DRAINAGE REPORT

FOR

Dollar General Store

Ashville
Ohio

APN: Vol. 566- p. 952, Vol. 585- p. 1346, Vol. 586- p. 402

Prepared for:

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September 27, 2016
Job Number: 16047

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INTRODUCTION

LOCATION OF PROPERTY

The Dollar General Store is a proposed development located along State Route 752 and State Route 316 in Ashville, Ohio. The project will encompass approximately 0.90 acres of APN's: Vol. 566- p. 952, Vol. 585- p. 1346, Vol. 586- p. 402. See Exhibit 1 for a general Vicinity Map.

DESCRIPTION OF PROPERTY

The parcel has been previously developed, but is currently a vacant lot with some gravel areas throughout the site, with minimal slope from high side on the south of the site, to State Route 752 on the north side.

PROJECT DESCRIPTION

The proposed development will consist of the construction of a 9,100 square foot Dollar General Store. All site improvements and infrastructure will be constructed at once; no phasing of the project is anticipated. We will have two driveway entrances accessing both State Route 752 and State Route 316.

FLOODPLAIN INFORMATION

According to the Flood Insurance Rate Map the site is located within unshaded Flood Zone X. The FIRM map is 39129C180J for Pickaway County, Ohio. Flood Zone X is defined as "Areas determined to be outside the 500 year flood plain". Please see Exhibit 4 for the FEMA map.

PROPOSED DRAINAGE FACILITIES

GENERAL DESCRIPTION ON-SITE FACILITIES

The site drainage for this project will be relatively simple. The entire site will drain into the proposed detention basin located along the southern side of the site. Our basin is designed to outlet the pre-existing site flow rate into the existing storm drainage system which runs along the alley to the west of the site. The sizing calculations have been included in Appendix C.

COMPLIANCE WITH REGULATIONS AND ADOPTED PLANS

The design criterion which has been used for this drainage report is in compliance with the Village of Ashville Drainage Manual.

HYDROLOGIC CRITERIA

The following design criteria assumptions were used for this analysis:

- Design for on-site facilities is based upon the 100 year storm event.
- Rainfall intensity/duration frequencies were obtained from Mid-Ohio Regional Planning Commission Stormwater Design Manual Exhibit IV-1 (Please see Appendix A)
- Runoff coefficients were obtained from Table 7-7 of the Rational Method QTR-55 Software Program distributed by Hasted Methods.

METHODOLOGY

The rational method was used to determine the peak flows. The parameters for this method are:

1. The drainage area (A, acres)
2. Time of Concentration (T_c, minutes)
3. Runoff Coefficient (C)
4. Rainfall Intensity (i, inches per hour)

The time of concentration is calculated based on the equation:

T_c=10 min or L/(Vx60), whichever is greater,

where

L=The travel distance in feet
V=Channel or overland velocity in feet per second

Due to the relatively small size of the site and sub areas and the high runoff potential within commercial developments, the minimum T_c of 10 minutes was used in this analysis.

For T_c=10 min., the rainfall intensities are i_1=2.80 in/hr, i_2=3.50 in/hr, i_5=4.40 in/hr, i_{10}=5.00 in/hr, i_{25}=5.80 in/hr, i_{50}=6.50 in/hr, and i_{100}=7.50 in/hr.

From the MORPC Stormwater Design Manual (See Appendix A), the following runoff coefficients were used:

Developed C=0.96
Undeveloped C=0.57

The peak runoff volume is calculated using the following equation: Q=CiA

FACILITY DESIGN CALCULATIONS

ON-SITE DRAINAGE CALCULATIONS

Our proposed commercial project will have an on-site storm drainage system consisting of one detention pond, which will receive all site runoff. Table 1 shows the increase in flows due to the development, Table 2 shows the critical storm calculation, and Table 3 shows the detention basin sizing criteria. All calculations and output supporting these tables can be found in Appendix B, and C.

Table 1 - Peak Basin Flow Summary
1 to 100-Year Frequency

Basin 1	Existing (cfs)	Developed (cfs)	Net Increase (cfs)
1 year	1.71	2.46	0.75
2 year	2.13	3.07	0.94
5 year	2.68	3.86	1.18
10 year	3.05	4.39	1.34
25 year	3.54	5.09	1.52
50 year	3.96	5.70	1.74
100 year	4.57	6.58	2.01

Table 2 – Critical Storm Summary
5-year Critical Storm

	Basin 1	i (in/hr)	C_{ex}	C_{pr}	V_{ex} (ft^3)	V_{pr} (ft^3)	
0%-10%	1 year	2.80	0.57	0.82	1025	1474	44%
10%-20%	2 year	3.50	0.57	0.82	1281	1843	
20%-50%	5 year	4.40	0.57	0.82	1610	2316	
50%-100%	10 year	5.00	0.57	0.82	1830	2632	
100%-250%	25 year	5.80	0.57	0.82	2122	3053	
250%-500%	50 year	6.50	0.57	0.82	2379	3422	
500% & up	100 year	7.50	0.57	0.82	2745	3948	

Table 3 - Basin Volume Summary
Sizing Requirements

	100 yr Volume Required (cf)	Water Quality Volume Required (cf)	Critical Storm Volume Required (cf)	Volume Provided (cf)
Basin 1	1,239	1,307	1,503	**2,019**

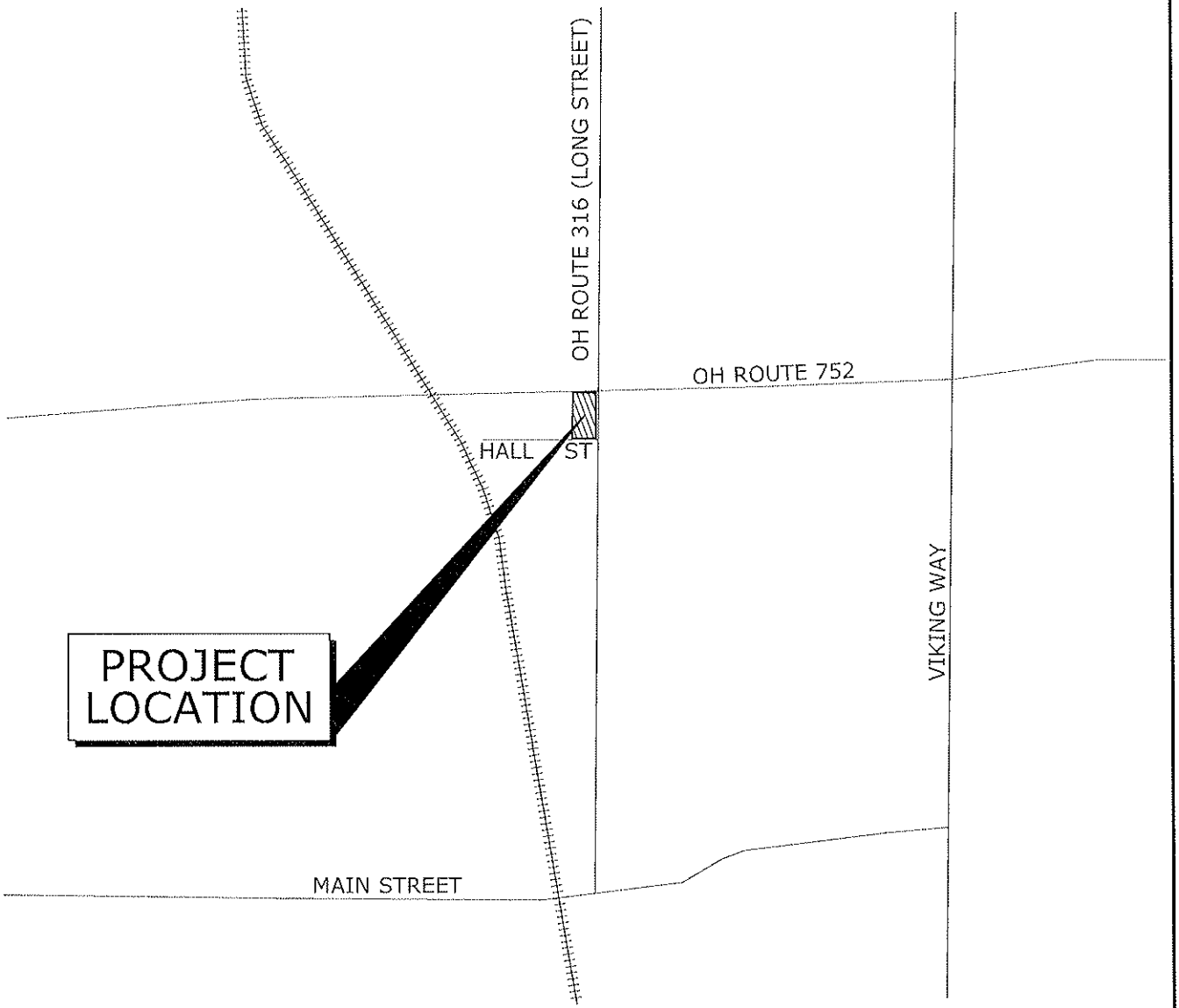
CONCLUSION

All designed storm drain and flood control facilities are effective in controlling storm runoff and have no impact on existing off-site facilities. Therefore, no mitigation of impacts is required. In addition, the storm drain and flood control facilities are in compliance with the following:

- FEMA requirements - No buildings are proposed within the existing or proposed 100-year flood plain boundaries.
- Drainage Laws – As designed, the drainage system shall promote and preserve the general health, welfare, and economic being of the region.
- The designed facilities are consistent with and integrated with the Village of Ashville drainage requirements.
- Village of Ashville Municipal Code – All items of concern such as reasonable use of and diversion of drainage have been addressed. No alteration of the drainage path occurs beyond the project boundaries. Therefore, no offsite impacts occur.
- All storm drain and flood control improvements have been designed to meet or exceed the design standards as set forth in the Mid-Ohio Regional Planning Commission Stormwater Design Manual.

EXHIBITS

DRAWN:	MAY	DATE:	5/5/16
DESCRIPTION: VICINITY MAP	APN: V.566-P.952, V.585-P.1346, V.586-P.402	SUBMITTAL:	EX-1



VICINITY MAP

SCALE: N.T.S.

PROJECT/CLIENT:

JOB #: 16047

DOLLAR GENERAL
Ashville, OH

CROSS DEVELOPMENT
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Executed: 15:17:58 09-29-2016

PROPOSED BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

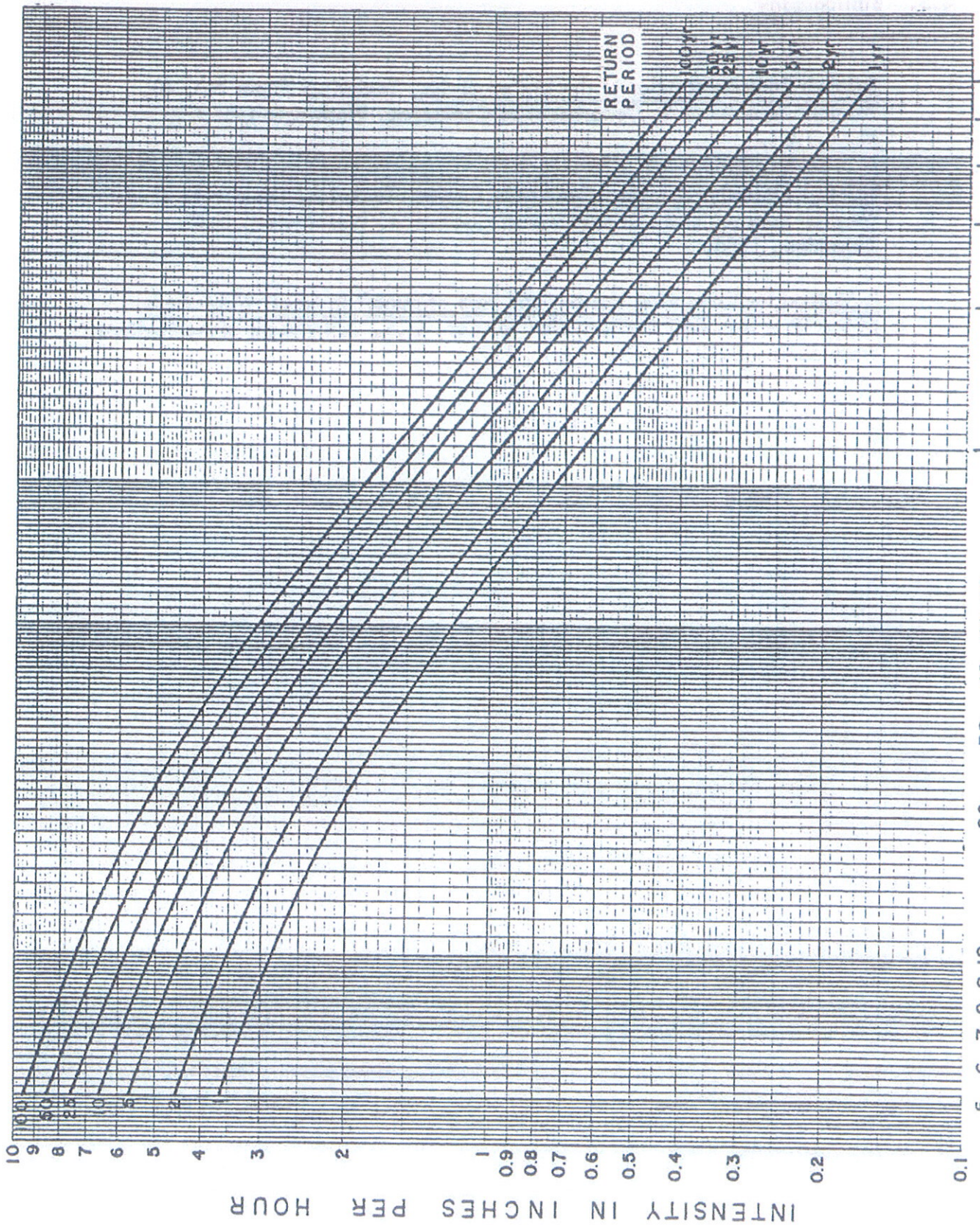
Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
PROPOSED	0.820	1.07						
			10.00	0.820	0.820	3.500	1.07	3.07

APPENDIX B

EXISTING DRAINAGE BASIN CALCULATIONS

EXHIBIT IV-1

RAINFALL INTENSITY - DURATION FREQUENCY CURVES



Source: U.S. Weather Service, T.P. Nº 40

RUNOFF COEFFICIENTS

LAND USE DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Cultivated land : without conservation treatment	.32	.50	.66	.74
: with conservation treatment	.17	.30	.43	.50
Pasture or range land: poor condition	.26	.45	.61	.69
good condition	.05	.16	.36	.47
Meadow: good condition	.05	.13	.30	.43
Wood or Forest land: thin stand, poor cover, no mulch	.05	.23	.41	.54
good cover	.05	.10	.29	.41
Open Spaces, lawns, parks, golf courses, cemeteries, etc.				
good condition: grass cover on 75% or more of the area	.05	.16	.36	.47
fair condition: grass cover on 50% to 75% of the area	.05	.28	.45	.57
Commercial and business areas (85% impervious)	.69	.77	.83	.86
Industrial districts (72% impervious)	.50	.66	.74	.80
Residential:				
Average lot size — Average % Impervious				
1/8 acre or less — 65	.41	.59	.72	.77
1/4 acre — 38	.16	.37	.54	.64
1/3 acre — 30	.12	.32	.50	.61
1/2 acre — 25	.09	.29	.47	.59
1 acre — 20	.06	.26	.45	.57
2 acres	.05	.23	.41	.50
Paved parking lots, roofs, driveways, etc.	.96	.96	.96	.96

The coefficients are applicable for storms of five to ten year return frequencies.

For recurrence intervals longer than ten years, the indicated runoff coefficients should be increased assuming that nearly all of the rainfall in excess of that expected from the ten year recurrence interval rainfall will become runoff and should be accommodated by an increased runoff coefficient.

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EXISTING BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 1 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
EXISTING	0.570	1.07						
			10.00	0.570	0.570	2.800	1.07	1.71

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EXISTING BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
EXISTING	0.570	1.07						
			10.00	0.570	0.570	3.500	1.07	2.13

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EXISTING BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
EXISTING	0.570	1.07						
			10.00	0.570	0.570	4.400	1.07	2.68

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EXISTING BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
EXISTING	0.570	1.07						
			10.00	0.570	0.570	5.000	1.07	3.05

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EXISTING BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
EXISTING	0.570	1.07						
			10.00	0.570	0.570	5.800	1.07	3.54

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EXISTING BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 50 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
EXISTING	0.570	1.07						
			10.00	0.570	0.570	6.500	1.07	3.96

All development in the City shall be constructed in a manner that does not result in an illicit discharge into the City's stormwater system. Discharges allowable under the terms of an NPDES permit are not considered illicit discharges.

3.3.2 Water Quality Volume (WQ_v) and Water Quality Flow (WQ_f) Determination

The following formula shall be used to determine the design water quality volume (WQ_v)[5]:

$$WQ_v = C * P * (A/12) = (0.447) * (0.75"/12") * 46{,}793 \text{ s.f.} = 1{,}307 \text{ c.f.}$$

where:

WQ_v= water quality volume in acre-feet
C = runoff coefficient appropriate for storms less than 1 inch
P = precipitation depth = 0.75 inch, and
A = drainage area in acres

3.3.2.1 Runoff Coefficients for Water Quality

Runoff coefficients appropriate for the various single family residential and Traditional Neighborhood Development (TND) types in Columbus are presented in **Table 3-5**. Runoff coefficients for non-single family residential and non-TND type developments may be determined using the following equation[6]:

$$C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04. = 0.447$$

where:

i = percent of the drainage area that is impervious = 63.3%

Detailed criteria for using the WQ_v to design each accepted type of stormwater quality control facility is found in subsequent sections of the Manual.

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[5] Ohio Environmental Protection Agency, Authorization for Stormwater Discharges Associated with Construction Activity Under the National Pollutant Discharge Elimination System
[6] ASCE/WEF, "Urban Runoff Quality Management", 1997

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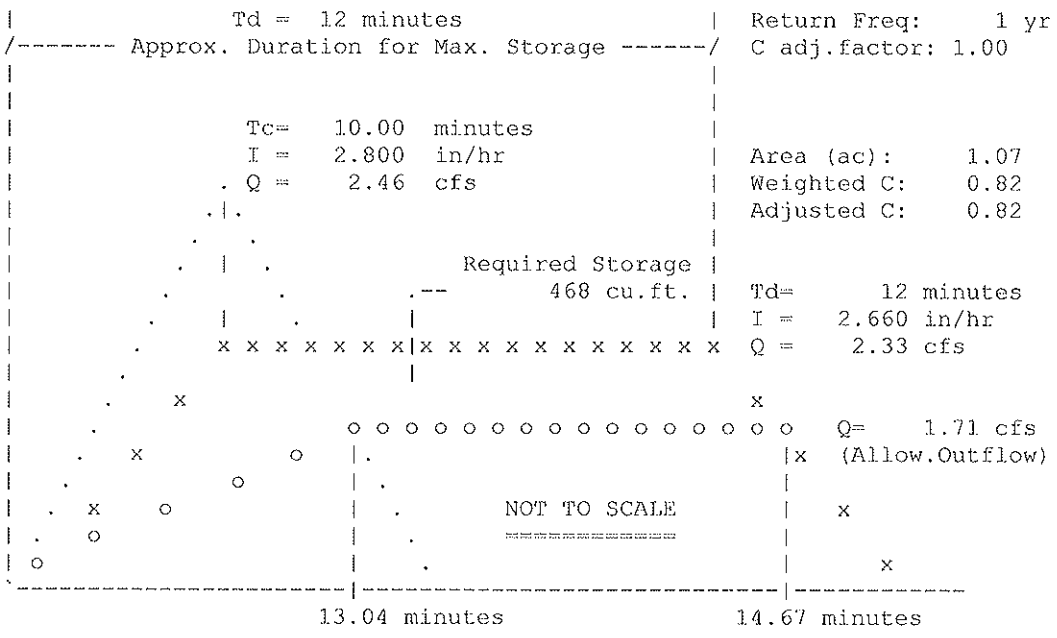
Executed: 15:17:58 09-29-2016

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 1 yr	Allowable Outflow: 1.71 cfs
'C' Adjustment: 1.000	Required Storage: 468 cu.ft.
Peak Inflow: 2.33 cfs	Inflow .HYD stored: NONE STORED



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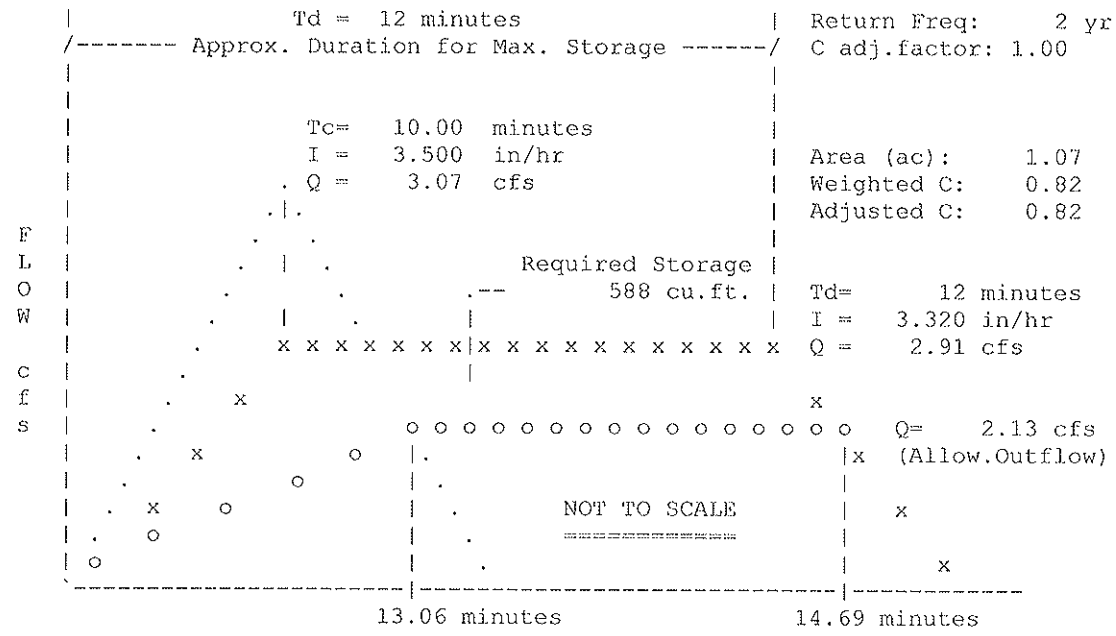
MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 2 yr	Allowable Outflow: 2.13 cfs
'C' Adjustment: 1.000	Required Storage: 588 cu.ft.
Peak Inflow: 2.91 cfs	Inflow .HYD stored: NONE STORED



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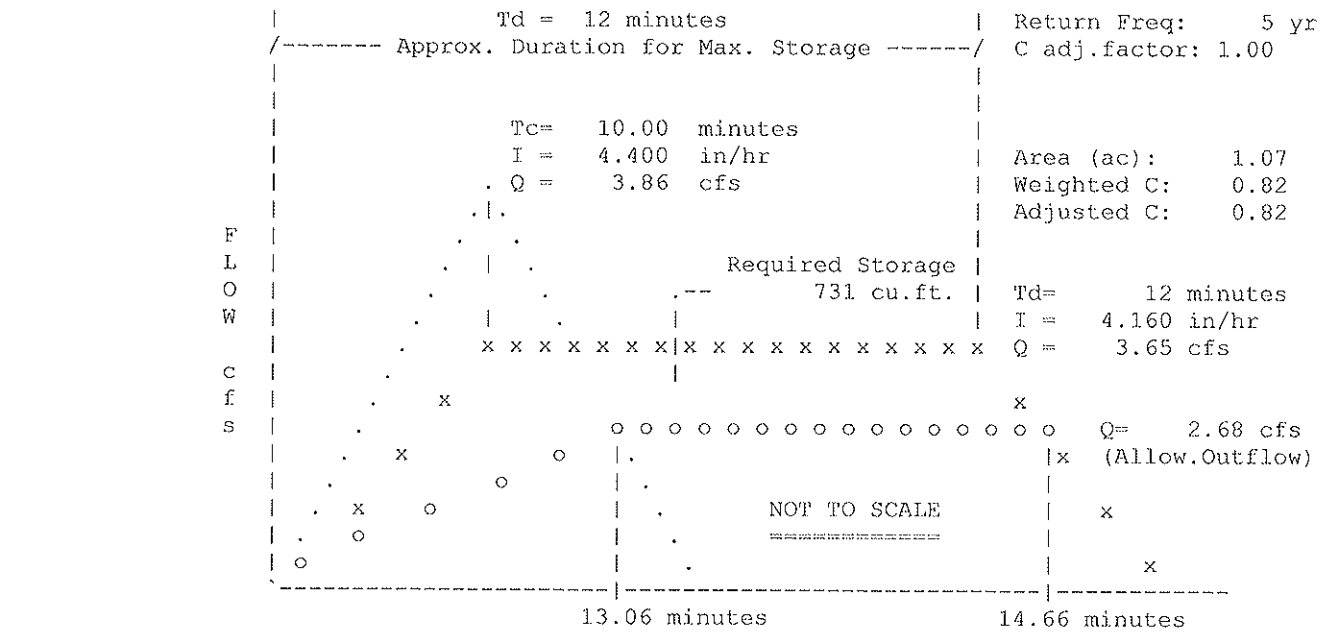
MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 5 yr	Allowable Outflow: 2.68 cfs
'C' Adjustment: 1.000	Required Storage: 731 cu.ft.
Peak Inflow: 3.65 cfs	Inflow .HYD stored: NONE STORED



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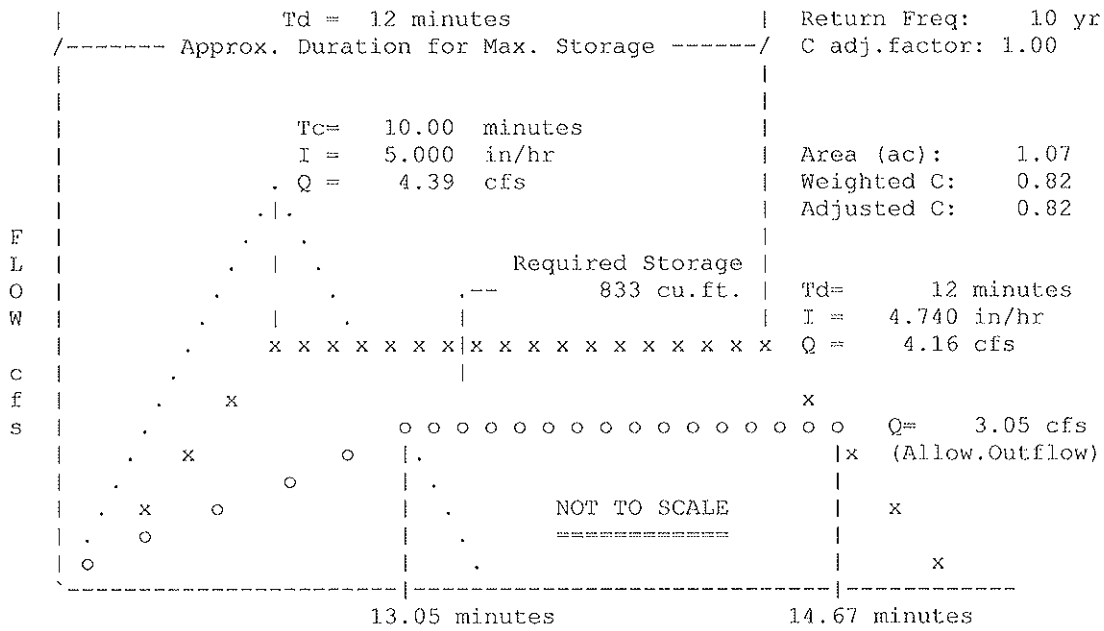
MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 10 yr	Allowable Outflow: 3.05 cfs
'C' Adjustment: 1.000	Required Storage: 833 cu.ft.
Peak Inflow: 4.16 cfs	Inflow .HYD stored: NONE STORED



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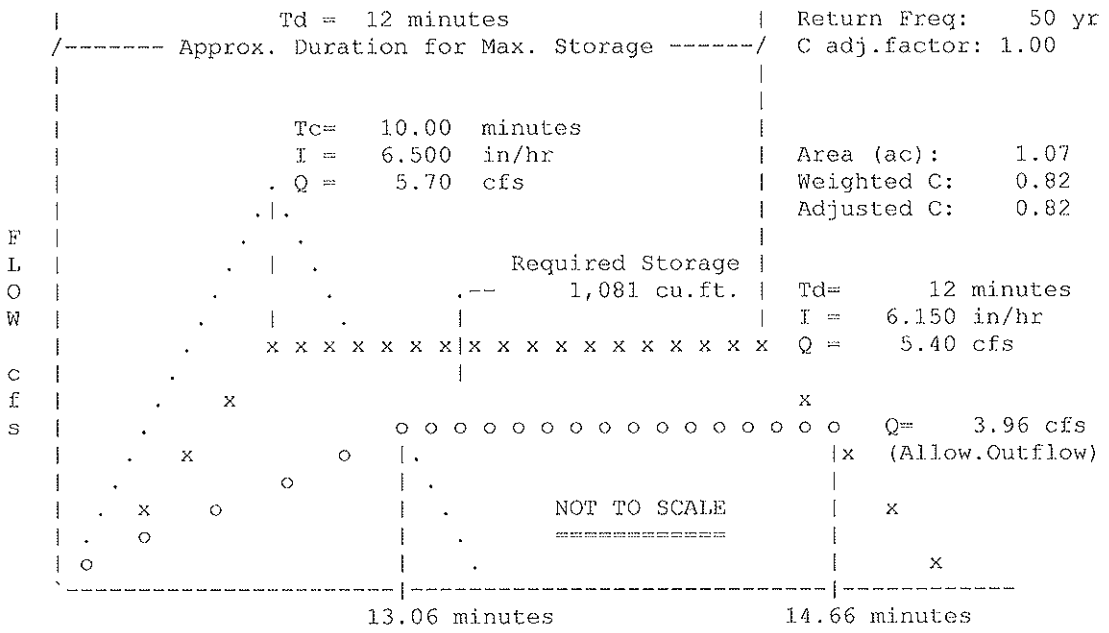
MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 50 yr	Allowable Outflow: 3.96 cfs
'C' Adjustment: 1.000	Required Storage: 1,081 cu.ft.
Peak Inflow: 5.40 cfs	Inflow .HYD stored: NONE STORED



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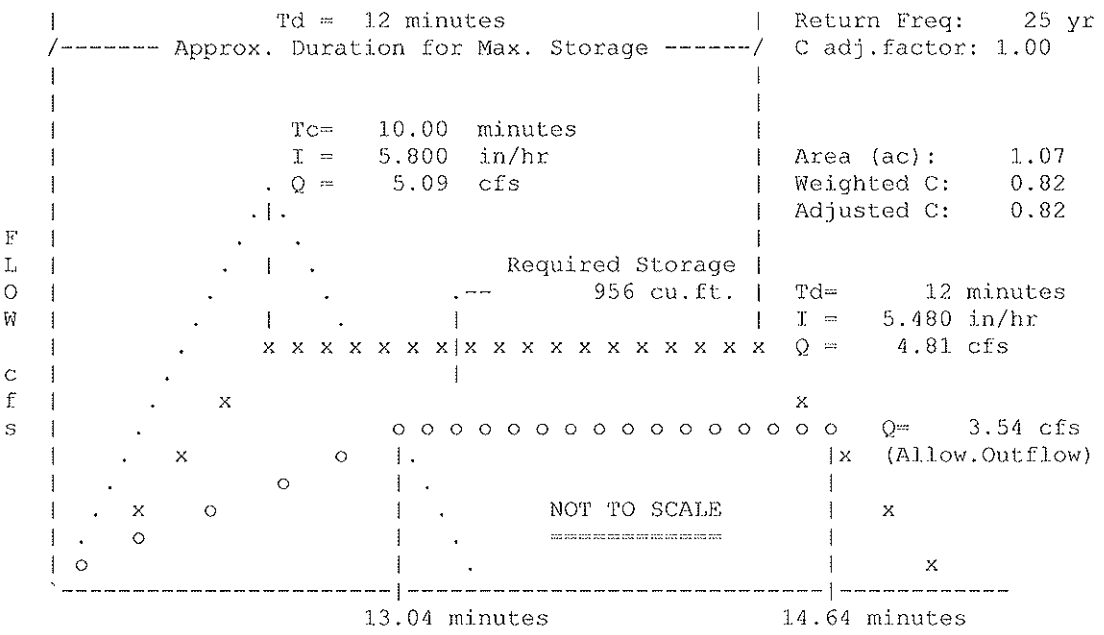
Executed: 15:17:58 09-29-2016

MODIFIED RATIONAL METHOD
----- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 25 yr	Allowable Outflow: 3.54 cfs
'C' Adjustment: 1.000	Required Storage: 956 cu.ft.
Peak Inflow: 4.81 cfs	Inflow .HYD stored: NONE STORED



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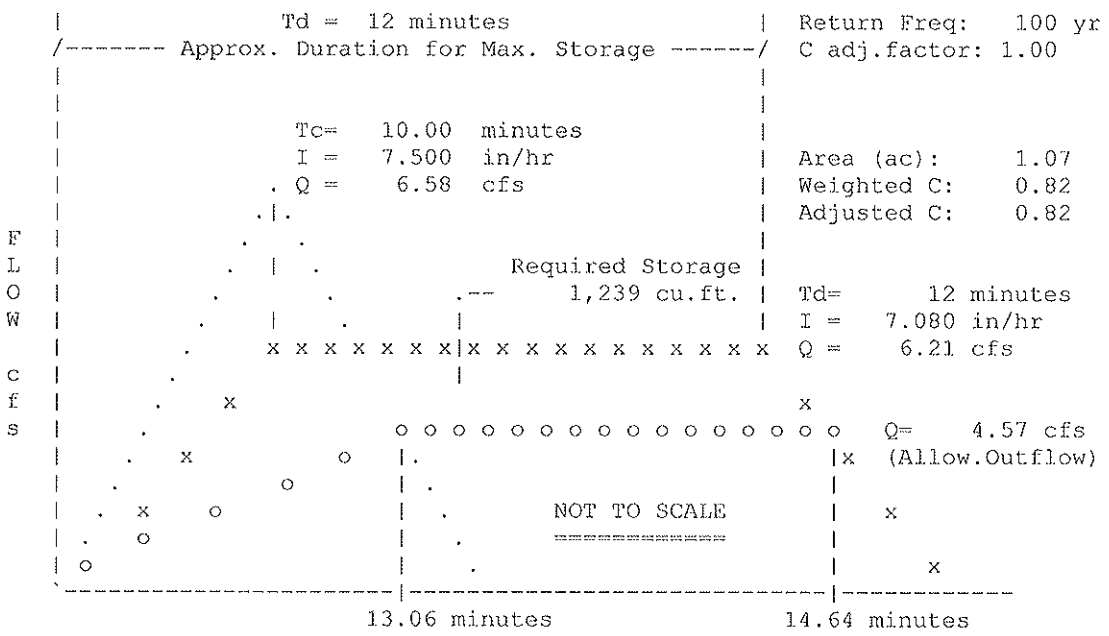
Executed: 15:20:35 09-29-2016

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 100 yr	Allowable Outflow: 4.57 cfs
'C' Adjustment: 1.000	Required Storage: 1,239 cu.ft.
Peak Inflow: 6.21 cfs	Inflow .HYD stored: NONE STORED



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PROPOSED BASIN

**** Modified Rational Hydrograph *****

Weighted C = 0.820 Area= 1.070 acres Tc = 10.00 minutes

Adjusted C = 0.820 Td= 12.00 min. I= 2.66 in/hr Qp= 2.33 cfs

RETURN FREQUENCY: 1 year storm Adj.factor = 1.00
Output file: NONE STORED

HYDROGRAPH FOR MAXIMUM STORAGE
For the 1 Year Storm

Time Minutes	Time increment = 1.00 Minutes Time on left represents time for first Q in each row.						
0.00	0.00	0.23	0.47	0.70	0.93	1.17	1.40
7.00	1.63	1.87	2.10	2.33	2.33	2.33	2.10
14.00	1.87	1.63	1.40	1.17	0.93	0.70	0.47
21.00	0.23	0.00					

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PROPOSED BASIN

**** Modified Rational Hydrograph *****

Weighted C = 0.820 Area= 1.070 acres Tc = 10.00 minutes

Adjusted C = 0.820 Td= 12.00 min. I= 3.32 in/hr Qp= 2.91 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
Output file: NONE STORED

HYDROGRAPH FOR MAXIMUM STORAGE
For the 2 Year Storm

Time increment = 1.00 Minutes
Time on left represents time for first Q in each row.

Time Minutes							
0.00	0.00	0.29	0.58	0.87	1.17	1.46	1.75
7.00	2.04	2.33	2.62	2.91	2.91	2.91	2.62
14.00	2.33	2.04	1.75	1.46	1.17	0.87	0.58
21.00	0.29	0.00					

Quick TR-55 Ver.5.46 S/N:
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PROPOSED BASIN

**** Modified Rational Hydrograph *****
Weighted C = 0.820 Area= 1.070 acres Tc = 10.00 minutes

Adjusted C = 0.820 Td= 12.00 min. I= 4.74 in/hr Qp= 4.16 cfs

RETURN FREQUENCY: 10 year storm Adj.factor = 1.00
Output file: NONE STORED

HYDROGRAPH FOR MAXIMUM STORAGE
For the 10 Year Storm

Time increment = 1.00 Minutes
Time on left represents time for first Q in each row.

Time Minutes							
0.00	0.00	0.42	0.83	1.25	1.66	2.08	2.50
7.00	2.91	3.33	3.74	4.16	4.16	4.16	3.74
14.00	3.33	2.91	2.50	2.08	1.66	1.25	0.83
21.00	0.42	0.00					

Quick TR-55 Ver.5.46 S/N:
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PROPOSED BASIN

**** Modified Rational Hydrograph *****

Weighted C = 0.820 Area= 1.070 acres Tc = 10.00 minutes

Adjusted C = 0.820 Td= 12.00 min. I= 7.08 in/hr Qp= 6.21 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.00
Output file: NONE STORED

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

Time increment = 1.00 Minutes
Time on left represents time for first Q in each row.

Time Minutes							
0.00	0.00	0.62	1.24	1.86	2.48	3.11	3.73
7.00	4.35	4.97	5.59	6.21	6.21	6.21	5.59
14.00	4.97	4.35	3.73	3.11	2.48	1.86	1.24
21.00	0.62	0.00					

Quick TR-55 Ver.5.46 S/N:
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PROPOSED BASIN

**** Modified Rational Hydrograph *****

Weighted C = 0.820 Area= 1.070 acres Tc = 10.00 minutes

Adjusted C = 0.820 Td= 12.00 min. I= 6.15 in/hr Qp= 5.40 cfs

RETURN FREQUENCY: 50 year storm Adj.factor = 1.00
Output file: NONE STORED

HYDROGRAPH FOR MAXIMUM STORAGE
For the 50 Year Storm

Time Minutes	Time increment = 1.00 Minutes Time on left represents time for first Q in each row.						
0.00	0.00	0.54	1.08	1.62	2.16	2.70	3.24
7.00	3.78	4.32	4.86	5.40	5.40	5.40	4.86
14.00	4.32	3.78	3.24	2.70	2.16	1.62	1.08
21.00	0.54	0.00					

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

PROPOSED BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 1 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
PROPOSED	0.820	1.07						
			10.00	0.820	0.820	2.800	1.07	2.46

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

PROPOSED BASIN

**** Modified Rational Hydrograph *****
Weighted C = 0.820 Area= 1.070 acres Tc = 10.00 minutes

Adjusted C = 0.820 Td= 12.00 min. I= 4.16 in/hr Qp= 3.65 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Output file: NONE STORED

HYDROGRAPH FOR MAXIMUM STORAGE
For the 5 Year Storm

Time Minutes	Time increment = 1.00 Minutes Time on left represents time for first Q in each row.						
0.00	0.00	0.36	0.73	1.09	1.46	1.82	2.19
7.00	2.55	2.92	3.28	3.65	3.65	3.65	3.28
14.00	2.92	2.55	2.19	1.82	1.46	1.09	0.73
21.00	0.36	0.00					

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

PROPOSED BASIN

**** Modified Rational Hydrograph *****

Weighted C = 0.820 Area= 1.070 acres Tc = 10.00 minutes

Adjusted C = 0.820 Td= 12.00 min. I= 5.48 in/hr Qp= 4.81 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.00
Output file: NONE STORED

HYDROGRAPH FOR MAXIMUM STORAGE
For the 25 Year Storm

Time Minutes	Time increment = 1.00 Minutes Time on left represents time for first Q in each row.						
0.00	0.00	0.48	0.96	1.44	1.92	2.40	2.88
7.00	3.37	3.85	4.33	4.81	4.81	4.81	4.33
14.00	3.85	3.37	2.88	2.40	1.92	1.44	0.96
21.00	0.48	0.00					

Quick TR-55 Ver.5.46 S/N:
Executed: 15:19:24 09-29-2016

EXISTING BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

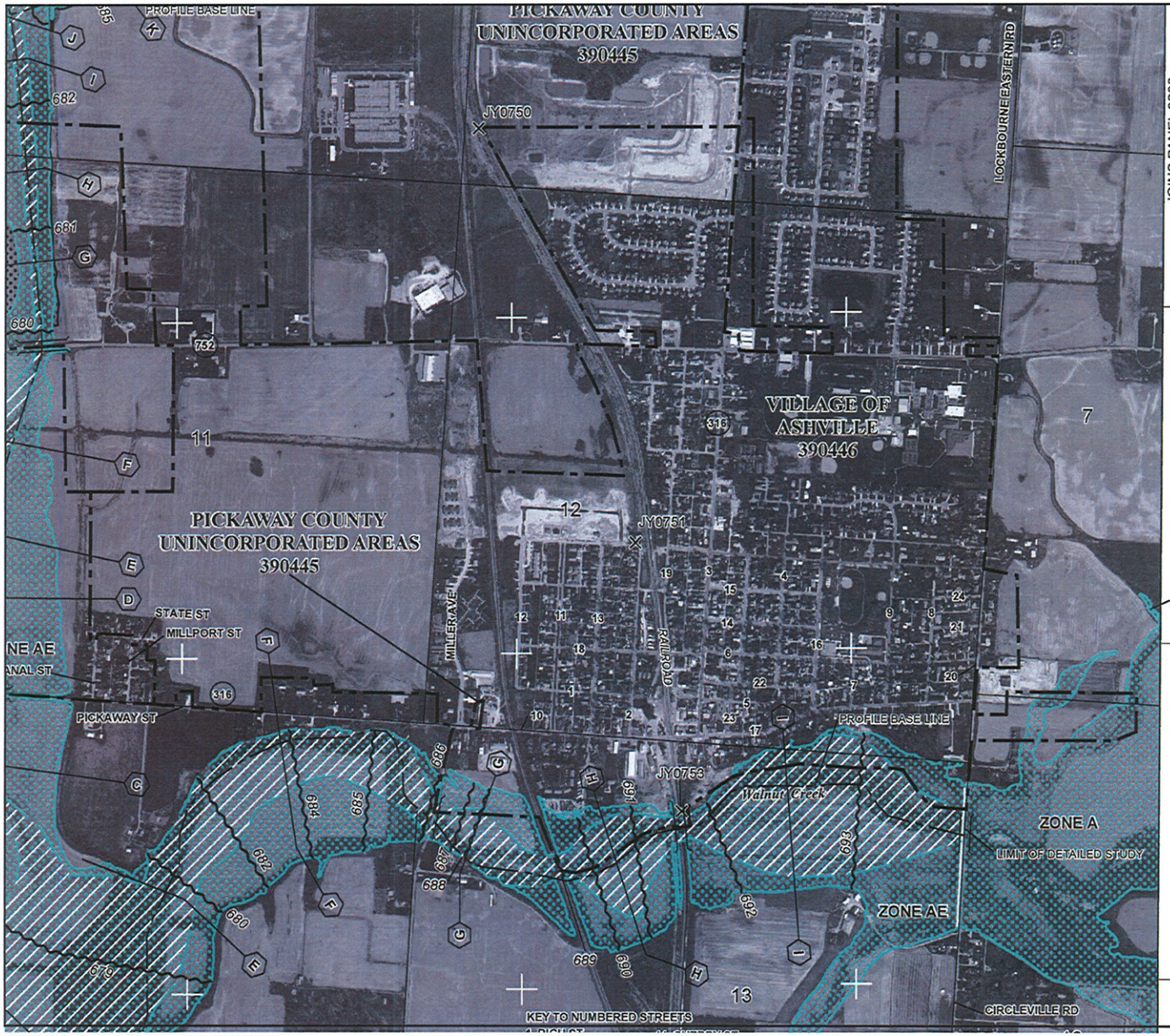
Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
EXISTING	0.570	1.07						
			10.00	0.570	0.570	7.500	1.07	4.57

APPENDIX A

REGIONAL
DRAINAGE CRITERIA



MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0180J

FIRM

FLOOD INSURANCE RATE MAP

PICKAWAY COUNTY, OHIO AND INCORPORATED AREAS

PANEL 180 OF 450

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ASHVILLE, VILLAGE OF	390446	0180	J
PICKAWAY COUNTY	390445	0180	J
SOUTH BLOOMFIELD, VILLAGE OF	390449	0180	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
39129C0180J

MAP REVISED
JULY 22, 2010

Federal Emergency Management Agency

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

PROPOSED BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
PROPOSED	0.820	1.07						
			10.00	0.820	0.820	4.400	1.07	3.86

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

PROPOSED BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
PROPOSED	0.820	1.07						
			10.00	0.820	0.820	5.000	1.07	4.39

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

PROPOSED BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
PROPOSED	0.820	1.07						
			10.00	0.820	0.820	5.800	1.07	5.09

Quick TR-55 Ver.5.46 S/N:
Executed: 15:20:35 09-29-2016

PROPOSED BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 50 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
PROPOSED	0.820	1.07						
			10.00	0.820	0.820	6.500	1.07	5.70

APPENDIX C

DETENTION BASIN CALCULATIONS

Quick TR-55 Ver.5.46 S/N:
Executed: 15:20:35 09-29-2016

PROPOSED BASIN

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
PROPOSED	0.820	1.07						
			10.00	0.820	0.820	7.500	1.07	6.58

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

MODIFIED RATIONAL METHOD
---- Grand Summary For All Storm Frequencies ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

Area = 1.07 acres Tc = 10.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
1	0.820	12	2.660	2.33	1.71	1,680	468
2	0.820	12	3.320	2.91	2.13	2,097	588
5	0.820	12	4.160	3.65	2.68	2,628	731
10	0.820	12	4.740	4.16	3.05	2,994	833
25	0.820	12	5.480	4.81	3.54	3,462	956

Quick TR-55 Ver.5.46 S/N:
Executed: 15:20:35 09-29-2016

****
****
* *
* *
* MODIFIED RATIONAL METHOD *
* ---- Grand Summary For All Storm Frequencies ---- *
* *
* *
****
****

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

Area = 1.07 acres Tc = 10.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
50	0.820	12	6.150	5.40	3.96	3,885	1,081
100	0.820	12	7.080	6.21	4.57	4,473	1,239

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 1 yr `C' Adjustment = 1.000 Allowable Q = 1.71 cfs

Hydrograph file: NONE STORED Tc = 10.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	VOLUMES Storage (cu.ft.)
0.820	0.820	10	2.800	1.07	2.46	1,474	448
**********	**********	**********	**********	**********	**********	Storage Maximum	
0.820	0.820	12	2.660	1.07	2.33	1,680	468
**********	**********	**********	**********	**********	**********	**********	**********
0.820	0.820	15	2.450	1.07	2.15	1,935	447
0.820	0.820	20	2.100	1.07	1.84	2,211	278
0.820	0.820	30	1.700	1.07	1.49	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 2 yr `C' Adjustment = 1.000 Allowable Q = 2.13 cfs

Hydrograph file: NONE STORED Tc = 10.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.820	0.820	10	3.500	1.07	3.07	1,843	565
0.820	0.820	12	3.320	1.07	2.91	2,097	588
0.820	0.820	15	3.050	1.07	2.68	2,408	557
0.820	0.820	20	2.600	1.07	2.28	2,737	335
0.820	0.820	30	2.050	1.07	1.80	Qpeak < Qallow	

********** Storage Maximum **********

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 5 yr `C' Adjustment = 1.000 Allowable Q = 2.68 cfs

Hydrograph file: NONE STORED Tc = 10.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.820	0.820	10	4.400	1.07	3.86	2,316	708
**********							Storage Maximum
0.820	0.820	12	4.160	1.07	3.65	2,628	731
0.820	0.820	15	3.800	1.07	3.33	3,001	677
0.820	0.820	20	3.200	1.07	2.81	3,369	363
0.820	0.820	30	2.600	1.07	2.28	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 10 yr `C' Adjustment = 1.000 Allowable Q = 3.05 cfs

Hydrograph file: NONE STORED Tc = 10.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.820	0.820	10	5.000	1.07	4.39	2,632	802
0.820	0.820	12	4.740	1.07	4.16	2,994	833
0.820	0.820	15	4.350	1.07	3.82	3,435	785
0.820	0.820	20	3.700	1.07	3.25	3,896	459
0.820	0.820	30	2.900	1.07	2.54	Qpeak < Qallow	

********** Storage Maximum **********

Quick TR-55 Ver.5.46 S/N:
Executed: 15:17:58 09-29-2016

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 25 yr `C' Adjustment = 1.000 Allowable Q = 3.54 cfs

Hydrograph file: NONE STORED Tc = 10.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.820	0.820	10	5.800	1.07	5.09	3,053	929
0.820	0.820	12	5.480	1.07	4.81	3,462	956
0.820	0.820	15	5.000	1.07	4.39	3,948	881
0.820	0.820	20	4.200	1.07	3.69	4,422	456
0.820	0.820	30	3.400	1.07	2.98	Qpeak < Qallow	

********** Storage Maximum

Quick TR-55 Ver.5.46 S/N:
Executed: 15:20:35 09-29-2016

MODIFIED RATIONAL METHOD
----- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 50 yr `C' Adjustment = 1.000 Allowable Q = 3.96 cfs

Hydrograph file: NONE STORED Tc = 10.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.820	0.820	10	6.500	1.07	5.70	3,422	1,046
**********						Storage Maximum	
0.820	0.820	12	6.150	1.07	5.40	3,885	1,081
**********							
0.820	0.820	15	5.625	1.07	4.94	4,442	1,006
0.820	0.820	20	4.750	1.07	4.17	5,001	553
0.820	0.820	30	3.750	1.07	3.29	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 15:20:35 09-29-2016

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

PROPOSED BASIN

RETURN FREQUENCY: 100 yr `C' Adjustment = 1.000 Allowable Q = 4.57 cfs

Hydrograph file: NONE STORED Tc = 10.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.820	0.820	10	7.500	1.07	6.58	3,948	1,206
**********						Storage Maximum	
0.820	0.820	12	7.080	1.07	6.21	4,473	1,239
**********							
0.820	0.820	15	6.450	1.07	5.66	5,093	1,135
0.820	0.820	20	5.400	1.07	4.74	5,686	572
0.820	0.820	30	4.300	1.07	3.77	Qpeak < Qallow	

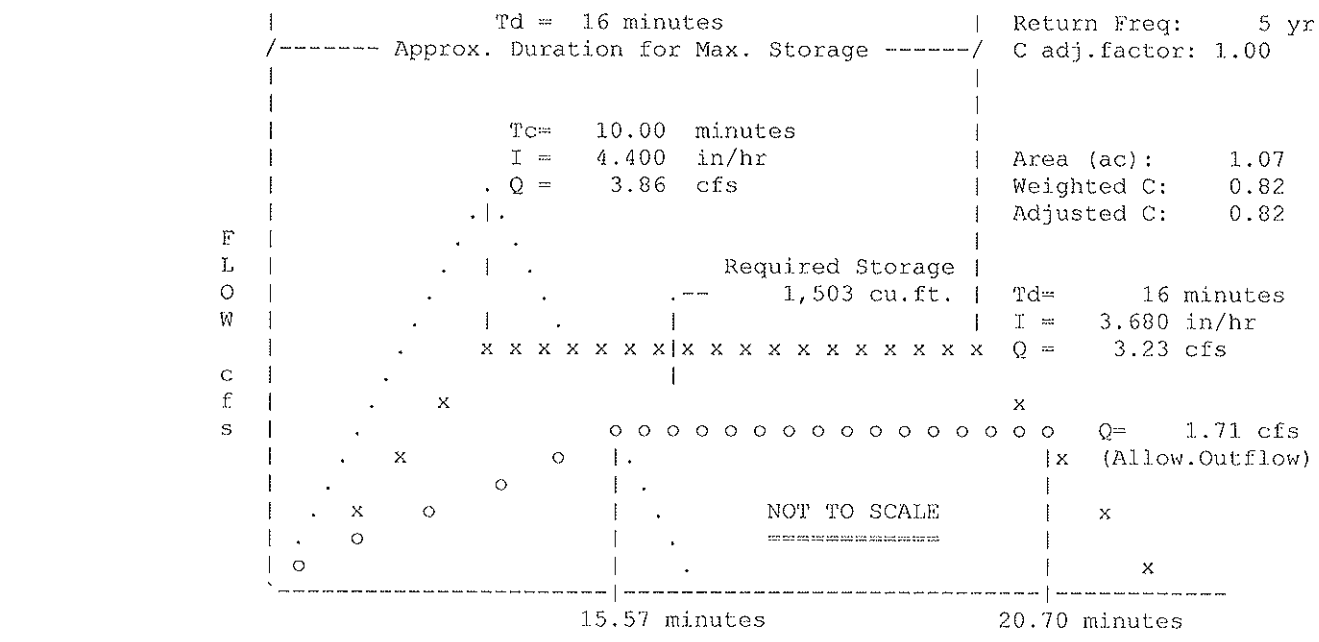
Quick TR-55 Ver.5.46 S/N:
Executed: 16:26:45 09-29-2016

MODIFIED RATIONAL METHOD
----- Graphical Summary for Maximum Required Storage -----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

CRITICAL STORM

```
**************************************************************************
*  RETURN FREQUENCY:   5 yr     |  Allowable Outflow:     1.71 cfs     *
*  'C' Adjustment: 1.000        |  Required Storage:     1,503 cu.ft. *
*-------------------------------------------------------------------------*
*  Peak Inflow:    3.23 cfs        Inflow .HYD stored: NONE STORED     *
**************************************************************************
```



Quick TR-55 Ver.5.46 S/N:
Executed: 16:26:45 09-29-2016

CRITICAL STORM

**** Modified Rational Hydrograph *****
Weighted C = 0.820 Area= 1.070 acres Tc = 10.00 minutes

Adjusted C = 0.820 Td= 16.00 min. I= 3.68 in/hr Qp= 3.23 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Output file: NONE STORED

HYDROGRAPH FOR MAXIMUM STORAGE
For the 5 Year Storm

Time Minutes	Time increment = 1.00 Minutes Time on left represents time for first Q in each row.						
0.00	0.00	0.32	0.65	0.97	1.29	1.61	1.94
7.00	2.26	2.58	2.91	3.23	3.23	3.23	3.23
14.00	3.23	3.23	3.23	2.91	2.58	2.26	1.94
21.00	1.61	1.29	0.97	0.65	0.32	0.00	

Quick TR-55 Ver.5.46 S/N:
Executed: 16:26:45 09-29-2016

CRITICAL STORM

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
CRITICAL	0.820	1.07						
			10.00	0.820	0.820	4.400	1.07	3.86

Quick TR-55 Ver.5.46 S/N:
Executed: 16:26:45 09-29-2016

MODIFIED RATIONAL METHOD

----- Grand Summary For All Storm Frequencies -----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

CRITICAL STORM

Area = 1.07 acres Tc = 10.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
5	0.820	16	3.680	3.23	1.71	3,100	1,503