HYDRAULIC ANALYSIS AND STORMWATER DESIGN CALCULATIONS

Prepared for
80 South William Street
Subdivision
Pearl River, NY 10965
68.20-2-76
HAMLET OF PEARL RIVER
TOWN OF ORANGETOWN
ROCKLAND COUNTY, NEW YORK

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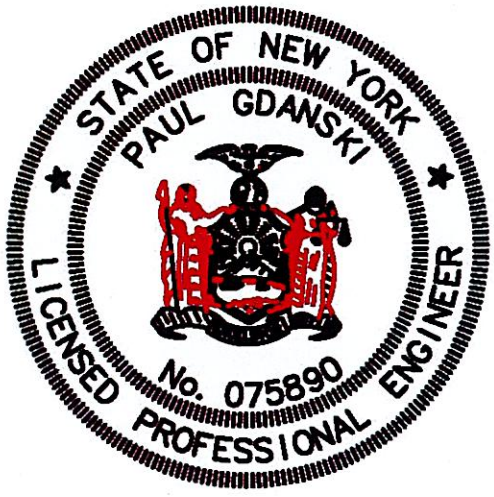

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Project Location

The subject site, a 0.82 acre (35,643.39 SF) parcel, located at 80 South William Street, on the eastern side, at the intersection with Jefferson Avenue, in the Hamlet of Pearl River, Town of Orangetown, Rockland County, New York.

Pre-Development Conditions

The existing parcel is flat to gently sloped from northwest to southeast. All of the site drains gradually towards the southeast corner of the property as overland flow. The area to be disturbed is currently comprised of existing structures and grass.

Project Type

This proposed project is to subdivide the existing parcel into two lots, each with a single-family dwelling and necessary infrastructure. The designer is required to provide water quantity volume mitigation as a result of additional impervious surface area above the total area existing at the site. The type of facility or practice chosen to provide mitigation are drywells.

Project Scope

The project involves the construction of two single-family dwellings. The site was analyzed in its entirety, rather than each individual lot. The disturbed area is comprised of existing structures and grassy areas. The total proposed impervious area within the drainage area will be 7,931 SF; with 5,839 SF of impervious surfaces currently existing within this area. Portions of South William Street are within the drainage area, however this impervious area will obviously remain unchanged. The overall increase in impervious surfaces requiring mitigation is therefore 2,092 SF. To account for this increase in impervious surfaces we are proposing one (1) drywell on each lot, as demonstrated in the subsequent calculations.

Soils

The USDA/NRCS soil survey for Rockland County shows the soils in the Project Site are Wethersfield Urban Land Complex (WuB) soils. These soils are of the Hydrologic Soil Group C. Infiltration testing and depth to groundwater will be conducted at the location of the proposed facilities.

Hydraulic and Hydrologic Analyses

The program utilized for quantifying stormwater runoff rates and volumes was TR-55 and the Westchester Method. The 100-year frequency rainfall was analyzed.

- Hydrologic/hydraulic analysis for all structural components of the stormwater control system for the applicable design storms.
- Comparison of post-development stormwater runoff conditions with predevelopment conditions.
- Dimensions, material specifications and installation details for each post-construction stormwater control practice.

Based on the calculations shown within the appendix, sufficient storage has been provided assuming an infiltration rate of at least 1":30 minutes. Actual infiltration rates will be determined in the field and this report will be updated accordingly. Drywells are proposed.

Drainage Calculations:

Infiltration Rate = 1":30 min

Use drywell, surrounded by 2 foot of stone (11 ft square envelope as shown on plan).

Volume within drywell (V_w):

D_i = 6 ft D_o = 7 ft d=6 ft $V_w = \pi * D_i^2/4 * 6\ ft = 169.6\ ft^3$

$V_w = 169.6\ ft^3$

Volume within stone:

V = rectangular envelope – drywell space =

Drywell space = $\pi * D_o^2/4 * 6\ ft = 230.9\ ft^3$

Rectangular stone envelope = Length x width x height = 11 ft x 11 ft x 7 ft = $847.0\ ft^3$

$V = 847.0\ ft^3 - 230.9\ ft^3 = 616.1\ ft^3$

Void Coefficient = 0.4

$V_{st} = 246.4\ ft^3$

Soil Infiltration Calculations:

Area of Percolation (A_p):

d = 1 ft, r = 0.5 ft

Surface Area of Cylinder (A_c) = π x d x h_{avg} = 3.14159 x 1 ft x 8.5 in/12 in/ft = $2.23\ ft^2$

Bottom Area = $A_b = \pi \times r^2 = 0.785\ ft^2$

$A_p = A_c + A_b = 2.23 + 0.785 = 3.01\ ft^2$

Volume of Percolation (V_p):

$V_p = A_b \times h = 0.785 \times 1$ in/12 in/ft = $0.0654\ ft^3$

Soil Percolation Rate = $S_r = V_p$/area/time

Field Infiltration = 1":30 min

$S_r = 0.0654\ ft^3 / 3.01\ ft^2 / 30$ min

$S_r = .00072\ ft^3/ft^2/min = .00072$ ft / min x 60 min/hr x 24 hr/day = $1.04\ ft^3/ft^2/day$

Use Clogging Factor of 25%

25% x 1.04 = $0.26\ ft^3/ft^2/day$

$S_r = 1.04 - 0.26 = 0.78\ ft^3/ft^2/day$

V_p = Surface Area x S_r = $121.00\ ft^2 \times 0.78\ ft^3/ft^2/day$

$V_p = 94.4\ ft^3$/day per drywell

Overall 24 hour volume per drywell (V_t):

$V_t = V_w + V_{st} + V_p = 169.6 + 246.4 + 94.4 = 510.4\ ft^3$

Required Storage Calculations:

Soils: Wethersfield Urban Land Complex WuB Hydrologic Group "C"

Drainage Area:

Drainage Area = DA = $39{,}865.3\ ft^2$

Drywell Area:

Undeveloped CN: Impervious Surface = $5{,}839\ ft^2$ @ CN of 98

Good Grass = $34{,}026.3\ ft^2$ @ CN of 74

Weighted CN = 77.5 (77)

Developed CN: Impervious Surface = 7,931 ft^2 @ CN of 98
Good Grass = 31,934.3 ft^2 @ CN of 74
Weighted CN = 78.77 (79)

100-year rainfall = 9.07 inches
From Table 2-1 of TR-55:
Initial Runoff = Q_i = 6.26 inches
Proposed Runoff = Q_p = 6.51 inches
Q = 6.51 in – 6.26 in = 0.25 inches

Storage Required = V_s = 0.25 in x (1 ft/12 in) x 39,865.3 ft^2 = 830.5 ft^3
Drywells Required = V_s / V_t = 830.5 ft^3/ 510.4 ft^3 = 1.63 drywells
Therefore, provide two (2) drywells, 6 ft inner diameter, 6 ft deep

Required Storage Volume Summary:
830.5 ft^3 required **1,020.8 ft^3 provided** **therefore OK**

The volume provided within a two-drywell system is greater than the storage volume required.

The impervious surface area of the proposed driveways is 2,447 square feet (1,044 SF for lot 1 and 1,403 SF for lot 2). We propose to provide one drywell on each lot to mitigate the increase in impervious surface at the site.

100-Year Rainfall=9.07 inches
Q_i=5.89 inches
Q_p=8.83 inches
Q=8.83 in – 5.89 in = 2.94 inches
V_s = 2.94 in x (1 ft/12 in) x 1,044 f^2 = 255.8 ft^3
V_s / V_t = 255.8 ft^3 / 510.4 ft^3 = 0.50 drywells
Therefore, one (1) drywell is sized appropriately for the driveway on lot 1.

100-Year Rainfall=9.07 inches
Q_i=5.89 inches
Q_p=8.83 inches
Q=8.83 in – 5.89 in = 2.94 inches
V_s = 2.94 in x (1 ft/12 in) x 1,403 f^2 = 343.7 ft^3
V_s / V_t = 343.7 ft^3 / 510.4 ft^3 = 0.67 drywells
Therefore, one (1) drywell is sized appropriately for the driveway on lot 1.