

**CAULFIELD & WHEELER, INC.**

Consulting Engineers □ Planners □ Surveyors
7900 Glades Road, Suite 100
Boca Raton, Florida 33434 (561) 392-1991

August 2nd 2024; Revised February 10th, 2025

All County Paving
1180 SW 10th St
Delray Beach, FL 33444
STORMWATER MANAGEMENT COMPUTATIONS
C&W Project #10722

Project is located at 1180 SW 10th St. It is bounded on the west by commercial warehouses, on the north by SW 10th St, on the south by Royal Palm Dr and on the east by commercial warehouses. The project includes redoing an existing parking lot that was not previously permitted with storm water management controls and landscaping amenities needed to support the development. We are not including the existing parking lot in our pre stormwater calculations.

- | | | |
|----|--|----------------------|
| A. | Acreage | Commercial |
| 1. | Total | = <u>4.88 Ac.</u> |
| 2. | Impervious | |
| | a. Buildings (roofs) | = <u>0.96 Ac.</u> |
| | b. Roads & Parking | = <u>2.53 Ac.</u> |
| | c. Water Surface/Interior Lake | = <u>0.00 Ac.</u> |
| 3. | Pervious | = <u>1.39 Ac.</u> |
| B. | Proposed Minimum Elevations | |
| | Control Elevation | = <u>7.50' NAVD</u> |
| 1. | Roads & Parking | = <u>14.00' NAVD</u> |
| 2. | Floors | = <u>14.63' NAVD</u> |
| C. | Design storm allowable discharge has been determined to be <u>0.27 cfs</u> , which is based on <u>70 csm for SFWMD C-15 Drainage Basin for Eastern Palm Beach County</u> . The site is designed to not discharge offsite, with exception to sheet flow runoff that can not be contained by perimeter berm set at an elevation to contain the design storm = 25 year, 3 day = 14.07' NAVD | |

D. Water level elevations

1. Estimated wet season water table = El. 7.50' NAVD
2. Receiving body water level has been determined not to affect discharge rates.
(Note: Proposed minimum road grade of 14.00' NAVD exceeds 2 ft. minimum distance above the wet season water table of 7.50' NAVD.

E. Rainfall amounts (24-hour)

1. Roads (5-year, 1 day) = 8.0 inches
2. Design (25-year, 3 day) = 16.0 inches
3. Floors (100-year, 3 day) = 20.0 inches

II. Design Criteria

A. Quality

1. See below excel spreadsheets for quality criteria/computations.

B. Quantity

1. See below excel spreadsheets for quantity criteria/computations.

III. Computations

A. Quality

1. See below excel spreadsheets for quality criteria/computations.

B. SCS Curve Number

1. See below excel spreadsheets for SCS curve number criteria/computations.

C. Project surface storage

1. Assumptions
 - a. See below excel spreadsheets for assumption criteria/computations.
2. Stage-Storage computations are shown on the following sheets of routing calculations.

IV. Check storm stages and discharges

A. Minimum building floor elevation

1. The rainfall of the 100-year, 3-day storm

= 18.00 in., per Figure C-9, SFWMD SWERP MANUAL
2. From the attached routing computations, the 100-year flood contour is at elevation of 14.62' NAVD. Since the existing minimum floor elevation is 14.63' NAVD,

the proposed minimum floor is acceptable.

B. Roads versus local criteria

1. The minimum road (crown) grade must be at least 2 feet above control elevation, which is El. 7.50' NAVD. Since minimum proposed road and parking elevation is 14.00' NAVD, the criteria is satisfied.
2. The minimum road and parking grade must also be no lower than the peak of the 5-year, 1-day storm. From the flood routing of that event, a peak elevation of 10.92' NAVD will occur. Since the proposed minimum road (crown) elevation is 14.00' NAVD,

The proposed minimum road elevation is acceptable.

C. Allowable peak discharge

1. Design storm allowable discharge has been determined to be 0.27 cfs, which is based on 70 csm for SFWMD C-15 Drainage Basin for Eastern Palm Beach County. The site is designed to not discharge offsite, with exception to sheet flow runoff that can not be contained by perimeter berm set at an elevation to contain the design storm = 25 year, 3 day = 14.07' NAVD.

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Stormwater Calculations

PROJECT: **All County Paving**
 DATUM: **ft-NAVD** (ft-NAVD or ft-NGVD)

LAND-USE		
TOTAL SITE AREA:	4.88	Ac.
BUILDING AREA:	0.95	Ac.
PAVEMENT AREA HIGH:	1.55	Ac.
PAVEMENT AREA LOW:	0.96	Ac.
POOL AREA:	0.000	Ac.
WATER SURFACE AREA:	0.00	Ac.
LAKE BANK AREA:	0.00	Ac.
PERVIOUS AREA (DRY DET):	0.06	Ac.
PERVIOUS AREA (DRY DET BANK):	0.26	Ac.
PERVIOUS AREA (MISC):	1.10	Ac.
GROUNDWATER EL.:	7.50	ft-NAVD
AVERAGE GROUND EL.:	14.00	ft-NAVD
DEPTH TO GROUNDWATER:	6.50	ft.
COMPACTED SOIL STORAGE:	8.18	in.
"S" VALUE:	3.99	--
CURVE NUMBER, CN:	71.48	--
TREATMENT REQUIREMENTS		
1" OVER TOTAL AREA:	0.41	Ac-ft
% IMPERVIOUS:	51%	
2.5" x %IMPERVIOUS:	1.28	in.
2.5" x %IMPERVIOUS x SITE AREA:	0.52	Ac-ft
TREATMENT VOLUME REQ'D:	0.52	Ac-ft
DRY PRETREATMENT VOL. REQ'D:	0.20	Ac-ft
150% NORMAL TREATMENT VOLUME	0.78	Ac-ft
EX. DRY DETENTION		
DRY DETENTION BOTTOM EL.:	8.50	ft-NAVD
DRY DETENTION BOTTOM AREA:	0.04	Ac-ft
DRY DETENTION TOP EL.:	13.50	ft-NAVD
DRY DETENTION TOP AREA:	0.22	Ac-ft
DRY DETENTION VOLUME PROVIDED:	0.65	Ac-ft

EXFILTRATION		
F.D. PIPE DIA.:	18.00	in.
F.D. PIPE INVERT EL.:	10.00	ft-NAVD
F.D. TOP OF TRENCH EL.:	12.00	ft-NAVD
F.D. BOTTOM OF TRENCH EL.:	3.05	ft-NAVD
AVG. GROUND (OR WEIR) EL.:	14.00	ft-NAVD
F.D. TRENCH WIDTH, W:	10.00	ft.
F.D. TRENCH HEIGHT:	8.95	ft.
DEPTH TO GROUNDWATER, H ₂ :	6.50	ft.
UNSATURATED TRENCH DEPTH, D _U :	4.50	ft.
SATURATED TRENCH DEPTH, D _S :	4.45	ft.
HYDRAULIC CONDUCTIVITY, K:	4.77E-04	cfs/ft ² /ft-head
TOTAL LENGTH OF PROPOSED F.D., L:	565	LF
F.D. TREATMENT VOLUME PROVIDED, V:	1.96	Ac-ft
$V = (L [K(H_2W + 2H_2D_U - D_U^2 + 2H_2D_S) + (1.39 \times 10^{-4})WD_U]) * 0.5$		
TREATMENT PROVIDED		
DRY DETENTION VOLUME PROVIDED:	0.65	Ac-ft
F.D. TREATMENT VOLUME PROVIDED:	1.96	Ac-ft
TOTAL TREATMENT VOLUME PROVIDED:	2.60	Ac-ft
PROP. DRY DETENTION		
DRY DETENTION BOTTOM EL.:	9.25	ft-NAVD
DRY DETENTION BOTTOM AREA:	0.02	Ac-ft
DRY DETENTION TOP EL.:	13.50	ft-NAVD
DRY DETENTION TOP AREA:	0.10	Ac-ft
DRY DETENTION VOLUME PROVIDED:	0.26	Ac-ft



Nar 35	Exfil	Pvmt High	Pvmt Low	Ex. Dry Det	Ex. Dry Det	Prop. Dry Det	Prop. Dry	Green	Walks
Area		1.55	0.96	0.04	Bank	0.17	0.02	0.09	1.10
Start Elev	7.50	14.10	12.38	8.50	8.50	9.25	9.25	13.00	10.05
End Elev	12.00	15.20	14.00	--	13.50	--	13.50	14.10	19.90

3yr-24hr RAINFALL, P:	6.50	in.
5yr-24hr RAINFALL, P:	8.00	in.
25yr-72hr RAINFALL, P:	16.00	in.
100yr-72hr RAINFALL, P:	20.00	in.
10yr-72hr RAINFALL, P:	13.00	in.

Start Feet ft-NAVD	Vert Storage Ac-ft	Linear Storage Ac-ft	Linear Storage Ac-ft	Vert Storage Ac-ft	Linear Storage Ac-ft	Vert Storage Ac-ft	Linear Storage Ac-ft	Linear Storage Ac-ft	Linear Storage Ac-ft	Linear Storage Ac-ft	Vert Storage Ac-ft	Total Storage Ac-ft
7.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.0	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
8.5	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43
9.0	0.65	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.70
9.5	0.87	0.00	0.00	0.04	0.02	0.04	0.02	0.00	0.00	0.00	0.00	0.99
10.0	1.09	0.00	0.00	0.06	0.04	0.06	0.04	0.00	0.00	0.00	0.00	1.29
10.5	1.30	0.00	0.00	0.08	0.07	0.08	0.07	0.00	0.00	0.00	0.00	1.61
11.0	1.52	0.00	0.00	0.11	0.11	0.11	0.11	0.00	0.00	0.00	0.00	1.95
11.5	1.74	0.00	0.00	0.13	0.16	0.13	0.16	0.00	0.00	0.00	0.00	2.31
12.0	1.96	0.00	0.00	0.15	0.21	0.15	0.21	0.00	0.00	0.00	0.00	2.68
12.5	1.96	0.00	0.00	0.17	0.28	0.17	0.28	0.00	0.00	0.00	0.00	2.86
13.0	1.96	0.00	0.11	0.19	0.35	0.19	0.35	0.00	0.00	0.00	0.00	3.16
13.5	1.96	0.00	0.37	0.21	0.43	0.21	0.43	0.13	0.00	0.00	0.00	3.75
14.0	1.96	0.00	0.78	0.23	0.52	0.23	0.52	0.50	0.00	0.00	0.00	4.74
14.5	1.96	0.11	1.26	0.25	0.61	0.25	0.61	1.05	0.00	0.00	0.00	6.10
15.0	1.96	0.57	1.74	0.28	0.69	0.28	0.69	1.60	0.00	0.00	0.00	7.80
15.5	1.96	1.32	2.22	0.30	0.78	0.30	0.78	2.15	0.00	0.00	0.00	9.79
16.0	1.96	2.09	2.70	0.32	0.87	0.32	0.87	2.70	0.00	0.00	0.00	11.82
16.5	1.96	2.87	3.18	0.34	0.95	0.34	0.95	3.25	0.00	0.00	0.00	13.84
17.0	1.96	3.64	3.66	0.36	1.04	0.36	1.04	3.80	0.00	0.00	0.00	15.86
17.5	1.96	4.42	4.14	0.38	1.13	0.38	1.13	4.35	0.00	0.00	0.00	17.88
18.0	1.96	5.19	4.62	0.40	1.21	0.40	1.21	4.90	0.00	0.00	0.00	19.90
18.5	1.96	5.97	5.10	0.42	1.30	0.42	1.30	5.45	0.00	0.00	0.00	21.92
19.0	1.96	6.74	5.58	0.45	1.39	0.45	1.39	6.00	0.00	0.00	0.00	23.94
19.5	1.96	7.52	6.06	0.47	1.48	0.47	1.48	6.55	0.00	0.00	0.00	25.97
20.0	1.96	8.29	6.54	0.49	1.56	0.49	1.56	7.10	0.00	0.00	0.00	27.99
20.5	1.96	9.07	7.02	0.51	1.65	0.19	1.65	7.65	0.00	0.00	0.00	29.69

3yr-24hr	3.35	in.
RUNOFF, Q5:	1.36	Ac-ft
5yr-24hr	4.63	in.
RUNOFF, Q5:	1.88	Ac-ft
25yr-72hr	12.04	in.
RUNOFF, Q25:	4.90	Ac-ft
100yr-72hr	15.90	in.
RUNOFF, Q100:	6.47	Ac-ft
10yr-24hr	9.20	in.
RUNOFF, Q5:	3.74	Ac-ft

ZERO DISCHARGE STAGES

MAX 3yr-24hr STAGE:	10.11
MAX 5yr-24hr STAGE:	10.90
MAX 25YR STAGE:	14.06
MAX 100YR STAGE:	14.61
MAX 10yr-72hr STAGE:	13.50

FLOOD-ROUTING STAGES

MAX 3yr-24hr STAGE:	
MAX 5yr-24hr STAGE:	
MAX 25YR STAGE:	
MAX 100YR STAGE:	

MINIMUM PARKING LOT EL.: 14.00 ft-NAVD

MINIMUM PERIMETER EL.: 14.20 ft-NAVD

MINIMUM FINISHED FLOOR EL.: 14.63 ft-NAVD

All county Paving

Delray Beach, FL

C & W Project No. 10722

SURFACE WATER MANAGEMENT CALCULATIONS

10 year, 1 day Pre/Post Analysis

DESIGN CRITERIA:

Water Table Elevation = 7.50 NAVD
Rainfall Depths: 11.00 Inches (10-year-1-day)

PROJECT AREAS:

	<u>Existing Calc. Assumption</u>	<u>Proposed</u>
Project Area	4.88 Ac.	4.88 Ac.
Buildings	0.96 Ac.	0.96 Ac.
Paved Areas	0.96 Ac.	2.53 Ac.
Sod/Landscape Areas	2.96 Ac.	1.39 Ac.

COMPUTATIONS:

I. Compute Pervious-Impervious Acreages:

Existing Conditions:

$$\begin{aligned}\text{Impervious Acreage} &= \text{Building + Paved Areas} \\ &= 0.96 + 0.96 = 1.92 \text{ Ac.} \\ \text{\% Impervious} &= \frac{1.92 \text{ Ac.}}{4.88 \text{ Ac.}} \times 100 = 39.3\% \\ \text{Pervious Acreage} &= \text{Project Area - Impervious} \\ &= 4.88 - 1.92 = 2.96 \text{ Ac.} \\ \text{\% Pervious} &= \frac{2.96 \text{ Ac.}}{4.88 \text{ Ac.}} \times 100 = 60.7\%\end{aligned}$$

Proposed Conditions:

$$\begin{aligned}\text{Impervious Acreage} &= \text{Building + Paved Areas} \\ &= 0.96 + 2.53 = 3.49 \text{ Ac.} \\ \text{\% Impervious} &= \frac{3.49 \text{ Ac.}}{4.88 \text{ Ac.}} \times 100 = 71.5\% \\ \text{Pervious Acreage} &= \text{Project Area - Impervious} \\ &= 4.88 - 3.49 = 1.39 \text{ Ac.} \\ \text{\% Pervious} &= \frac{1.39 \text{ Ac.}}{4.88 \text{ Ac.}} \times 100 = 28.5\%\end{aligned}$$

II. Compute Soil Storage and SCS Curve Number:

1. Water Table Elevation = 7.50 NAVD
2. Average Proposed Finished Grade Elev. = 14.00 NAVD
3. Average depth to wet season water table = 14.00 - 7.50 = 6.50 ft.
4. From the soil storage table, for an average depth of 6.50 ft., considering 25% soil compact 8.18 inches.

Existing Conditions:

5. Ground storage under pervious areas:

$$\frac{8.18}{12 \text{ in./ft.}} \times 2.96 \text{ Ac.} = 2.02 \text{ Ac.-ft.}$$

6. Equivalent soil storage:

$$S = \frac{2.02 \text{ Ac.-ft.}}{4.88 \text{ Ac.}} \times \frac{12 \text{ in.}}{1 \text{ ft.}} = 2.76$$

7. SCS Curve Number:

$$CN = \frac{1000}{S + 10} = 67$$

Proposed Conditions:

8. Ground storage under pervious areas:

$$\frac{8.18}{12 \text{ in./ft.}} \times 1.39 \text{ Ac.} = 0.95 \text{ Ac.-ft.}$$

9. Equivalent soil storage:

$$S = \frac{0.95 \text{ Ac.-ft.}}{4.88 \text{ Ac.}} \times \frac{12 \text{ in.}}{1 \text{ ft.}} = 4.24$$

10. SCS Curve Number:

$$CN = \frac{1000}{S + 10} = 81$$

III. Compute the increase of runoff for a 10-year, 1-day event:

3-day Rainfall Amount: 11.00 in.

Existing Conditions:

$$\text{Runoff} = \frac{[11.00 - 0.2(4.96)]^2}{[11.00 + 0.8(4.96)]} = \frac{100.15}{14.97} = 6.69$$

$$\text{Volume} = \frac{6.69 \times 4.88}{12} = 2.72 \text{ Ac.-ft.}$$

Proposed Conditions:

$$\text{Runoff} = \frac{[11.00 - 0.2 (2.33)]^2}{[11.00 + 0.8 (2.33)]} = \frac{110.97}{12.86} = 8.63$$

$$\text{Volume} = \frac{8.63 \times 4.88}{12} = 3.51 \text{ Ac-ft.}$$

Increase in Runoff:

$$\text{Increase} = 3.51 - 2.72 = \underline{\underline{0.79 \text{ Ac-ft.}}}$$

10 year, 1 day storm volume increase of 0.79 Ac-ft is accomodated by the proposed
exfiltration trenches and dry detention areas which provide 2.60 Ac-Ft of storage