Stormwater Management Calculations

for

Lots 9 & 10, Block 236,

Dennis Township, Cape May County, New Jersey

September 12, 2023

Prepared by:

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DESCRIPTION

The project site sits within Lots 9 and 10, Block 236 in the Township of Dennis, which has an area of approximately 0.596 acres. There are no wetlands present on the parcel, or the portion of the parcel where the improvements will be constructed.

Lot 9 currently consists of a 1 story, 1 family frame residence with a concrete driveway that transitions to asphalt near the side of the residence. Short grass is the predominant ground cover over much of the parcel, and the northwest and southwest boundaries of the property are wooded. An adjacent 1 story, 1 family dwelling is located on Lot 10, which shares a driveway with the dwelling on Lot 9. Aside from a concrete sidewalk and step/landing in front on the dwelling on Lot 9, ground cover consists primarily of short grass. The west corner of the lot is wooded, as is the northwest boundary. The shared driveway to both residences provides access to US Route 9.

The total area considered for the drainage design included 0.36 acres, which included only the approximate area that is due to have improvements constructed as part of this project. The pre-construction condition of the site consists of concrete/asphalt (Curve Number = 98 and area of 0.0655 acres), short grass (Curve Number = 61 and area of 0.2528 acres), and dense underbrush/woods (Curve Number = 55 and area of 0.0417 acres). The post-construction condition of the site consists of concrete/asphalt (Curve Number = 98 and area of 0.0779 acres), short grass (Curve Number = 61 and area of 0.2330 acres), dense underbrush/woods (Curve Number = 55 and area of 0.0417 acres), and stone/gravel (Curve Number = 85 and area of 0.0074 acres). Because runoff is marginally increased in this area due to the increased impervious area, a 5-foot wide by 2-foot deep stone trench with four 8" diameter perforated pipes is proposed adjacent to the handicap parking space for runoff storage. This design provides enough storage between the void spaces of the stone and the perforated pipe to store runoff from storms of varying durations, up to a 100-year storm, as required.

Stormwater calculations are based on the current version of the New Jersey Stormwater Management Regulations and the New Jersey Best Practices Manual, revised through July 2023. Calculations area also based on the Natural Resources Conservation Service (NRCS) Technical Release 55 – Urban Hydrology for Small Watersheds (TR-55). A summary report is included for the 2, 5, 10, 25, 50, and 100-year storms.

MAINTENANCE PROCEDURES

Maintenance of the stone trench/perforated pipe retention area should be performed on a regular basis. Sand and/or other fine-grained material should not be placed in this area to avoid excessive fouling of the void spaces to retain full storage capacity.

FLOW SUMMARY

EXISTING CONDITION:

STORM	PEAK FLOW, Q (cfs)	VOLUME (cf)
2 YEAR	---	---
5 YEAR	---	---
10 YEAR	---	---
25 YEAR	---	---
50 YEAR	0.001	18
100 YEAR	0.009	235

PROPOSED CONDITION:

STORM	PEAK FLOW, Q (cfs)	VOLUME (cf)
2 YEAR	---	---
5 YEAR	---	---
10 YEAR	---	---
25 YEAR	0.001	7
50 YEAR	0.003	42
100 YEAR	0.011	309

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OCEAN VIEW, NEW JERSEY 08230
(609) 624-1944

JOB: TURNER LAW OFFICE - F3330
SHEET No.: 1 OF 3
CALCULATED BY: RGC DATE: 9/7/23
CHECKED BY: LAS DATE: 9/11/23
SCALE: N/A

PRE-CONSTRUCTION CONDITION:

AREA = 15,704 SF = 0.36 AC

LENGTH = MIN(100', 132.5') = 100'

"n" = 0.015 (SHORT GRASS)

SLOPE = $S = \frac{16.9 - 16.4}{132.5} = 0.38\%$

P_2 = 3.35 IN. (2-YEAR, 24-HOUR STORM)

$T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} S^{0.4}} = \frac{0.007((0.015)(100'))^{0.8}}{(3.35)^{0.5}(0.0038)^{0.4}} = 0.31$ HOURS = 18.6 MINS

$t_{SHEET\ FLOW\ TOTAL}$

SHALLOW CONCENTRATED FLOW TRAVEL TIME: $T_t = \frac{\text{FLOW LENGTH}}{3,600V}$

FLOW LENGTH = 132.5 + 100' = 32.5'

FROM GRAPH ON PAGE 32 OF BMP CHAPTER 5, $V_{SHORT\ GRASS}$ = 0.5 FPS

$T_t = \frac{32.5}{3,600(0.5)} = 0.018$ HRS = 1.08 MINS.

TOTAL TOC: Σ(SHEET FLOW + SHALLOW CONCENTRATED FLOW) = 19.7 MINS.

SOILS ON SITE: DoeA0 - DOWNER SANDY LOAM, 0 TO 2% SLOPES - (SOIL GROUP B)
EveB - EVESBORO SAND, 0 TO 5% SLOPES

ASSUME SOIL GROUP FOR SITE IS "B"

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JOB: TURNER LAW OFFICE - 13330
SHEET No.: 2 OF 3
CALCULATED BY: RGC3 DATE: 9/7/23
CHECKED BY: LAS DATE: 9/11/23
SCALE: N/A

CN CALCULATIONS:

	AREA (AC)	CN	(AREA)(CN)
IMPERVIOUS:	0.0655	98	6.42
GRASS:	0.2528	61	15.42
WOODS:	0.0417	55	2.29

COMPOSITE CN = 24.13 SAY 24

PROPOSED CONDITION:

IMPERVIOUS = 3,395 SF = 0.078 AC
GRASS = 1,817 SF = 0.042 AC
WOODS = 10,492 SF = 0.241 AC

TOTAL LENGTH OF FLOW = 43 FT

SHEET FLOW L = MIN(100, $\frac{100\sqrt{S}}{n}$) = $\frac{100\sqrt{0.003}}{0.011}$ = 497.9 FT
∴ L = 100 FT

$S = \frac{16.93 - 16.79}{43} = 0.003$ L = 43' < 100'
n = 0.011 FOR CONCRETE

$T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} S^{0.4}} = \frac{0.007((0.011)(43))^{0.8}}{(3.35)^{0.5}(0.003)^{0.4}} = 0.021$ HRS = 1.29 MINS.

(USED 1.6 MINS IN PROGRAM, AS THIS WAS SMALLEST T_c ALLOWED).

SINCE L < 100' SHEET FLOW ONLY - NO SHALLOW CONCENTRATED FLOW.

CN CALCULATIONS:

	AREA (AC)	CN	(AREA)(CN)
IMPERVIOUS	0.0779	98	7.63
GRASS	0.2330	61	14.21
WOODS	0.0417	55	2.29
GRAVEL	0.0074	85	0.63

Σ(AREA)(CN) = 24.76
SAY CN = 25

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JOB: TURNER LAW OFFICE - F3330
SHEET No.: 3 OF 3
CALCULATED BY: RGC3 DATE: 9/7/23
CHECKED BY: LAS DATE: 9/11/23
SCALE: N/A

MAXIMUM VOLUME OF RUNOFF (100 YEAR STORM) = 309 CF
(CALCULATED BY PROGRAM)

STORAGE CAPACITY OF 8" Ø PIPES: $(128.88\ LF)(\pi)\left(\frac{4}{12}\right)^2 = 44.99\ CF$

STONE BED STORAGE CAPACITY ASSUMING POROSITY = 30%:
$((161.10\ SF)(2\ FT\ DEEP) - 44.9\ CF)\ 0.3 = 83.19\ CF$

TOTAL STORAGE = PIPES + STONE BED = 44.99 + 83.19 = 128.18 CF

100-YEAR STORM PRE-EXISTING CONDITION RUNOFF = 235 CF

RUNOFF TO BE STORED = 309 - 235 = 74 CF < 128.18 CF (PROVIDED)