SANITARY SEWER & POTABLE WATER ENGINEER'S REPORT

For

RPM Development, LLC

Proposed Multifamily Residential Development

2495 Brunswick Pike (AKA Alt. Route 1)
Block 2001, Lots 3, 60-66 & 68
Township of Lawrence
Mercer County, New Jersey

Prepared by:

D DYNAMIC ENGINEERING

1904 Main Street
Lake Como, NJ 07719
(732) 974-0198

Thomas J. Muller

Thomas J. Muller, PE, PP
NJ Professional Engineer License #52179

April 2020
DEC # 1279-99-010

INTRODUCTION

The subject property is known as Block 2001, Lots 3, 60-66 and 68 as shown on the Tax Maps of the Township of Lawrence, Mercer County, New Jersey.

The southern portion of the lot is currently developed with the Lawrence Shopping Center and associated loading and parking areas. The northern portion of the lot was historically developed with a parking area and a man-made drainage ditch, and currently consists of mostly open space. The property is bordered to the north by Texas Avenue with residential uses beyond, to the east and south by commercial uses with Brunswick Pike beyond, and to the west by wetlands with residential uses beyond.

The proposed project includes constructing a residential development consisting of three (3) multi-family three-story buildings and six (6) two-story duplexes for a total floor area of 87,283 SF and 70 units. Additional improvements include 79 parking spaces and associated driveways, landscaped areas, stormwater management facilities, and accompanying site amenities in the northern portion of the lot.

PROPOSED SANITARY SEWER SYSTEM

The proposed sanitary sewer service will be provided to the proposed three-story buildings via a 6" PVC lateral service connection at a 1.04% minimum slope and to the proposed duplexes via a 4" PVC lateral service connection at a 2.08% minimum slope. Both service laterals will ultimately connect to the existing 8" clay main within Texas Avenue via a new sanitary manhole. Service capacity has been confirmed by Ewing-Lawrence Sewerage Authority.

SEWERAGE FLOW CALCULATION

Sanitary sewage flow estimation has been calculated utilizing N.J.A.C. 7:14A-23.3. Considering the above, proposed sewage flows are estimated as follows:

<u>Average Daily Flow in Gallons Per Day (GPD)</u>

1 Bedroom Units	8 Units x 150 GPD / Unit =	1,200 GPD
2 Bedroom Units	37 Units x 225 GPD / Unit =	8,325 GPD
3 Bedroom Units	25 Units x 300 GPD / Unit =	<u>7,500 GPD</u>
		17,025 GPD

Proposed Total Sewage Flow = 17,025 GPD

SANITARY SEWER PIPE DESIGN

Per NJDEP regulations, the criteria for establishing the size of a gravity sanitary sewer lateral is to convey two times the average daily flow with the pipe flowing half full. Utilizing Manning's Equation with a roughness coefficient of 0.010 for PVC pipe, the following is the minimum capacity of the existing and proposed sanitary sewer laterals:

Pipe Size	Slope	Roughness (n)	Capacity at ½ Full	2 X ADF
6" PVC	1.04%	0.010	241,040 GPD	34,050 GPD
4" PVC	2.08%	0.010	115,618 GPD	34,050 GPD

The proposed 6" PVC and 4" PVC sanitary sewer laterals can convey two times the proposed average daily flow proposed by the onsite development while flowing half full.

PROPOSED WATER SYSTEM

Each proposed building will have its own domestic water service, all of which will connect to the existing 12" water main located in Texas Avenue. Service availability has been confirmed for the proposed development by Trenton Water Works.

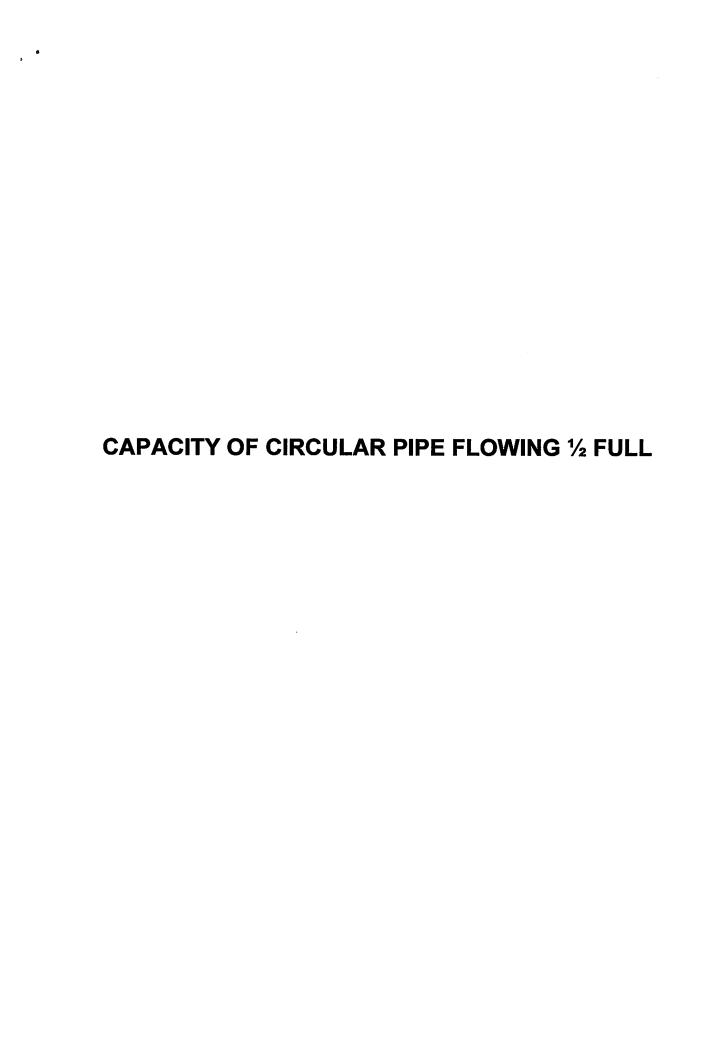## DOMESTIC WATER DEMAND CALCULATION

N.J.A.C. 5:21-5.2, Table 5.1, was utilized to calculate projected domestic water usage. Estimated domestic water demand can be calculated as follows:

Average Daily Demand in Gallons Per Day (GPD)

1 Bedroom Garden Apartment	8 Units x 120 GPD / Unit =	960 GPD
2 Bedroom Garden Apartment	37 Units x 175 GPD / Unit =	6,475 GPD
3 Bedroom Garden Apartment	25 Units x 270 GPD / Unit =	6,750 GPD
		14,185 GPD

Proposed Total Water Demand = 14,185 GPD

APPENDIX

CAPACITY OF CIRCULAR PIPE FLOWING ½ FULL

DYNAMIC ENGINEERING

Capacity of Circular Pipe Flowing 1/2 Full

Project: Proposed Multifamily Residential Development

Job #: 1279-99-010

Location: Township of Lawrence

Computed By: LPG

Checked By: TJM

Date: 4/15/2020

PIPE DESCRIPTION	SLOPE (%)	SIZE (IN)	MANNING'S COEFFICIENT (n)	VELOCITY (FT/S)	CAPACITY (CFS)	CAPACITY (GPD)	CAPACITY (MGD)
Prop. 6" PVC	1.040%	6	0.010	3.80	0.37	241,040	0.24
Prop. 4" PVC	2.080%	4	0.010	4.10	0.18	115,618	0.12

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
$A=(\pi*D^2/4)*0.5=0.3927*D^2$
$R=A/Wp=0.3927*D^2/((2*\pi*D/2)*0.5)=0.25*D$

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:

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

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