPOSED USE: EMBANKMENT DATE SAMPLED: 5/8/07 BY: MS

ANDREW HIGH
CONSTRUCTION SERVICES MANAGER

GARY A. DREW, P.E., VICE PRESIDENT
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
(239)768-6600
Fax (239)768-0409

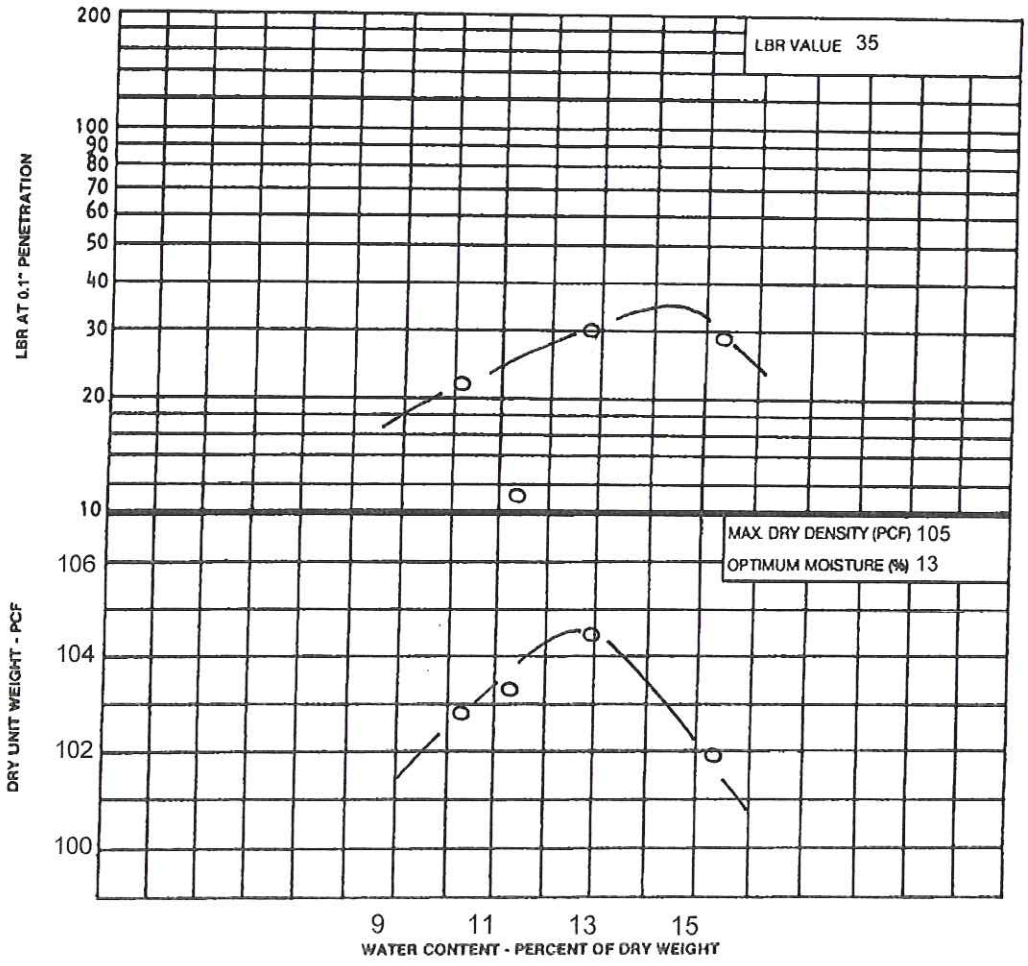
REPORT OF LIMEROCK BEARING RATIO DESIGNATION FM 5-515

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO.: 07-4550

CC.

REPORTED TO: HDR ENGINEERING INC



LBR

SAMPLE NO. 6 SAMPLE LOCATION STATION NO. 60+00, 20' LEFT OF B/L SURVEY

DESCRIPTION DARK GRAYISH BROWN FINE SAND

PROPOSED USE EMBANKMENT DATE SAMPLED 7/30/07 BY: MS

REMARKS:

GARY A. DREW, P.E., BRANCH MANAGER
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
Phone (239)768-6600 Fax (239)768-0409
Florida Certificate of Authorization No. 00005950

REPORT OF SOIL CLASSIFICATION - ASTM D 2487

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO: 07-4550

REPORTED TO: HDR ENGINEERING INC

COPIES:

SIEVE ANALYSIS - ASTM C 136

SIEVE SIZE	PERCENT RETAINED	PERCENT PASSING	SPECIFIED RANGE
3 ½ inch			
3 inch			
1 inch			
¾ inch			
½ inch			
3/8 inch			
No. 4			
No. 8			
No. 10	0.0	100.0	
No. 16			
No. 30			
No. 40	21.3	78.7	
No. 50			
No. 60	72.6	27.4	
No. 100	90.0	10.0	
No. 200	98.1	1.9	

CLASSIFICATION

SOIL CHARACTERISTICS

LIQUID LIMIT: NP

PLASTICITY INDEX: NP
ASTM D 4318

% ORGANIC CONTENT (L.O.I): N/A
ASTM D 2974

REMARKS:

TOTAL DRY WEIGHT 286.4 grams

SAMPLE NO.: 6 SAMPLE LOCATION: STATION NO. 60+00, 20' LEFT OF B/L SURVEY

UNIFIED CLASS.: SP - POORLY GRADED SAND AASHTO CLASS.: A-3

DESCRIPTION: DARK GRAYISH BROWN FINE SAND

PROPOSED USE: EMBANKMENT DATE SAMPLED: 7/30/07 BY: MS

ANDREW HIGH
CONSTRUCTION SERVICES MANAGER

GARY A. DREW, P.E., VICE PRESIDENT
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
(239)768-6600
Fax (239)768-0409

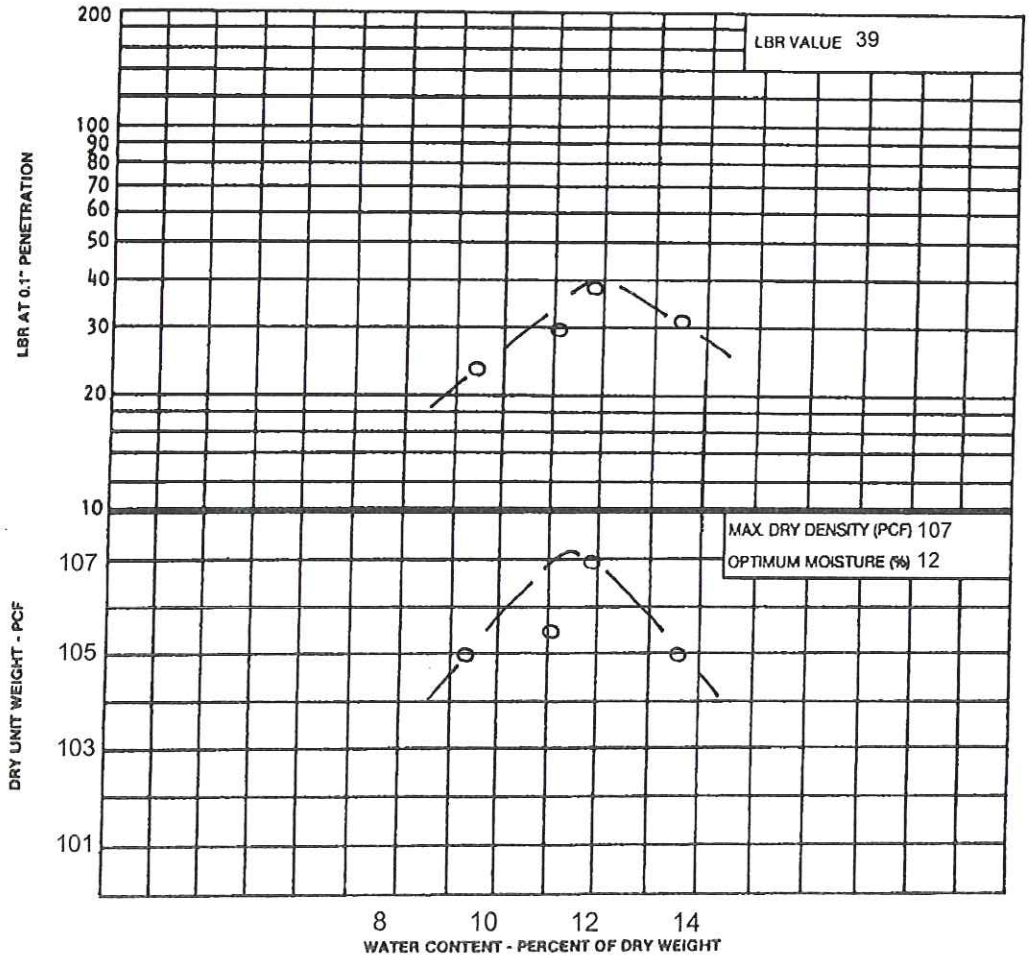
REPORT OF LIMEROCK BEARING RATIO DESIGNATION FM 5-515

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO.: 07-4550

CC.

REPORTED TO: HDR ENGINEERING INC



LBR

SAMPLE NO. 7 SAMPLE LOCATION STATION NO. 83+50, 20' RIGHT B/L SURVEY

DESCRIPTION DARK GRAYISH BROWN FINE SAND

PROPOSED USE EMBANKMENT DATE SAMPLED 7/30/07 BY: MS

REMARKS:

GARY A. DREW, P.E., BRANCH MANAGER
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

Ardaman & Associates, Inc.

9970 Bavaria Road
Fort Myers, Florida 33913
Phone (239)768-6600 Fax (239)768-0409
Florida Certificate of Authorization No. 00005950

REPORT OF SOIL CLASSIFICATION - ASTM D 2487

PROJECT: HOMESTEAD RD - CN #06-17 FROM SOUTH OF SUNRISE TO ALABAMA RD
LEHIGH ACRES, LEE COUNTY, FLORIDA

FILE NO: 07-4550

REPORTED TO: HDR ENGINEERING INC
ATTN KIM SPARATA
2202 N WEST SHORE BLVD #250
TAMPA FL 33607-5755

COPIES: 2-CLIENT

SIEVE ANALYSIS - ASTM C 136

SIEVE SIZE	PERCENT RETAINED	PERCENT PASSING	SPECIFIED RANGE
3 ½ inch			
3 inch			
1 inch			
¾ inch			
½ inch			
3/8 inch			
No. 4			
No. 8			
No. 10	0.0	100.0	
No. 16			
No. 30			
No. 40	20.8	79.2	
No. 50			
No. 60	69.9	30.1	
No. 100	88.6	11.4	
No. 200	98.2	1.8	

CLASSIFICATION

SOIL CHARACTERISTICS

LIQUID LIMIT: NP

PLASTICITY INDEX: NP
ASTM D 4318

% ORGANIC CONTENT (L.O.I): N/A
ASTM D 2974

REMARKS:

TOTAL DRY WEIGHT 273.6 grams

SAMPLE NO.: 7 SAMPLE LOCATION: STATION NO. 83+50, 20' RIGHT B/L SURVEY

UNIFIED CLASS.: SP - POORLY GRADED SAND AASHTO CLASS.: A-3

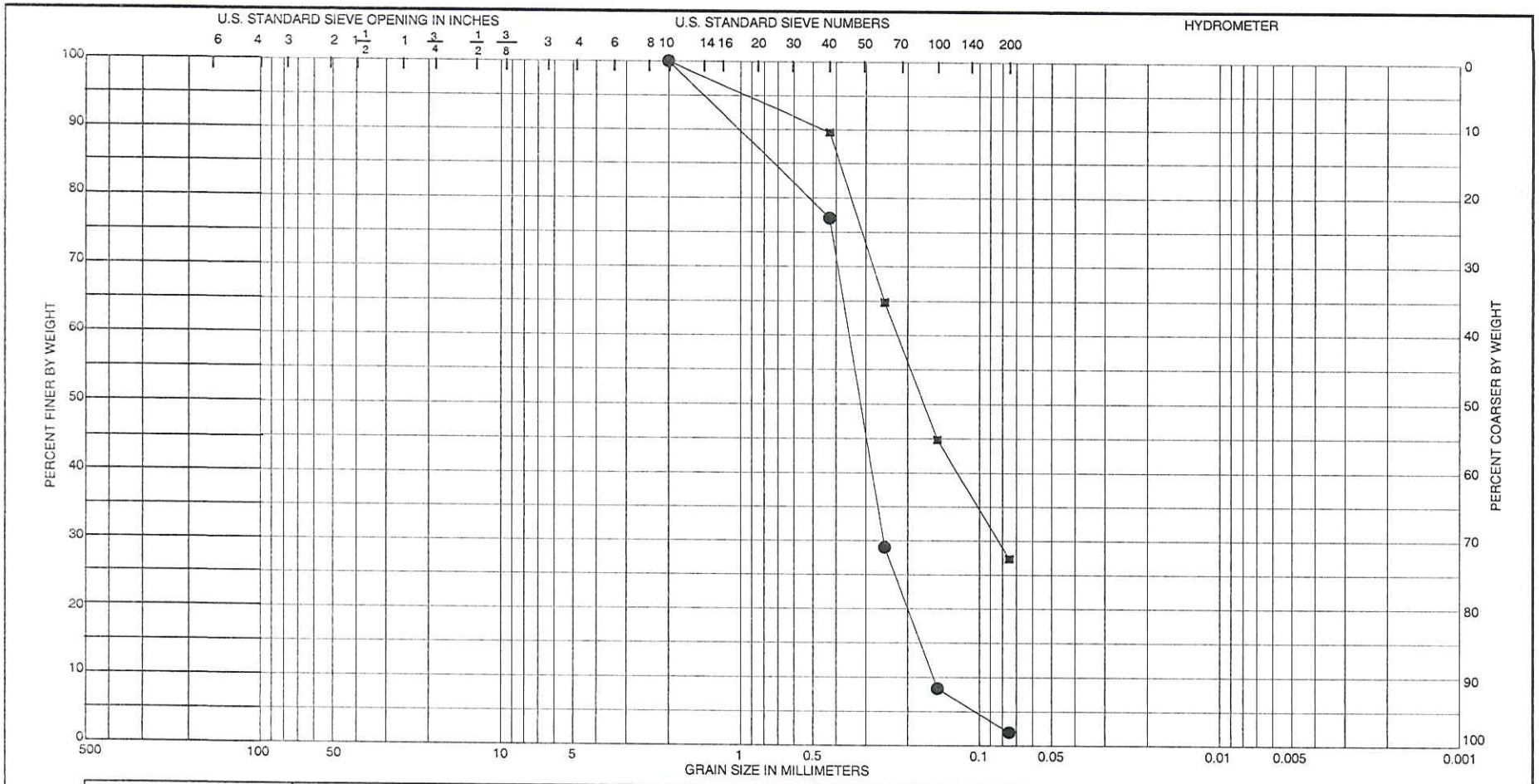
DESCRIPTION: DARK GRAYISH BROWN FINE SAND

PROPOSED USE: EMBANKMENT DATE SAMPLED: 7/30/07 BY: MS

ANDREW HIGH
CONSTRUCTION SERVICES MANAGER

GARY A. DREW, P.E., VICE PRESIDENT
FL. LICENSE NO. 35504

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.



BOULDERS/BROKEN ROCK	GRAVEL	SAND		SILT OR CLAY
		COARSE	FINE	

Boring No.	Sample No.	Depth	Symbol	Sample Description	Class	NM %	LL	PI
P-4	2	15.0'	●	Fine sand	A-3	2.8	NP	NP
P-5	2	6.5'	■	Clayey Sand	A-2-6	15	23	10
			▲					
			◆					

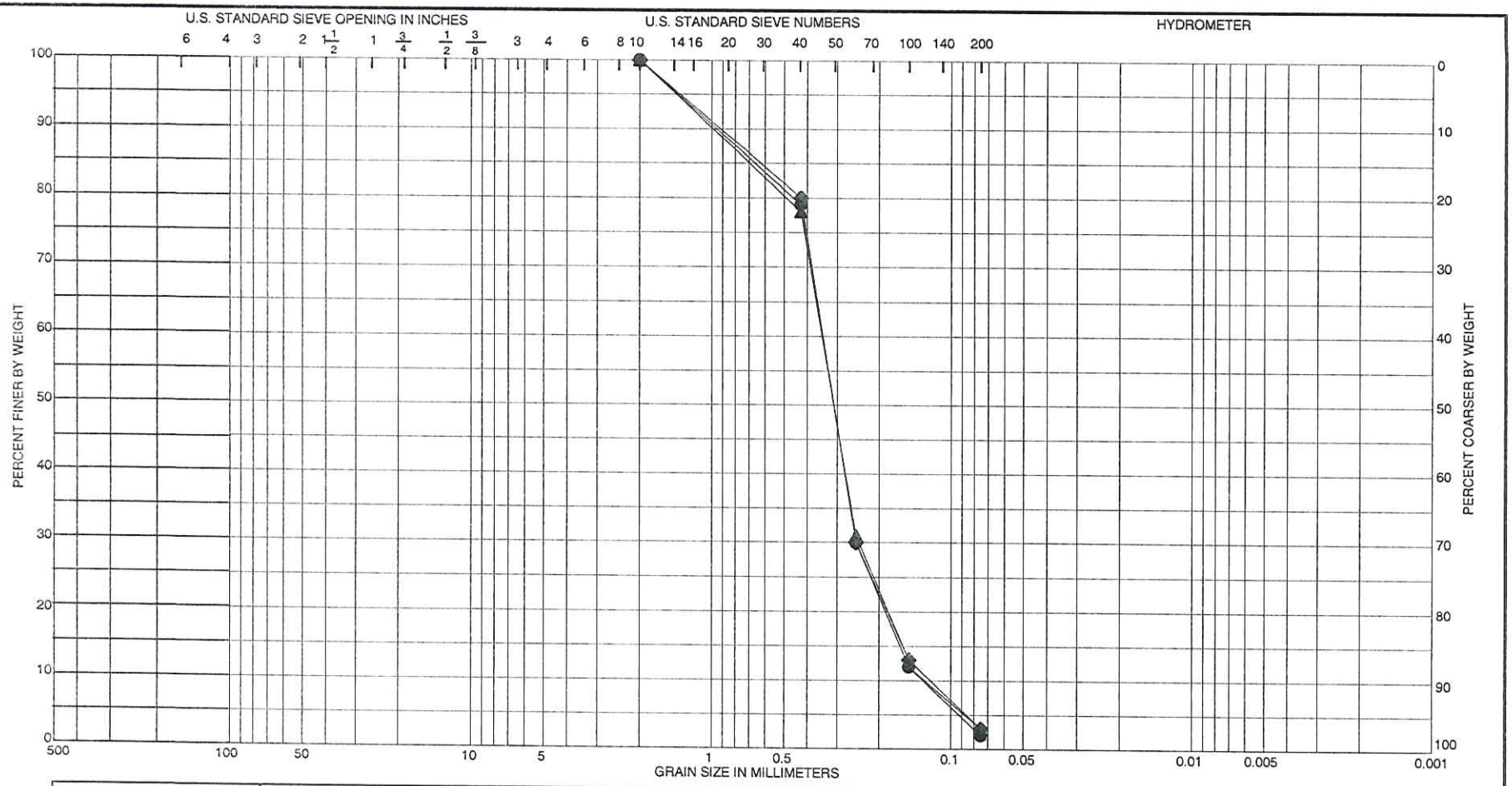
GRADATION CURVES

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HOMESTEAD ROAD FROM SUNRISE TO ALABAMA RD.
WIDENING DESIGN

DRAWN BY:	CHECKED BY:	DATE:
ES	GD	05/22/07

FILE NO.	APPROVED BY:	FIGURE:
07-4550	Gary A. Drew, P.E.	2



BOULDERS/BROKEN ROCK	GRAVEL	SAND		SILT OR CLAY
		COARSE	FINE	

Boring No.	Sample No.	Depth	Symbol	Sample Description	Class	NM %	LL	PI
88	1	2.0'	●	Fine sand	A-3	15	NP	NP
65	1	2.0'	■	Fine Sand	A-3	14	NP	NP
79	1	2.0'	▲	Fine sand	A-3	13	NP	NP
60	1	2.0'	♦	Fine sand	A-3	2	NP	NP

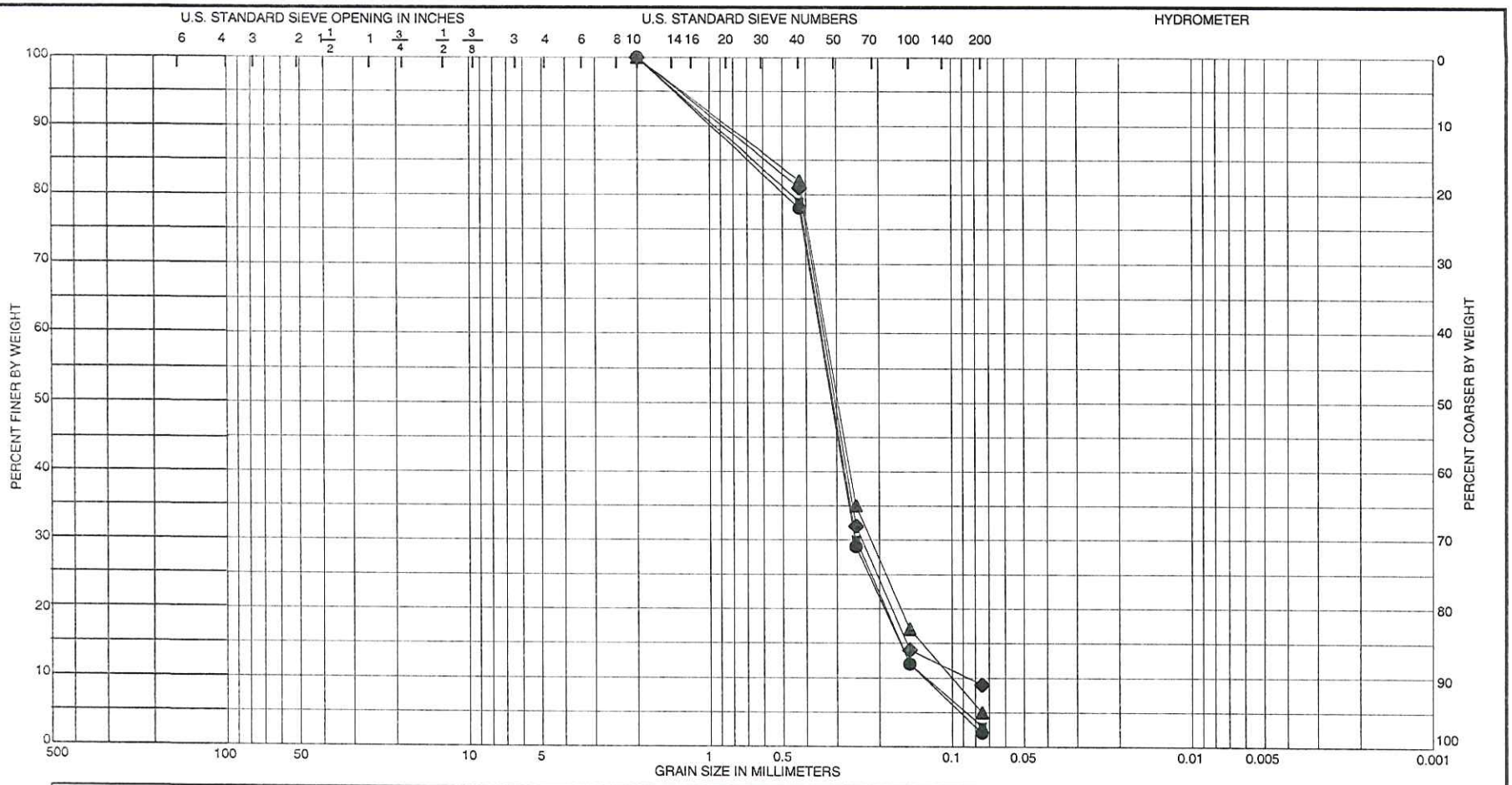
GRADATION CURVES

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HOMESTEAD ROAD FROM SUNRISE TO ALABAMA RD.
WIDENING DESIGN

DRAWN BY:	CHECKED BY:	DATE:
FS	GD	08/23/07

FILE NO.	APPROVED BY:	FIGURE:
07-4550	Gary A. Drew, P.E.	3



BOULDERS/BROKEN ROCK	GRAVEL	SAND		SILT OR CLAY
		COARSE	FINE	

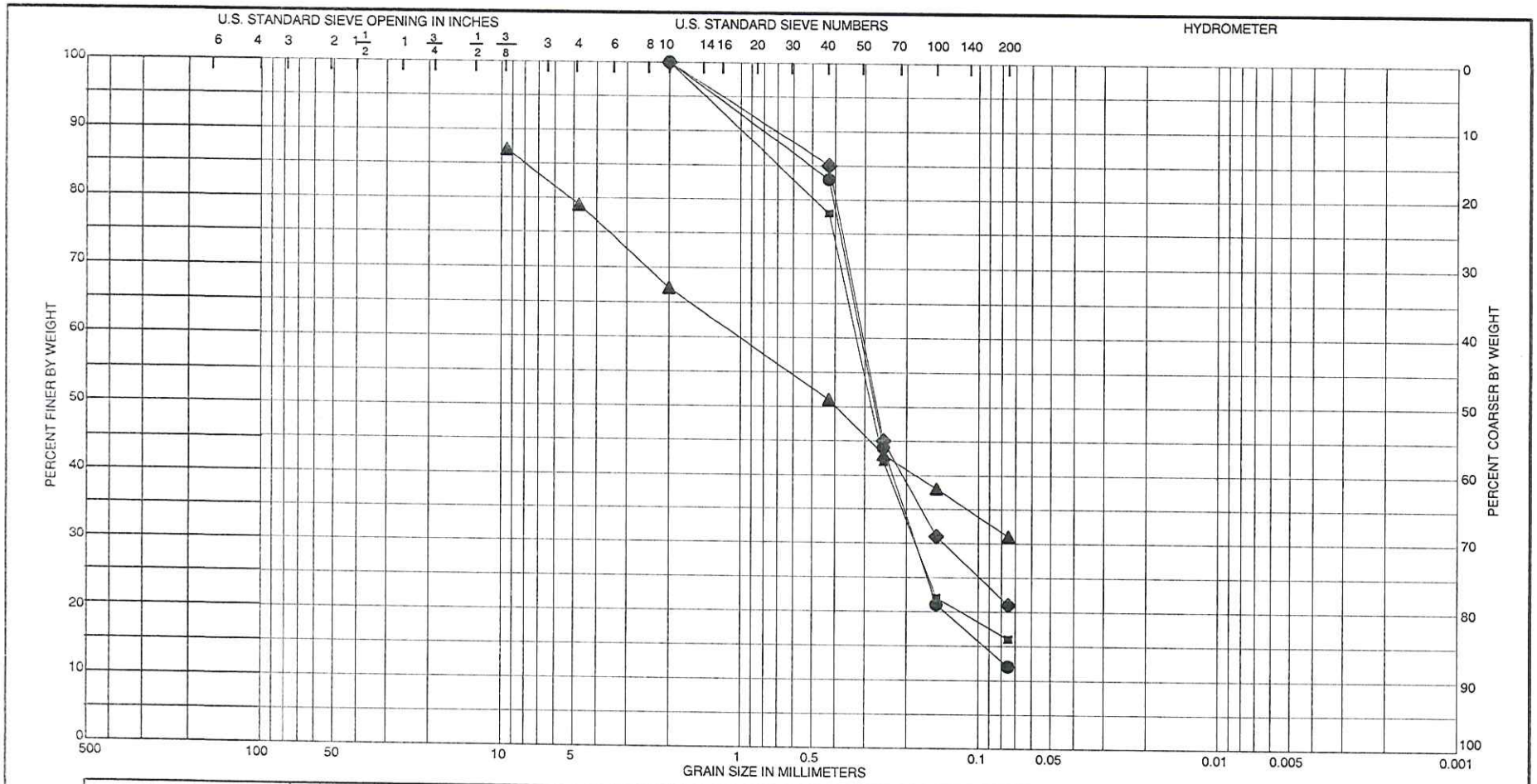
Boring No.	Sample No.	Depth	Symbol	Sample Description	Class	NM %	LL	PI
64	1	2.0'	●	Fine sand	A-3	1	NP	NP
20	1	2.0'	■	Fine sand	A-3	2	NP	NP
8	1	2.0'	▲	Slightly silty fine sand	A-3	7	NP	NP
37	2	3.0'	♦	Slightly silty fine sand	A-3	7	NP	NP

GRADATION CURVES

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HOMESTEAD ROAD FROM SUNRISE TO ALABAMA RD.
WIDENING DESIGN

DRAWN BY: ES	CHECKED BY: GD	DATE: 08/23/07
FILE NO. 07-4550	APPROVED BY: Gary A. Drew, P.E.	FIGURE: 4



BOULDERS/BROKEN ROCK	GRAVEL	SAND		SILT OR CLAY
		COARSE	FINE	

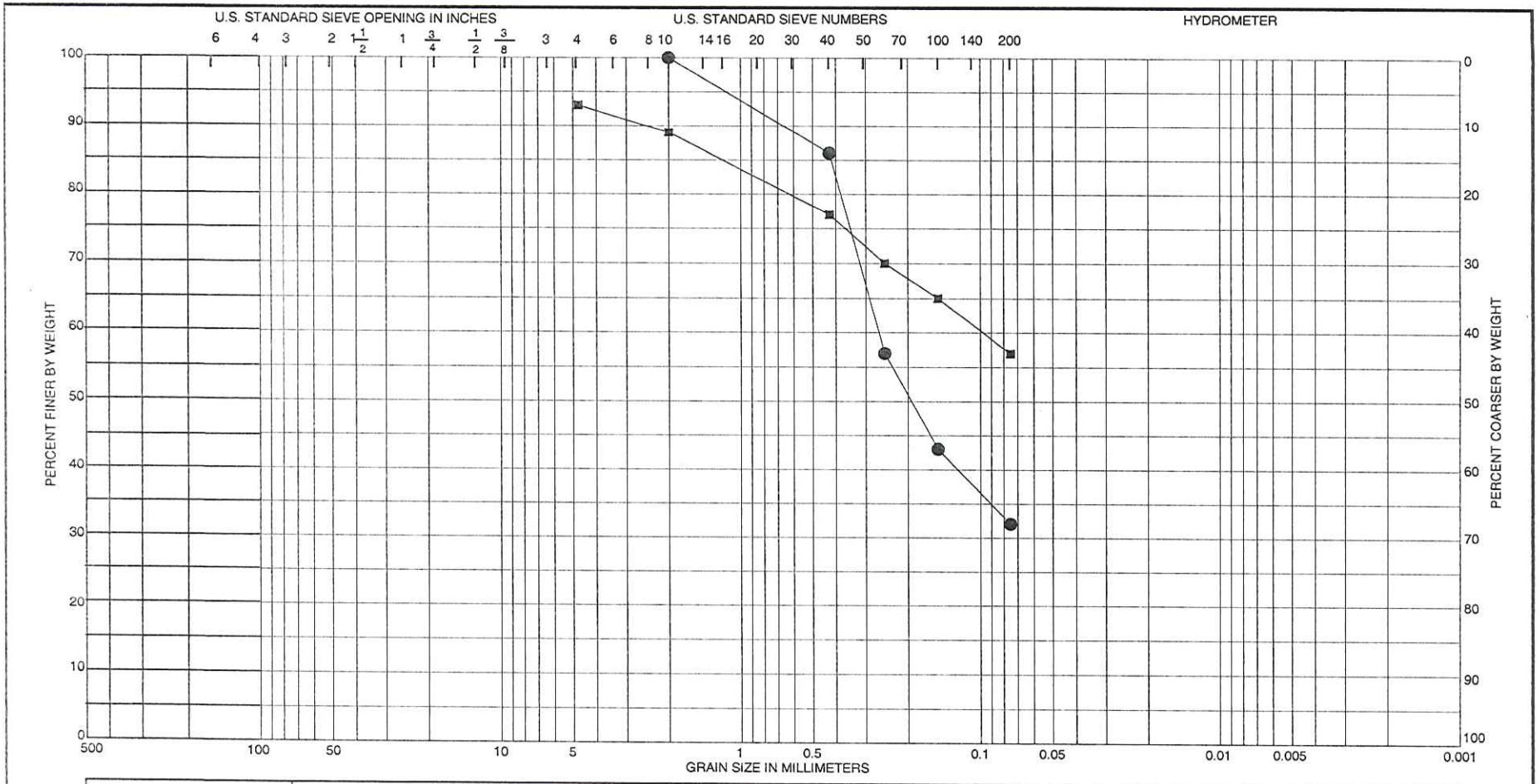
Boring No.	Sample No.	Depth	Symbol	Sample Description	Class	NM %	LL	PI
14	2	4.0'	●	Slightly silty fine sand	A-2-4	12	NP	NP
90	2	4.5'	■	Silty fine sand	A-2-4	17	NP	NP
39	5	12.0'	▲	Silty fine sand, some gravel.	A-2-4	26	NP	NP
50	3	4.0'	◆	Silty clayey fine sand	A-2-4	7	NP	NP

GRADATION CURVES

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HOMESTEAD ROAD FROM SUNRISE TO ALABAMA RD.
WIDENING DESIGN

DRAWN BY: ES	CHECKED BY: GD	DATE: 08/23/07
FILE NO. 07-4550	APPROVED BY: Gary A. Drew, P.E.	FIGURE: 5



Boring No.	Sample No.	Depth	Symbol	Sample Description	Class	NM %	LL	PI
78	4	8.0'	●	Clayey fine sand	A-2-6	17	----	----
15	4	10.0'	■	Sandy silt, trace gravel	A-4	25	NP	NP
			▲					
			♦					

GRADATION CURVES

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HOMESTEAD ROAD FROM SUNRISE TO ALABAMA RD.
WIDENING DESIGN

DRAWN BY:	CHECKED BY:	DATE:
FS	GD	08/23/07

FILE NO.	APPROVED BY:	FIGURE:
07-4550	Gary A. Drew, P.E.	6

APPENDIX C

SAMPLING AND TESTING METHODS SOIL CLASSIFICATION (AASHTO)
AND UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

SOIL BORING, SAMPLING AND TESTING METHODS

Standard Penetration Test

The Standard Penetration Test (SPT) is a widely accepted method of in situ testing of foundation soils (ASTM D-1586). A 2-foot (0.6 m) long, 2-inch (50 mm) O.D. split-barrel sampler attached to the end of a string of drilling rods is driven 18 inches (0.45 m) into the ground by successive blows of a 140-pound (63.5 Kg) hammer freely dropping 30 inches (0.76 m). The number of blows needed for each 6 inches (0.15 m) of penetration is recorded. The sum of the blows required for penetration of the second and third 6-inch (0.15 m) increments penetration constitutes the test result or N-value. After the test, the sampler is extracted from the ground and opened to allow visual description of the retained soil sample. The N-value has been empirically correlated with various soil properties allowing a conservative estimate of the behavior of soils under load. The following tables relate N-values to a qualitative description of soil density and, for cohesive soils, an approximate unconfined compressive strength (Qu):

Cohesionless Soils:	N-Value	Description
	0 to 4	Very loose
	4 to 10	Loose
	10 to 30	Medium dense
	30 to 50	Dense
	Above 50	Very dense

Cohesive Soils:	N-Value	Description	Qu
	0 to 2	Very soft	Below 0.25 tsf (25 kPa)
	2 to 4	Soft	0.25 to 0.50 tsf (25 to 50 kPa)
	4 to 8	Medium stiff	0.50 to 1.0 tsf (50 to 100 kPa)
	8 to 15	Stiff	1.0 to 2.0 tsf (100 to 200 kPa)
	15 to 30	Very stiff	2.0 to 4.0 tsf (200 to 400 kPa)
	Above 30	Hard	Above 4.0 tsf (400 kPa)

The tests are usually performed at 5-foot (1.5 m) intervals. However, more frequent or continuous testing is done by our firm through depths where a more accurate definition of the soils is required. The test holes are advanced to the test elevations by rotary drilling with a cutting bit, using circulating fluid to remove the cuttings and hold the fine grains in suspension. The circulating fluid, which is bentonitic drilling mud, is also used to keep the hole open below the water table by maintaining an excess hydrostatic pressure inside the hole. In some soil deposits, particularly highly pervious ones, flush-coupled casing must be driven to just above the testing depth to keep the hole open and/or prevent the loss of circulating fluid. After completion of a test boring, the hole is kept open until a steady state groundwater level is recorded. The hole is then sealed by backfilling with neat cement.

Representative split-spoon samples from each sampling interval and from different strata are brought to our laboratory in air-tight jars for classification and testing, if necessary. Afterwards, the samples are discarded unless prior arrangements have been made.

Power Auger Borings

Auger borings are used when a relatively large, continuous sampling of soil strata close to the ground surface is desired. A 4-inch (100 mm) diameter, continuous flight, helical auger with a cutting head at its end is screwed into the ground in 5-foot (1.5 m) sections. It is powered by the

rotary drill rig. The sample is recovered by withdrawing the auger out of the ground without rotating it. The soil sample so obtained, is described and representative samples put in bags or jars and returned to the laboratory for classification and testing, if necessary.

Hand Auger Borings

Hand auger borings are used, if soil conditions are favorable, when the soil strata are to be determined within a shallow (approximately 5-foot [1.5 m]) depth or when access is not available to power drilling equipment. A 3-inch (75 mm) diameter hand bucket auger with a cutting head is simultaneously turned and pressed into the ground. The bucket auger is retrieved at approximately 6-inch (0.15 m) intervals and its contents emptied for inspection. Sometimes post-hole diggers are used, especially in the upper 3 feet (1 m) or so. The soil sample obtained is described and representative samples put in bags or jars and transported to the laboratory for classification and testing, if necessary.

Undisturbed Sampling

Undisturbed sampling implies the recovery of soil samples in a state as close to their natural condition as possible. Complete preservation of in situ conditions cannot be realized; however, with careful handling and proper sampling techniques, disturbance during sampling can be minimized for most geotechnical engineering purposes. Testing of undisturbed samples gives a more accurate estimate of in situ behavior than is possible with disturbed samples.

Normally, we obtain undisturbed samples by pushing a 2.875-inch (73 mm) I.D., thin wall seamless steel tube 24 inches (0.6 m) into the soil with a single stroke of a hydraulic ram. The sampler, which is a Shelby tube, is 30 (0.8 m) inches long. After the sampler is retrieved, the ends are sealed in the field and it is transported to our laboratory for visual description and testing, as needed. Undisturbed sampling is noted on the boring logs as thus "U-".

Laboratory Test Methods

Soil samples returned to our laboratory are looked at again by a geotechnical engineer or geotechnician to obtain more accurate descriptions of the soil strata. Laboratory testing is performed on selected samples as deemed necessary to aid in soil classification and to help define engineering properties of the soils. The test results are presented on the soil boring logs at the depths at which the respective sample was recovered, except that grain size distributions or selected other test results may be presented on separate tables, figures or plates as discussed in this report. The soil descriptions shown on the logs are based upon visual-manual procedures in accordance with local practice. Soil classification is in general accordance with the Unified Soil Classification System (ASTM D-2487) and is also based on visual-manual procedures. Following is a list of abbreviations that may appear in the Remarks column on the boring logs indicating additional laboratory testing was performed.

DD - Dry Density of Undisturbed Sample
k - Hydraulic Conductivity (Coefficient of Permeability)
Qu - Unconfined Compression Strength; ASTM D-2166 (soil), D-2938 (rock)
Consol - One-Dimensional Consolidation test performed on subsample from undisturbed sample; ASTM D-2425 (report usually presented in Appendix)

THE PROJECT SOIL DESCRIPTION PROCEDURE FOR SOUTHWEST FLORIDA[1]
For use with the ASTM D 2487 Unified Soil Classification System

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

BOULDERS (> 12" [300 mm]) and COBBLES (3" [75 mm] TO 12" [300 mm]):

GRAVEL: Coarse Gravel: 3/4" (19 mm) to 3" (75 mm)
Fine Gravel: No. 4 (4.75 mm) Sieve to 3/4" (19 mm)

Descriptive adjectives:

0 - 5%	--	no mention of gravel in description
5 - 15%	--	trace
15 - 29%	--	some
30 - 49%	--	gravelly (shell, limerock, cemented sands)

SANDS

COARSE SAND: No. 10 (2 mm) Sieve to No. 4 (4.75 mm) Sieve
MEDIUM SAND: No. 40 (425 μm) Sieve to No. 10 (2 mm) Sieve
FINE SAND: No. 200 (75 μm) Sieve to No. 40 (425 μm) Sieve

Descriptive adjectives:

0 - 5%	--	no mention of sand in description
5 - 15%	--	trace
15 - 29%	--	some
30 - 49%	--	sandy

SILT/CLAY: < #200 (75 μm) sieve

SILTY OR SILT: PI < 4
SILTY CLAYEY OR SILTY CLAY: 4 ≤ PI ≤ 7
CLAYEY OR CLAY: PI > 7

Descriptive adjectives/adverbs:

< - 5%	--	clean (no mention of silt or clay in description).
5 -12% to 15%	--	slightly
16 - 35%	--	clayey, silty, or silty clayey
36 - 49%	--	very

ORGANIC SOILS

Organic Content	Descriptive Adjectives	Classification
0 - 2.5%	usually no mention of organics in description	See Above
2.6 - 5%	slightly organic	add "with organic fines" to group name

THE PROJECT SOIL DESCRIPTION PROCEDURE FOR SOUTHWEST FLORIDA[1]
For use with the ASTM D 2487 Unified Soil Classification System

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ORGANIC SOILS (Continued):

Organic Content	Descriptive Adjectives	Classification
5 - 30%	organic	SM with organic fines Organic Silt (OL) Organic Clay (OL) Organic Silt (OH) Organic Clay (OH)

HIGHLY ORGANIC SOILS AND MATTER

	Description	
30-75%	sandy peat	Peat (PT)
	silty peat	Peat (PT)
>75%	amorphous peat	Peat (PT)
	fibrous peat	Peat (PT)

STRATIFICATION AND STRUCTURE

Descriptive Term		Thickness
with interbedded		
seam	--	less than 1/2-inch (13 mm) thick
layer	--	1/2 to 12-inches (13 to 300 mm) thick
stratum	--	more than 12-inches (300 mm) thick
pocket	--	small, erratic deposit, usually less than 1-foot
lens	--	lenticular deposits
occasional	--	one or less per foot of thickness
frequent	--	more than one per foot of thickness
calcareous	--	containing calcium carbonate (reaction to diluted HCL)
hardpan	--	spodic horizon usually medium dense
marl	--	mixture of carbonate clays, silts, shells and sands.

ROCK CLASSIFICATION (FLORIDA) CHART

Symbol	Typical Description
LS	Hard Bedded Limestone or Caprock
WLS	Fractured or Weathered Limestone
LR	Limerock (gravel, sand, silt and clay mixture)
SLS	Stratified Limestone and Soils

(1) This soil description procedure was developed specifically for projects in southwest Florida because it is believed that the terminology will be better understood as a result of local practice. It is not intended to supplant other visual-manual classification procedures for description and identification of soils such as ASTM D 2488.

BY: G.A. DREW, P.E. (1995)

TABLE 1 Soil Classification Chart

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
COARSE-GRAINED SOILS More than 50 % retained on No. 200 sieve	Gravels More than 50 % of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5 % fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12 % fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50 % or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5 % fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]	SP	Poorly graded sand[I]
		Sands with Fines More than 12 % fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
FINE-GRAINED SOILS 50 % or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	$\frac{\text{Liquid limit – oven dried}}{\text{Liquid limit – not dried}} < 0.75$	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		organic	$\frac{\text{Liquid limit – oven dried}}{\text{Liquid limit – not dried}} < 0.75$	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12 % fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12 % fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15 % sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15 % gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29 % plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30 % plus No. 200, predominantly sand, add "sandy" to group name.

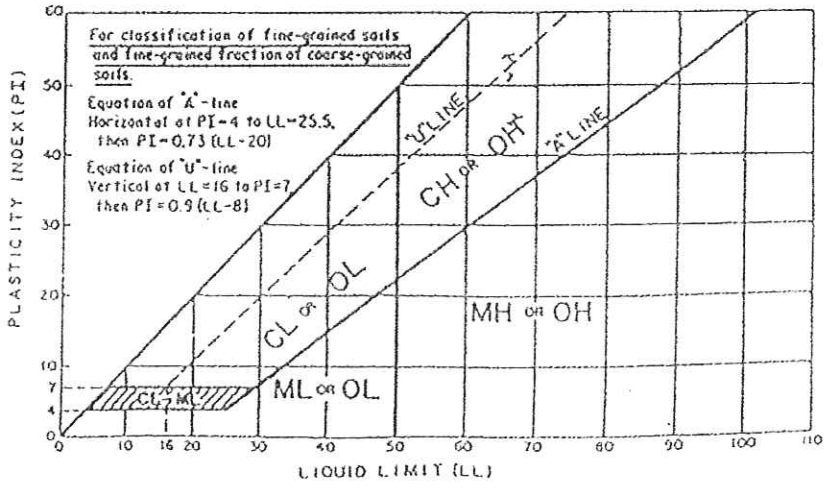
[M] If soil contains ≥ 30 % plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



THE PROJECT SOIL DESCRIPTION PROCEDURE FOR SOUTHWEST FLORIDA [1]
For use with the AASHTO M-145 or ASTM D 3282 soil classification system only
CLASSIFICATION OF SOILS AND SOIL-AGGREGATE MIXTURES FOR HIGHWAY CONSTRUCTION PURPOSES

BROKEN ROCK/BOULDERS: >3" (75 mm)

GRAVEL: 3" (75 mm) to #10 (2 mm) sieve

Descriptive adjectives:

0 - 5%	--	no mention of gravel in description
5 - 15%	--	trace
15 - 29%	--	some
30 - 49%	--	gravelly (shell, limerock, cemented sands)

SANDS

COARSE SAND: #10 (2 mm) to #40 (425 μm)
FINE SAND: #40 (425 μm) TO #200 (75 μm)

Descriptive adjectives:

0 - 5%	--	no mention of sand in description
5 - 15%	--	trace
15 - 29%	--	some
30 - 49%	--	sandy

SILT/CLAY: < #200 (75 μm) sieve

SILTY OR SILT: PI < 4
SILTY CLAYEY OR SILTY CLAY: $4 \leq PI \leq 10$
CLAYEY OR CLAY: PI > 10

Descriptive adjectives:

< - 5%	--	clean (no mention of silt or clay in description)
5 - 15%	--	slightly
16 - 35%	--	clayey, silty, or silty clayey
36 - 49%	--	very

ORGANIC SOILS (MUCK) and HIGHLY ORGANIC SOILS AND MATTER (PEAT)

Organic Content	Descriptive Adjectives	Classification
0 - 2.5%	usually no mention of organics in description	See Above
2.6 - 5%	slightly organic	add * to symbol
5-30%	organic sand or silt	A-8
5-30%	clayey organic silt	A-8
30-75%	sandy peat	A-8
30-75%	silty peat	A-8
>75%	amorphous peat	A-8
>75%	fibrous peat	A-8

THE PROJECT SOIL DESCRIPTION PROCEDURE FOR SOUTHWEST FLORIDA [1]

For use with the AASHTO M-145 or ASTM D 3282 soil classification system only

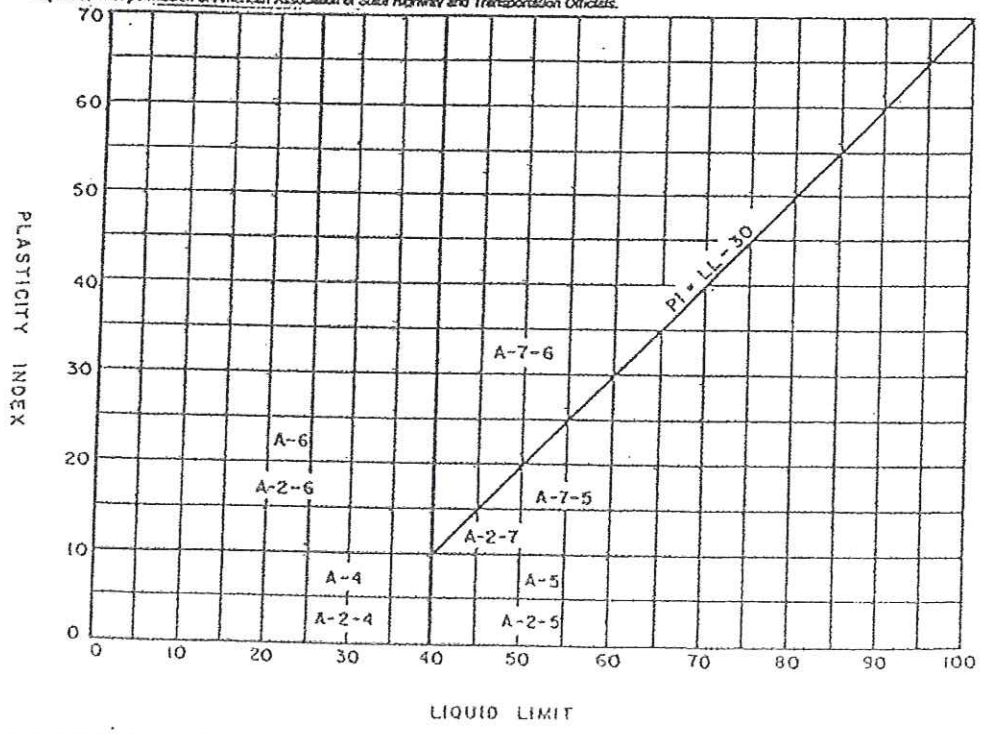
CLASSIFICATION OF SOILS AND SOIL-AGGREGATE MIXTURES FOR HIGHWAY CONSTRUCTION PURPOSES

TABLE 2 Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35 % or less passing No. 200)							Silt-Clay Materials (More than 35 % passing No. 200)			
Group classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6
Sieve analysis, % passing:											
No. 10 (2.00 mm)	50 max	...	...	...	...	...	...	...	...	...	...
No. 40 (425 μm)	30 max	50 max	51 min	...	...	...	...	...	...	...	...
No. 200 (75 μm)	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fraction passing No. 40 (425 μm):											
Liquid limit	...		...	40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min
Plasticity index	6 max		N.P.	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11 min[A]
Usual types of significant constituent materials	Stone Fragments, Gravel and Sand		Fine Sand	Silty or Clayey Gravel and Sand				Silty Soils		Clayey Soils	
General rating as subgrade	Excellent to Good							Fair to Poor			

[A] Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30 (see Fig. 1).

Reprinted with permission of American Association of State Highway and Transportation Officials.

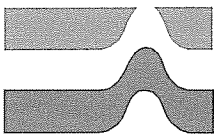


Note—A-2 soils contain less than 35 % finer than 200 sieve.

FIG. 1 Liquid Limit and Plasticity Index Ranges for Silt-Clay Materials

(1) This soil description procedure was developed specifically for projects in southwest Florida where the AASHTO soil classification is used because it is believed that the terminology will be better understood as a result of local practice. It is not intended to supplant other visual-manual classification procedures for description and identification of soils such as ASTM D 2488.

REPORT OF
GEOTECHNICAL ENGINEERING SERVICES
PROPOSED STRUCTURES
HOMESTEAD ROAD WIDENING FROM
SOUTH OF SUNRISE BLVD. TO ALABAMA ROAD
LEHIGH ACRES, LEE COUNTY, FLORIDA
ARDAMAN PROJECT NO. 07-4550



Ardaman & Associates, Inc.

OFFICES

Orlando, 8008 S. Orange Avenue, Orlando, Florida 32809, Phone (407) 855-3860
Bartow, 1525 Centennial Drive, Bartow, Florida 33830, Phone (863) 533-0858
Cocoa, 1300 N. Cocoa Blvd., Cocoa, Florida 32922, Phone (321) 632-2503
Fort Myers, 9970 Bavaria Road, Fort Myers, Florida 33913, Phone (239) 768-6600
Miami, 2608 W. 84th Street, Hialeah, Florida 33016, Phone (305) 825-2683
Port Charlotte, 740 Tamiami Trail, Unit 3, Port Charlotte, Florida 33954, Phone (941) 624-3393
Port St. Lucie, 460 Concourse Place NW, Unit 1, Port St. Lucie, Florida 34986, Phone (772) 878-0072
Sarasota, 2500 Bee Ridge Road, Sarasota, Florida 34239, Phone (941) 922-3526
Tallahassee, 3175 West Tharpe Street, Tallahassee, Florida 32303, Phone (850) 576-6131
Tampa, 3925 Coconut Palm Drive, Suite 115, Tampa, Florida 33619, Phone (813) 620-3389
West Palm Beach, 2200 North Florida Mango Road, Suite 101, West Palm Beach, Florida 33409, Phone (561) 687-8200

MEMBERS:
A.S.F.E.
American Concrete Institute
American Society for Testing and Materials
Florida Institute of Consulting Engineers

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

July 17, 2008
Ardaman Project No. 07-4550

HDR Engineering, Inc.
2621 Cattlemen Road, #106
Sarasota, Florida 34232

Attention: Mr. Donnie Holcomb, P.E.

Subject: **Report of Geotechnical Engineering Services**
Proposed Structures
Homestead Road Widening from South of
Sunrise Boulevard to Alabama Road
Lehigh Acres, Lee County, Florida

Gentlemen:

Ardaman & Associates, Inc. (Ardaman) is pleased to submit this report of geotechnical engineering services for the proposed structures for the Homestead Road Widening project from south of Sunrise Boulevard to Alabama Road in Lehigh Acres, Lee County, Florida. This study was requested and authorized by **HDR Engineering, Inc.**

The following report presents the results of our study for the proposed structures to date and includes the results of our field and laboratory testing program, and our foundation design recommendations for the proposed structures.

Ardaman appreciates this opportunity to be of further service to you and looks forward to maintaining our professional relationship as the project continues. If you have any questions regarding the contents of this report, please do not hesitate to contact our office.

Very truly yours,

Ardaman & Associates, Inc.
Florida Certificate of Authorization No. 00005950

7/17/08

Gary A. Drew, P.E.
Branch Manager/Vice President
Florida License No. 35504

1 COPY-HDR/TAMPA, Philip Walker, P.E.

G:\Emily\Gary\07-4550\Homestead Road\07-4550 Structures Report.doc

TABLE OF CONTENTS

1.0 INTRODUCTION 2
1.1 Project Description 2
1.2 Project Approach 2
1.3 Report Format 3

2.0 SITE DESCRIPTION 3
2.1 General 3

3.0 FIELD EXPLORATION 3
3.1 Boring Locations and Utility Clearance 3
3.2 Standard Penetration Test (SPT) 3

4.0 LABORATORY TESTING 4
4.1 Soil Classification Testing 4
4.2 Percent Fines 4
4.3 Moisture Content 4
4.4 Corrosion Parameter Testing 4
4.5 Laboratory Test Results 5

5.0 GENERALIZED SUBSURFACE SOIL CONDITIONS 5
5.1 Structure Borings 5
5.2 Groundwater 6

6.0 ENGINEERING EVALUATIONS AND RECOMMENDATIONS 6
6.1 Box Culverts 6
6.2 Temporary Sheet Pile Walls 8
6.3 Signal Poles, Cantilever Structures and Weirs 8
6.4 Environmental Classification 8

7.0 REPORT LIMITATIONS 7

FIGURES

FIGURE NOS. 12 THROUGH 20

APPENDIX

SAMPLING AND TESTING METHODS SOIL CLASSIFICATION
UNIFIED SOIL CLASSIFICATION SYSTEM ASTM D-2487

1.0 INTRODUCTION

1.1 Project Description

Homestead Road will be improved to a four-lane divided roadway beginning 3,500 feet south of its intersection with Sunrise Boulevard and extending northward to its intersection with Alabama Road in Lehigh Acres, Lee County, Florida. The project begins with Station 511+44 centerline construction and ends with Station 634+01—a distance of 2.3 miles.

The typical design section will be a 4-lane divided roadway with curb and gutter. Approximately 1 to 2 feet of embankment will be required under the pavement section.

This report discusses the proposed structures for this project as summarized below:

TYPE OF STRUCTURE	APPROXIMATE STATION LOCATION
Bonefish Canal Box Culvert Extension	STA. 592
Spur A Canal Box Culvert Extension	STA. 603
Homestead Road/Dave Canal Box Culvert	STA. 604 - 606
Homestead Road/Dave Canal Temporary Sheet Pile Wall	STA. 605 - 606
Veterans Academy Signal Poles	STA. 585
Fire Station Signal Poles	STA. 602
School Zone Cantilever Poles	STA. 604 and 608
Alabama Road Signal Poles	STA. 625
54-4-6 Canal Structure	offsite
Spur A Weir Structure	offsite

Information about the roadway soil survey has been submitted separately from this report.

1.2 Project Approach

For this geotechnical study, we performed Standard Penetration Test (SPT) borings to evaluate the foundations for the planned structures. Boring test locations were selected based on site access constraints. This report presents the borings drilled for each structure and our foundation design recommendations.

In completing this evaluation, we have performed the following services:

1. Planned and performed an exploration program consisting of SPT borings to depths of 30 and 40 feet below existing grade at each structure.

2. Visually classified the soil samples obtained from the SPT borings and performed laboratory tests on selected representative samples.

3. Reviewed the field and laboratory data and then evaluated that data for the foundation system.

4. Prepared this engineering report which summarizes our field and laboratory testing, the subsurface soil and groundwater conditions encountered and presents our engineering evaluations and foundation design recommendations.

1.3 Report Format

This report begins with a site description and discussion of the field and laboratory testing programs. These sections are followed by a description of the general subsurface conditions encountered and then foundation evaluations for the proposed structures. The soil boring profiles and boring locations are presented in **Figures No. 12 through 20**.

2.0 SITE DESCRIPTION

2.1 General

Homestead Road exists as a two-lane rural road. From the project beginning northward about 8,000 feet, land use is mostly agricultural or vacant and then becomes more developed with residences and commercial businesses to the project end at Alabama Road. Three canals cross under Homestead Road.

We were able to locate our test borings where planned for most of the structures; however, some minor movement of borings was necessary due to underground and above ground utilities and other obstructions.

3.0 FIELD EXPLORATION

3.1 Boring Locations and Utility Clearance

Utility clearances were coordinated by Ardaman. The field exploration program consisted of SPT borings near each proposed structure as site constraints would allow. The borings were located by station and offset from the centerline of construction for Homestead Road. Boring elevations at each location were estimated from the Plan and Profile Sheets provided by HDR Engineering, Inc. The boring locations and soil profiles are presented in **Figure Nos. 12 through 20**.

3.2 Standard Penetration Test (SPT)

The SPT borings were performed in general conformance with ASTM D-1586. Continuous soil sampling using a 1-3/8 inch I.D. split-barrel sampler was performed in the top 10 feet and then at 5-foot intervals thereafter. After seating the sampler 6 inches, the number of successive blows required to drive the sampler 12 inches into the soil constitutes the test result commonly referred to as the N-value. The N-value has been empirically correlated with various soil properties and is considered to be indicative of the relative density of cohesionless soils and the consistency of cohesive soils. The recovered split spoon

samples were visually classified in the field with representative portions of the samples placed in jars and transported to our office for review by a Geotechnical Engineer and confirmation of the field classification.

4.0 LABORATORY TESTING

4.1 Soil Classification Testing

Representative soil samples collected from the SPT borings were visually classified in the laboratory by a geotechnical engineer to confirm the field classifications. The samples were described in general accordance with the Unified Soil Classification System (ASTM D-2488). The results of laboratory tests were used to confirm the visual classification. The laboratory program consisted of percent fines, natural moisture content and environmental corrosion tests. The tests were performed on selected samples believed to be representative of the materials encountered. The USCS classification for each soil stratum encountered is shown on the soil profiles presented in **Figure Nos. 12 through 20**.

4.2 Percent Fines

The percent fines were conducted in general accordance with the Florida Test Method: designation FM1-T011. The percentage by weight passing the No. 200 Sieve is the amount of silt and clay sized particles. The gradation of a soil, including the amount of silt and clay, affects its engineering properties, including permeability, consolidation rate, suitability as roadway subgrade, and suitability as general fill material.

4.3 Moisture Content

The laboratory moisture content test consists of the determination of the percentage of moisture by weight in selected samples in general accordance with AASHTO test designation T 265. Briefly, natural moisture content is determined by weighing a sample of the selected material and then drying it in a warm oven. Care is taken to use a temperature of 105° C so as not to destroy any organics. The sample is removed from the oven and reweighed. The difference of the two weights is the amount of moisture removed from the sample. The weight of the moisture divided by the weight of the dry soil sample is the percentage by weight of the moisture in the sample.

4.4 Corrosion Parameter Testing

Environmental corrosion tests were conducted in accordance with the Florida test method: designations FM 5-550, FM 5-551, FM 5-552 and FM 5-553. These tests were performed on recovered soil samples obtained from the SPT borings, and on water samples from the canals. Environmental corrosion tests measure parameters such as pH, resistivity, sulfate content and chloride content. The results are as follows:

Structure No.	Depth (feet)	Soil Type	Resistivity (ohm-cm)	Chloride (ppm)	Sulfates (ppm)	pH
Bonefish Canal Box Culvert Extension	0 - 4	SP	4,800	75	55	6.8
	Canal Water		1,800	35	257	6.3
Spur A Box Culvert Extension	0 - 6	SP	11,000	60	68	7.1
	Canal Water		1,700	20	276	6.3
Homestead Road/Dave Canal Box Culvert	0 - 4	SP	6,900	45	30	6.5
	4 - 7	SC	1,200	30	106	7.0
Veterans Signal Poles	0 - 4	SP	3,200	30	40	6.5
	4 - 8	SC	6,800	30	50	6.4
Fire Station Signal Poles	0 - 5	SP	15,000	30	40	8.5
School Zone Cantilevers	0 - 4	SP	16,000	30	10	7.9
	4 - 7	SC	1,200	30	108	7.0
Alabama Road Signal Poles	0 - 5	SP	10,000	60	92	6.9
54-4-6 Canal Structure	Canal Water		2,300	15	29	7.8
Spur A Weir Structure	Canal Water		2,100	35	114	7.9

4.5 Laboratory Test Results

The laboratory test results are presented on the soil boring profiles presented in **Figure Nos. 12 through 20** at the depths from which the samples were recovered.

5.0 GENERALIZED SUBSURFACE SOIL CONDITIONS

5.1 Structure Borings

The general soil profile along the project alignment consists of sandy soils underlain by a thin stratum of clayey sands which in turn are underlain by calcareous gravelly silty sands followed by sandy silts and sandy clays. The following table represents the general soil strata encountered. The soil samples collected were classified using the Unified Soil Classification System (USCS). The soil descriptions and corresponding USCS symbols associated with the project are listed below.

Typical Soil Description	USCS Symbol
Fine sand.	SP
Clayey sand.	SC
Slightly silty to silty fine sand, some shell and cemented sand.	SP-SM/SM with Gravel
Sandy silt.	SM
Sandy clay.	CL

Generalized subsurface soil conditions for each structure location are presented graphically on **Figure Nos. 12 through 20**. The stratification shown is based on visual examination of recovered samples and interpretation of the field logs by a geotechnical engineer. The soil types shown represent observed materials in the test borings and may not reflect variations between the borings and beyond the depth explored.

5.2 Groundwater

The groundwater table was encountered at depths ranging from 3-1/2 to 10 feet below ground surface. Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences, such as ditches and ponds. We estimate that the seasonal high groundwater table is approximately 2 to 2-1/2 feet below the natural ground surface, which corresponds to an elevation of approximately 24 feet NGVD.

6.0 ENGINEERING EVALUATIONS AND RECOMMENDATIONS

6.1 Box Culverts

Based on the results of the borings and our analyses and experience with similar projects, the soils encountered are suitable for support of the proposed box culverts after proper site preparation. If buried organic soils, debris or unsuitable fills are encountered during construction, that are not shown on the borings logs, they should be removed and replaced with clean, compacted, sandy soils in accordance with the FDOT Standard Specifications for Road and Bridge Construction (SSRBC) and Standard Index 500. Site preparation and backfilling procedures should be in accordance with FDOT SSRBC Section 410 and Standard Index 505. The following report sections present the results of our analysis and foundation design recommendations for the proposed box culvert structures.

The borings performed in the proposed box culvert structure areas generally encountered loose to medium dense fine sands underlain by a thin stratum of medium stiff clayey sands which in turn are underlain by medium dense gravelly calcareous silty sands within the foundation influence zone. The soils encountered are considered suitable for the proposed construction. Clayey sands or gravelly calcareous silty sands will likely be encountered in the bottom of the box culvert excavations (approx. +19.25 ft. NGVD). These soil types should be undercut at least one-foot and backfilled with FDOT No. 57 Stone or similar gravel to help stabilize the bottom of excavation condition.

It is our understanding that these structures will be designed using Load Resistance Factor Design (LRFD) methods. The factored resistance was estimated using the following equation:

$qr = \varphi \times qn = \varphi \times qult$

Where:

qr = The Factored Resistance
φ = Resistance Factor = 0.45
qn = qult = Nominal Bearing Resistance

The following table presents the estimated factored resistance for the structures using a resistance factor (φ) of 0.45.

In addition, we show the allowable net soil contact pressure for each box culvert structure. This net soil contact pressure should not be exceeded to keep total and differential settlements to less than 1-inch and 1/2-inch, respectively.

Estimated Factored Resistance of Box Culverts			
Structure No.	**Factored Resistance (psf)**	**Allowable Net Soil Contact Pressure (psf)**	**Modulus of Subgrade Reaction (kcf)**
Bonefish Canal 7' x 5' Box Culvert Extension	3,200	2,300	85
Spur A Canal 6' x 4' Box Culvert Extension	3,700	2,700	100
Homestead Rd./Dave Canal 6' x 4' Box Culvert	3,700	2,700	100
Note—The factored resistance presented above is based on applying a resistance factor to the computed Meyerhof ultimate bearing capacity.			

The settlement of the proposed box culvert structures should occur rapidly after loading. Thus, the expected settlement should occur during construction as dead loads are imposed. Provided the recommended site preparation operations are properly performed, and the allowable net soil contact pressure listed above is not exceeded, the total settlement of the structure should not exceed approximately 1-inch. Differential settlement is estimated to be on the order of 1/2 of the total settlement. Differential settlement of this magnitude is usually considered tolerable for the anticipated construction without need for bond beams.

Soil design parameters for existing soil conditions at each structure location are summarized on the soil profile sheets (**Figure Nos. 12 through 14**). We expect that select soils will be used to backfill completed box culvert and wing walls; therefore, the following soil design parameters would be approximate.

SOIL DESIGN PARAMETERS FOR SELECT BACKFILL SOILS					
APPROXIMATE SOIL UNIT WEIGHT (pcf)	ANGLE OF INTERNAL FRICTION (degrees)	COHESION (psf)	EARTH PRESSURE COEFFICIENT		
			Ka	Ko	Kp
110	30	0	0.33	0.50	3.00

6.2 Temporary Sheet Pile Walls

Construction of the box culvert under Homestead Road connecting the Spur A and Dave canals will require excavation adjacent to and across Homestead Road. The excavation adjacent to existing Homestead where traffic will be maintained parallel to the excavation will require an excavated slope no steeper than 2 (horizontal) to 1 (vertical) to maintain a minimum factor of safety of 1.33 for slope stability. Temporary sheet piling will be used for phasing of the Dave Canal box culvert under Homestead Road and we recommend using the following soil design parameters.

Soil Design Parameters for Temporary Sheet Piles			
Depth	**Approx. Saturated Soil Unit Weight**	**Angle of Internal Friction**	**Cohesion**
0 - 17'	112 pcf	30°	0 psf
17' - 30'	102 pcf	26°	0 psf

The zero depth corresponds to an elevation of approximately +26 feet NGVD. The seasonal high groundwater table is estimated to be +24 feet NGVD.

6.3 Signal Poles, Cantilever Structures and Weirs

The soil properties based on the samples obtained and the recorded N-Values were averaged and are presented on the soil profile sheets for each structure (**Figure Nos. 15 through 20**). The soil properties presented include the ultimate cohesive strength, c, in pounds per square foot (psf); the angle of internal friction, ø, in degrees; and the total saturated unit weight, γ_{sat} and γb, in pounds per cubic foot (pcf).

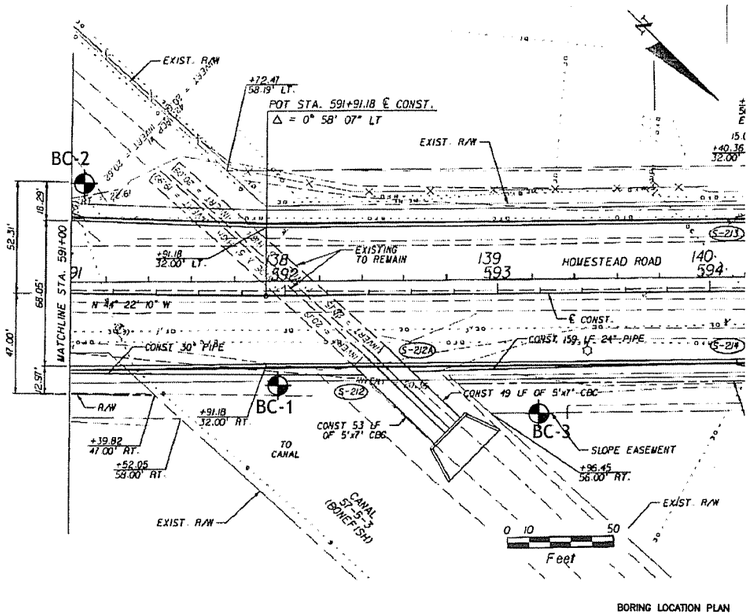
6.4 Environmental Classification

Based on the laboratory test results and the January 2008 FDOT Structures Design Guidelines, SDG 1.3, the soils at each structure location are classified as Slightly Aggressive for concrete structures and Moderately Aggressive for steel structures because the resistivity values range from 3,200 to 4,200 ohm-cm and pH range from 6.5 to 6.9. The water from the canals is classified as Moderately Aggressive because of the resistivity values range from 1700 to 2300 ohm-cm and sulfates range from 257 to 276 ppm.

7.0 REPORT LIMITATIONS

The analyses and recommendations submitted in this report are based upon the anticipated location and type of construction and the data obtained from the soil borings performed at the locations indicated and does not reflect any variations which may occur between these borings. If any variations become evident during the course of construction, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. When final design plans and specifications are available, a general review by our office is made to check that the assumptions made in preparation of this report are correct and that earthwork and foundation recommendations are properly interpreted and implemented.

FIGURES NOS. 12 THROUGH 20



BORING LOCATION PLAN

CORROSION SERIES TEST RESULTS

DEPTH feet	RESISTIVITY Ohms-cm	CHLORIDES ppm	SULFATES ppm	pH
0-4	4600	75	55	6.8
CANAL WATER	1800	35	257	6.3

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: MODERATELY AGGRESSIVE
STEEL: MODERATELY AGGRESSIVE

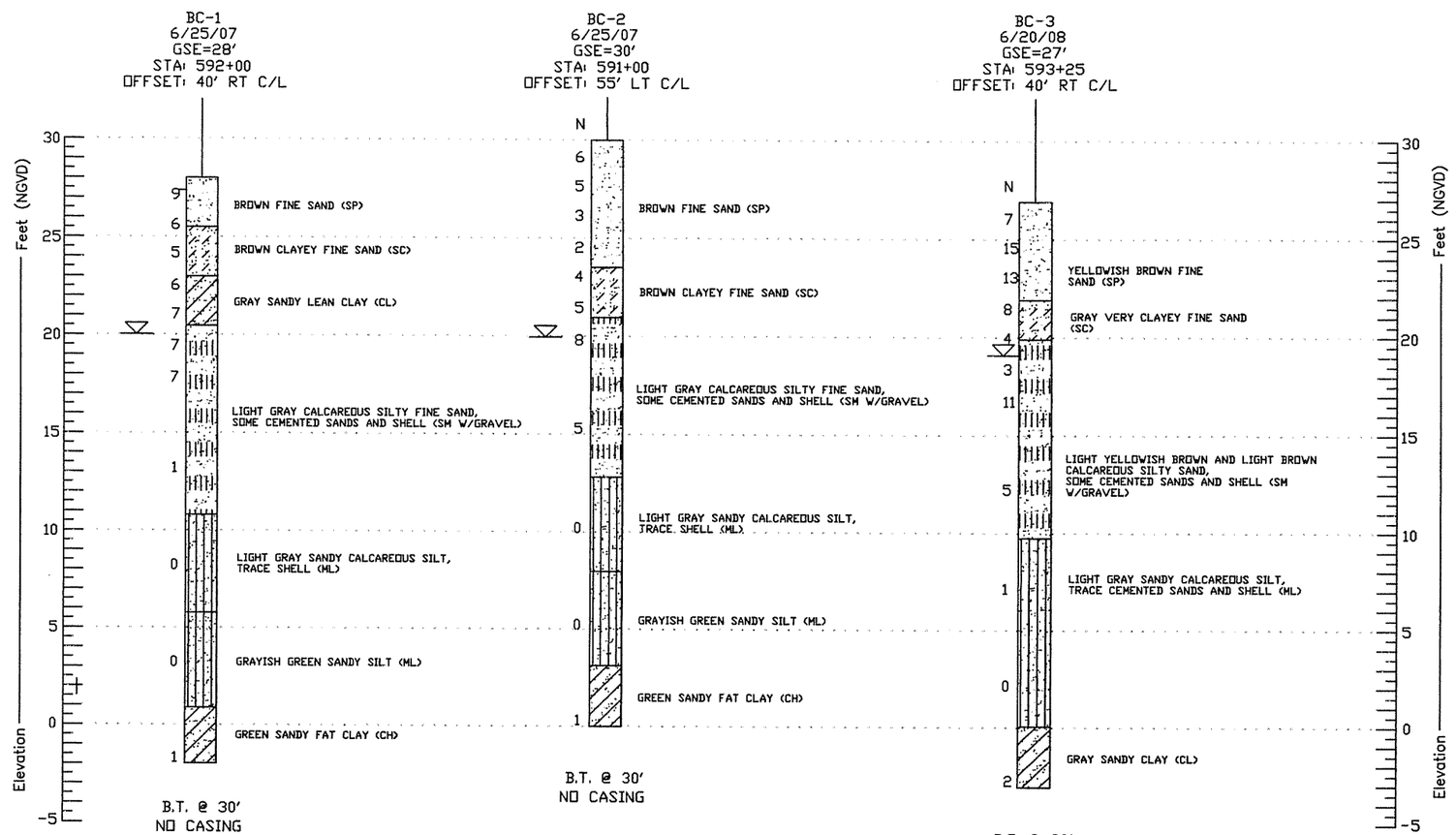
SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 0-10'
AUTO 15'-30'

LEGEND

- FINE SAND
- SILTY FINE SAND
- SANDY SILT
- SANDY CLAY
- CLAYEY FINE SAND
- STANDARD PENETRATION TEST (SPT) BORING LOCATION
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
- GROUNDWATER LEVEL MEASURED ON DATE DRILLED
- GSE — GROUND SURFACE ELEVATION (FEET, NGVD)
- SP, SC-SM, ML, CH, CL — UNIFIED SOIL CLASSIFICATION SYSTEM
- LOSS OF DRILLING FLUID CIRCULATION
- B.T. — BORING TERMINATION DEPTH



SOIL PROFILES

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

SOIL DESIGN PARAMETERS FOR BORINGS BC-1, BC-2 AND BC-3

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γsat	γb			ACTIVE (Ka)	PASSIVE (Kp)
0-4	2-15	SP	112	50	30	0	0.33	3.00
4-8	4-8	SC,CL	112	50	--	750	1	1
8-17	1-11	SM W/GR	112	50	30	0	0.33	3.00
17-27	0-1	ML	102	40	26	0	0.39	2.56
27-30	1-2	CL, CH	107	45	--	500	1	1

REVISIONS											
Date	By	Description	Date	By	Description						

	Names	Dates
Drawn by	JAR	07/08
Checked by	GAD	07/08
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504
Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

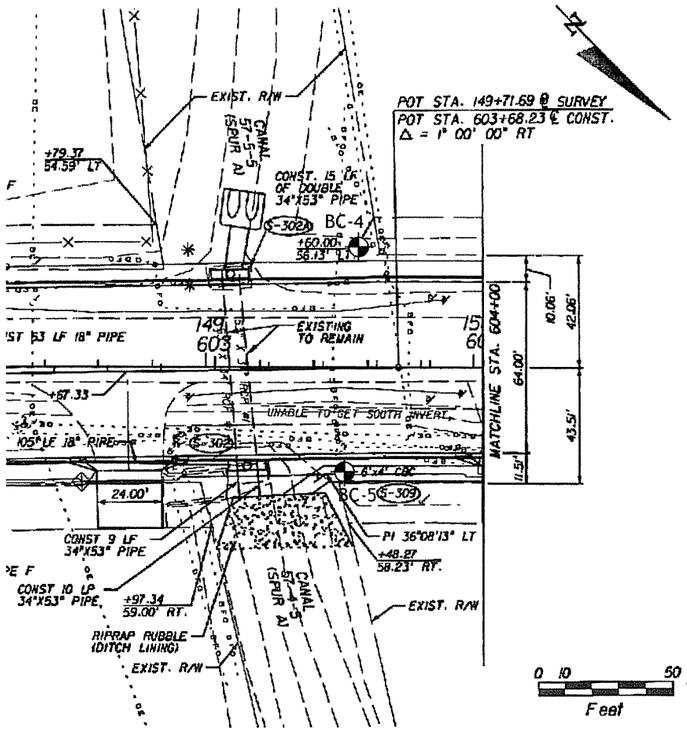
Ardaman & Associates, Inc.

SEAL:
7/17/08

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

BONEFISH CANAL
BOX CULVERT BORINGS
HOMESTEAD ROAD WIDENING - SUNRISE BLVD TO ALABAMA RD

SHEET NO. 12



BORING LOCATION PLAN

CORROSION SERIES TEST RESULTS

DEPTH feet	RESISTIVITY Ohms-cm	CHLORIDES ppm	SULFATES ppm	pH
0-6	11,000	60	68	7.1
CANAL WATER	1700	20	276	6.3

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: MODERATELY AGGRESSIVE
STEEL: MODERATELY AGGRESSIVE

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 0-10'
AUTO 15'-30'

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

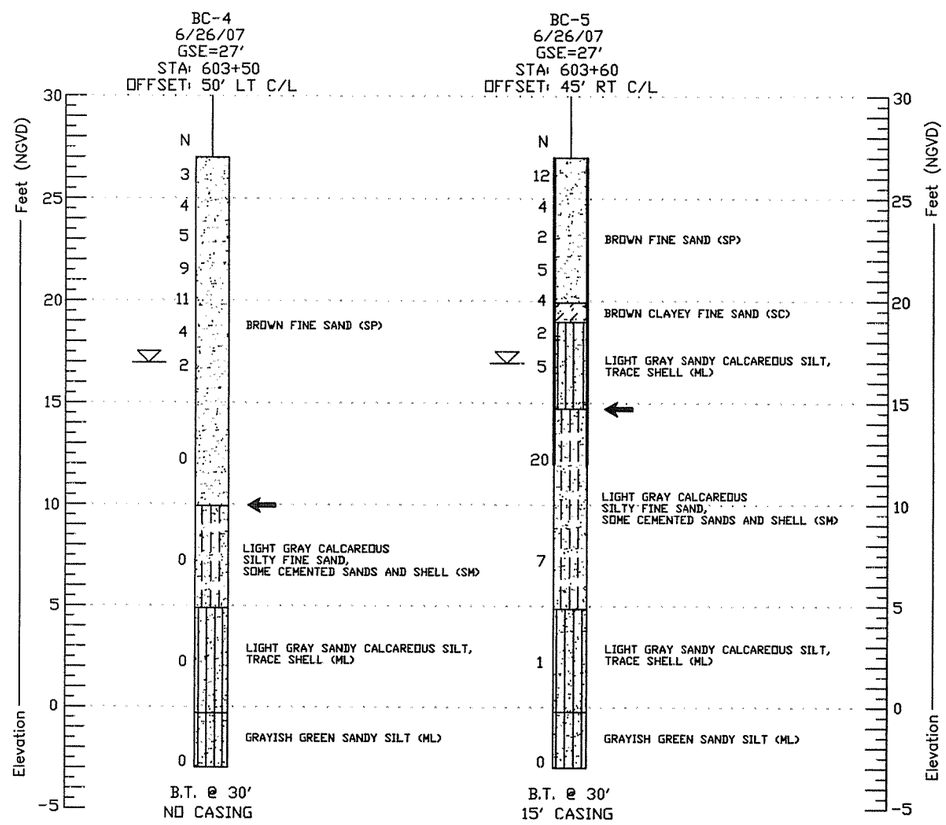
II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

LEGEND

- FINE SAND
- SILTY FINE SAND
- SANDY SILT
- SANDY CLAY
- CLAYEY FINE SAND
- STANDARD PENETRATION TEST (SPT) BORING LOCATION
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
- GROUNDWATER LEVEL MEASURED ON DATE DRILLED
- GSE — GROUND SURFACE ELEVATION (FEET, NGVD)
- SP, SC-SM, ML, CH, CL — UNIFIED SOIL CLASSIFICATION SYSTEM
- LOSS OF DRILLING FLUID CIRCULATION
- B.T. — BORING TERMINATION DEPTH
- HW CASING



SOIL PROFILES

SOIL DESIGN PARAMETERS FOR BORINGS BC-4 & 5

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γsat	γb			ACTIVE (Ka)	PASSIVE (Kp)
0-6	2-13	SP	112	50	30	0	0.33	3.00
6-8	2-4	SC	112	50	--	750	1	1
8-22	0-20	SM w/gr	112	50	30	0	0.33	3.00
22-30	0-2	ML	102	40	26	0	0.39	2.56

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	JAR	07/08
Checked by	GAD	07/08
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504

Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

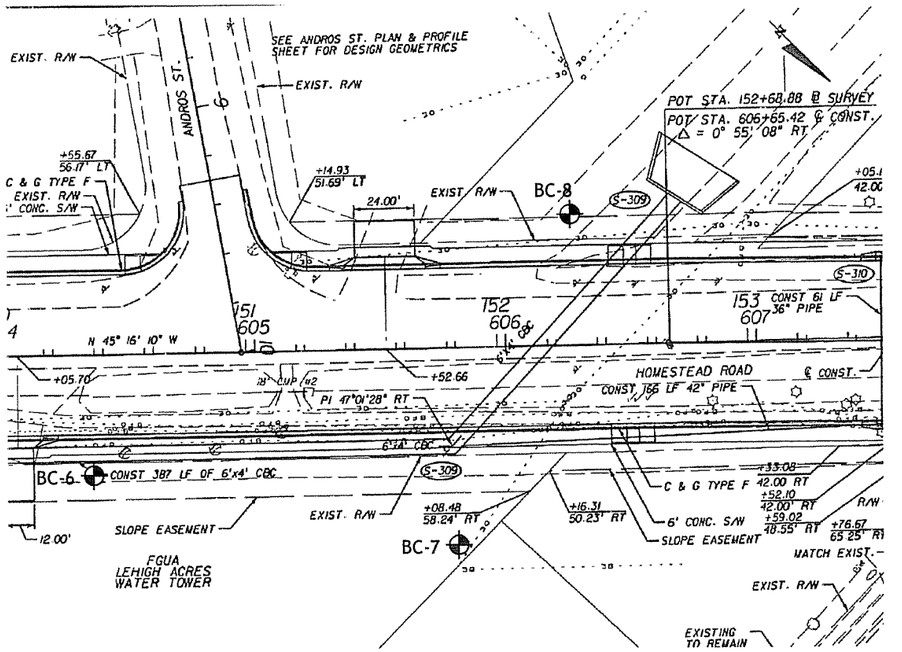
Ardaman & Associates, Inc.

SEAL:
7/17/08

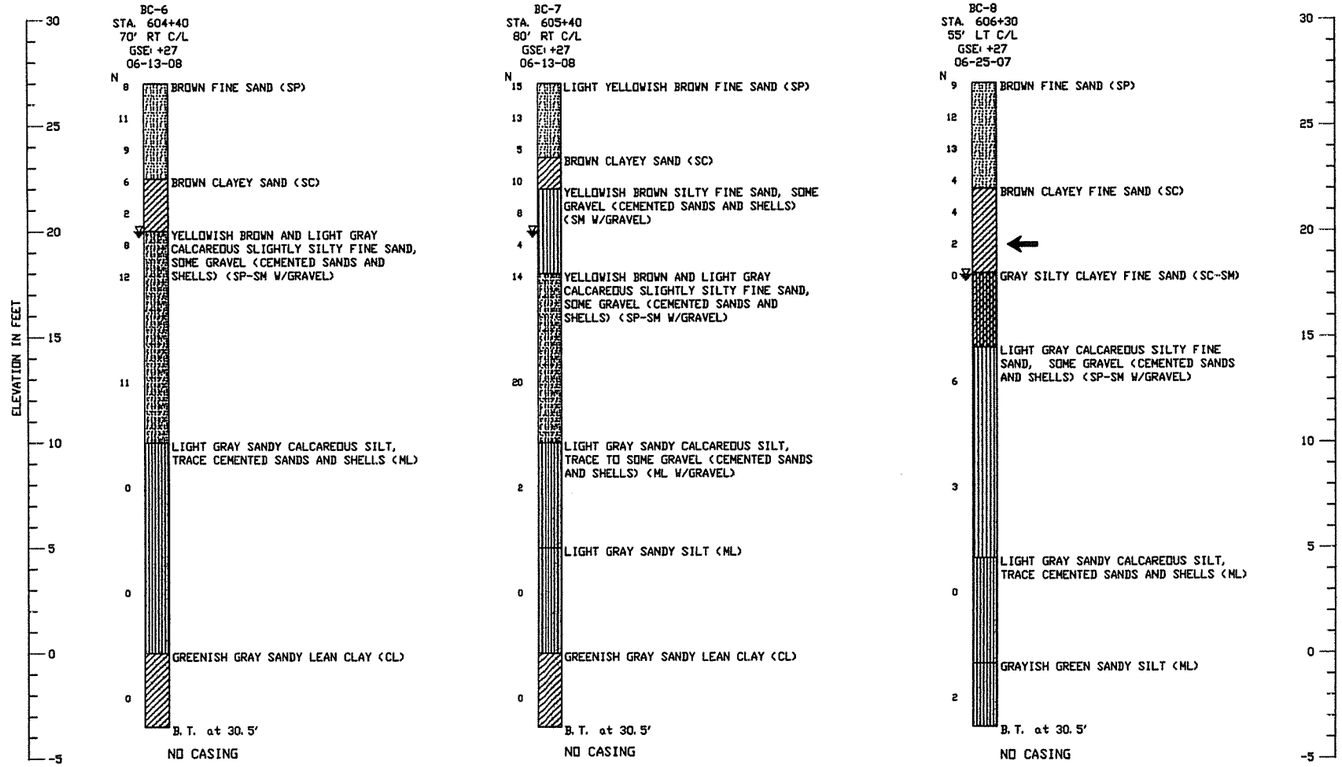
LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

SPUR A BOX CULVERT BORINGS
HOMESTEAD ROAD WIDENING - SUNRISE BLVD TO ALABAMA RD

SHEET NO.
13



BORING LOCATION PLAN



CORROSION SERIES TEST RESULTS

DEPTH feet	RESISTIVITY Ohms-cm	CHLORIDES ppm	SULFATES ppm	pH
0--4	6,900	45	30	6.5
4--7	1,200	30	106	7.0

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: MODERATELY AGGRESSIVE
STEEL: MODERATELY AGGRESSIVE

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 6'-10'
AUTO 15'-30'

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

LEGEND

Strata symbols

- Fine sand
- Clayey sand
- Slightly silty sand
- Sandy silt
- Sandy lean clay
- Silty sand
- Sandy silty clay

- STANDARD PENETRATION TEST (SPT) BORING LOCATION
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
- GROUNDWATER LEVEL MEASURED ON DATE DRILLED
- GSE — GROUND SURFACE ELEVATION (FEET, NGVD)
- SP, SC-SM, ML, CH, CL — UNIFIED SOIL CLASSIFICATION SYSTEM
- LOSS OF DRILLING FLUID CIRCULATION
- B.T. — BORING TERMINATION DEPTH

SOIL PROFILES

SOIL DESIGN PARAMETERS FOR BORINGS BC-6 AND BC-7

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERNAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γsat	γb			ACTIVE (Ka)	PASSIVE (Kp)
0-4	5-15	SP	112	50	30	--	0.33	3.00
4-7	2-10	SC	112	50	--	750	1	1
7-17	4-20	SP-SM W/GR	112	50	31	--	0.32	3.12
17-27	0	ML	102	40	26	--	0.39	2.56
27-30	0	CL	107	45	--	--	1	1

SOIL DESIGN PARAMETERS FOR BORINGS BC-8

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERNAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γsat	γb			ACTIVE (Ka)	PASSIVE (Kp)
0-5	4-13	SP	112	50	30	--	0.33	3.00
5-9	2-4	SC	107	45	--	500	1	1
9-22	0-6	SP-SM W/GR	107	45	28	--	0.36	2.77
22-30	0	ML	102	40	26	--	0.39	2.56

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	JAR	07/08
Checked by	GAD	07/08
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504
Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

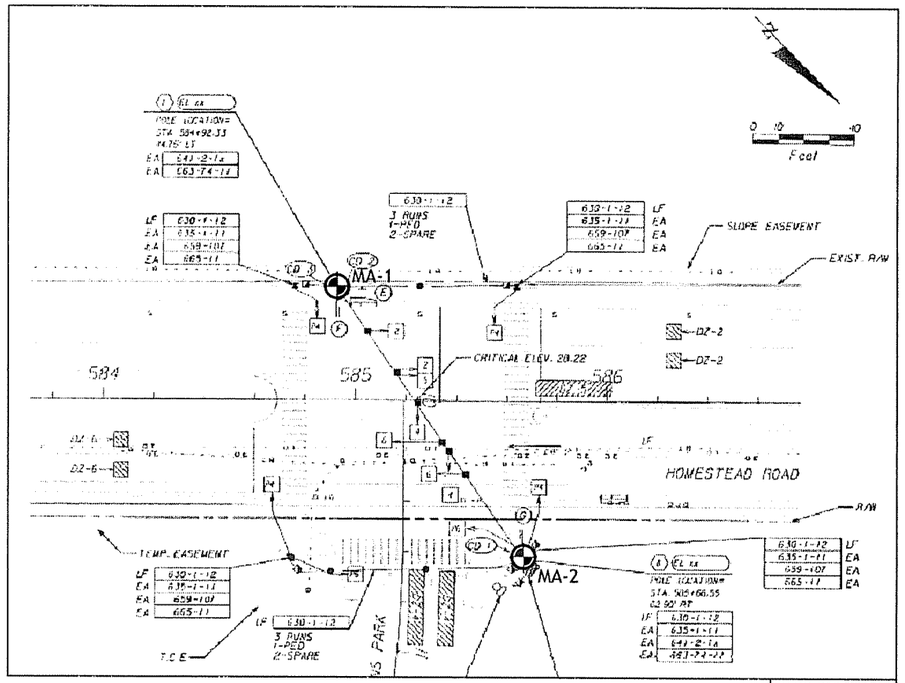
Ardaman & Associates, Inc.

SEAL:
7/17/08

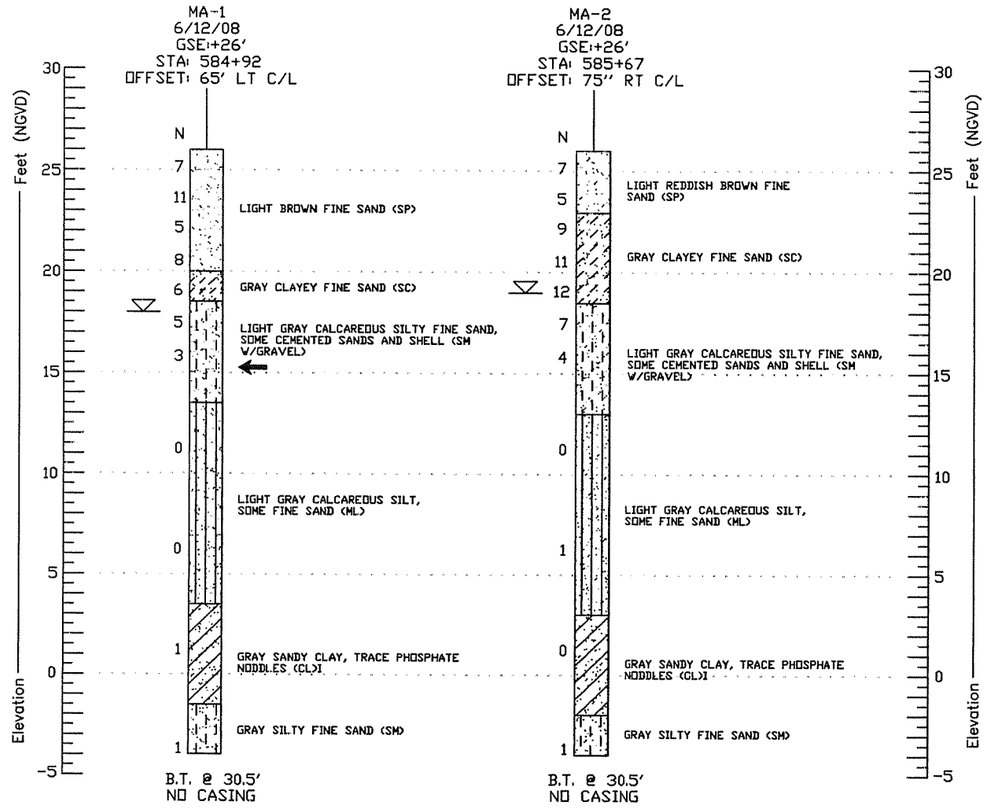
LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

DAVE CANAL BOX CULVERT BORINGS
HOMESTEAD ROAD WIDENING – SUNRISE BLVD TO ALABAMA RD

SHEET NO. 14



BORING LOCATION PLAN



SOIL PROFILES

CORROSION SERIES TEST RESULTS

DEPTH feet	RESISTIVITY Ohms-cm	CHLORIDES ppm	SULFATES ppm	pH
0-4	3,200	30	40	6.5
4-8	6,800	30	50	6.4

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: SLIGHTLY AGGRESSIVE
STEEL: MODERATELY AGGRESSIVE

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 6'-10'
AUTO 15'-30'

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

LEGEND

FINE SAND
SILTY FINE SAND
SANDY SILT
SANDY CLAY
CLAYEY FINE SAND

STANDARD PENETRATION TEST (SPT) BORING LOCATION
N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
GROUNDWATER LEVEL MEASURED ON DATE DRILLED
GSE GROUND SURFACE ELEVATION (FEET, NGVD)
SP, SC-SM, ML, CH, CL UNIFIED SOIL CLASSIFICATION SYSTEM
LOSS OF DRILLING FLUID CIRCULATION
B.T. BORING TERMINATION DEPTH

SOIL DESIGN PARAMETERS FOR BORINGS MA-1 AND MA-2

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γsat	γb			ACTIVE (Ka)	PASSIVE (Kp)
0-5	5-11	SP	112	50	30	0	0.33	3.00
5-7	6-12	SC	117	55	--	1000	1	1
7-12	3-7	SM w/gr	107	45	29	0	0.35	2.88
12-22	0-1	ML	102	40	26	0	0.39	2.56
22-27	0-1	CL	107	45	--	125	1	1
27-30	1	SM	102	40	26	0	0.39	2.56

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	JAR	07/08
Checked by	GAD	07/08
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504
Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

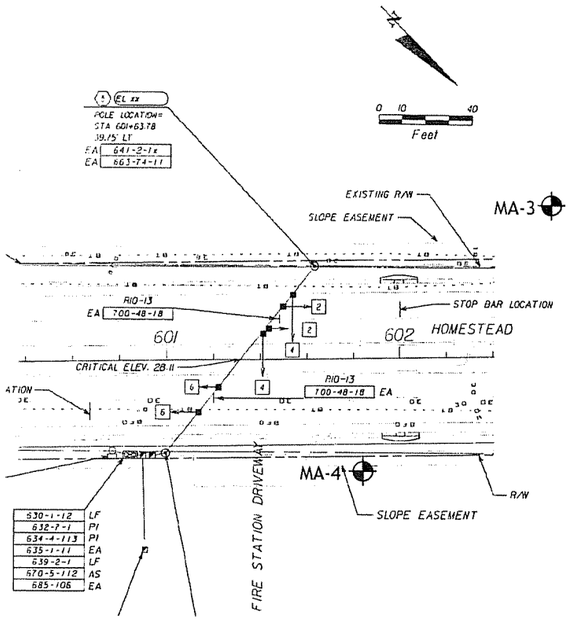
Ardaman & Associates, Inc.

SEAL:
7/17/08

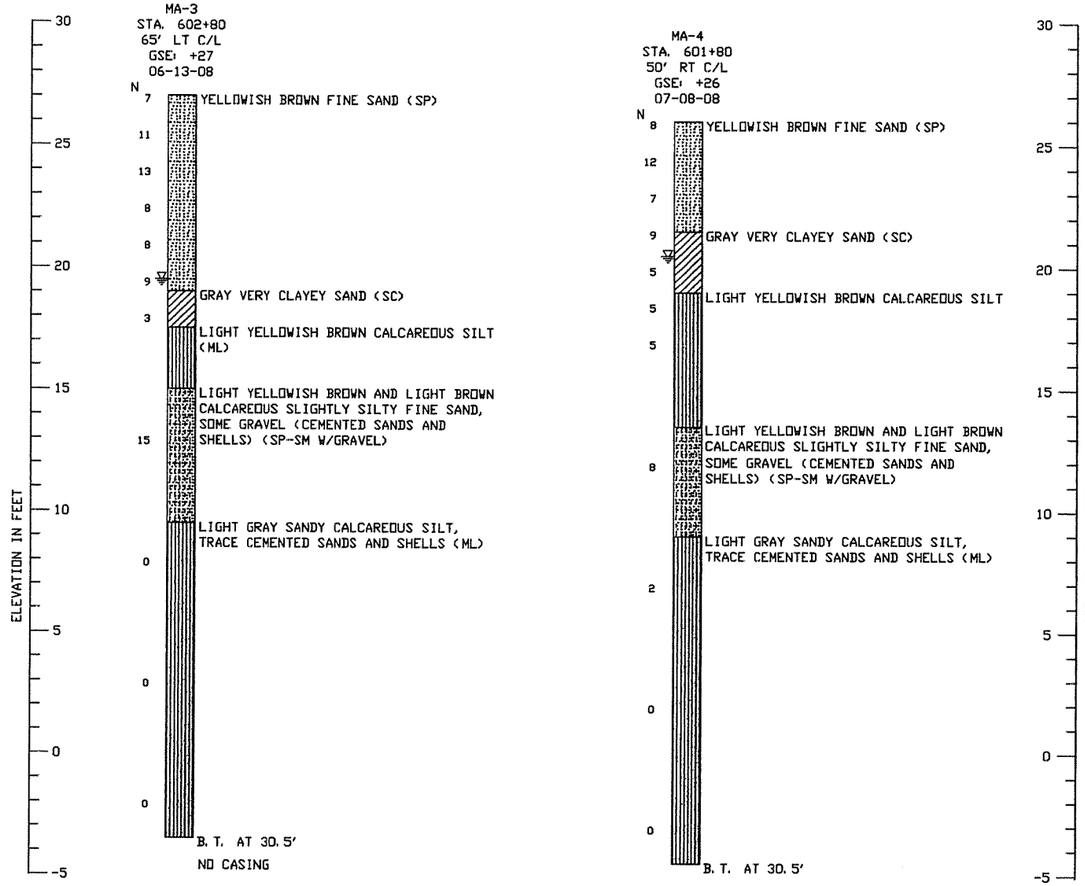
LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

VETERANS ACADEMY SIGNAL BORINGS
HOMESTEAD ROAD WIDENING - SUNRISE BLVD TO ALABAMA RD

SHEET NO. 15



BORING LOCATION PLAN



SOIL PROFILE

CORROSION SERIES TEST RESULTS

DEPTH feet	RESISTIVITY Ohms-cm	CHLORIDES ppm	SULFATES ppm	pH
0-5	15,000	30	40	8.5

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: SLIGHTLY AGGRESSIVE
STEEL: SLIGHTLY AGGRESSIVE

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 6'-10'
AUTO 15'-30'

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

LEGEND

Strata symbols

- Fine sand
- Clayey sand
- Sandy silt
- Slightly silty sand

- STANDARD PENETRATION TEST (SPT) BORING LOCATION
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
- GROUNDWATER LEVEL MEASURED ON DATE DRILLED
- GSE — GROUND SURFACE ELEVATION (FEET, NGVD)
- SP, SC-SM, ML, CH, CL — UNIFIED SOIL CLASSIFICATION SYSTEM
- LOSS OF DRILLING FLUID CIRCULATION
- B.T. — BORING TERMINATION DEPTH

SOIL DESIGN PARAMETERS FOR BORINGS MA-3 AND MA-4

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERNAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γsat	γb			ACTIVE (Ka)	PASSIVE (Kp)
0-9	7-13	SP	112	50	30	–	0.33	3.00
9-12	3-5	ML	107	45	28	–	0.36	2.77
12-17	2-15	SP-SM W/GR	112	50	31	–	0.32	3.12
17-30	0	ML	102	40	26	–	0.39	2.56

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	JAR	07/08
Checked by	GAD	07/08
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504
Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

Ardaman & Associates, Inc.

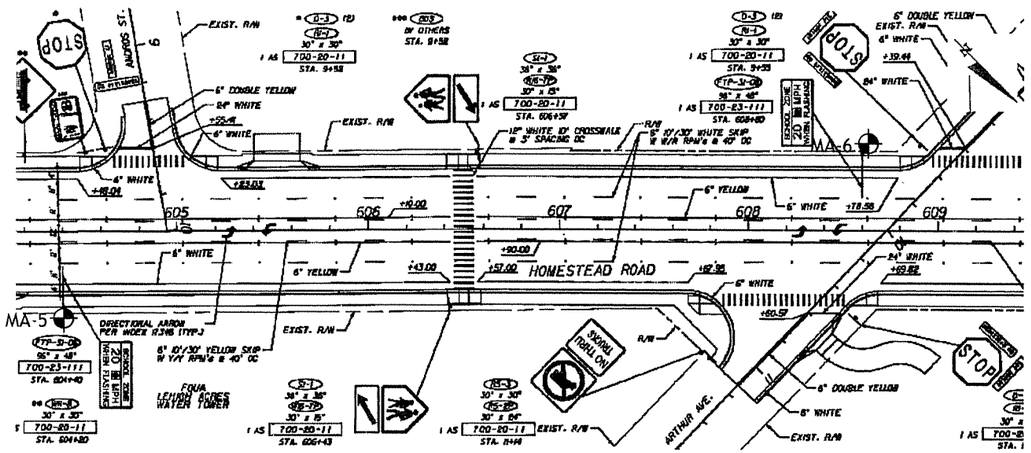
SEAL:
7/17/08

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

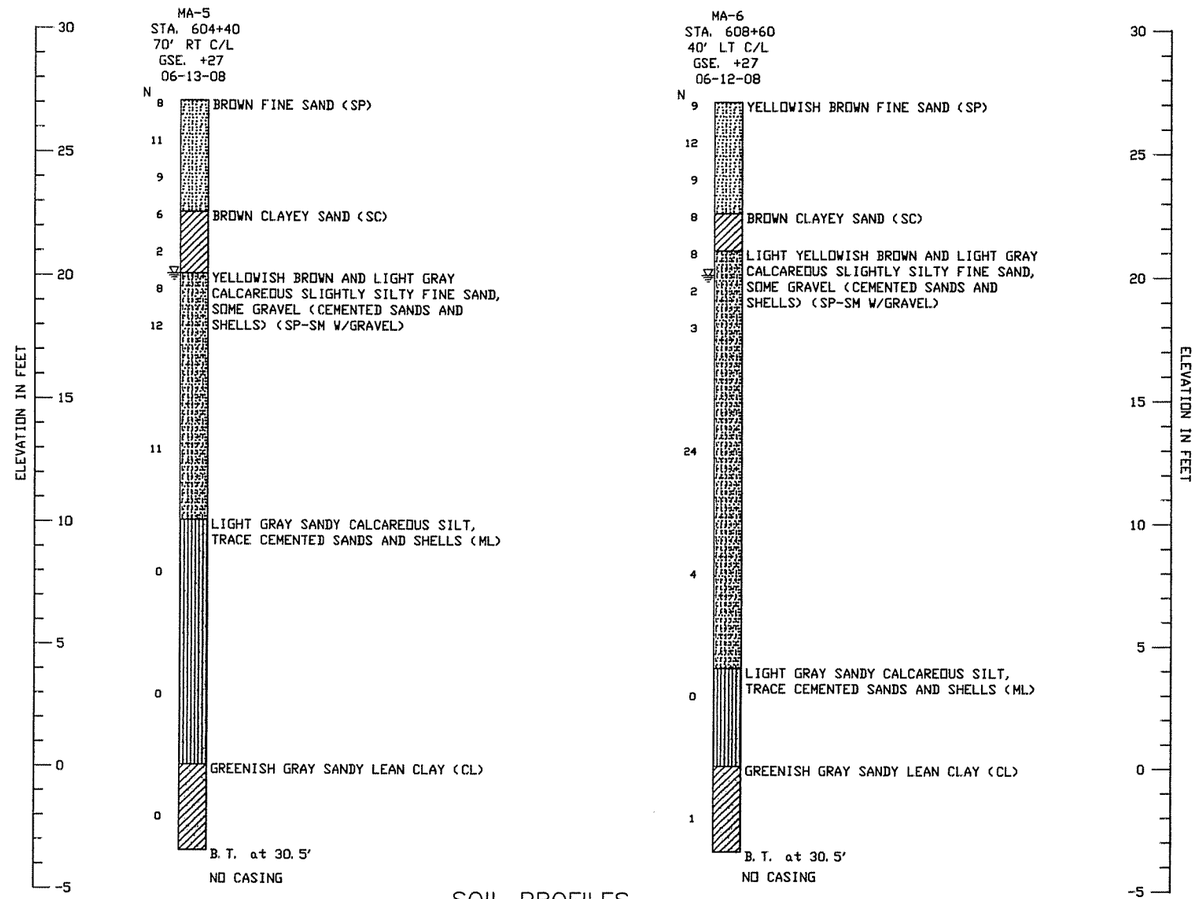
FIRE STATION SIGNAL. BORINGS

HOMESTEAD ROAD WIDENING -- SUNRISE BLVD TO ALABAMA RD

SHEET NO. 16



BORING LOCATION PLAN



SOIL PROFILES

CORROSION SERIES TEST RESULTS

DEPTH feet	RESISTIVITY Ohms-cm	CHLORIDES ppm	SULFATES ppm	pH
0-4	16,000	30	10	7.9
4-7	1,200	30	106	7.0

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: MODERATELY AGGRESSIVE
STEEL: MODERATELY AGGRESSIVE

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 6'-10'
AUTO 15'-30'

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

LEGEND

Strata symbols

- Fine sand
- Clayey sand
- Slightly silty sand
- Sandy silt
- Sandy lean clay

- STANDARD PENETRATION TEST (SPT) BORING LOCATION
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
- GROUNDWATER LEVEL MEASURED ON DATE DRILLED
- GSE — GROUND SURFACE ELEVATION (FEET, NGVD)
- SP, SC-SM, ML, CH, CL — UNIFIED SOIL CLASSIFICATION SYSTEM
- LOSS OF DRILLING FLUID CIRCULATION
- B.T. — BORING TERMINATION DEPTH

SOIL DESIGN PARAMETERS FOR BORINGS MA-5

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF) ysat	APPROX. SOIL UNIT WEIGHT (PCF) yb	ANGLE OF INTERNAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT ACTIVE (Ka)	EARTH PRESSURE COEFFICIENT PASSIVE (Kp)
0-4	8-11	SP	112	50	30	–	0.33	3.00
07-Apr	2-6	SC	112	50	–	750	1	1
7-17.5	8-12	SP-SM W/GR	112	50	31	–	0.32	3.12
17.5-27.5	0	ML	102	40	26	–	0.39	2.56
27.5-30	0	CL	107	45	–	250	1	1

SOIL DESIGN PARAMETERS FOR BORINGS MA-6

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF) ysat	APPROX. SOIL UNIT WEIGHT (PCF) yb	ANGLE OF INTERNAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT ACTIVE (Ka)	EARTH PRESSURE COEFFICIENT PASSIVE (Kp)
0-4.5	9-12	SP	112	50	30	–	0.33	3.00
4.5-6	8	SC	112	50	–	750	1	1
6-22	2-24	SP-SM W/GR	112	50	30	–	0.33	3.00
22-27	0	ML	102	40	26	–	0.39	2.56
27-30	1	CL	107	45	–	–	1	1

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	JAR	07/08
Checked by	GAD	07/08
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504
Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

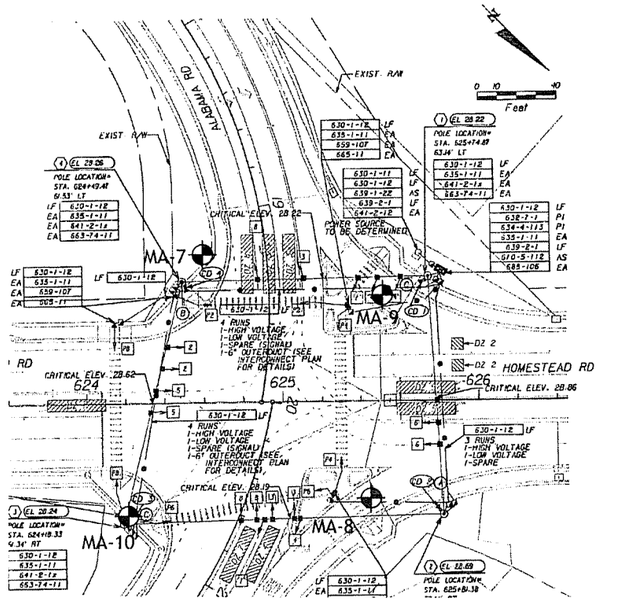
Ardaman & Associates, Inc.

SEAL
7/17/08

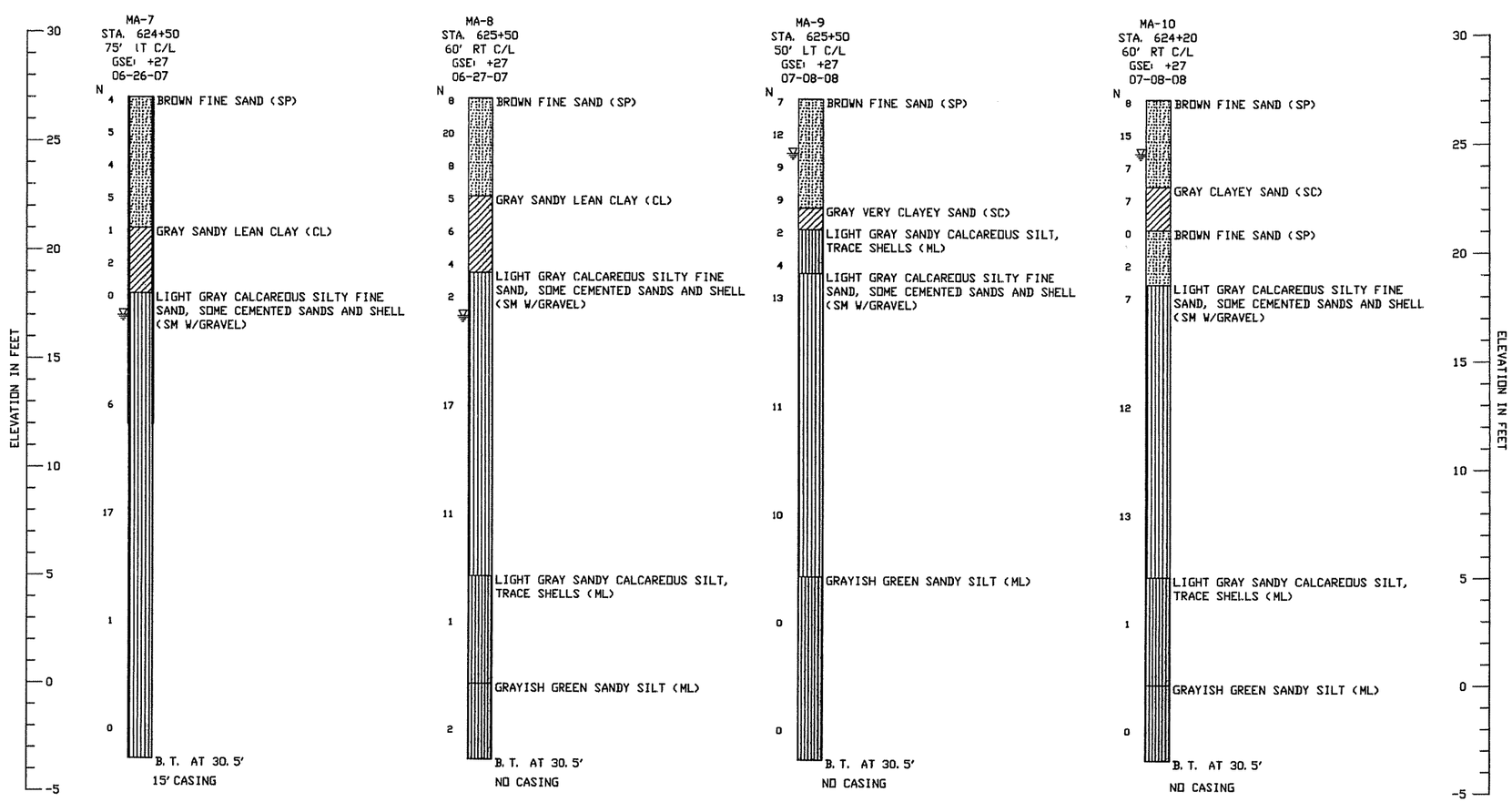
LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

SCHOOL ZONE
CANTILEVER STRUCTURES BORINGS
HOMESTEAD ROAD WIDENING -- SUNRISE BLVD TO ALABAMA RD

SHEET NO.
17



BORING LOCATION PLAN



SOIL PROFILES

CORROSION SERIES TEST RESULTS

DEPTH feet	RESISTIVITY Ohms-cm	CHLORIDES ppm	SULFATES ppm	pH
0-5	10,000	60	92	6.9

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: SLIGHTLY AGGRESSIVE
STEEL: MODERATELY AGGRESSIVE

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 6'-10'
AUTO 15'-30'

LEGEND

- Fine sand
- Sandy lean clay
- Silty sand
- Sandy silt
- Clayey sand
- STANDARD PENETRATION TEST (SPT) BORING LOCATION
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
- GROUNDWATER LEVEL MEASURED ON DATE DRILLED
- GSE — GROUND SURFACE ELEVATION (FEET, NGVD)
- SP, SC-SM, ML, CH, CL — UNIFIED SOIL CLASSIFICATION SYSTEM
- LOSS OF DRILLING FLUID CIRCULATION
- B.T. — BORING TERMINATION DEPTH
- HW CASING

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

SOIL DESIGN PARAMETERS FOR BORINGS MA-7,MA-8, MA-9 & MA-10

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERNAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γs at	γb			ACTIVE (Ka)	PASSIVE (Kp)
0-5	4-20	SP	112	50	30	-	0.33	3.00
5-8	1-9	SC/CL	112	50	--	750	1	1
8-22	0-17	SM W/GR	112	50	30	-	0.33	3.00
22-30	0-2	ML	102	40	26	-	0.39	2.56

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	GBD	08/07
Checked by	GAD	08/07
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504
Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

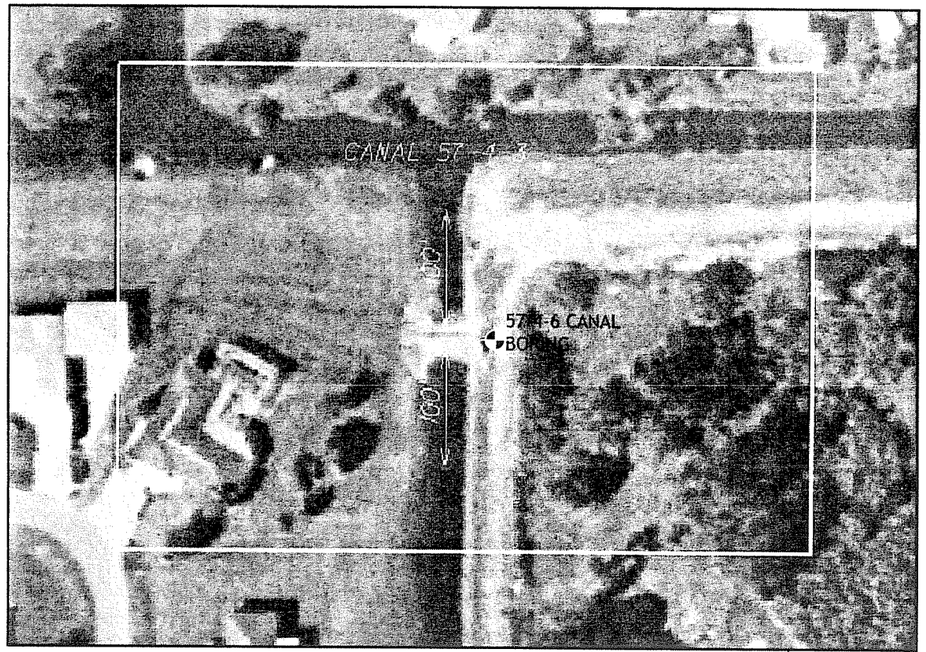
Ardaman & Associates, Inc.

SEAL:
7/7/08

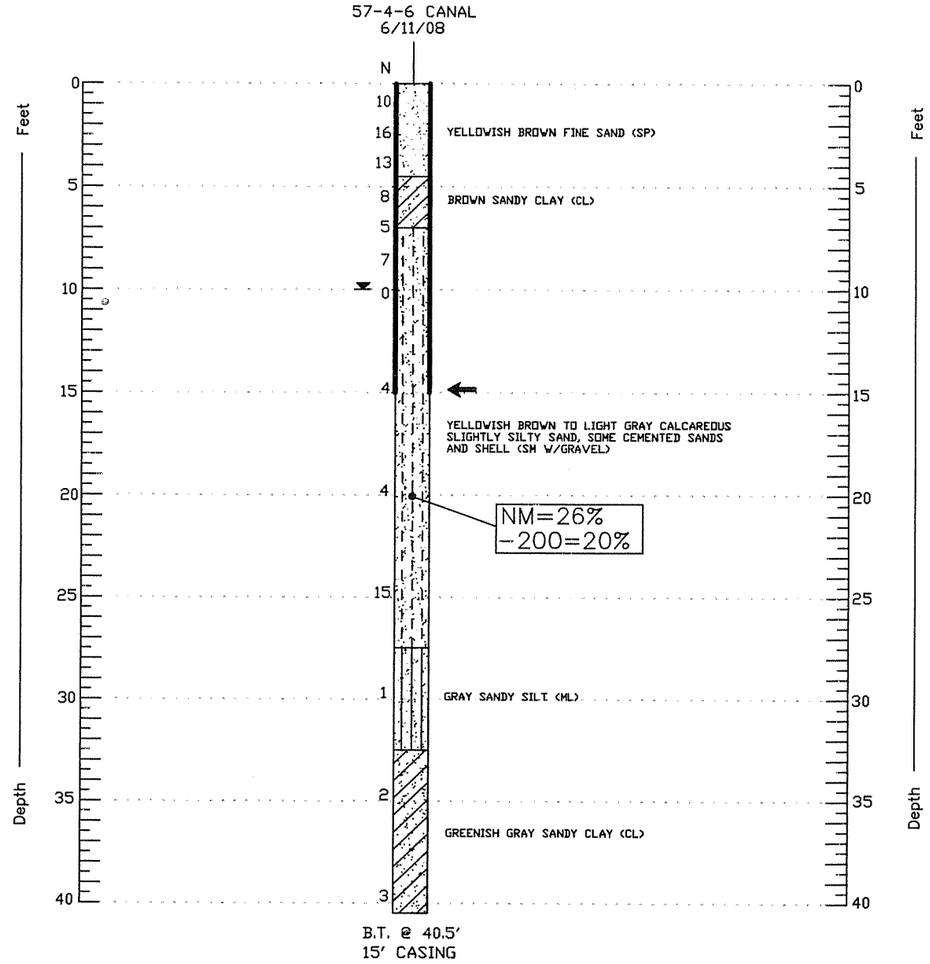
LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ALABAMA RD. SIGNAL BORINGS
HOMESTEAD ROAD WIDENING – SUNRISE BLVD TO ALABAMA RD

SHEET NO. 18



BORING LOCATION PLAN



SOIL PROFILE

CORROSION SERIES TEST RESULTS

	RESISTIVITY Ohms–cm	CHLORIDES ppm	SULFATES ppm	pH
CANAL WATER	2300	15	29	7.8

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: MODERATELY AGGRESSIVE
STEEL: MODERATELY AGGRESSIVE

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 0–10'
AUTO 15'–30'

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2–4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

LEGEND

FINE SAND	STANDARD PENETRATION TEST (SPT) BORING LOCATION
SILTY FINE SAND	N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
SANDY SILT	GSE — GROUND SURFACE ELEVATION (FEET, NGVD)
SANDY CLAY	SP, SC–SM, ML, CH, CL — UNIFIED SOIL CLASSIFICATION SYSTEM
CLAYEY FINE SAND	B.T. — BORING TERMINATION DEPTH
	HW CASING
	NM — NATURAL MOISTURE CONTENT
	–200 — PERCENT FINES

SOIL DESIGN PARAMETERS FOR BORING 57–4–6 CANAL

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N–VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γsat	γb			ACTIVE (Ka)	PASSIVE (Kp)
0–5	10–16	SP	112	50	30	0	0.33	3.00
5–7	5–8	CL	117	55	--	750	1	1
7–27	0–15	SP–SM w/gr	112	50	31	0	0.32	3.12
27–32	1	ML	102	40	26	0	0.39	2.56
32–40	2–3	CL	107	45	--	250	1	1

REVISIONS									
Date	By	Description	Date	By	Description				
							Names	Dates	
						Drawn by	JAR	07/08	
						Checked by	GAD	07/08	
						Designed by			
						Checked by			
						Approved by			

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504
Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

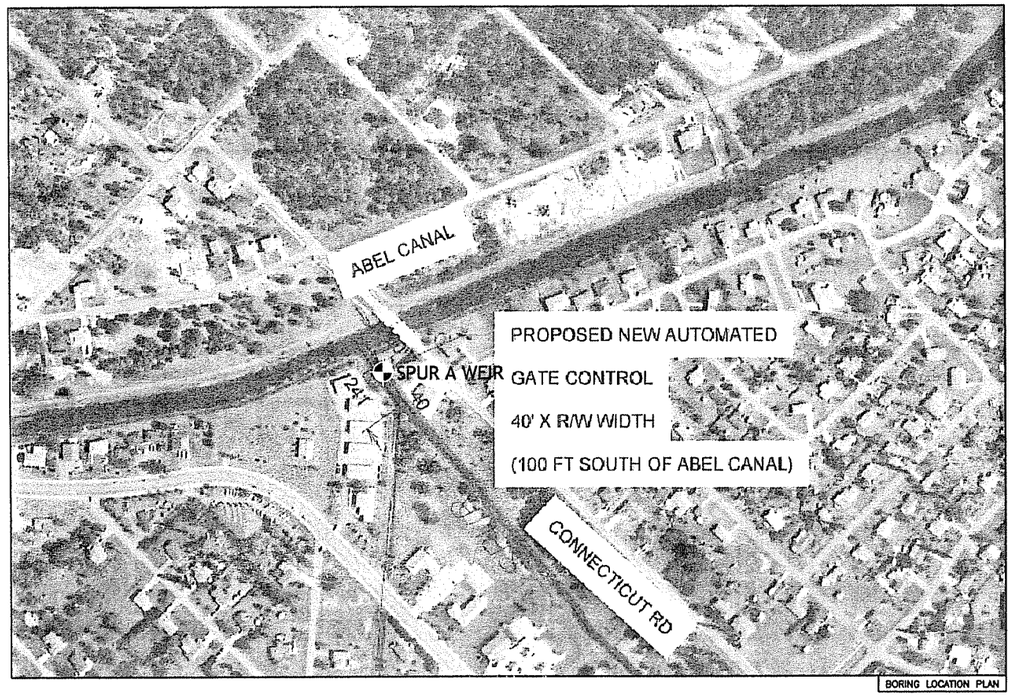
Ardaman & Associates, Inc.

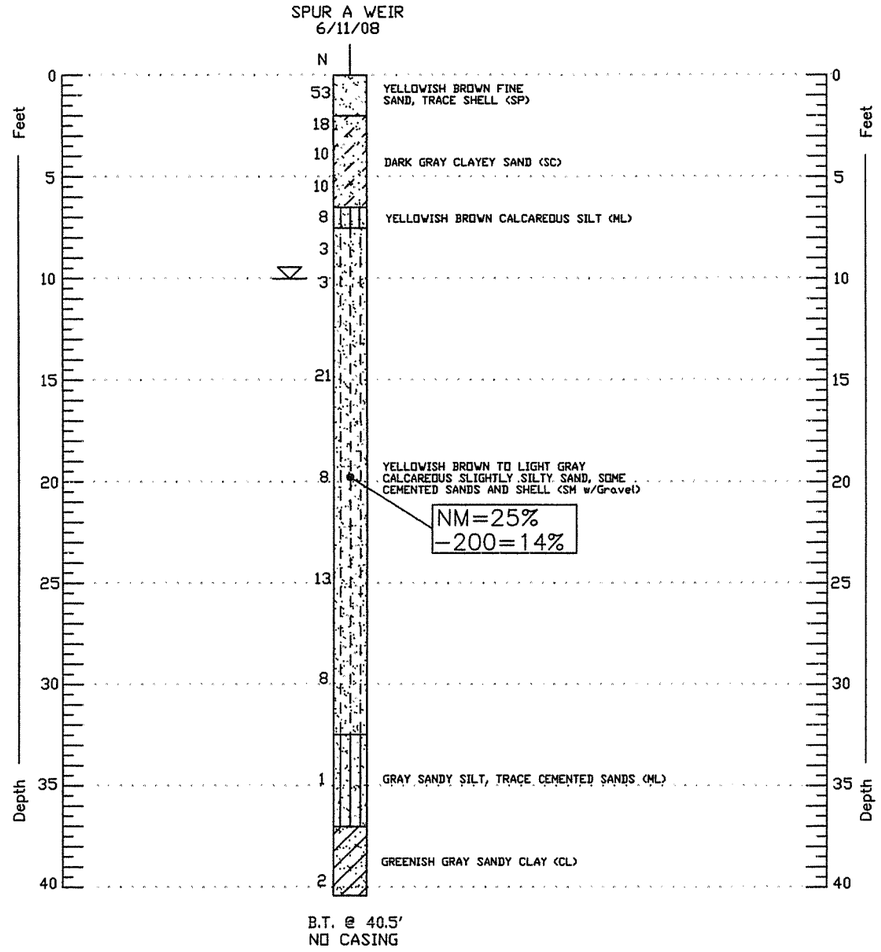
SEAL
7/17/08

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

57–4–6 CANAL STRUCTURE BORING
HOMESTEAD ROAD WIDENING – SUNRISE BLVD TO ALABAMA RD

SHEET NO. 19





SOIL PROFILE

CORROSION SERIES TEST RESULTS

	RESISTIVITY Ohms-cm	CHLORIDES ppm	SULFATES ppm	pH
CANAL WATER	2100	35	114	7.9

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: MODERATELY AGGRESSIVE
STEEL: MODERATELY AGGRESSIVE

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

DRILL RIG: TRUCK MOUNTED CME 55

STANDARD PENETRATION TEST DATA:
SPOON I.D.= 1.375"
SPOON O.D.= 2.0"
HAMMER DROP= 30"
HAMMER WEIGHT= 140 lbs.
HAMMER TYPE= SAFETY 0-10'
AUTO 15'-30'

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

LEGEND

- FINE SAND
- SILTY FINE SAND
- SANDY SILT
- SANDY CLAY
- CLAYEY FINE SAND

- STANDARD PENETRATION TEST (SPT) BORING LOCATION
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
- GROUNDWATER LEVEL MEASURED ON DATE DRILLED
- GSE — GROUND SURFACE ELEVATION (FEET, NGVD)
- SP, SC-SM ML, CH, CL — UNIFIED SOIL CLASSIFICATION SYSTEM
- LOSS OF DRILLING FLUID CIRCULATION
- B.T. — BORING TERMINATION DEPTH
- NM — NATURAL MOISTURE CONTENT
- -200 — PERCENT FINES

SOIL DESIGN PARAMETERS FOR BORING SPUR A WEIR

DEPTH BELOW GROUND SURFACE (FEET)	SPT RANGE (N-VALUE)	SOIL TYPE	APPROX. SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERAL FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT	
			γsat	γb			ACTIVE (Ka)	PASSIVE (Kp)
0-2	53	SP	112	50	34	0	0.28	3.53
2-7	10-18	SC	122	60	--	1250	1	1
7-32	3-21	SP-SM w/gr	117	55	32	0	0.31	3.25
32-37	1	ML	102	40	26	0	0.39	2.56
37-40	2	CL	107	45	--	250	1	1

REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	JAR	07/08
Checked by	GAD	07/08
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD:
G.A. DREW, P.E.
FL. REG. NO. 35504
Ardaman & Associates, Inc.
9970 BAVARIA ROAD
FT. MYERS, FL. 33913
PHONE (239) 768-6600
ENG. AUTH NO. 5950

Ardaman & Associates, Inc.

SEAL

7/17/08

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

SPUR A WEIR STRUCTURE BORING
HOMESTEAD ROAD WIDENING - SUNRISE BLVD TO ALABAMA RD

SHEET NO. 20

APPENDIX

SAMPLING AND TESTING METHODS SOIL CLASSIFICATION UNIFIED SOIL CLASSIFICATION SYSTEM ASTM D-2487

SOIL BORING, SAMPLING AND TESTING METHODS

Standard Penetration Test

The Standard Penetration Test (SPT) is a widely accepted method of in situ testing of foundation soils (ASTM D-1586). A 2-foot (0.6 m) long, 2-inch (50 mm) O.D. split-barrel sampler attached to the end of a string of drilling rods is driven 18 inches (0.45 m) into the ground by successive blows of a 140-pound (63.5 Kg) hammer freely dropping 30 inches (0.76 m). The number of blows needed for each 6 inches (0.15 m) of penetration is recorded. The sum of the blows required for penetration of the second and third 6-inch (0.15 m) increments penetration constitutes the test result or N-value. After the test, the sampler is extracted from the ground and opened to allow visual description of the retained soil sample. The N-value has been empirically correlated with various soil properties allowing a conservative estimate of the behavior of soils under load. The following tables relate N-values to a qualitative description of soil density and, for cohesive soils, an approximate unconfined compressive strength (Qu):

Cohesionless Soils:	N-Value	Description
	0 to 4	Very loose
	4 to 10	Loose
	10 to 30	Medium dense
	30 to 50	Dense
	Above 50	Very dense

Cohesive Soils:	N-Value	Description	Qu
	0 to 2	Very soft	Below 0.25 tsf (25 kPa)
	2 to 4	Soft	0.25 to 0.50 tsf (25 to 50 kPa)
	4 to 8	Medium stiff	0.50 to 1.0 tsf (50 to 100 kPa)
	8 to 15	Stiff	1.0 to 2.0 tsf (100 to 200 kPa)
	15 to 30	Very stiff	2.0 to 4.0 tsf (200 to 400 kPa)
	Above 30	Hard	Above 4.0 tsf (400 kPa)

The tests are usually performed at 5-foot (1.5 m) intervals. However, more frequent or continuous testing is done by our firm through depths where a more accurate definition of the soils is required. The test holes are advanced to the test elevations by rotary drilling with a cutting bit, using circulating fluid to remove the cuttings and hold the fine grains in suspension. The circulating fluid, which is bentonitic drilling mud, is also used to keep the hole open below the water table by maintaining an excess hydrostatic pressure inside the hole. In some soil deposits, particularly highly pervious ones, flush-coupled casing must be driven to just above the testing depth to keep the hole open and/or prevent the loss of circulating fluid. After completion of a test boring, the hole is kept open until a steady state groundwater level is recorded. The hole is then sealed by backfilling with neat cement.

Representative split-spoon samples from each sampling interval and from different strata are brought to our laboratory in air-tight jars for classification and testing, if necessary. Afterwards, the samples are discarded unless prior arrangements have been made.

Power Auger Borings

Auger borings are used when a relatively large, continuous sampling of soil strata close to the ground surface is desired. A 4-inch (100 mm) diameter, continuous flight, helical auger with a cutting head at its end is screwed into the ground in 5-foot (1.5 m) sections. It is powered by the

rotary drill rig. The sample is recovered by withdrawing the auger out of the ground without rotating it. The soil sample so obtained, is described and representative samples put in bags or jars and returned to the laboratory for classification and testing, if necessary.

Hand Auger Borings

Hand auger borings are used, if soil conditions are favorable, when the soil strata are to be determined within a shallow (approximately 5-foot [1.5 m]) depth or when access is not available to power drilling equipment. A 3-inch (75 mm) diameter hand bucket auger with a cutting head is simultaneously turned and pressed into the ground. The bucket auger is retrieved at approximately 6-inch (0.15 m) intervals and its contents emptied for inspection. Sometimes post-hole diggers are used, especially in the upper 3 feet (1 m) or so. The soil sample obtained is described and representative samples put in bags or jars and transported to the laboratory for classification and testing, if necessary.

Undisturbed Sampling

Undisturbed sampling implies the recovery of soil samples in a state as close to their natural condition as possible. Complete preservation of in situ conditions cannot be realized; however, with careful handling and proper sampling techniques, disturbance during sampling can be minimized for most geotechnical engineering purposes. Testing of undisturbed samples gives a more accurate estimate of in situ behavior than is possible with disturbed samples.

Normally, we obtain undisturbed samples by pushing a 2.875-inch (73 mm) I.D., thin wall seamless steel tube 24 inches (0.6 m) into the soil with a single stroke of a hydraulic ram. The sampler, which is a Shelby tube, is 30 (0.8 m) inches long. After the sampler is retrieved, the ends are sealed in the field and it is transported to our laboratory for visual description and testing, as needed. Undisturbed sampling is noted on the boring logs as thus "U-".

Laboratory Test Methods

Soil samples returned to our laboratory are looked at again by a geotechnical engineer or geotechnician to obtain more accurate descriptions of the soil strata. Laboratory testing is performed on selected samples as deemed necessary to aid in soil classification and to help define engineering properties of the soils. The test results are presented on the soil boring logs at the depths at which the respective sample was recovered, except that grain size distributions or selected other test results may be presented on separate tables, figures or plates as discussed in this report. The soil descriptions shown on the logs are based upon visual-manual procedures in accordance with local practice. Soil classification is in general accordance with the Unified Soil Classification System (ASTM D-2487) and is also based on visual-manual procedures. Following is a list of abbreviations that may appear in the Remarks column on the boring logs indicating additional laboratory testing was performed.

DD - Dry Density of Undisturbed Sample
k - Hydraulic Conductivity (Coefficient of Permeability)
Qu - Unconfined Compression Strength; ASTM D-2166 (soil), D-2938 (rock)
Consol - One-Dimensional Consolidation test performed on subsample from undisturbed sample; ASTM D-2425 (report usually presented in Appendix)

THE PROJECT SOIL DESCRIPTION PROCEDURE FOR SOUTHWEST FLORIDA[1]
For use with the ASTM D 2487 Unified Soil Classification System

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ORGANIC SOILS (Continued):

Organic Content	Descriptive Adjectives	Classification
5 - 30%	organic	SM with organic fines Organic Silt (OL) Organic Clay (OL) Organic Silt (OH) Organic Clay (OH)

HIGHLY ORGANIC SOILS AND MATTER

	Description	
30-75%	sandy peat	Peat (PT)
	silty peat	Peat (PT)
>75%	amorphous peat	Peat (PT)
	fibrous peat	Peat (PT)

STRATIFICATION AND STRUCTURE

Descriptive Term		Thickness
with interbedded		
seam	--	less than 1/2-inch (13 mm) thick
layer	--	1/2 to 12-inches (13 to 300 mm) thick
stratum	--	more than 12-inches (300 mm) thick
pocket	--	small, erratic deposit, usually less than 1-foot
lens	--	lenticular deposits
occasional	--	one or less per foot of thickness
frequent	--	more than one per foot of thickness
calcareous	--	containing calcium carbonate (reaction to diluted HCL)
hardpan	--	spodic horizon usually medium dense
marl	--	mixture of carbonate clays, silts, shells and sands.

ROCK CLASSIFICATION (FLORIDA) CHART

Symbol	Typical Description
LS	Hard Bedded Limestone or Caprock
WLS	Fractured or Weathered Limestone
LR	Limerock (gravel, sand, silt and clay mixture)
SLS	Stratified Limestone and Soils

(1) This soil description procedure was developed specifically for projects in southwest Florida because it is believed that the terminology will be better understood as a result of local practice. It is not intended to supplant other visual-manual classification procedures for description and identification of soils such as ASTM D 2488.

BY: G.A. DREW, P.E. (1995)

THE PROJECT SOIL DESCRIPTION PROCEDURE FOR SOUTHWEST FLORIDA[1]

For use with the ASTM D 2487 Unified Soil Classification System

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

BOULDERS (> 12" [300 mm]) and COBBLES (3" [75 mm] TO 12" [300 mm]):

GRAVEL: Coarse Gravel: 3/4" (19 mm) to 3" (75 mm)
Fine Gravel: No. 4 (4.75 mm) Sieve to 3/4" (19 mm)

Descriptive adjectives:

0 - 5%	-- no mention of gravel in description
5 - 15%	-- trace
15 - 29%	-- some
30 - 49%	-- gravelly (shell, limerock, cemented sands)

SANDS

COARSE SAND:	No. 10 (2 mm) Sieve to No. 4 (4.75 mm) Sieve
MEDIUM SAND:	No. 40 (425 μm) Sieve to No. 10 (2 mm) Sieve
FINE SAND:	No. 200 (75 μm) Sieve to No. 40 (425 μm) Sieve

Descriptive adjectives:

0 - 5%	--	no mention of sand in description
5 - 15%	--	trace
15 - 29%	--	some
30 - 49%	--	sandy

SILT/CLAY: < #200 (75 μm) sieve

SILTY OR SILT: PI < 4
SILTY CLAYEY OR SILTY CLAY: 4 ≤ PI ≤ 7
CLAYEY OR CLAY: PI > 7

Descriptive adjectives/adverbs:

< - 5%	--	clean (no mention of silt or clay in description).
5 -12% to 15%	--	slightly
16 - 35%	--	clayey, silty, or silty clayey
36 - 49%	--	very

ORGANIC SOILS

Organic Content	Descriptive Adjectives	Classification
0 - 2.5%	usually no mention of organics in description	See Above
2.6 - 5%	slightly organic	add "with organic fines" to group name

TABLE 1 Soil Classification Chart

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
COARSE-GRAINED SOILS More than 50 % retained on No. 200 sieve	Gravels More than 50 % of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5 % fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12 % fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50 % or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5 % fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]	SP	Poorly graded sand[I]
		Sands with Fines More than 12 % fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
FINE-GRAINED SOILS 50 % or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	$\frac{\text{Liquid limit – oven dried}}{\text{Liquid limit – not dried}} < 0.75$	OL	Organic clay[K,L,M,N] Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		organic	$\frac{\text{Liquid limit – oven dried}}{\text{Liquid limit – not dried}} < 0.75$	OH	Organic clay[K,L,M,P] Organic silt[K,L,M,Q]
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12 % fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12 % fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15 % sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15 % gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29 % plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30 % plus No. 200, predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30 % plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

