

STORMWATER MANAGEMENT SUMMARY

STOR N LOCK SELF STORAGE UNITS

LOCATED ON INDEPENDENCE DR.,
IN THE CITY OF NAPOLEON, HENRY COUNTY, OHIO

PREPARED FOR:



(567) 230-1947

PREPARED BY:



60 Northwood Dr.
Tiffin, OH 44883
(419) 618-0899

July, 2022

SUBMITTAL REVIEW

- APPROVED
- APPROVED WITH REVISIONS
- REJECTED

PROJECT: Stor N Lock

DATE: 2022.07.13 RVWD BY: CR
City of Napoleon



Terrence R. Wright

TERRENCE R. WRIGHT, PE/PS

7/9/22
DATE

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1.0 PROJECT BACKGROUND

The proposed development is located at 1070 Independence Dr. in the town of Napoleon, Henry County, Ohio. There is an existing drainage ditch located along the east side of the property, the ditch flows south.

The project is located on an existing 3.032 Acre undeveloped parcel on the north side of Independence Dr. The proposed developments are self storage units with an asphalt drive/parking and storm water detention. The project will have multiple phases. The storm water detention will be sized to handle all phases.

2.0 PRE-DEVELOPED

The proposed developed area is 3.032 Acres with a pre-developed condition consisting of open space lawn in good condition.

3.0 POST-DEVELOPED

The proposed post-developed condition will consist of buildings, asphalt drive / parking, and grass.

The storm water detention system is designed using the Storm water Regulations for Napoleon Ohio and utilizing HydroCAD. Design of the peak flow rates are calculated using the SCS TR-20 Runoff Method. The proposed developed area will have a detention basin designed to store all storms up to and including a 100-yr storm and only allow a peak discharge that is below the peak discharge rate being the pre-developed 2-yr storm event the basin is also designed to handle the required Water Quality Volume (WQv) which includes 20% for sediment storage. The detention basin outlet will be a 2'x2' catch basin with a 12" HDPE N12 tile that will outlet into an existing storm water maintenance ditch. A 6" orifice will be placed in the side of the catch basin. The top of the catch basin will contain a standard grate. See improvement plans for specific elevations and sizes.

4.0 STORM WATER CALCULATIONS AND SUMMARY

2-yr Pre-developed runoff volume = 0.191 af (0.94 cfs)
 2-yr Post-developed runoff volume = 0.484 af (8.94 cfs)

Volume increase = $(0.484-0.191) / 0.191 = 153\%$ (25-yr Critical Storm)

ALLOWABLE DISCHARGE SUMMARY

STORM EVENT	DEVELOPED PEAK FLOW	ALLOWABLE	ACTUAL PEAKFLOW	MAX. ELEV.	STORAGE
2-yr	8.94 cfs	0.94 cfs	0.20 cfs	676.50	16,203 cf
5-yr	11.13 cfs	0.94 cfs	0.52 cfs	676.76	19,504 cf
10-yr	12.85 cfs	0.94 cfs	0.71 cfs	677.00	22,820 cf
25-yr	15.09 cfs	0.94 cfs	0.91 cfs	677.34	27,666 cf
50-yr	16.78 cfs	3.15 cfs	1.63 cfs	677.58	31,175 cf
100-yr	18.51 cfs	3.76 cfs	3.70 cfs	677.72	33,235 cf

CONSTRUCTION BMP SETTLING POND

DEWATERING VOLUME = $(67 \text{ CY/AC}) \times (\text{ACRES}) \times 27 \text{ CF/CY}$

ACRES ACRES

SEDIMENTATION STORAGE ZONE = $(1000 \text{ CF}) \times (\text{DISTURBED AC})$

VOLUME CF
 48HRS CF

POST CONSTRUCTION WATER QUALITY VOLUME EXTENDED DETENTION

$WQ_v = R_v \times P \times A / 12$ $R_v = 0.05 + 0.9i$

$i =$ fraction impervious

$P =$

ACRES

WQ_v AC-FT

CF

20% WQ_v CF

RELEASE RATE $Q = WQ_v / \text{DRAIN TIME}$

DRAIN TIME = HOURS

$Q =$ CFS

$Q =$ GPM

StorNlock_pre

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Napoleon 24-hr S1 2-yr Rainfall=2.46"

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Summary for Subcatchment 1: pre-developed

Runoff = 0.94 cfs @ 13.42 hrs, Volume= 0.191 af, Depth> 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Napoleon 24-hr S1 2-yr Rainfall=2.46"

Area (ac)	CN	Description
* 3.032	80	grass open space in good condition
3.032		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
99.9	300	0.0025	0.05		Sheet Flow, grass Grass: Dense n= 0.240 P2= 2.00"
4.8	100	0.0025	0.35		Shallow Concentrated Flow, grass Short Grass Pasture Kv= 7.0 fps
104.7	400	Total			

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Napoleon 24-hr S1 2-yr Rainfall=2.46"

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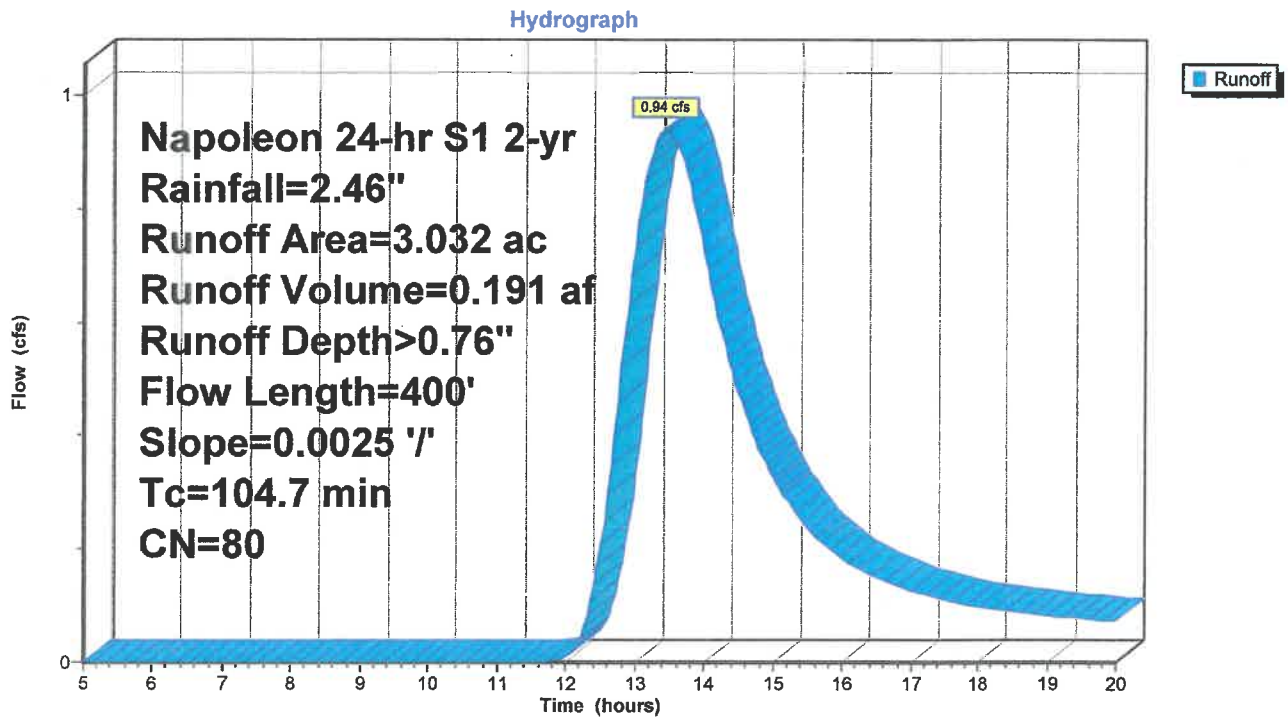
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Events for Subcatchment 1: pre-developed

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
2-yr	2.46	0.94	0.191	0.76

Subcatchment 1: pre-developed



Events for Subcatchment 1: pre-developed

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-yr	2.05	0.62	0.130	0.51
2-yr	2.46	0.94	0.191	0.76
5-yr	3.06	1.46	0.291	1.15
10-yr	3.55	1.92	0.379	1.50
25-yr	4.23	2.59	0.508	2.01
50-yr	4.79	3.15	0.619	2.45
100-yr	5.38	3.76	0.740	2.93

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Napoleon 24-hr S1 2-yr Rainfall=2.46"

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Summary for Subcatchment 1: post-developed

Runoff = 8.94 cfs @ 12.07 hrs, Volume= 0.484 af, Depth> 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Napoleon 24-hr S1 2-yr Rainfall=2.46"

Area (ac)	CN	Description
* 1.779	98	Roofs, Paved Drives
* 1.253	93	Paved Roads Open Ditches in R/W
3.032	96	Weighted Average
1.253		41.33% Pervious Area
1.779		58.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	300	0.0025	0.67		Sheet Flow, developed Smooth surfaces n= 0.011 P2= 2.60"
1.6	100	0.0025	1.02		Shallow Concentrated Flow, developed Paved Kv= 20.3 fps
9.0	400	Total			

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Napoleon 24-hr S1 2-yr Rainfall=2.46"

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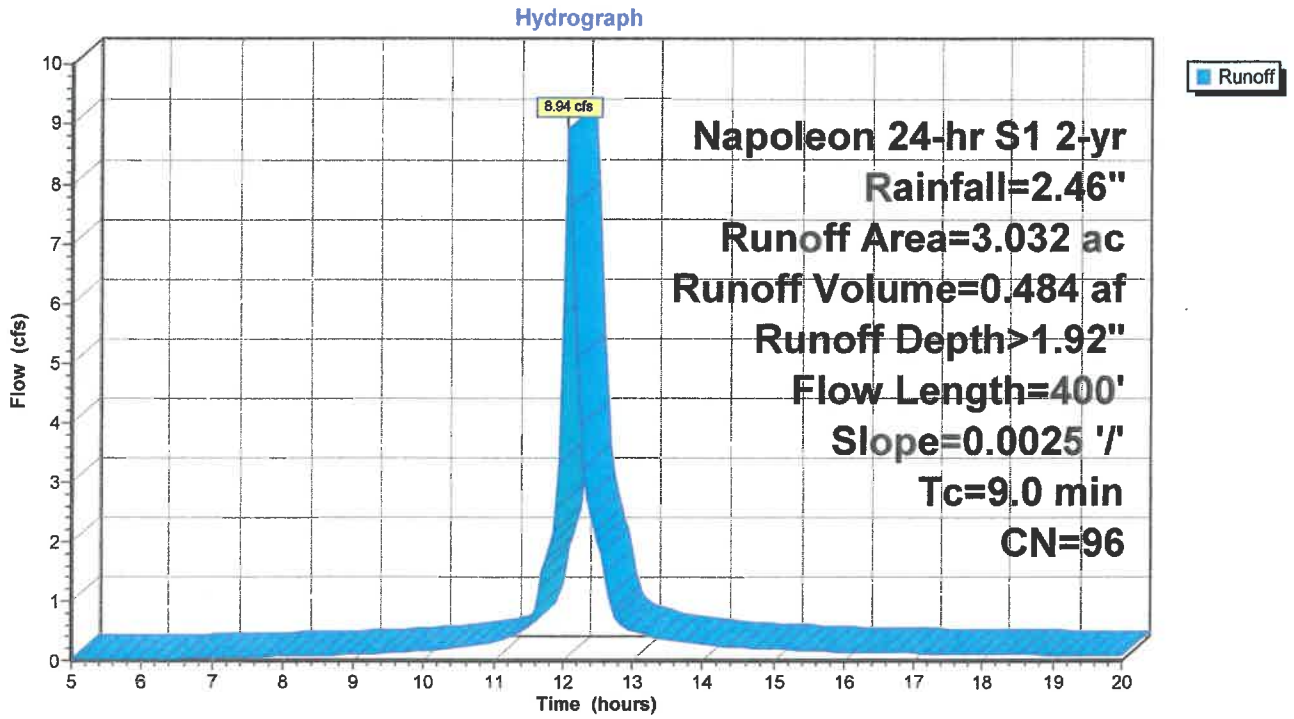
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Events for Subcatchment 1: post-developed

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
2-yr	2.46	8.94	0.484	1.92

Subcatchment 1: post-developed



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Napoleon 24-hr S1 100-yr Rainfall=5.38"

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Events for Subcatchment 1: post-developed

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-yr	2.05	7.25	0.388	1.54
2-yr	2.46	8.94	0.484	1.92
5-yr	3.06	11.13	0.625	2.47
10-yr	3.55	12.85	0.740	2.93
25-yr	4.23	15.09	0.899	3.56
50-yr	4.79	16.78	1.029	4.07
100-yr	5.38	18.51	1.165	4.61

Summary for Pond 4P: (new Pond)

[82] Warning: Early inflow requires earlier time span

Inflow Area = 3.032 ac, 58.67% Impervious, Inflow Depth > 4.61" for 100-yr event
 Inflow = 18.51 cfs @ 12.07 hrs, Volume= 1.165 af
 Outflow = 3.70 cfs @ 12.60 hrs, Volume= 0.705 af, Atten= 80%, Lag= 31.4 min
 Primary = 1.08 cfs @ 12.60 hrs, Volume= 0.579 af
 Secondary = 2.62 cfs @ 12.60 hrs, Volume= 0.127 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 677.72' @ 12.60 hrs Surf.Area= 15,495 sf Storage= 33,235 cf

Plug-Flow detention time= 219.2 min calculated for 0.705 af (61% of inflow)
 Center-of-Mass det. time= 152.2 min (893.3 - 741.1)

Volume	Invert	Avail.Storage	Storage Description
#1	675.00'	37,747 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
675.00	9,182	0	0	9,182
676.00	11,374	10,258	10,258	11,411
677.00	13,723	12,530	22,789	13,802
678.00	16,229	14,958	37,747	16,356

Device	Routing	Invert	Outlet Devices
#1	Primary	676.25'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	675.00'	0.04 cfs Exfiltration when above 675.00'
#3	Secondary	677.50'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.08 cfs @ 12.60 hrs HW=677.72' (Free Discharge)

- ↑ 1=Orifice/Grate (Orifice Controls 1.04 cfs @ 5.31 fps)
- ↑ 2=Exfiltration (Exfiltration Controls 0.04 cfs)

Secondary OutFlow Max=2.61 cfs @ 12.60 hrs HW=677.72' TW=674.97' (Dynamic Tailwater)

- ↑ 3=Orifice/Grate (Weir Controls 2.61 cfs @ 1.52 fps)

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Napoleon 24-hr S1 100-yr Rainfall=5.38"

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Events for Pond 4P: (new Pond)

Event	Inflow (cfs)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-yr	7.25	0.07	0.07	0.00	676.36	14,440
2-yr	8.94	0.20	0.20	0.00	676.50	16,203
5-yr	11.13	0.52	0.52	0.00	676.76	19,504
10-yr	12.85	0.71	0.71	0.00	677.00	22,820
25-yr	15.09	0.91	0.91	0.00	677.34	27,666
50-yr	16.78	1.63	1.02	0.60	677.58	31,175
100-yr	18.51	3.70	1.08	2.62	677.72	33,235

Stage-Area-Storage for Pond 4P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
675.00	9,182	0	677.60	15,201	31,462
675.05	9,286	462	677.65	15,328	32,225
675.10	9,391	929	677.70	15,455	32,995
675.15	9,496	1,401	677.75	15,583	33,771
675.20	9,602	1,878	677.80	15,711	34,553
675.25	9,708	2,361	677.85	15,840	35,342
675.30	9,815	2,849	677.90	15,969	36,137
675.35	9,923	3,342	677.95	16,099	36,939
675.40	10,031	3,841	678.00	16,229	37,747
675.45	10,139	4,346			
675.50	10,249	4,855			
675.55	10,359	5,370			
675.60	10,469	5,891			
675.65	10,580	6,417			
675.70	10,692	6,949			
675.75	10,804	7,487			
675.80	10,917	8,030			
675.85	11,030	8,578			
675.90	11,144	9,133			
675.95	11,259	9,693			
676.00	11,374	10,258			
676.05	11,486	10,830			
676.10	11,599	11,407			
676.15	11,712	11,990			
676.20	11,826	12,578			
676.25	11,941	13,173			
676.30	12,056	13,772			
676.35	12,171	14,378			
676.40	12,287	14,990			
676.45	12,404	15,607			
676.50	12,521	16,230			
676.55	12,639	16,859			
676.60	12,757	17,494			
676.65	12,876	18,135			
676.70	12,995	18,781			
676.75	13,115	19,434			
676.80	13,236	20,093			
676.85	13,357	20,758			
676.90	13,478	21,429			
676.95	13,600	22,106			
677.00	13,723	22,789			
677.05	13,843	23,478			
677.10	13,964	24,173			
677.15	14,086	24,874			
677.20	14,207	25,582			
677.25	14,330	26,295			
677.30	14,453	27,014			
677.35	14,576	27,740			
677.40	14,700	28,472			
677.45	14,825	29,210			
677.50	14,950	29,955			
677.55	15,075	30,705			