WATER AND SANITARY SEWER ENGINEER'S REPORT

For

Windsor 1 Developers, LLC
Proposed Wawa Food Market & Fueling Station and Hotel

Block 7, Lot 59
US Route 1 (Brunswick Pike) & Emmons Drive
Township of West Windsor
Mercer County, New Jersey

Prepared by:

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I. INTRODUCTION

The project area is comprised of Block 7, Lot 59 in the Township of West Windsor, Mercer County, New Jersey. The subject site currently consists of an existing hotel development with 113 rental rooms. The proposed redevelopment consists of subdividing the property into two (2) lots and constructing a 4-story Hyatt Hotel consisting of 120 rental rooms and a 5,585 SF Wawa Food Market with a Fueling Station consisting of sixteen (16) filling stations. Additional site improvements include constructing new driveways, parking areas, landscaping, lighting and other associated improvements.

II. EXISTING DOMESTIC WATER & SANITARY SEWER DEMANDS

In accordance with N.J.A.C. 7:10-12.6(2) 2 – Table 1, the NJDEP Standard for Domestic Water Demand is:

Hotel - 50 gallons per person per day (4 persons per room)

Estimated existing domestic water demand can be calculated as follows:

Hotel (113 Rooms x 4 persons/room) – 452 Persons x 50 GPD/Person **= 22,600.0 GPD**

In accordance with N.J.A.C. 7:14A-23.3(a), the sanitary sewer demands for the existing use is estimated as follows:

Hotel - 75 gallons per bedroom per day

Estimated existing average sanitary sewer daily flow can be calculated as follows:

Hotel – 113 Rooms x 75 GPD/Room **= 8,475.0 GPD**

III. PROPOSED DOMESTIC WATER SYSTEM

Convenience Retail Store – A proposed 2” domestic water service line will connect to the existing 12” water main located within Emmons Drive.

Hotel – A proposed 2” domestic water service and 6” fire service line will connect to the existing water main located within Emmons Drive.

PROPOSED WATER DEMANDS

In accordance with N.J.A.C. 7:10-12.6(2) 2 – Table 1, the NJDEP Standard for Domestic Water Demand is:

Store, Office Building - 0.125 gallons per square foot per day

Hotel - 50 gallons per person per day (4 persons per room)

Estimated domestic water demand can be calculated as follows:

Convenience Retail Store – 5,585 SF x 0.125 GPD/SF	= 698.1 GPD
Hotel (120 Rooms) – 480 Persons x 50 GPD/Person	= 24,000.0 GPD
Total Proposed Domestic Water Demand	= **24,698.1 GPD**

IV. PROPOSED SANITARY SEWER SYSTEM

Sanitary sewer service for the Hotel will be provided through a 6" SDR-35 PVC line to the existing sewer main located on-site site. Sanitary sewer service for the Convenience Store will be provided for through two (2) 6" SDR-35 PVC laterals. One (1) lateral will connect to a proposed grease trap, then both 6" laterals will connect to a proposed 8" lateral, that will connect to the existing on-site sanitary main.

PROPOSED SANITARY SEWER DEMANDS

In accordance with N.J.A.C. 7:14A-23.3(a), the sanitary sewer demands for the proposed uses are estimated as follows:

Store, Office Building - 0.10 gallons per square foot per day

Fuel Station – 125 GPD/Filling Station

Hotel - 75 gallons per bedroom per day

Estimate proposed average sanitary sewer daily flow can be calculated as follows:

Convenience Retail Store – 5,585 SF x 0.1 GPD/SF	= 558.5 GPD
Fuel Stations – 16 Filling Stations x 125 GPD/Filling Station	= 2,000.0 GPD
Hotel – 120 Rooms x 75 GPD/Room	= 9,000 GPD
Total Proposed Sanitary Sewer Demand	= **11,558.5 GPD**

PROPOSED SANITARY SEWER DESIGN

Per NJDEP regulations, the criteria for establishing the size of sanitary sewer gravity pipes is to convey two times the average flow with the pipe flowing half full. Utilizing Manning's equation with a roughness coefficient of 0.010 for a PVC pipe, the following is the minimum capacity of the proposed gravity sewers.

Use	Pipe Size	Slope	Roughness (n)	Capacity at ½ Full	2 X ADF
Wawa	8"	0.5%	0.010	359,937 GPD	5,117 GPD
Hotel	6"	1.04%	0.010	241,040 GPD	18,000 GPD

The proposed sanitary sewer design, including the 8" PVC lateral at 0.5% and the 6" PVC lateral at 1.04%, can efficiently convey two times the proposed average daily flow while flowing half full while only using 7.5% of the line's total capacity (Hotel) in the most conservative case.

V. EXISTING VS. PROPOSED DEMAND COMPARISON

	EXISTING	PROPOSED	TOTAL INCREASE
WATER	22,600.0 GPD	24,698.1 GPD	2,098.1 GPD
SEWER	8,475.0 GPD	11,558.5 GPD	3,083.5 GPD

VI. CONCLUSION

In summary, this report has been prepared to further expand on the water and sanitary sewer designs for the proposed commercial development as shown within the Preliminary and Final Site Plan set for Windsor 1 Developers, LLC. As demonstrated above, it does not appear the proposed development will have a negative impact on the existing infrastructure.

APPENDIX

CAPACITY OF CIRCULAR PIPE FLOWING ½ FULL

Capacity of Circular Pipe Flowing 1/2 Full

Project: Proposed Wawa & Hotel
Job #: 1478-99-043
Location: Township of West Windsor, Mercer County, NJ

Computed By: MP
Checked By: MTS
Date: 2/12/2020

PIPE DESCRIPTION	SLOPE (%)	SIZE (IN)	MANNING'S COEFFICIENT (n)	VELOCITY (FT/S)	CAPACITY (CFS)	CAPACITY (GPD)	CAPACITY (MGD)
Prop. 8" SDR-35 PVC	0.500%	8	0.010	3.19	0.56	359,937	0.36
Prop. 6" SDR-35 PVC	1.040%	6	0.010	3.80	0.37	241,040	0.24

Variables Defined
Q=Capacity of Pipe (CFS)
V=Velocity in Pipe Section (FT/S)
R=Hydraulic Radius of Pipe Section
S=Slope of Pipe Section (FT/FT)
D=Diameter of Pipe (FT)
d=Depth of Flow in Pipe (FT)
n=Manning's Coefficient
Wp=Wetted Perimeter (FT)

Typical Values for Manning's Coefficient (n)

n(RCP)=	0.013	
n(HDPE-Smooth Interior)=	0.012	*Varies with Manufacturer
n(DIP)=	0.013	
n(PVC)=	0.010	
n(CMP)=	0.024	

Equations used:
Q=VA
V=(1.49/n)*R^(2/3)*S^(1/2)
Q=(1.49/n)*R^(2/3)*S^(1/2)*A

Utilizing Appendix 16.A from the Civil Engineering Reference Manual-Seventh Edition, by Micheal Lindeburg, Copyright 1999
The following equations were utilized to calculate the Hydraulic Radius and Area of a Circular Pipe Section flowing 1/2 full
A=(π*D^2/4)*0.5=0.3927*D^2
R=A/Wp=0.3927*D^2/((2*π*D/2)*0.5)=0.25*D

Therefore:
Q=(1.49/n)*(0.25*D)^(2/3)*S^(1/2)*(0.3927*D^2)
V=(1.49/n)*(0.25*D)^(2/3)*S^(1/2)

Unit Conversion Equations
1 Cubic Foot=7.4805 Gallons
1 Day = 86,400 Seconds
Therefore:

$$\frac{\text{Cubic Foot}}{\text{Second}} \times \frac{\text{86,400 Seconds}}{\text{1 Day}} \times \frac{\text{7.4805 Gallons}}{\text{1 Cubic Foot}} = \frac{\text{Gallon}}{\text{Day}}$$

$$\frac{\text{Gallon}}{\text{Day}} \times \frac{\text{1 Million Gallons}}{\text{1,000,000 Gallons}} = \frac{\text{Million Gallons}}{\text{Day}}$$