
STORMWATER DRAINAGE REPORT

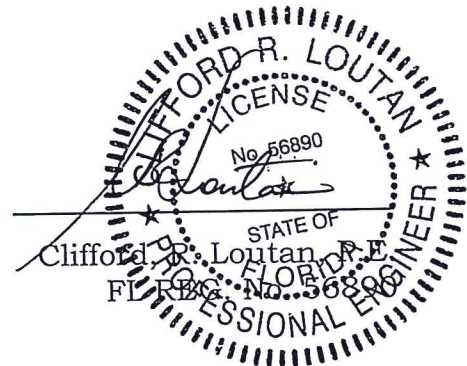
Project:

FIRST GATE COMMERCE CENTER
SECTION 30, TOWNSHIP 48S, RANGE 42E
BROWARD COUNTY, FLORIDA
STE PROJECT #19-3970

Prepared by:

SUN-TECH ENGINEERING, INC.
4577 NOB HILL ROAD, SUITE 102
SUNRISE, FL 33351

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Sun-Tech
Engineering, Inc.

Engineers • Planners • Surveyors

4577 Nob Hill Road, Suite 102 Sunrise, FL, 33351
Tel: (954) 777-3123 – Fax: (954) 777-3114
Certificate of Authorization #7097

Pre-Development Calculations

**FIRST GATE COMMERCE CENTER - PRE (MASTER PERMIT)
SURFACE WATER MANAGEMENT CALCULATIONS
PROJECT No. 19-3970**

HORIZONTAL SURFACE LAND USE BREAKDOWN			GRADING PARAMETERS (NAVD)	
LAND USE	AREA (AC)	PERCENT	FROM	TO
BUILDING	2.30	25%	13.25	13.25
PAVEMENT	4.20	45%	11.25	13.00
SIDEWALK	0.20	2%	13.00	13.25
GRASS	2.23	24%	11.25	12.75
DRA	0.25	3%	9.25	13.25
DRA BANK	0.12	1%	9.25	10.70
TOTAL	9.30	99%		

STAGE-STORAGE CALCULATIONS

Stage (ft-NAVD)	Area (acres)						Volume (ac-ft)	
	PAVEMENT	SIDEWALK	GRASS	DRA BANK	DRA	Total	Storage	Total Provided
8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00	0.02	0.25	0.27	0.13	0.13
10.00	0.00	0.00	0.00	0.06	0.25	0.31	0.28	0.28
10.50	0.00	0.00	0.00	0.10	0.25	0.35	0.44	0.44
11.00	0.00	0.00	0.00	0.12	0.25	0.37	0.62	0.62
11.50	0.60	0.00	0.37	0.12	0.25	1.34	1.05	1.05
12.00	1.80	0.00	1.12	0.12	0.25	3.29	2.21	2.21
12.50	3.00	0.00	1.86	0.12	0.25	5.23	4.34	4.34
13.00	4.20	0.00	2.23	0.12	0.25	6.80	7.34	7.34
13.50	4.20	0.20	2.23	0.12	0.25	7.00	10.79	10.79
14.00	4.20	0.20	2.23	0.12	0.25	7.00	14.29	14.29
14.50	4.20	0.20	2.23	0.12	0.25	7.00	17.79	17.79

Project Location Hydraulic Details

Design Water Level = 8.00
Allowable Discharge = 0 cfs

Design Storm Rainfall Amounts (in.)

Storm Frequency	SFWMD		
	1 hr	24 hr	72 hr
5 year	3.2		
10 year		9.0	
25 year			16.0
100 year			19.6

Soil Storage Calculation

- A. Total Pervious Area = 2.60 acres
- B. Depth to Water Table = 3.83 feet
If depth to water table is greater than 4 ft, interpolation is calculated using 4 ft.
- C. From SFWMD Environmental Resource Permit Information Manual 2014, Part II, Letter F. Soil Storage, For 'Developed/Flat Woods', the Cumulative Available Soil Storage is:
- Sp = 6.30 inches
- D. Site Soil Storage = Sp x (Pervious Area/Total Area)
= 1.76 inches
- E. Runoff Curve Number = 1000 / (S + 10)
CN = 85.02

Water Quantity Calculations

A. Calculate the Runoff in Inches.

Q=	$(\text{Rainfall} - 0.2 \times \text{Soil Storage})^2 / (\text{Rainfall} + 0.8 \times \text{Soil Storage})$	
Q _{5yr-1hr} =	1.76	inches
Q _{10yr-1day} =	7.18	inches
Q _{25yr-3dy} =	14.06	inches
Q _{100yr-3dy} =	17.67	inches

B. Calculate the Runoff Volume

V=	Q x Project Area (1 ft / 12 in)	
V _{5yr-1hr} =	1.36	ac-ft
V _{10yr-1day} =	5.57	ac-ft
V _{25yr-3dy} =	10.90	ac-ft
V _{100yr-3dy} =	13.70	ac-ft

C. Using the stage-storage chart and the runoff volumes calculated above, the corresponding stages can be interpolated.

Stage _{5yr-1hr} =	11.63	ft
Stage _{10yr-1day} =	12.70	ft
Stage _{25yr-3dy} =	13.52	ft
Stage _{100yr-3dy} =	13.91	ft

Post-Development Calculations

**FIRST GATE COMMERCE CENTER - POST
SURFACE WATER MANAGEMENT CALCULATIONS
PROJECT No. 19-3970**

HORIZONTAL SURFACE LAND USE BREAKDOWN			GRADING PARAMETERS (NAVD)	
LAND USE	AREA (AC)	PERCENT	FROM	TO
BUILDING	3.02	32%	15.50	15.50
LOADING	1.54	17%	10.70	11.50
PAVEMENT	1.66	18%	11.50	14.80
SIDEWALK	0.16	2%	12.10	15.50
GRASS	1.97	21%	10.50	14.75
DRA	0.65	7%	9.00	15.50
DRA Bank	0.30	3%	9.00	10.70
TOTAL	9.30	100%		

STAGE-STORAGE CALCULATIONS

Stage (ft- NAVD)	Area (acres)							Volume (ac-ft)	
	LOADING	PAVEMENT	SIDEWALK	GRASS	DRA Bank	DRA	Total	Storage	Total Provided
8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00	0.00	0.09	0.65	0.74	0.35	0.35
10.00	0.00	0.00	0.00	0.00	0.18	0.65	0.83	0.74	0.74
10.50	0.00	0.00	0.00	0.00	0.26	0.65	0.91	1.17	1.17
11.00	0.58	0.00	0.00	0.23	0.30	0.65	1.76	1.84	1.84
11.50	1.54	0.00	0.00	0.46	0.30	0.65	2.95	3.02	3.02
12.00	1.54	0.25	0.00	0.70	0.30	0.65	3.44	4.62	4.62
12.50	1.54	0.50	0.02	0.93	0.30	0.65	3.94	6.46	6.46
13.00	1.54	0.75	0.04	1.16	0.30	0.65	4.45	8.56	8.56
13.50	1.54	1.01	0.07	1.39	0.30	0.65	4.95	10.91	10.91
14.00	1.54	1.26	0.09	1.62	0.30	0.65	5.46	13.51	13.51
14.50	1.54	1.51	0.11	1.85	0.30	0.65	5.97	16.37	16.37
15.00	1.54	1.66	0.14	1.97	0.30	0.65	6.26	19.42	19.42
15.50	1.54	1.66	0.16	1.97	0.30	0.65	6.28	22.31	22.31

Project Location Hydraulic Details

Design Water Level = 8.00
Allowable Discharge = 0 cfs

Design Storm Rainfall Amounts (in.)

Storm Frequency	SFWMD		
	1 hr	24 hr	72 hr
5 year	3.2		
10 year		9.0	
25 year			16.0
100 year			19.6

Soil Storage Calculation

- A. Total Pervious Area = 2.92 acres
- B. Depth to Water Table = 4.26 feet
If depth to water table is greater than 4 ft, interpolation is calculated using 4 ft.
- C. From SFWMD Environmental Resource Permit Information Manual 2014, Part II, Letter F. Soil Storage, For 'Developed/Flat Woods', the Cumulative Available Soil Storage is:
- Sp = 6.75 inches
- D. Site Soil Storage = Sp x (Pervious Area/Total Area)
= 2.12 inches
- E. Runoff Curve Number = 1000 / (S + 10)
CN = 82.51

Water Quantity Calculations

A. Calculate the Runoff in Inches.

$$Q = \frac{(\text{Rainfall} - 0.2 \times \text{Soil Storage})^2}{(\text{Rainfall} + 0.8 \times \text{Soil Storage})}$$

$Q_{5\text{yr-1hr}} = 1.57$ inches
 $Q_{10\text{yr-1day}} = 6.88$ inches
 $Q_{25\text{yr-3dy}} = 13.71$ inches
 $Q_{100\text{yr-3dy}} = 17.31$ inches

B. Calculate the Runoff Volume

$$V = Q \times \text{Project Area (1 ft / 12 in)}$$

$V_{5\text{yr-1hr}} = 1.22$ ac-ft
 $V_{10\text{yr-1day}} = 5.33$ ac-ft
 $V_{25\text{yr-3dy}} = 10.63$ ac-ft
 $V_{100\text{yr-3dy}} = 13.41$ ac-ft

C. Using the stage-storage chart and the runoff volumes calculated above, the corresponding

$\text{Stage}_{5\text{yr-1hr}} = 10.53$ ft
 $\text{Stage}_{10\text{yr-1day}} = 12.19$ ft
 $\text{Stage}_{25\text{yr-3dy}} = 13.44$ ft
 $\text{Stage}_{100\text{yr-3dy}} = 13.98$ ft

Water Quality Calculations (Note: Excluding the roof/building areas)

Stage (ft-NAVD)	DRA	
	Area (ac)	Volume (ac-ft)
8.00	0.00	0.00
8.50	0.00	0.00
9.00	0.00	0.00
9.50	0.74	0.35
10.00	0.83	0.74
10.50	0.91	1.17
11.00	0.95	1.64
11.50	0.95	2.11
12.00	0.95	2.59

A. Compute the first inch of runoff from the entire site.

$$= 1 \text{ inch} \times \text{Total Area} \times (1 \text{ ft} / 12 \text{ in})$$

= 0.78 ac-ft

B. Compute 2.5 inches times the percentage of imperviousness.

- Site Area (SA), for water quality pervious/impervious calculations only
 $\text{SA} = \text{Total Area} - (\text{roof} + \text{lake})$
 = 6.28 Acres
- Impervious Area (IA), for water quality pervious/impervious calculations only
 $\text{IA} = \text{Site Area (SA)} - \text{Pervious Area}$
 = 3.36 Acres
- Percentage of imperviousness for water quality
 $\% \text{imp} = (\text{IA} / \text{SA}) \times 100\%$
 = 53.50 %
- For 2.5 inches times percentage of imperviousness
 $= 2.5 \text{ inches} \times \% \text{imp}$
 = 1.34 inches
- Compute volume required for quality detention
 $= \text{inches to be treated} \times (\text{total site} - \text{lake}) \times (1 \text{ ft} / 12 \text{ in})$
 = 1.04 ac-ft (CONTROLS)

C. Since 2.5 inches times the percentage of impervious is greater than the first inch of runoff over the entire site, the volume to be treated is:

Volume to be treated = 1.04 ac-ft

- Since Dry Retention is proposed, a minimum 50% of the controlling water quality volume shall be retained.
 Volume to be treated = 0.52 ac-ft
- Interpolating from the Stage-Storage Table, the Volume to be treated is met at a stage of:
 Stage (Water Quality) = 9.72 ft

D. Since this is a commercial project, 0.5 in. dry detention/retention Pre-treatment must be provided.

$$= 1/2 \text{ inch} \times (\text{Total Site} - \text{Lake}) \times (1 \text{ ft} / 12 \text{ in})$$

= 0.39 ac-ft

Interpolating from the Stage-Storage Table, the Pre-treatment Volume is met at a stage of:
 Stage (Pre-Treat) = 9.55 ft