TOWN OF GOLDEN BEACH
DRAINAGE COMPUTATION WORKSHEET

Last Updated January 13th, 2017

In order to help the residential developments (single family units) the Town has developed a worksheet to aid applicants in determining the volume of runoff generated during a 10-year / one-day storm. This has been the adopted Level of Service (LOS) standard in the Town's Comprehensive Plan since December 1988 and is also the drainage standard specified in the Miami-Dade County Public Works Manual, Section D4 – Water Control. The calculations follow the methodology recommended by the SFWMD in their publication "Management and Storage of Surface Waters, Permit Information Manual, Volume 4" and their publication "Technical Publication EMA #390 - Frequency Analysis of Daily Rainfall Maxima for Central and South Florida" dated January 2001. Applicants may include the calculations on this worksheet with their permit application. A registered professional engineer or a registered architect must perform these calculations.

Once the volume of runoff generated during a 10-year / one-day storm within the property or a sub-basin within the property is determined, the applicant must include calculations showing this volume will be contained within the property. Retention of this volume can be provided within shallow retention swales, injection wells, and collection systems for reuse (example - cistern for irrigation), underground drains or other methods approved by the Town.

The applicant must also provide plans showing existing and proposed land elevations throughout the property demonstrating the volume of runoff generated during the design storm (10-year / one-day) will be contained within the on-site retention system. The existing and proposed land elevations must also show no overflow from the property will occur to adjacent properties or Right-of-Ways during a 10- year one-day storm.

<u>Definitions are located below the worksheet</u>.

Step 1:

Determine A A = _______________ square feet

Step 2:

Determine AP and AI AP = _______________ square feet
AI = _______________ square feet

Note: P = Pervious / I = Impervious

Step 3:

Determine the average NGVD land elevation of pervious areas within property or sub-basin within the property.

Average Elevation of Pervious Areas = _______________ feet NGVD

Property Address______________________________

Step 4:

Determine the distance between the average high ground water elevation and the average elevation of the previous areas. For design purposes, the average high ground water elevation for most of Golden Beach is 2 feet NGVD (Additionally, please check with your geotechnical engineer and/or geotechnical report.)

Distance = ______________ feet

Step 5:

Determine an S_1 value from the table below:

Distance between ground water table and average elevation of pervious areas.	S_1
1 foot	0.45 inches
2 feet	1.88 inches
3 feet	4.95 inches
4 feet	8.18 inches
>4 feet	8.18 inches

If necessary, compute a value of S_1 by interpolation.

S_1 = ______________ inches

Step 6:

Determine S as:

$$S = \frac{AP}{A} * S_1$$

S is computed in inches S = ________ inches

Step 7:

Determine runoff depth (R) as:

$$R = \frac{(P - 0.2 * S)^2}{(P + 0.8 * S)}$$

Where P = 7.95 inches of rainfall produced during a 10-year / one-day storm. Then:

$$R = \frac{(7.95 - 0.2 * S)^2}{(7.95 + 0.8 * S)}$$

R is computed in inches R = ________ inches

Property Address______________________________

Step 8:

Determine runoff depth (R) as:

$$V = A * \frac{R}{12}$$

V is computed in cubic feet. V is the volume of runoff generated during a 10-year / one day storm within the property or sub-basin of the property. This is the volume of runoff that must be contained within the property.

V = __________ cubic feet

Step 9:

Compute "retention volume provided" (VP) as the retention volume capacity, in cubic feet, of swales, retention areas, and drains within the property or sub-basin within property.

- **Attach calculations showing how the volume was calculated.**
- **Calculations must be consistent with existing and proposed elevations shown on design plans.**

VP = __________ cubic feet

Step 10:

Compare values of retention volume provided (VP in Step 9) with retention volumes needed (V in Step 8). Retention volume provided (VP) must be larger than retention volume needed (V).
(VP = __________ cubic feet) > (V = __________ cubic feet)

NOTE: These volume calculations are needed to satisfy the Town of Golden Beach Comprehensive Plan Level of Service (LOS) and Code requirements.

DEFINITIONS			
P:	**Rainfall depth in inches.**	**A:**	**Total area of property in square feet.**
S:	**Soil storage capacity in inches.**	**AP:**	**Total pervious areas within property in square feet.**
R:	**Runoff depth in inches.**	**V:**	**Volume of runoff in cubic feet.**
AI:	**Total area of roof, pavement, patios, pool decks, walkways and any other hardscape areas within the property in square feet (i.e., total impervious area).**		

Note: * means multiply.

TECHNICAL PUBLICATION
EMA # 390

Frequency Analysis of Daily Rainfall Maxima For Central and South Florida

January 2001

by

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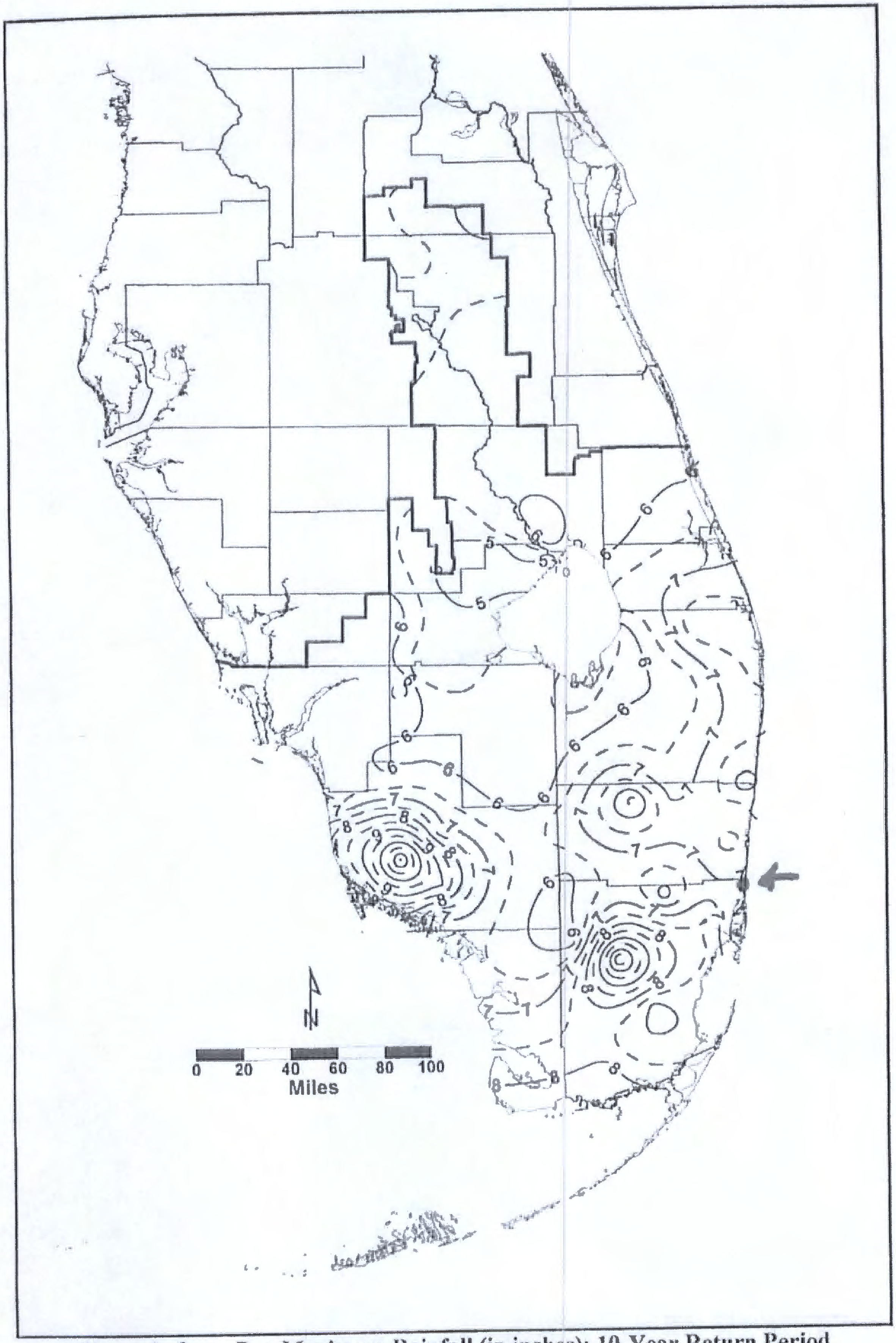

Figure 9. One - Day Maximum Rainfall (in inches): 10-Year Return Period

Results and Discussion

From the selected probability distribution, the rainfall estimates at various probability levels (i.e., inverse of return periods) were determined for each station. The rainfall estimates for two-, five-, 10-, 25-, 50-, and 100-year return periods and for three durations are presented in **Appendices N, O,** and **P.**

The summary of results from the frequency analysis is presented in **Table 11.** The table shows the range of rainfall estimates (in inches) for six return periods and three durations. For 2-year return period, the ratios of three-day to one-day rainfall estimate were 1.31 and 1.32 for minimum and maximum, respectively. For 100-year return period, the ratios of three-day to one-day rainfall estimate were 1.48 and 1.09 for minimum and maximum, respectively. Likewise, for 2-year return period, the ratios of five-day to one-day rainfall estimate were 1.42 and 1.38 for minimum and maximum, respectively. For 100-year return period, the ratios of five-day to one-day rainfall estimate were 1.83 and 1.27 for minimum and maximum, respectively. In addition, it was evident that the rainfall estimated values for a given return period and duration vary from one gage station to another indicating spatial variation in rainfall estimates. As expected, the variations in rainfall estimates for one-day duration are highest compare to three-day and five-day durations. Similarly, the variations in rainfall estimates increase as the return period increase from 2-year to 100-year.

Table 11
Rainfall Estimates (inches) for Various Return Periods and Three Durations

Duration	One-Day		Three-Day		Five-Day	
Return Period	Rainfall (inches)		Rainfall (inches)		Rainfall (inches)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
2-year	2.6	5.0	3.4	6.6	3.7	6.9
5-year	3.7	8.8	4.9	8.9	5.7	10.0
10-year	4.5	11.4	6.2	11.5	7.1	12.4
25-year	5.3	15.1	7.2	15.4	8.9	16.6
50-year	5.7	17.8	8.1	18.9	10.1	21.2
100-year	6.0	21.0	8.9	22.8	11.0	26.6

The areas located within the Key West islands and Lake Okeechobee were excluded from this rainfall frequency analysis.