BERTIN ENGINEERING
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JOB	22-147: Jersey City, NJ		
SHEET NO.	1	OF	4
CALCULATED BY	MBL	DATE	3/23/2022
CHECKED BY	EMH	DATE	3/23/2022
SCALE			

STORMWATER DRAINAGE CALCULATIONS

PROPOSED 3-FAMILY BUILDING
BLOCK 4601, LOT 17
221 LIBERTY AVENUE
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

BE# 22-147

MARCH 23, 2022

Eric M. Hough, NJPE Lic#51893

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1. DETERMINE THE CHANGE IN SURFACE RUNOFF DUE TO THE PROPOSED CONSTRUCTION:

The total size of the proposed disturbed area on-site is 0.081 acres. The development will increase the amount of impervious area. The resulting increase in runoff will be handled by a dry well.

The limit of disturbance of the project is less than 1 acre and will not increase impervious surfaces by more than 1/4 acre. As a result, the project is not a "Major Development" as defined by NJAC 7:8 and therefore not required to meet the groundwater recharge, water quality and water quantity requirements. The site has been designed to have the proposed runoff peak rates for the 2-, 10- & 100-year storm events equal or less than the existing runoff peak rates.

I) Determine Rainfall Intensity (I) for 2, 10 & 100 Year Storms:

1. For exisiting conditions: T_c = 10 mins
   For proposed conditions: T_c = 10 mins

2. Calculate I_2, I_{10} & I_{100}: (Based on Trenton Rainfall Database)

For T_c = 10.0 mins

I_2 = 4.3 in/hr
I_{10} = 5.9 in/hr
I_{100} = 8.0 in/hr

II) Use Rational Formula to Determine Flow for Existing Conditions:

Q = c x I x A where Q = Flow (cfs), c = Runoff Coefficient, I = Rainfall Intensity (in/hr)

use c = 0.35 for Pervious Areas
0.95 for Impervious Areas

Total area = 3,533 sf = **0.081 ac**
Impervious = 2,574 sf = **0.059 ac**
Pervious = 959 sf = **0.022 ac**

$$c = \frac{0.30 \times 0.022 + 0.95 \times 0.059}{0.081} = \mathbf{0.79}$$

Q_2 = 0.79 x 4.3 x 0.081 = **0.28 cfs**
Q_{10} = 0.79 x 5.9 x 0.081 = **0.38 cfs**
Q_{100} = 0.79 x 8.0 x 0.081 = **0.51 cfs**

III) Use Rational Formula to Determine Flow for Proposed Conditions:

Total area = 3,533 sf = **0.081 ac**
Impervious = 3,421 sf = **0.079 ac**
Pervious = 112 sf = **0.003 ac**

$$c = \frac{0.30 \times 0.003 + 0.95 \times 0.079}{0.081} = \mathbf{0.94}$$

Q_2 = 0.94 x 4.3 x 0.081 = **0.33 cfs**
Q_{10} = 0.94 x 5.9 x 0.081 = **0.45 cfs**
Q_{100} = 0.94 x 8.0 x 0.081 = **0.61 cfs**

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STORM (year)	EXISTING (cfs)	PROPOSED (cfs)	CHANGE (cfs)
2	0.28	0.33	0.05
10	0.38	0.45	0.07
100	0.51	0.61	0.10

IV) Conclusion:

The calculations indicate that the proposed site redevelopment increases the surface runoff for the three storms. Runoff due to a 2, 10 & 100-year storm are increased by 0.05, 0.07 & 0.10 cfs respectively. The proposed roof area will be captured and infiltrated to reduce the proposed runoff rates to below existing.

2. DRY WELL DESIGN

The dry well is designed for a 10-year storm of 60 minute duration with an intensity of 2 in/hr. One dry well is proposed to collect a portion of the roof runoff from the proposed dwelling.

I) Determine Collected Area:

Total Roof Area = 2,275 sf = **0.052 ac** (Roof Area, All Impervious)
Collected Roof Area = 1,706 sf = **0.039 ac** (Roof Area, All Impervious)

c = **0.95**

The dry well will hold the entire 10 year runoff.

II) Calculate Q_{100} for Drainage Area:

Q_{100} = 0.95 x 2.0 x 0.039 = 0.07 cfs

III) Calculate Rainfall Amount to be stored by Dry Well:

Volume = $Q \times T_d$ = 0.07 cfs x 60 min x 60 secs/min = 252.0 cf

IV) Determine Dry Well Sizing:

Volume of Dry Well: $V_d = (\pi/4) \times 7.33^2 \times 4$ = 168.8 cf
Volume of Void in Stone: $V_v = 0.4\ [(10 \times 10 \times 5) - (\pi/4) \times 8^2 \times 4)]$ = 119.6 cf
(assume void coeff. = 0.4)

Total Volume Stored: $V_d + V_v$ = **288.4 cf**
288.4 cf > 252.0 cf

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3. DETERMINE THE CHANGE IN SURFACE RUNOFF FOR THE REDUCED PROPOSED DRAINAGE AREA:

Existing runoff should be compared to the runoff generated by the uncollected portion of the proposed drainage area.

Total area = 1,827 sf = **0.042 ac (Reduced Drainage Area)**
Impervious = 1,715 sf = **0.039 ac**
Pervious = 112 sf = **0.003 ac**

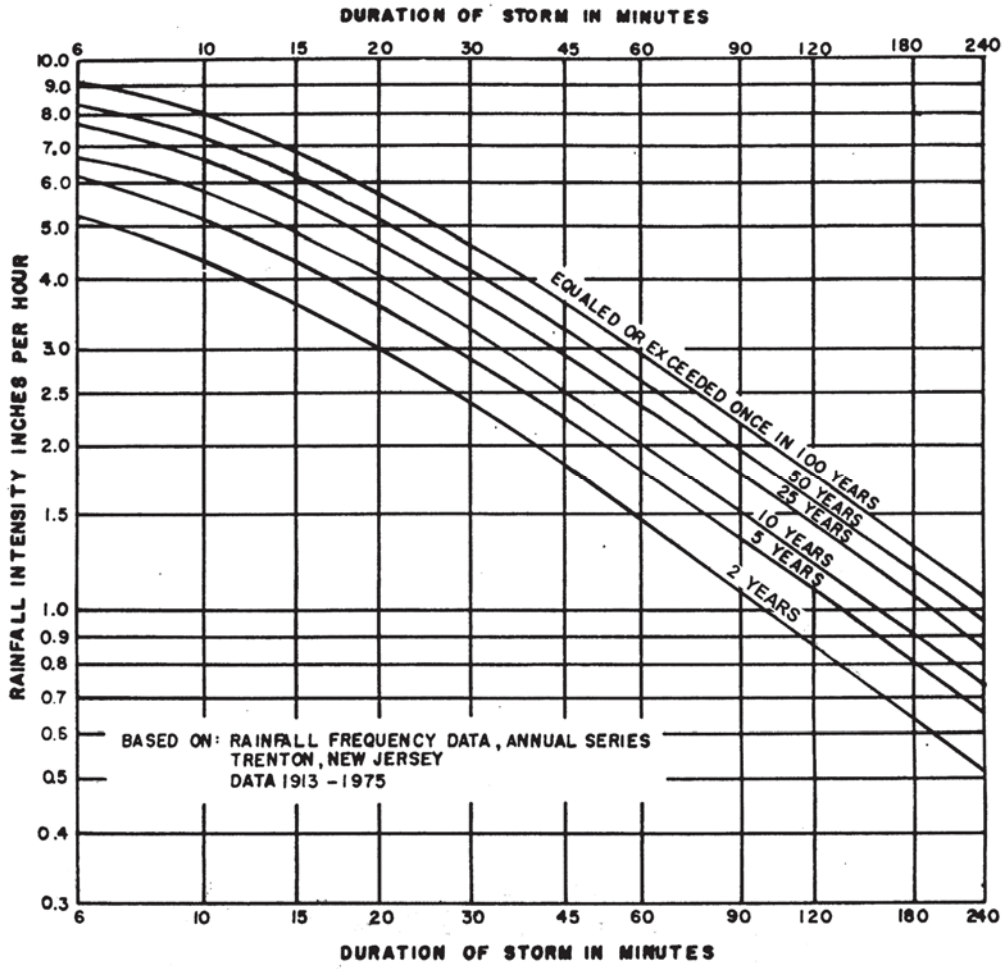
$$c = \frac{0.30 \times 0.003 + 0.95 \times 0.039}{0.042} = \mathbf{0.91}$$

Q_2 = 0.91 x 4.3 x 0.042 = **0.16 cfs**
Q_{10} = 0.91 x 5.9 x 0.042 = **0.23 cfs**
Q_{100} = 0.91 x 8.0 x 0.042 = **0.31 cfs**

STORM (year)	EXISTING (cfs)	PROPOSED (cfs)	CHANGE (cfs)	% Exist.
2	0.28	0.16	-0.11	59.7%
10	0.38	0.23	-0.15	59.7%
100	0.51	0.31	-0.21	59.7%

The calculations indicate that the proposed site redevelopment with infilration decreases the surface runoff for the three storms. Runoff due to a 2, 10 & 100-year storm are decreased by 0.11, 0.15 & 0.21 cfs respectively. Since the project is not a Major Development, no additional reductions are required.

Figure 5-4: Rainfall Intensity-Duration-Frequency Curves



Note: Adapted from Figure 2.1-2 in the NJDEP *Technical Manual for Stream Encroachment Permits*.