



A Civil Engineering Firm
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August 10, 2023

Drainage Calculations for **12 Houses Pompano Beach** **NW 10th Street** **Pompano Beach, FL 33060**

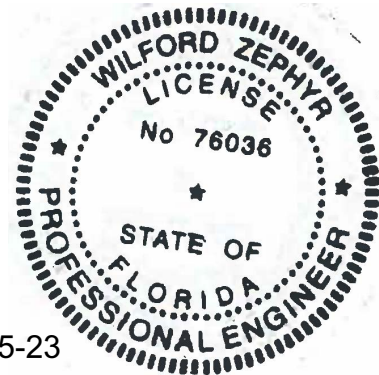
PEAK STAGES

STORM EVENT	PRE-DEVELOPMENT	POST-DEVELOPMENT
5 Year - 1 Hour	N/A	6.50' NAVD88
25 YEAR - 3 DAY	9.85' NAVD88	9.50' NAVD88
100 YEAR - 3 DAY	10.11' NAVD88	9.75' NAVD88

Prepared by:

**WILFORD
ZEPHYR**

Digitally signed by
WILFORD ZEPHYR
Date: 2023.08.15
17:03:04 -04'00'



8-15-23

Wilford Zephyr, P.E., LEED AP, CFM

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY WILFORD ZEPHYR ON THE DATE ADJACENT TO THE SEAL.

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Project Name: 12 Houses Pompano Beach
Project Address: NW 10th Street
Pompano Beach, FL 33060
ZE Project #: 23-34

Date: 08/10/23
Designed by:
Wilford Zephyr, P.E.

Pre Development

All Elevations are referenced to NAVD88 vertical datum

Site Data

Project Area:	1.9 AC	
Pavement Area:	0.19 AC	
Building Area:	0.46 AC	
Grass Area (Pervious):	1.25 AC	
Lake Area:	0 AC	
Total Pervious Area:	1.25 AC	65.79%
Total Impervious Area:	0.65 AC	34.21%

Design Parameters

Water Table Elevation:	3.50 ft
Exist. Crown of Road Elev.:	10.26 ft
Average Finished Grades:	8.70 ft
Prop. Finished Floor Elev.:	12.50 ft

C Factor

Pervious:	0.6
Impervious:	0.9

$$\text{C Factor (weighted)} = \frac{1.25 (0.60) + 0.19 (.90)}{1.44} = 0.64$$

Storm Event Information

3 year, 1 hour event:	2.5 inches (for retention/detention)
25 year, 24 hour event:	10.50 inches
25 year, 72 hour event:	14.27 inches (Finished Floor Elevation)
100 year, 24 hour event:	13 inches
100 year, 72 hour event:	17.67 inches (Finished Floor Elevation)

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Soil Storage (S) & Curve Number (CN)

All Elevations are referenced to NAVD88

Cumulative Water Storage (CWS)

Design Water Table (WT) = 3.50 ft

Average Finished Grade = 8.70 ft

Average Depth to Water Table (DWT) = 5.20 ft

Cumulative Water Storage (CWS) = 6.75 IN
(from table below)

Cumulative Soil Moisture Storage (flatwoods soil)

DWT	NAS	DAS
1.0 '	0.60 "	0.45 "
2.0 '	2.50 "	1.88 "
3.0 '	5.40 "	4.05 "
4.0 '	9.00 "	6.75 "

DWT=Depth to Water Table

NAS=Natural Available Storage

DAS=Developed Available Storage

Soil Storage (S in inches)

$S = CWS \times (\text{percentage of total pervious area}) = 4.44$

Curve Number (CN)

$CN = 1000 / (S + 10) = 69.25$

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Water Quality Retention/Detention Calculations

Water Quality Design for 5 yr - 1 hour storm

- A. For a wet detention system, size system for highest of first inch of runoff over the entire site or 2.5" times the % impervious area
- B. For a dry detention system, size system for 75% of the volume required for a wet detention system.
- C. For a retention system, size system for 50% of the volume required for a wet detention system.

1 IN Over Entire Site

1 IN X 1 ft /12 IN X = First 1" of runoff

1" X 1.90 acres = 1.90 acre-inches (0.158 acre-ft)

2.5 INCHES Times Percent Impervious

Total project area - roof area = 1.90 acres - 0.46 acres = 1.44 acres

1.44 acres - 1.25 acres (pervious area) = 0.19 acres

0.19 acres / 1.44 acres X 100% = 13.19% impervious

2.5" X 0.1319 = 0.33" to be treated

0.33" X 1.90 acres = 0.63 acre-inches (0.053 acre-feet)

0.158 acre-ft of storage required for water quality.

(1.90 AC-IN storage provided in Ret. Areas)

**Water quality storage provided in proposed
exfiltration trench system.**

Water Quality Vol. Provided:

RET. AREA #1 = 0.162 AC-IN
RET. AREA #2 = 0.158 AC-IN
RET. AREA #3 = 0.158 AC-IN
RET. AREA #4 = 0.158 AC-IN
RET. AREA #5 = 0.158 AC-IN
RET. AREA #6 = 0.158 AC-IN
RET. AREA #7 = 0.162 AC-IN
RET. AREA #8 = 0.158 AC-IN
RET. AREA #9 = 0.158 AC-IN
RET. AREA #10 = 0.158 AC-IN
RET. AREA #11 = 0.158 AC-IN
RET. AREA #12 = 0.158 AC-IN

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Runoff (Q) & Runoff Volume (V) Calculations

All Elevations are referenced to NAVD88

$$Q = (P - 0.2S)^2 / (P + 0.8S) \quad V = Q \times A \text{ (ft/ 12 in)}$$

Q = direct runoff (inches)

P = rainfall (inches)

S = soil storage (inches)

A = site area (acre)

V = Runoff Volume (ac-ft)

Finished Floor Elevation

P_{1 day} = 100 year, 24 hour event: 13 (inches)

P_{3 day} = 100 year, 72 hour event: 17.67 (inches)

S = 4.44 (inches)

A = 1.9 (acre)

Q = 13.27 (inches)

V = 2.10 (ac-ft)

Corresponding Stage = 9.75 ft

Set minimum finished floor elevation at 12.50' NAVD88.

Perimeter Control Elevation

P_{1 day} = 25 year, 24 hour event: 10.5 (inches)

P_{3 day} = 25 year, 72 hour event: 14.27 (inches)

S = 4.44 (inches) (see "Soil Storage" sheet

A = 1.9 (acre) for calculating "S")

Q = 10.05 (inches)

V = 1.59 (ac-ft)

Corresponding Stage = 9.50 ft

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Q = direct runoff (inches)

P = rainfall (inches)

S = soil storage (inches)

A = site area (acre)

V = Runoff Volume (ac-ft)

5 Year - 1 Hour (Lowest Catch Basin Elevation)

$P_{3 \text{ day}}$ = 100 year, 72 hour event: 3.28 (inches)

S = 4.44 (inches)

A = 1.9 (acre)

Q = 0.84 (inches)

V = 0.13 (ac-ft)

Corresponding Stage = 6.50 ft

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Stage Storage

All Elevations are referenced to NAVD88

Total Surface Storage Area = 1.44 AC

	(1.14 AC) (Lin. 8.25-9.50')	(0.19 AC) (Lin. from 9'-9.55')	(0.11 AC) (From 6.50')		
	Surface Storage	Surface Storage	Surface Storage	Trench Storage	Total
Stage	(Landscape)	(Pavement)	Retention Areas		
8.50 '	0.143 AC-FT	0.000 AC-FT	0.22 AC-FT	0.000 AC-FT	0.36 AC-FT
9.00 '	0.428 AC-FT	0.000 AC-FT	0.50 AC-FT	0.000 AC-FT	0.92 AC-FT
9.50 '	0.713 AC-FT	0.048 AC-FT	0.83 AC-FT	0.000 AC-FT	1.59 AC-FT
10.00 '	1.283 AC-FT	0.138 AC-FT	1.21 AC-FT	0.000 AC-FT	2.63 AC-FT

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Site Data

Project Area:	1.9 AC	
Pavement Area:	0 AC	
Building Area:	0 AC	
Grass Area (Pervious):	1.9 AC	
Lake Area:	0 AC	
Total Pervious Area:	1.9 AC	100.00%
Total Impervious Area:	0 AC	0.00%

Design Parameters

Water Table Elevation:	3.50 ft
Exist. Crown of Road Elev.:	10.26 ft
Average Finished Grades:	9.50 ft
Prop. Finished Floor Elev.:	N/A

C Factor

Pervious:	0.6
Impervious:	0.9

C Factor (weighted) = $\frac{1.9 (0.60) + 0 (.90)}{1.9} = 0.6$

Storm Event Information

3 year, 1 hour event:	2.5 inches (for retention/detention)
25 year, 24 hour event:	10.50 inches
25 year, 72 hour event:	14.27 inches (Finished Floor Elevation)
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Average Finished Grade = 9.50 ft

Average Depth to Water Table (DWT) = 6.00 ft

Cumulative Water Storage (CWS) = 6.75 IN
(from table below)

Cumulative Soil Moisture Storage (flatwoods soil)

DWT	NAS	DAS
1.0 '	0.60 "	0.45 "
2.0 '	2.50 "	1.88 "
3.0 '	5.40 "	4.05 "
4.0 '	9.00 "	6.75 "

DWT=Depth to Water Table

NAS=Natural Available Storage

DAS=Developed Available Storage

Soil Storage (S in inches)

$S = \text{CWS} \times (\text{percentage of total pervious area}) = 6.75$

Curve Number (CN)

$\text{CN} = 1000 / (S + 10) = 59.70$

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Runoff (Q) & Runoff Volume (V) Calculations

All Elevations are referenced to NAVD88

$$Q = (P - 0.2S)^2 / (P + 0.8S) \quad V = Q \times A \text{ (ft/ 12 in)}$$

Q = direct runoff (inches)

P = rainfall (inches)

S = soil storage (inches)

A = site area (acre)

V = Runoff Volume (ac-ft)

Finished Floor Elevation

P_{1 day} = 100 year, 24 hour event: 13 (inches)

P_{3 day} = 100 year, 72 hour event: 17.67 (inches)

S = 6.75 (inches)

A = 1.9 (acre)

Q = 11.54 (inches)

V = 1.83 (ac-ft)

Corresponding Stage = 10.11 ft

Perimeter Control Elevation

P_{1 day} = 25 year, 24 hour event: 10.5 (inches)

P_{3 day} = 25 year, 72 hour event: 14.27 (inches)

S = 6.75 (inches) (see "Soil Storage" sheet

A = 1.9 (acre) for calculating "S")

Q = 8.49 (inches)

V = 1.34 (ac-ft)

Corresponding Stage = 9.85 ft

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Stage Storage

All Elevations are referenced to NAVD88

Total Surface Storage Area = 1.90 AC

(1.90 AC)

(0.00 AC)

(Lin. 8.80'-9.50')

(Lin. from 0.00'-0.00')

Stage	Surface Storage (Landscape)	Surface Storage (Pavement)	Trench Storage	Total
9.00 '	0.190 AC-FT	0.000 AC-FT	0.000 AC-FT	0.23 AC-FT
9.50 '	0.665 AC-FT	0.000 AC-FT	0.000 AC-FT	0.66 AC-FT
10.00 '	1.615 AC-FT	0.000 AC-FT	0.000 AC-FT	1.62 AC-FT
10.50 '	2.565 AC-FT	0.000 AC-FT	0.000 AC-FT	2.57 AC-FT

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