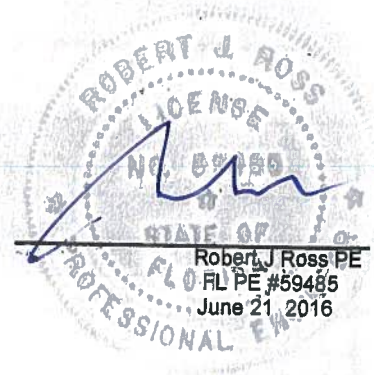




Immokalee Community Pool
820 Complex Drive
Immokalee Reservation
STOF

Drainage Report
June 21th 2016

Prepared by:
Ross Engineering, Inc.
3325 S. University Drive, Suite 111
Davie, FL 33328



A. STORMWATER MANAGEMENT PLAN

The scope of work for this project includes addition of a swimming pool and amenities . New concrete walkways, restrooms ,kiddie pool and gazebo , and the addition of green areas are proposed. The proposed land use reflects a net increase in pervious area. Therefore, this report is focused on water quality treatment volume only. The water quality treatment volume requirements will be handled in retention areas as outlined below .

B. LAND USE BREAKDOWN

See appendix C for site area of land disturbance

Pre-Development

Land Use Breakdown (Post-Development)				
	Area		Grade	
	ac	%	Low	High
Impervious Areas				
Pervious Areas	0.727	100%		
Green	0.727	100%	25.10	25.90
Total	0.727	100.0%	Weighted Average	25.50

Post-Development

Land Use Breakdown (Post-Development)				
	Area		Grade	
	ac	%	Low	High
Impervious Areas	0.209	36.36%		
Building	0.036	5.00%		
Pool	0.115	5.80%	28.40	
Pool Deck	0.042	15.90%	27.67	28.40
Concrete Walkway	0.016	2.20%	25.20	25.50
Pervious Areas	0.518	64.64%		
Retention Area 1 (L)	0.050	6.90%	23.40	25.20
Retention Area 1 (V)	0.155	20.80%	23.40	
Retention Area 2 (L)	0.057	7.90%	26.00	27.00
Retention Area 2 (V)	0.066	9.10%	26.00	
Green	0.190	26.30%	25.20	28.20
Total	0.727	100.0%	Weighted Average	26.01

C. WATER CONTROL ELEVATION

Seasonal High Water Table (SHWT) = 17.50' NGVD

See appendix B for SHWT

	Green	Total
Area (AC)	0.73	
Low Elev	25.10	
High Elev	25.90	
Stage Feet NGVD	Linear Storage ac-ft	Total Storage ac-ft
20.00	0.00	0.00
20.50	0.00	0.00
21.00	0.00	0.00
21.50	0.00	0.00
22.00	0.00	0.00
22.50	0.00	0.00
23.00	0.00	0.00
23.50	0.00	0.00
24.00	0.00	0.00
24.50	0.00	0.00
25.00	0.00	0.00
25.50	0.07	0.07
26.00	0.36	0.36
26.50	0.73	0.73
27.00	1.09	1.09
27.50	1.45	1.45
28.00	1.82	1.82
28.50	2.18	2.18
29.00	2.54	2.54

Post Development - Stage Storage Table

	Pool Deck	Pool	Concrete Walkway	Retention area 1	Retention area 1	Retention Area 2	Retention Area 2	Green Space	Total
Area (AC)	0.12	0.04	0.02	0.05	0.15	0.06	0.07	0.19	
Low Elev	27.67	28.40	25.20	23.40	23.40	26.00	26.00	25.20	
High Elev	28.40		25.50	25.20	0.00	27.00	0.00	28.20	
Stage Feet NGVD	Linear Storage ac-ft	Vertical Storage ac-ft	Linear Storage ac-ft	Linear Storage ac-ft	Vertical Storage ac-ft	Linear Storage ac-ft	Vertical Storage ac-ft	Linear Storage ac-ft	Total Storage ac-ft
20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23.50	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02
24.00	0.00	0.00	0.00	0.01	0.09	0.00	0.00	0.00	0.10
24.50	0.00	0.00	0.00	0.02	0.17	0.00	0.00	0.00	0.18
25.00	0.00	0.00	0.00	0.04	0.24	0.00	0.00	0.00	0.28
25.50	0.00	0.00	0.00	0.06	0.32	0.00	0.00	0.00	0.38
26.00	0.00	0.00	0.01	0.09	0.39	0.00	0.00	0.02	0.51
26.50	0.00	0.00	0.02	0.11	0.47	0.01	0.03	0.05	0.69
27.00	0.00	0.00	0.03	0.14	0.54	0.03	0.07	0.10	0.90
27.50	0.00	0.00	0.03	0.16	0.62	0.06	0.10	0.17	1.13
28.00	0.01	0.00	0.04	0.19	0.69	0.09	0.13	0.25	1.39
28.50	0.05	0.00	0.05	0.21	0.77	0.11	0.17	0.34	1.70
29.00	0.11	0.02	0.06	0.24	0.84	0.14	0.20	0.44	2.05

D. WATER QUALITY DESIGN CRITERIA (5 year-1hr)

1. If a wet detention system, then whichever is the greater of the first inch of runoff from the entire site or 3.28 inches times the percentage of imperviousness.
2. If a dry detention system, then 75% of the volume required for wet detention.
3. If a retention system, then 50% of the volume required.
4. Any detention system shall be designed to discharge no more than ½ inch of the detained volume per 24 hours.

E. WATER QUALITY CALCULATIONS

POST-Development

1. Compute the first inch of runoff from the developed project:
= 1 in. x 0.722 ac x 1 ft / 12 in.
= **0.060 ac-ft for the first inch of runoff**
2. Compute 3.28 inches times the percentage of imperviousness:
 - a. Site area for water quality pervious/impervious calculations only:
= Total project - (water surfaces + roof)
= 0.722 ac - (0.036 ac + 0.0042 ac)
= **0.644 ac of site area for water quality**
 - b. Impervious area for water quality pervious/impervious calculations only
= (Site area for water quality pervious/impervious) - pervious
= 0.644 ac - 0.208 ac
= **0.436 ac of impervious area for water quality**
 - c. Percentage of imperviousness for water quality:
= (Impervious area for water quality/Site area for water quality) x 100%
= (0.436 ac / 0.644 ac) x 100%
= **67.70% imperviousness for water quality**
 - d. For 3.28 inches times the percentage impervious:
= 3.28 in. x 0.677
= **2.22 in. to be treated**
 - e. Compute volume required for water quality retention:
= inches to be treated x (total site - water surfaces)
= 2.22 in. x (0.722 ac - 0.036 ac - 0.042 ac) x 1 ft/12 in.
= **0.119 ac-ft (1.430 ac-in) required retention storage**
3. Since the 0.119 ac-ft is greater than the 0.06 ac-ft computed for the first inch of runoff, the volume of **0.119 ac-ft** controls.
4. The site is providing 0.323 ac. of retention. Therefore adequate water quality treatment has been provided.

Flood Routing Maximum Stages Results (See Appendix B for Model Output)

Pre-Development 10 Yr 24 hour Maximum Stage = El. 25.79
Post-Development 10 Yr 24 hour Maximum Stage = El. 24.70

Pre-Development 25 Yr 72 hour Maximum Stage = El. 26.28
Post-Development 25 Yr 72 hour Maximum Stage = El. 26.22



APPENDIX A

Design Maps

- **Water Table Map**

Appendix C: Isohyetal Maps
from SFWMD Technical Memorandum, *Frequency Analysis of One and Three Day
Rainfall Maxima for central and southern Florida*, Paul Trimble, October 1990.

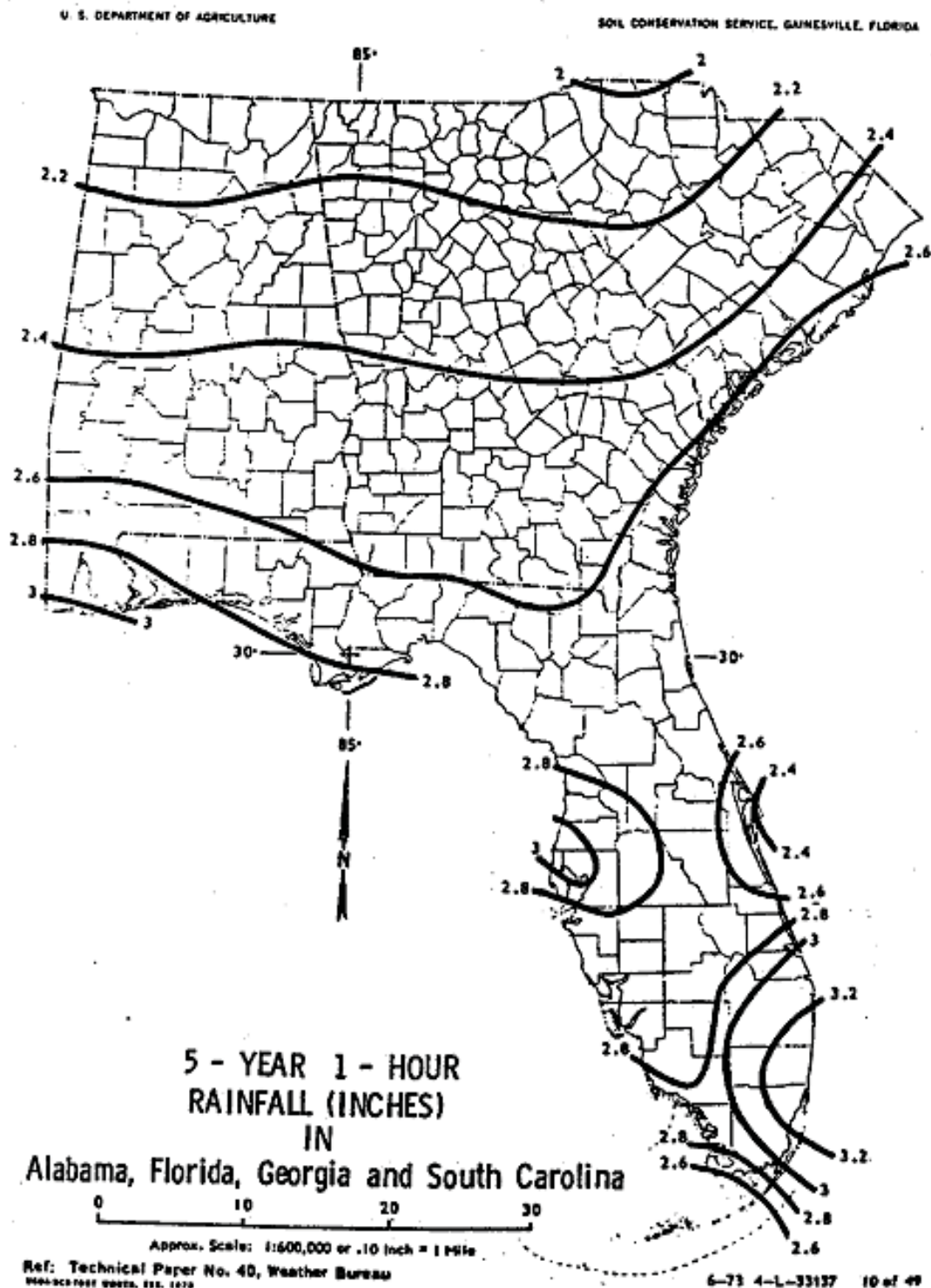


Figure C-1

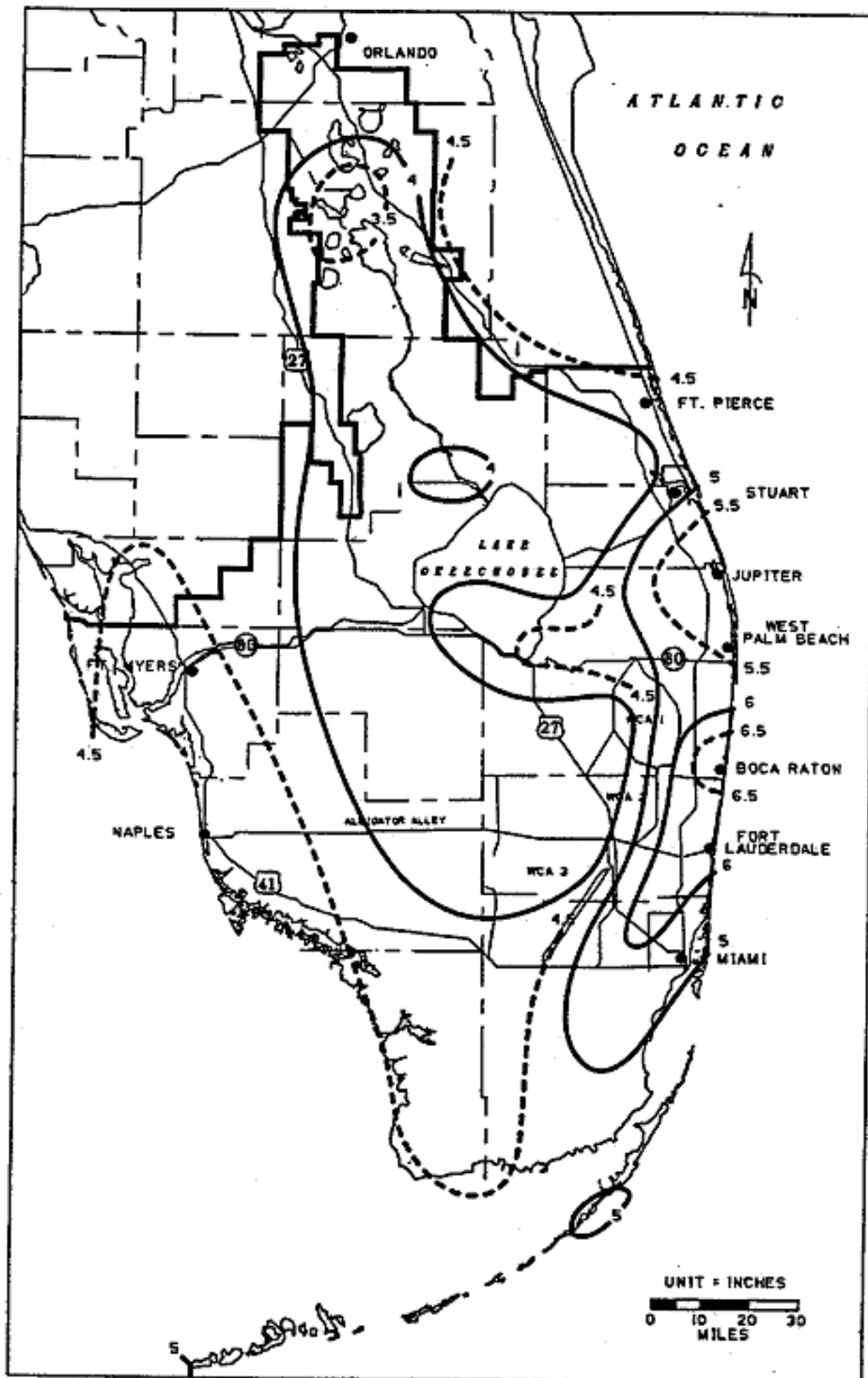


FIGURE C-2. 1-DAY RAINFALL: 3-YEAR RETURN PERIOD

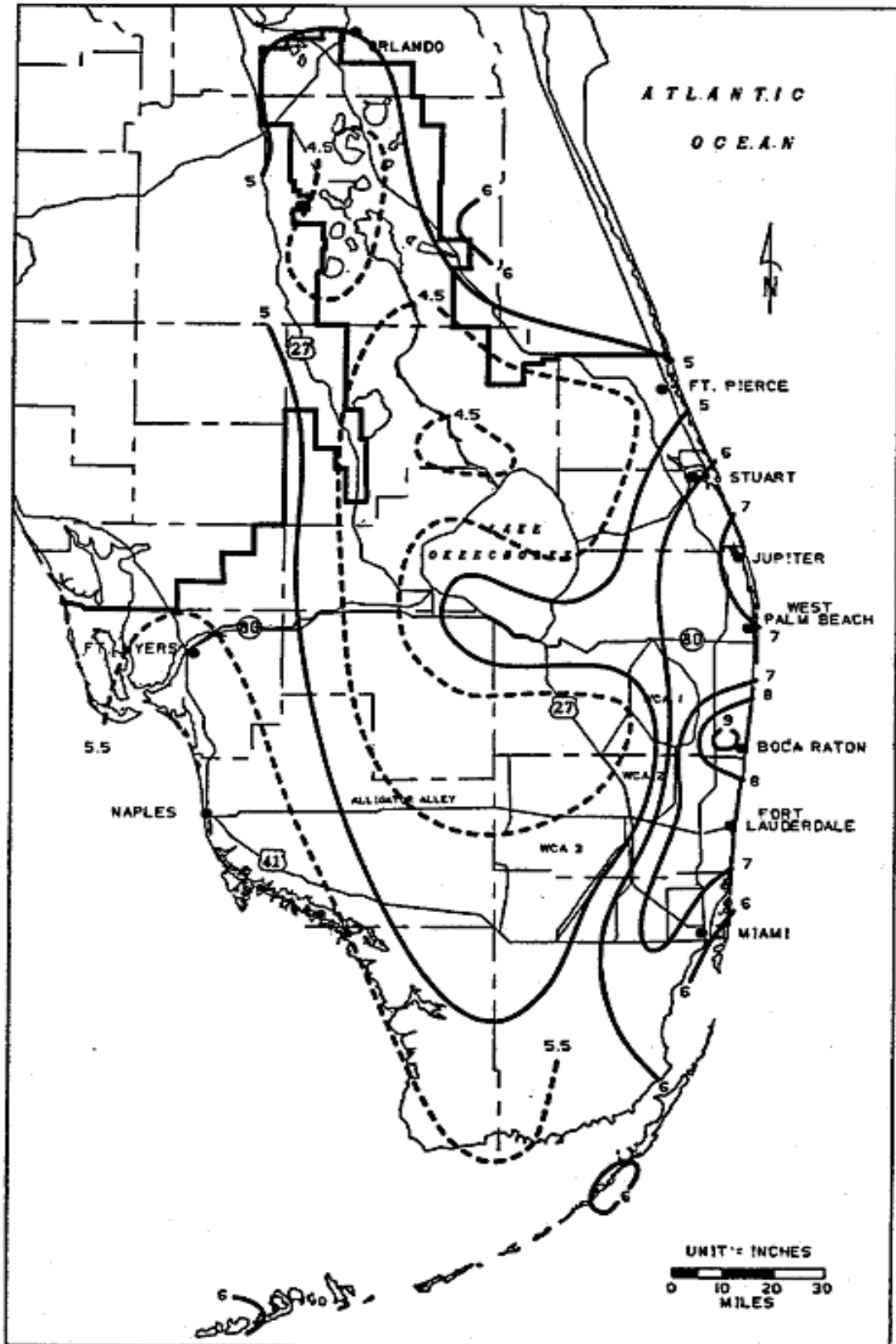


FIGURE C-3. 1-DAY RAINFALL: 5-YEAR RETURN PERIOD

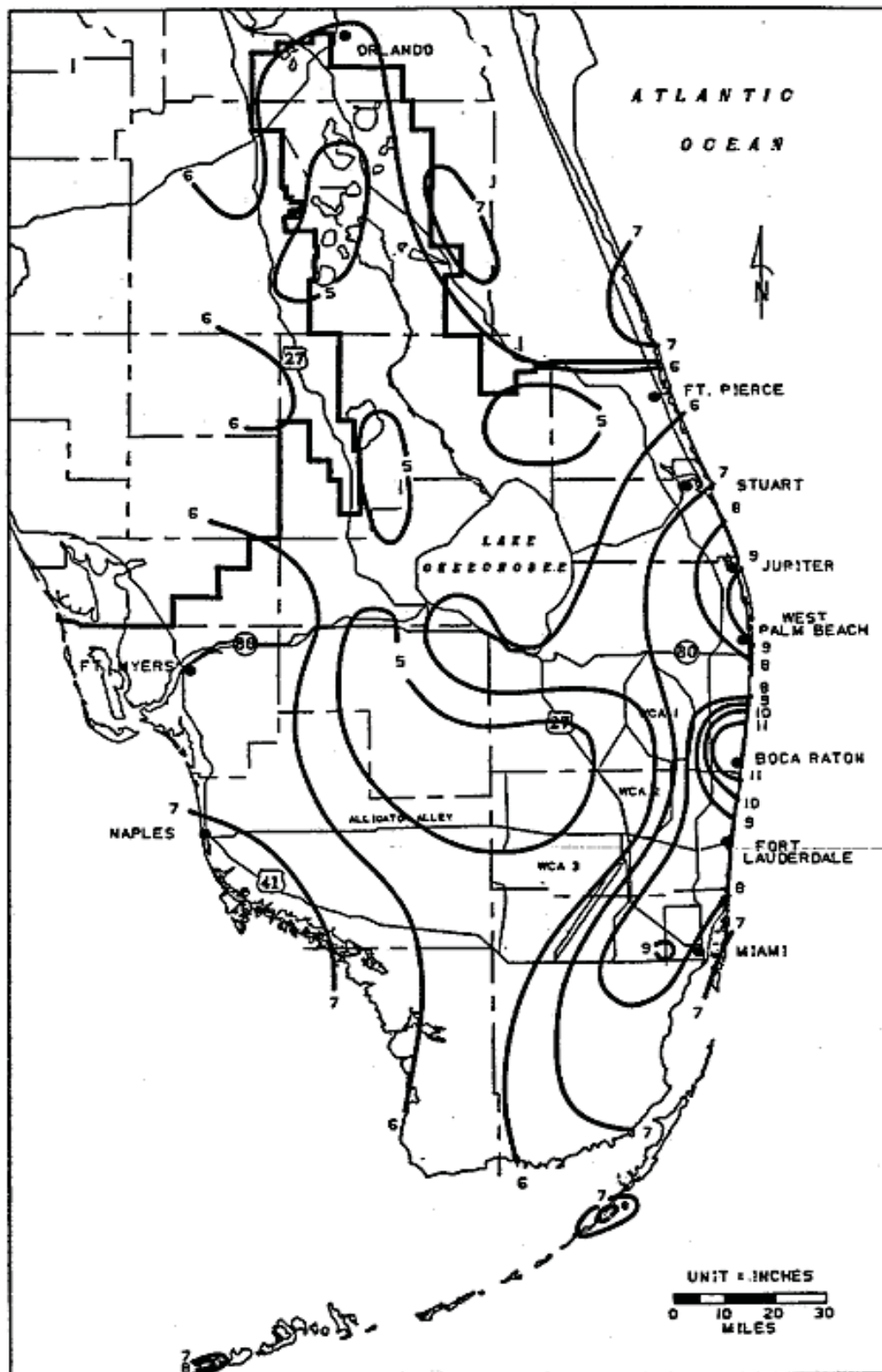


FIGURE C-4. 1-DAY RAINFALL: 10-YEAR RETURN PERIOD

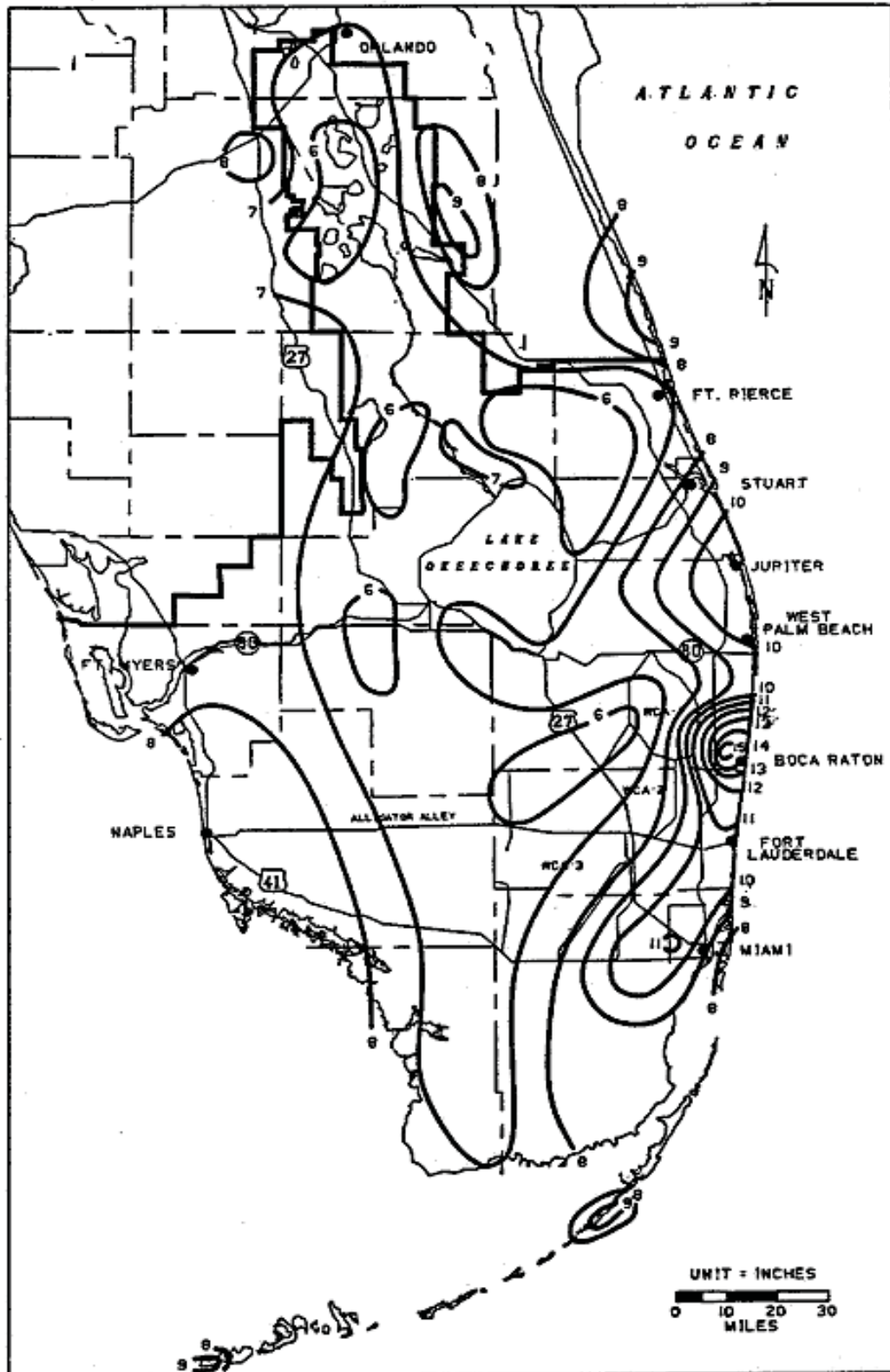


FIGURE C-5. 1-DAY RAINFALL: 25-YEAR RETURN PERIOD

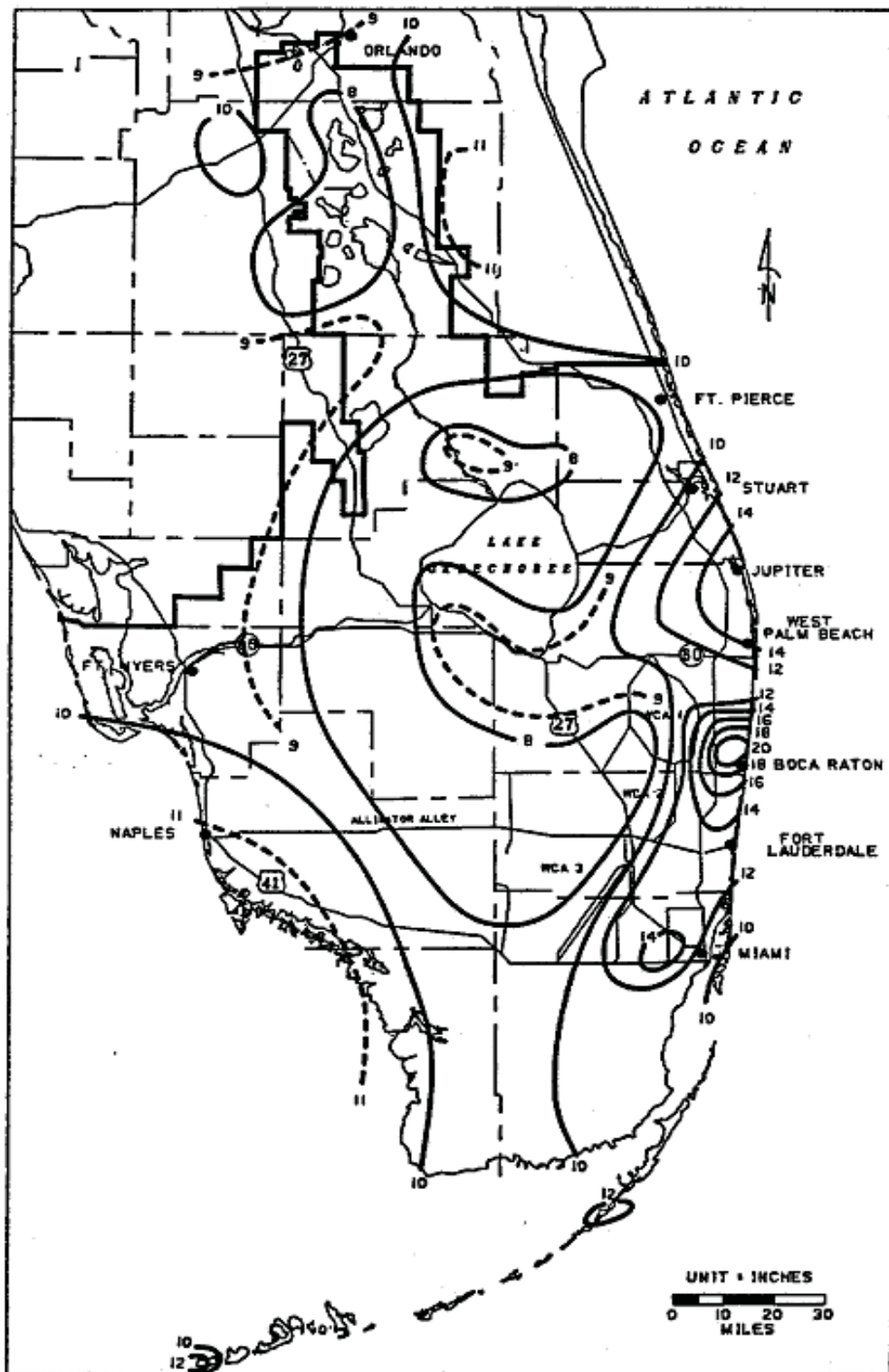


FIGURE C-6. 1-DAY RAINFALL: 100-YEAR RETURN PERIOD

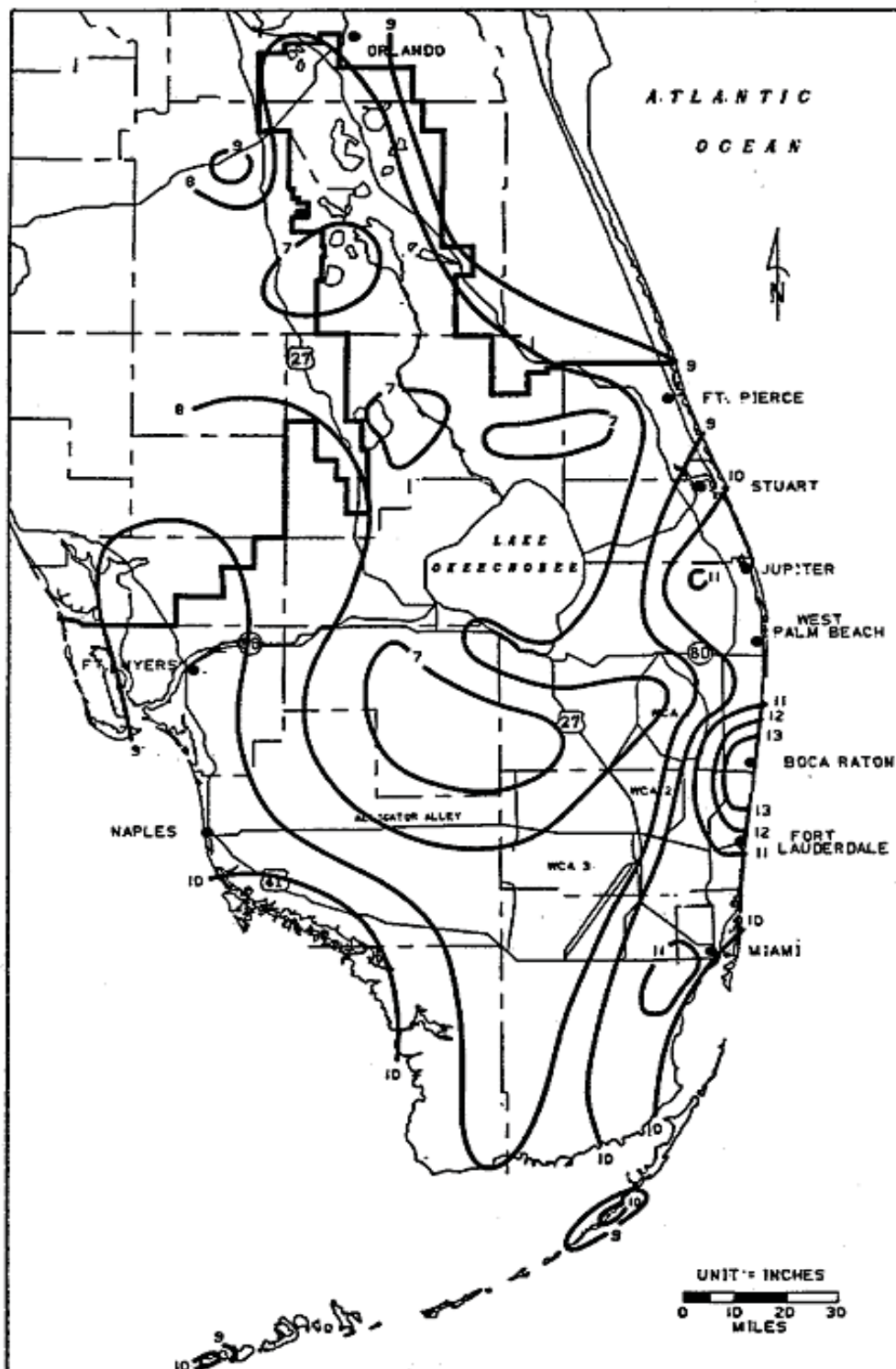


FIGURE C-7. 3-DAY RAINFALL: 10-YEAR RETURN PERIOD

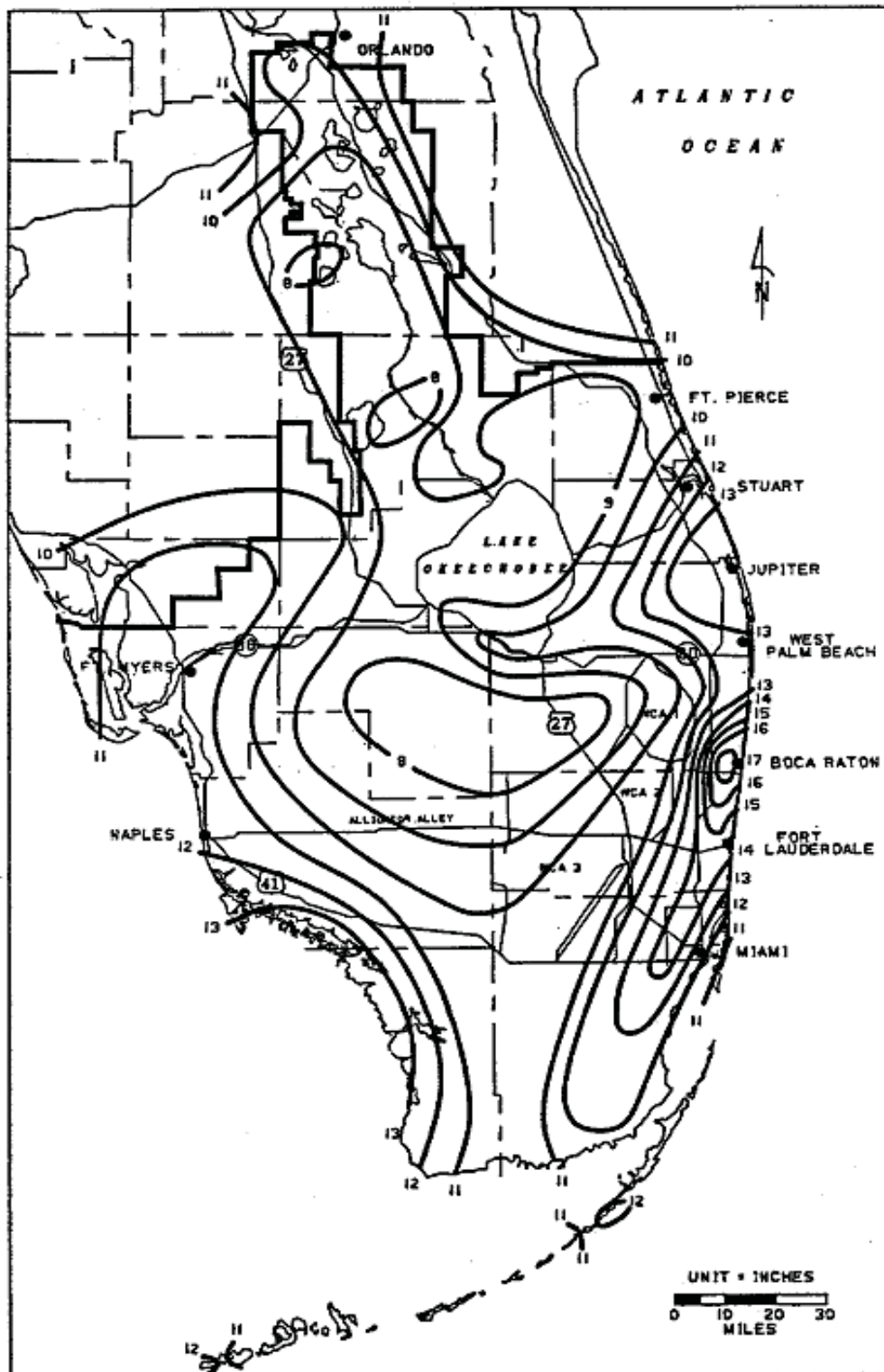


FIGURE C-8. 3-DAY RAINFALL: 25-YEAR RETURN PERIOD

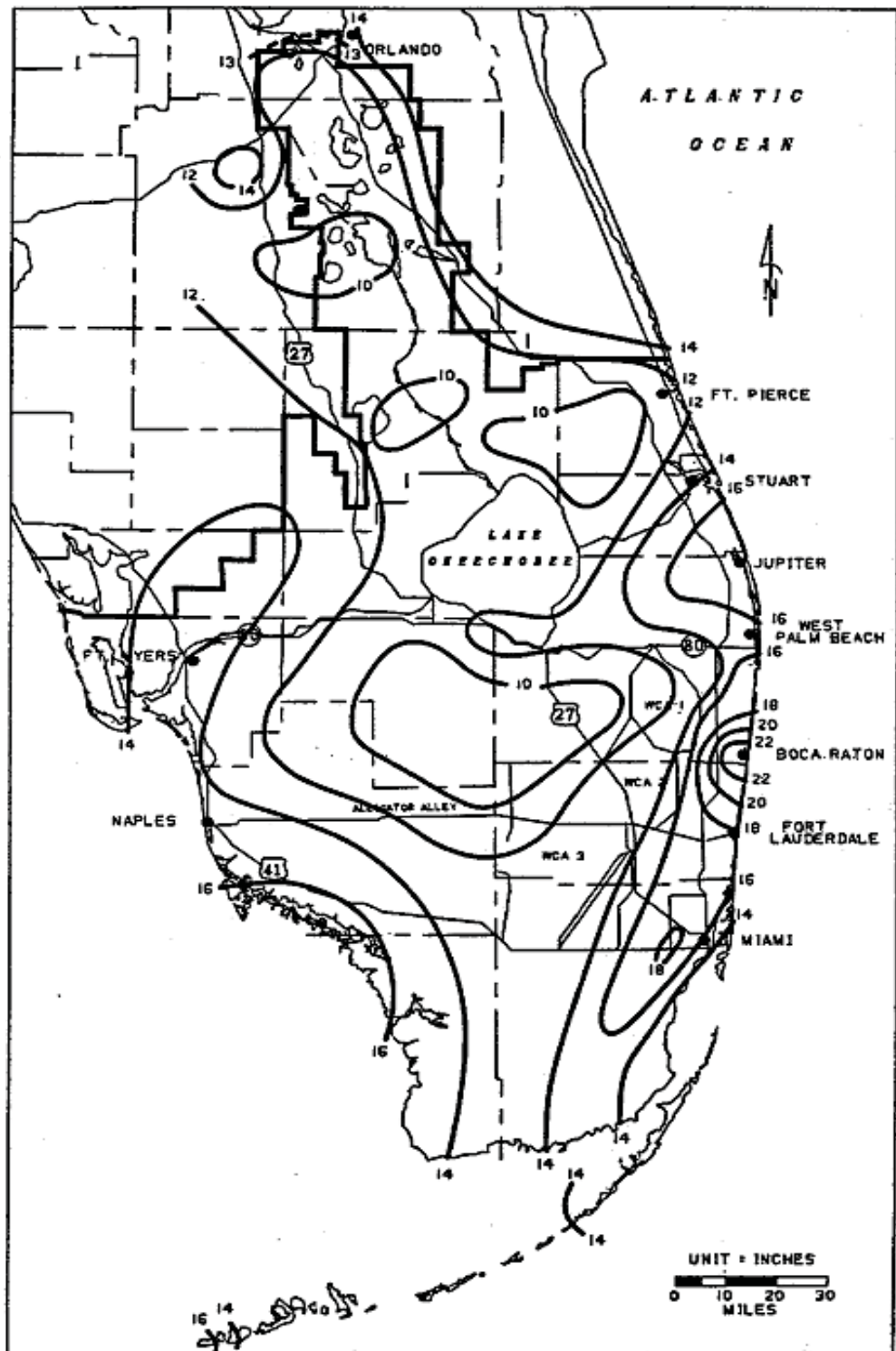


FIGURE C-9. 3-DAY RAINFALL: 100-YEAR RETURN PERIOD



APPENDIX B



Cascade Output

Project Name: Immokalee Pool

Reviewer: Ross Engineering

Project Number:

Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;0000 hr Duration: 24 hr

Time Step: 0.2 hr, Iterations: 10

Basin 1: Site

Method: Santa Barbara Unit Hydrograph

Rainfall Distribution: SFWMD - 24 hr

Design Frequency: 10 year

1 Day Rainfall: 8 inches

Area: 0.722 acres

Ground Storage: 8.18 inches

Time of Concentration: 0.5 hours

Initial Stage: 17.5 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
25.50	0.07
26.00	0.36
26.50	0.73
27.00	1.09
27.50	1.45
28.00	1.82
28.50	2.18

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)
-------	-----------	-----------	-----------	-----------

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Site	25.79	24.00	17.50	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Site	0.17	0.00	0.00	0.07	0.24	0.00

Project Name: Immokalee Pool Project

Reviewer: Ross Engineering

Project Number:

Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;0000 hr Duration: 24 hr

Time Step: 0.2 hr, Iterations: 10

Basin 1: Site

Method: Santa Barbara Unit Hydrograph

Rainfall Distribution: SFWMD - 24 hr

Design Frequency: 10 year

1 Day Rainfall: 8 inches

Area: 0.721997 acres

Ground Storage: 5.82 inches

Time of Concentration: 0.5 hours

Initial Stage: 17.5 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
23.00	0.00
23.50	0.02
24.00	0.10
24.50	0.18
25.00	0.28
25.50	0.38
26.00	0.51
26.50	0.69
27.00	0.90
27.50	1.13
28.00	1.39
28.50	1.70
29.00	2.05

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)
-------	-----------	-----------	-----------	-----------

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Site	24.70	24.00	17.50	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Site	0.22	0.00	0.00	0.00	0.22	0.00

Project Name: Immokalee Pool

Reviewer: Ross Engineering

Project Number:

Period Begin: Jan 01, 2000;0000 hr End: Jan 04, 2000;0000 hr Duration: 72 hr

Time Step: 0.2 hr, Iterations: 10

Basin 1: Site

Method: Santa Barbara Unit Hydrograph

Rainfall Distribution: SFWMD - 3day

Design Frequency: 25 year

3 Day Rainfall: 15 inches

Area: 0.726997 acres

Ground Storage: 8.18 inches

Time of Concentration: 0.5 hours

Initial Stage: 17.5 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
25.50	0.07
26.00	0.36
26.50	0.73
27.00	1.09
27.50	1.45
28.00	1.80
28.50	2.18
29.00	2.54

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)
-------	-----------	-----------	-----------	-----------

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Site	26.28	72.00	17.50	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Site	0.50	0.00	0.00	0.07	0.57	0.00

Project Name: Immokalee Pool

Reviewer: Ross Engineering

Project Number:

Period Begin: Jan 01, 2000;0000 hr End: Jan 04, 2000;0000 hr Duration: 72 hr

Time Step: 0.2 hr, Iterations: 10

Basin 1: Site

Method: Santa Barbara Unit Hydrograph

Rainfall Distribution: SFWMD - 3day

Design Frequency: 25 year

3 Day Rainfall: 15 inches

Area: 0.726997 acres

Ground Storage: 5.83 inches

Time of Concentration: 0.5 hours

Initial Stage: 17.5 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
0.00	0.00
23.50	0.02
24.00	0.10
24.50	0.19
25.00	0.28
25.50	0.39
26.00	0.52
26.50	0.70
27.00	0.92
27.50	1.15
28.00	1.41
28.50	1.73
29.00	2.07

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)
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BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Site	26.22	72.00	17.50	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Site	0.59	0.00	0.00	0.01	0.60	0.00