



**TOWNSHIP of HOPEWELL
MERCER COUNTY**

**201 WASHINGTON CROSSING – PENNINGTON ROAD
TITUSVILLE, NEW JERSEY 08560-1410**

PROJECT / APPLICATION

BLOCK:

LOT:

ADDRESS:

PROJECT NAME:

**REPORTS AND SUPPORTING
DOCUMENTS**

SANITARY SEWER REPORT

WATER REPORT

May 11, 2023

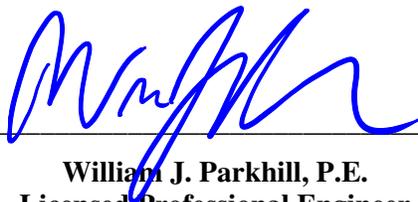
Project # APR-2203

**SANITARY SEWER REPORT
FOR
HERRITAGE AT HOPEWELL
2500 PENNINGTON ROAD**

**BLOCK 78, LOT 17
HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY**

**PREPARED FOR:
AMERICAN PROPERTIES AT HOPEWELL II, LLC**

**PREPARED BY:
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I. INTRODUCTION

The proposed project consists of 55 market rate townhomes as well as one affordable housing apartment building with 12 units and internal roadways, parking stalls, and an on-site sanitary sewer conveyance system. The site is located at 2500 Pennington Road (NJSH Route 31), Hopewell Township, Mercer County and is known as Block 78, Lot 17. The site contains a total of 11.08 acres.

This report analyzes the on-site sanitary sewer conveyance system design and establishes the proposed sewage flow for the project. This report is intended to further support applications for approval of the sanitary sewer system improvements by Hopewell Township as the collection entity, and Ewing-Lawrence Sewerage Authority (ELSA) as the treatment entity, as well as by the New Jersey Department of Environmental Protection for the Treatment Works Application Program.

II. PROPOSED PROJECT

The proposed project outlined in this report involves the construction of fifty-five (55) market rate townhomes consisting of 3-bedroom units as well as one affordable housing apartment building with a mix of 12 units, two (2) 1-bedroom, six (6) 2-bedroom, and four (4) 3-bedroom garden apartments. The sanitary sewer collection system includes the construction of 1,977 LF of 8-inch PVC SDR-35 sanitary sewer main which will convey flow from the proposed units. The project wastewater flow from the buildings and lateral connections require NJDEP Treatment Works Approval (TWA) and are designed in accordance with the standards outlined in Title 7 of the New Jersey Administrative Code and Hopewell Township.

It is the purpose of this report to show that the proposed onsite sanitary sewerage infrastructure will safely convey the required sewage volumes to the existing sanitary sewer main owned and operated by the Township of Hopewell. As noted above, the methods of determining average and peak sewage volumes follow the procedures obtained from the New Jersey Department of Environmental Protection.

III. SANITARY SEWER SYSTEM DESIGN

The proposed collection system will convey sanitary sewer flows from the proposed residential development. The proposed sewer main extension will connect to the existing 8-inch PVC SDR-35 sanitary main in Westminster Court. Design flows are calculated using the criteria provided in N.J.A.C. 7:14A-23.3

1. **Proposed Average Daily Flow:**

Affordable Apartment Units (2 one-bedroom units, 6 two-bedroom units, 4 three-bedroom units):

$$\begin{aligned} 1 \text{ Bedroom Units: } Q_{\text{avg.}} &= 2 \text{ units} \times 150 \text{ GPD/unit} = 300 \text{ GPD} \\ 2 \text{ Bedroom Units: } Q_{\text{avg.}} &= 6 \text{ units} \times 225 \text{ GPD/unit} = 1,350 \text{ GPD} \\ 3 \text{ Bedroom Units: } Q_{\text{avg.}} &= 4 \text{ units} \times 300 \text{ GPD/unit} = 1,200 \text{ GPD} \\ \hline \text{Total Proposed Flow} &= 2,850 \text{ GPD} \approx 0.00285 \text{ MGD} \end{aligned}$$

Residential Townhouse Units (55 three bedroom units):

$$\begin{aligned} 3 \text{ Bedroom Units: } Q_{\text{avg.}} &= 55 \text{ units} \times 300 \text{ GPD/unit} = 16,500 \text{ GPD} \\ \hline \text{Total Proposed Flow} &= 16,500 \text{ GPD} \approx 0.0165 \text{ MGD} \end{aligned}$$

Total Proposed Average Daily Flow: 19,350 GPD = 0.0194 MGD

2. **Sewer Main Capacity Analysis**

The proposed 8-inch PVC sewer main will be sufficient to convey the flows from the proposed development (0.0194 MGD) as calculated below:

$$Q_d = \frac{1.486}{n} \times A \times R^{2/3} \times S^{1/2}$$

where,

- Q_d = design capacity, cfs (1/2 full)
- n = Mannings roughness coefficient (PVC = 0.010)
- A = flow area (1/2 full) = 0.175 S.F.
- R = hydraulic radius = A/WP = 0.167 ft.
- S = pipe slope = 0.004 ft/ft.

$$Q_d = \frac{1.486}{0.010} \times 0.175 \times 0.167^{2/3} \times 0.004^{1/2} = 0.498 \text{ cfs}$$

$$Q_d = 0.498 \text{ cfs} \times 0.6463 \text{ mgd/cfs} = 0.322 \text{ mgd}$$

$$\text{Minimum Design Capacity} = 2 \times Q_{\text{avg.}} \text{ (flowing 1/2 full)}$$

$$= 2 \times 0.0194 \text{ mgd}$$

$$= 0.0388 \text{ mgd}$$

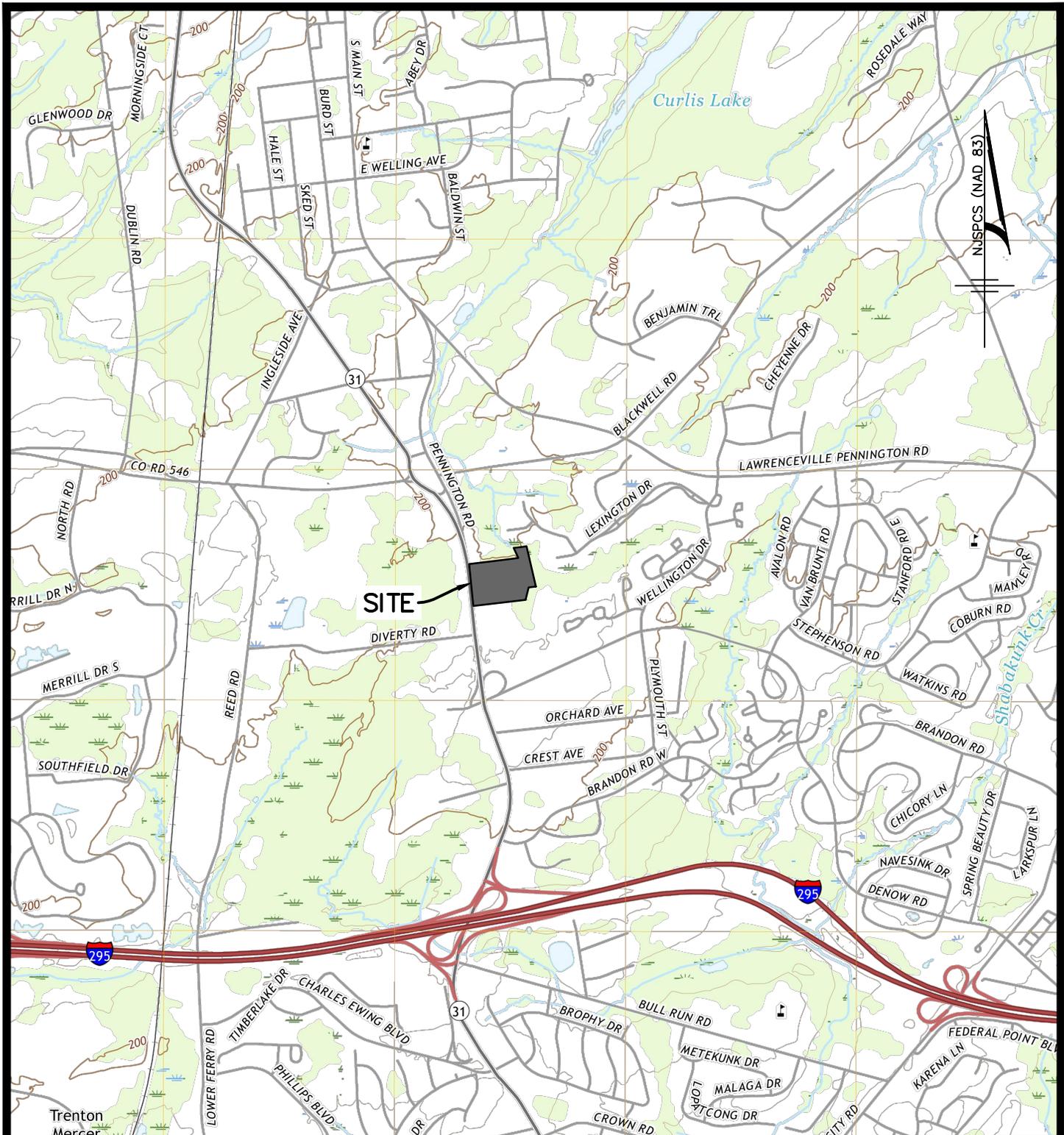
$$\frac{Q_d}{Q_{\text{avg.}}} = \frac{0.322 \text{ mgd}}{0.039 \text{ mgd}} = 8.25 > 1 \quad \therefore \text{OK}$$

(Capacity exceeds demand)

IV. CONCLUSION

The analysis herein demonstrates that the proposed sewer main can adequately convey wastewater flows from the proposed development to the existing sewer main in Westminster Court.

APPENDIX A
USGS MAP



MidAtlantic
Engineering Partners, LLC

**USGS QUAD MAP EXHIBIT
BLOCK 78; LOT 17
2500 PENNINGTON ROAD**

SITUATED IN
HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY

| | | | |
|-------------------|-------------------------------|-----------------------------|--------------------------------------|
| DRAWN BY: MJB | CHECKED BY: | RELEASED BY: | PROJECT No.: |
| DATE: 05/11/23 | HORIZONTAL SCALE: 1"=2000' | VERTICAL SCALE: AS SHOWN | DRAWING NAME: 99-Map Exhibits.dwg |

Certificate of Authorization No. 24GA28184000
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 William J. Parkhill II P.E. PE No. GE04753800
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APPENDIX B
COST ESTIMATE

MidAtlantic Engineering Partners

Cost Estimate of Improvements

Heritage at Hopewell

Hopewell Township, Mercer County, New Jersey

Job Number: APR-2203

Date: May 11, 2023

| Ref. | Description | Units | Qty. | Cost | Total |
|------|---|-------|------|------------|-------------|
| 1 | Pipe (8" PVC SDR 35) | L.F. | 1977 | \$18.00 | \$35,586.00 |
| 2 | Manhole | Each | 16 | \$2,250.00 | \$36,000.00 |
| 3 | 4" PVC SDR 35 Lateral (Including Cleanouts) | LF | 2194 | \$15.00 | \$32,910.00 |
| 4 | Tie in to Existing | Each | 1 | \$2,000.00 | \$2,000.00 |

Total: \$106,496.00

APPENDIX C
TECHNICAL SPECIFICATIONS

SANITARY SEWER DESIGN STANDARDS AND CONSTRUCTION DETAILS

IN



Township of
HOPEWELL
Mercer County | New Jersey

MARK W. KATARYNIAK, P.E.
New Jersey Professional Engineer No. 24GE03890900
TOWNSHIP ENGINEER

Adopted by Ordinance No. 20-1735
Dated 11/23/2020

PREPARED BY

HERBERT J. SEEBURGER, JR., P.E.
New Jersey Professional Engineer No. 24GE04748700
VAN CLEEF ENGINEERING ASSOCIATES
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HAMILTON, NEW JERSEY 08691

**TOWNSHIP OF HOPEWELL
MERCER COUNTY, NEW JERSEY**

ORDINANCE NO. 20-1735

**ORDINANCE ESTABLISHING STANDARD DESIGN SPECIFICATIONS AND
CONSTRUCTION DETAILS FOR PUBLIC SANITARY SEWER COLLECTION
FACILITIES IN HOPEWELL TOWNSHIP**

WHEREAS, the Township of Hopewell chooses to amend its ordinances from time to time to update outdated provisions and procedures and clarify requirements; and

WHEREAS, the Township of Hopewell desires to incorporate energy efficiency and reliability into all existing and future public sanitary sewer collection systems within the township, while reducing operating and ownership costs; and

WHEREAS, there is a need to develop standard design and construction specifications as a guide for the repair of existing and construction of future public sanitary sewer collection systems throughout the township to achieve these goals; and

WHEREAS, the Township Engineer recommends standard construction specifications and details be established, published and available to the public as the technical regulations all public sanitary sewer collection systems owned by the municipality shall conform to when constructed, or altered.

NOW, THEREFORE, BE IT ORDAINED AND ESTABLISHED by the Township Committee of the Township of Hopewell, County of Mercer, State of New Jersey that Chapter 17 (XVII), Article VI, of the Code of the Township of Hopewell, entitled “Design Standards”, and Chapter 19 (XIX) of the Code of the Township of Hopewell entitled “Sewer and Water Matters” be amended, modified and supplemented as follows:

Section 1. PUBLIC SANITARY SEWER STANDARDS

In Chapter 17, “Land Use and Development”, Article VI “Design Standards”, add new Section 17-117 “Public Sanitary Sewers” as follows:

§17-117: Public Sanitary Sewers

- a. All public sanitary sewer collection systems to be constructed that will be owned and under the jurisdiction of the Township of Hopewell shall conform to the standard construction specifications and details established in Section 19-1.7.

Section II. SEWER MATTERS

In Chapter 19-1, “Sewer Matters”, add new Section 19-1.7 “Sanitary Sewer Design Standards” as follows:

§19-1.7: Sanitary Sewer Design Standards

- a. All public sanitary sewer collection systems owned and under the jurisdiction of the Township of Hopewell shall conform to the standard construction specifications and details established by the township for the construction of new or alteration of existing collection systems.
- b. Standard requirements for the construction or alteration of public sanitary sewer

collection systems owned and under the jurisdiction of the Township of Hopewell shall conform to the “Sanitary Sewer Standards and Construction Details in the Township of Hopewell”, dated October 2020, or latest edition as prepared by the Township Engineer, which is incorporated herein by reference and available through the Office of the Township Engineer.

- c. Public sanitary sewer collection systems that are located within the township and are owned or under the jurisdiction of private developments, homeowners’ associations or regional sewage authorities are not required to conform to the standards established herein by reference.
- d. Individual sewage disposal systems located on private property are not required to conform to the standards established herein by reference.

SECTION VI. SEVERABILITY.

If any section, subsection, paragraph, sentence or other part of this Ordinance is adjudged unconstitutional or invalid, such judgment shall not affect or invalidate the remainder of this Ordinance, but shall be confined in its effect to the section, subsection, paragraph, sentence or other part of this Ordinance directly involved in the controversy in which said judgment shall have been rendered and all other provisions of this Ordinance shall remain in full force and effect.

SECTION VII. INCONSISTENT ORDINANCES REPEALED.

All Ordinances or parts of Ordinances which are inconsistent with the provisions of this Ordinance are hereby repealed, but only to the extent of such inconsistencies.

SECTION VIII. EFFECTIVE DATE.

This Ordinance shall take effect immediately upon final adoption and publication in the manner prescribed by law and the filing of same with the Mercer County Planning Board pursuant to N.J.S.A. 40:55d- 16.

Date Introduced: November 9, 2020
Date Advertised: November 13, 2020
Date Adopted: November 23, 2020



Kristin L. McLaughlin
Mayor

Attest:


Laurie E. Gompf
Municipal Clerk

**HOPEWELL TOWNSHIP
SANITARY SEWER DESIGN STANDARDS**

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SANITARY SEWER DESIGN STANDARDS**

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**HOPEWELL TOWNSHIP
SANITARY SEWER DESIGN STANDARDS**

SECTION 1.0 - Design of Gravity Sewers

Material used in the construction of gravity sewers shall be as follows: gravity sewers shall be constructed of Polyvinyl Chloride (PVC), Reinforced Concrete (RCP), Ductile Iron (DIP) or Cast Iron (CIP). Inverted siphons shall be constructed of ductile iron pipe unless otherwise permitted by the Township.

All sewers and force mains shall be designed to flow with a minimum velocity of not less than two feet per second at full flow and a maximum velocity of ten feet per second, utilizing a Hazen-Williams coefficient of 120 (C=120). Inverted siphons shall be designed for a minimum velocity of three feet per second and a maximum velocity of six feet per second.

All gravity sewer mains shall be designed to carry four times the average daily flow upon full development of the tributary area.

Average flow shall be assumed to be 100 gallons per capita per day, and each unit to be occupied by four persons (300 gallons per day per EDU), unless it can be demonstrated to the Township's satisfaction that a different standard should be applied because of the unique nature of the proposed use.

For commercial, industrial, or residential developments, design flows shall be in accordance with NJDEP Rules and Regulation for Preparation of Plans for Sewer Systems and Wastewater Treatment Plants, latest revision, and are subject to approval by the Township's Engineer.

The Township will establish flow standards for any construction not included in the above.

Minimum size of gravity sanitary sewer mains shall be eight inch (8") diameter, with a minimum desirable slope of 0.4% and a minimum desirable velocity of 2 feet per second (2 FPS). Minimum size of force mains shall be two inch (2") diameter. Where terminal manholes and gravity sewers are designed, and the average design flow through the pipe is less than 8,000 gallons per day, the minimum slope shall be such that the design flow produces a velocity of 2 feet per second (2 FPS).

Connections made into existing manholes shall be cored and an approved watertight adapter shall be installed.

Where the proposed gravity sewer main passes improved lots other than the Applicant's proposed lots, it will be the applicant's responsibility to furnish and install laterals, deep house connections and wye cleanouts to the improved lots.

All sewers must be designed on a separate plan in which all water from roofs, sump pumps, cellars, streets and any other storm water collection must not be allowed to enter the proposed sanitary sewerage facilities. Discharge from any HVAC system is expressly prohibited to enter the sanitary sewerage system.

Sanitary sewer mains shall be constructed as close to the centerline of the road as possible. All sewer mains shall clear other utility crossings or obstructions. Sanitary sewers shall be eighteen inches (18") minimum below water lines. Twelve inches (12") minimum clearance is required with all other utilities (gas, storm, electric, etc.). Clearances shall be shown at all crossings.

HOPEWELL TOWNSHIP SANITARY SEWER DESIGN STANDARDS

Where sewers are constructed in wet easement areas, they shall be constructed with twelve foot wide stable stone access roads so that Township vehicles can access the entire length of the wet area. The Township Engineer shall determine the need for stone access roads in all other easement areas.

Sanitary sewer mains shall be located a minimum of ten (10) feet horizontally from parallel proposed or existing water mains.

Where water and sewer mains are parallel and a four (4) inch sewer lateral cross the water main, the sanitary sewer lateral shall be eighteen inches (18") minimum below the water line unless otherwise approved by the Township Engineer.

Pipe type and strength classification shall be selected based on accepted engineering design practice for the service, depth of bury, and loading.

Distances between manholes shall not exceed three hundred (300) feet.

Individual connections to the sewer main in the street shall be provided for each individual family dwelling proposed for connection. Each connection shall be provided with a clean out between the ROW line and curb.

Materials used in the construction shall be in accordance with these standards and the Township's Standard Details. Each house connection shall include a complete four inch (4") diameter PVC cleanout assembly with protection box as shown on the Standard Details.

SECTION 2.0 - Pipe Materials

Reinforced Concrete Pipe (RCP)

RCP shall meet all the requirements of the A.S.T.M. Specification C76, Wall B.

RCP shall not be used for gravity sewers less than thirty (30) inches in diameter.

In no case shall pipe with a strength classification of less than Class IV be permitted. For depths less than three feet, measured from top of the pipe, installed under traffic areas, Class V pipe shall be required. Pipe shall have maximum length of 20 feet.

RCP joints shall be the steel and rubber gasketed joint as described in Gifford-Hill American Specification SP-32, and as manufactured by Gifford-Hill American, Price Brothers or equal, and shall conform to AWWA C-302. Joints shall be made up in accordance with the manufacturer's recommendations, and shall be properly cleaned and lubricated and prepared prior to making the joint. After making up the joint, the gasket shall be verified as to proper positioning using a feeler gage supplied by the manufacturer. Upon proper jointing, the joint shall be externally wrapped with special grout bands furnished by the pipe manufacturer and filled with grout to the full circumference of the joint. The internal joint shall be filled with mortar to the flush inside face of the pipe.

Interior of RCP and fittings shall be shop coated with two (2) coats of a coal tar epoxy coating, equal to Carboline 300M, for a total dry film thickness of 16 mils, applied in strict accordance with the

HOPEWELL TOWNSHIP SANITARY SEWER DESIGN STANDARDS

manufacturer's written instructions. At a minimum, surface preparation shall include removal of all dirt, laitance and other foreign materials, and abrasive blasting. Prior to coating, the manufacturer shall perform testing on every tenth section of pipe produced in accordance with ASTM D4263 to verify that capillary moisture in the concrete is absent prior to coating. Upon completion of mortar coating of interior joint, the mortar coating shall be given two (2) field coats of the coal tar epoxy applied to a total dry film thickness of 16 mils, applied in strict accordance with the manufacturer's written instructions.

The applicant shall evaluate the soil conditions in the location of the pipe installation and report on the corrosiveness of the soil to the pipeline. An exterior pipe protective coating suitable for exposure to the soil and moisture conditions shall be applied to the pipe based on the evaluated soil conditions, and where required by the Township. Acceptable coating shall be Carboline 300M Coal Tar Epoxy, or approved equal, applied in strict accordance with the manufacturer's written recommendations. The pipe may alternatively be wrapped with a polyethylene wrap of a suitable thickness.

Ductile Iron Pipe (DIP)

DIP shall be centrifugally cast in metal or sand molds in accordance with A.N.S.I. Specification A21.51, cement lined and bituminous seal coated in accordance with A.N.S.I. Specification A-21.4, latest revision, minimum thickness Class 52.

The joint shall conform to the requirements of A.N.S.I. A.21.11 and shall be of a type that employs a single elongated groove gasket to effect a joint seal such as United States Pipe Company's "Tyton" joint, American Ductile Iron Pipe "Fastite" joint, or equal. Gaskets shall be of a composition suitable for exposure to sewage, and to soil conditions surrounding the pipeline. Pipe shall be furnished with flanges where connections to flanged fittings are required.

The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing, and roughness. All surface preparation, coating, curing and handling shall be in strict accordance with the manufacturer's recommendations.

The exterior of ductile iron pipe shall be coated with a 1-mil asphaltic coating in accordance with AWWA C151.

Where required by the Township, and where required by acid soil conditions, furnish and install a continuous polyethylene sleeve, conforming to the requirements of AWWA C105. The sleeve shall consist of a tubular 8 mil thick linear low-density film or 4 mil thick high-density cross laminated film.

Cast Iron Pipe (CIP)

Cast iron pipe and fittings shall be pit cast extra heavy thickness in accordance with A.N.S.I. Specification A74, and shall only be permitted for use in house service connections.

The joint shall incorporate a neoprene gasket in accordance with ASTM C-564.

The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing, and roughness. The cast iron pipe shall have an internal lining of amine cured Novalac epoxy containing at least 20 percent by volume of ceramic quartz pigment, Protecto 401 Ceramic

HOPEWELL TOWNSHIP SANITARY SEWER DESIGN STANDARDS

Epoxy® or approved equal, applied at a dry film thickness of 40 mils. All surface preparation, coating, curing and handling shall be in strict accordance with the manufacturer's recommendations.

The exterior of cast iron pipe shall be coated with a minimum 1-mil asphaltic coating in accordance with AWWA C 151.

Where required by Township and where required by acid soil conditions, furnish and install a continuous polyethylene sleeve, conforming to the requirements of AWWA C105. The sleeve shall consist of a tubular 8 mil thick linear low-density film or 4 mil thick high-density cross-laminated film.

Polyvinyl Chloride Pipe (PVC)

PVC solid wall sewer pipe shall be permitted for all gravity collection system pipelines and for gravity connection laterals.

The material from which the pipe and fittings are extruded shall be high impact types of PVC, unplasticized, having high mechanical strength and maximum chemical resistance conforming to TYPE 1, Grade 1, of the specification for rigid polyvinyl chloride compounds, ASTM D1784, latest edition. Pipe shall be free from defects, bubbles and other imperfections in accordance with accepted commercial practice.

PVC solid wall pipe shall meet the requirements of ASTM D3034. Plastic pipe and fittings shall conform to ASTM D 3034 latest revision, with a wall thickness designated for SDR 35 (minimum) for pipes 8 to 15 inches; ASTM F679 for pipes 18 to 27 inches. Pipes 4" to 6" shall be Schedule 40.

SDR 35 PVC pipe shall not be used if less than four (4) feet of cover or more than twenty feet (20') will be provided. SDR 26 PVC pipe shall be used for depths greater than twenty feet (20').

See Standard Details for minimum required PVC pipe bedding details. The Applicant shall submit for approval, details of the pipes, joints, fittings, beddings, etc., which they intend to use.

Plastic pipe shall be polyvinyl chloride sewer pipe with bell and spigot ends. O-Ring rubber gasketed joints shall conform to ASTM D3212.

The adequacy of the pipe gasketed joint shall be demonstrated, by a test at the manufacturing plant in accordance with ASTM D2444 Stiffness, latest revisions.

Rubber ring gaskets shall be manufactured as per ASTM F477 latest revision. The gasket shall be the sole element depended upon to make the joint watertight.

SECTION 3.0 - Pipe Appurtenances

Manholes

Manholes shall be provided at ends of sewer lines, at intersections and at changes of grade or alignment. Distances between manholes shall not exceed 300' feet. Where sewers enter manholes at elevations two feet or more above the invert out, drop manholes shall be provided and drop pipes

HOPEWELL TOWNSHIP SANITARY SEWER DESIGN STANDARDS

shall be built. The maximum permitted drop shall be six (6) feet. Additional manholes shall be provided if required to meet the six (6) feet maximum drop requirement.

Manholes shall be of pre-cast concrete or cast-in-place concrete.

If pre-cast manhole bases, barrels and cones are used, they shall be equal to reinforced concrete pipe and fittings conforming to A.S.T.M. Specification C-478, with round rubber gasketed joints, conforming to A.S.T.M. specification C-361, Maximum absorption shall be 8% in accordance with A.S.T.M. specification C-76.

Manhole frames and covers shall be of cast iron conforming to specifications A.S.T.M. A-48-83, Class 30B and be suitable for A.A.S.H.T.O. H-20 Highway loading. Frame and covers shall be as shown on the Standard Details. The letters "H T Sewer" shall be cast integrally in the cover; or "SANITARY SEWER" if to remain private.

All manhole covers in easements or in remote areas shall be Campbell Foundry catalog No. 1486 or equal with locking covers. All manhole covers in low lying or flood prone areas shall be watertight Campbell Foundry catalog No. 6548 or equal and be set six (6) inches above finished grade unless located in an improved area (lawn, roadway, driveway, etc.).

Manholes shall be supplied with suitable flexible watertight connections cast into all pipe openings, with capability of deflecting a minimum of nine (9) degrees.

Cleanouts

All cleanouts shall be left a minimum of 24" above finished grade during initial construction, immediately after final testing of all cleanouts, installation of the cleanout protection box as shown on the Standard Details will be required and installed to final grade. Cleanout shall be located two (2) feet behind the face of curb or edge of pavement.

Inverted Siphons

Inverted siphons, if permitted, shall be constructed of ductile iron, lined with a hydrogen sulfide sewer safe coating and shall not have less than two barrels. Provision shall be made for jetting and for flushing. Velocity shall not be less than 3 feet per second and adjustable flow control gates in chambers shall be provided. Inlet and outlet chambers shall be furnished and installed to facilitate inspection, isolation of each barrel, and cleaning of each barrel. These are special conditions and further standards will be provided by the Township.

Special Structures

Special structures, including diversion structures, doghouse manholes, bypass manholes and metering structures shall be reviewed and approved on a case by case basis. The Township reserves the right to supplement these standards with additional requirements where they are in the interest of the Township for the proper design and construction of the sewerage system.

**HOPEWELL TOWNSHIP
SANITARY SEWER DESIGN STANDARDS**

SECTION 4.0 - Service Connections

General Requirements

Connections shall be made in accordance with the Township's Standard Details, and shall be PVC Schedule 40 (Schedule 80 for deep house connections) or heavy duty cast iron.

All connections must have an inspection/observation cleanout, with a PVC plug when used with ductile iron or a bronze or brass plug when used with PVC to be placed two (2') feet from the face of the curb or edge of pavement. To the maximum extent possible, the cleanouts must not be situated in the sidewalk or in driveways.

Deep house connections shall be installed where required as shown on the Standard Details.

The maximum length of four (4") inch PVC piping to the first cleanout shall be 20' and slopes shall be not less than ¼" per foot.

House connections shall be constructed of a minimum diameter of four (4) inches. Deep house connections shall be provided where the sewer main centerline is more than ten (10) feet below the finished surface. Pipe materials shall be as required based on the requirements of the Standard Details.

Each house connection shall include a complete four (4) inch diameter cast iron or PVC clean out assembly with a protective box as indicated in the Standard Details.

Where water and sewer mains are parallel and a four (4) inch sewer lateral cross the water main, the sanitary sewer lateral shall be eighteen inches (18") minimum below the water line unless otherwise approved by the Township Engineer.

Pipe type and strength classification shall be selected based on accepted engineering design practice for the service, depth of bury, and loading.

Service Connections to Existing Sewer Mains

Connections to the sewer shall be made through an approved wye, saddle or other types as approved by the Township. Refer to Standard Details.

The Applicant's Contractor will be responsible for locating and protecting all existing utilities including, but not necessarily limited to, water, steam, oil, gas, sanitary sewers, storm sewers, drains, telephone ducts and electric conduits, or any other similar facilities which may be encountered during the construction operation. He shall be held solely responsible for locating all underground structures. He shall, at his own expense, arrange with the owners of such utilities for their aid and assistance in locating and protecting them and shall pay all charges, costs and expenses in connection therewith.

The Applicant's Contractor shall be required to obtain any and all necessary Road Opening Permits.

Cast iron (pit cast) house connection pipe, fittings and cleanouts shall be used when connecting existing ACP mains to individual houses. The material shall be extra heavy thickness conforming to the

HOPEWELL TOWNSHIP SANITARY SEWER DESIGN STANDARDS

requirements of ANSI specification A-74. Neoprene gasket joints shall conform to ASTM C-564. PVC laterals can also be used upon pre-approval by the Township.

Service Connections to New Sewer Mains

Service connections to new sewer mains shall be with approved materials and in accordance with the Standard Details.

Where the proposed gravity sewer main passes lots other than the Applicant's proposed lots, it will be the applicant's responsibility to furnish and install laterals, deep house connections and cleanouts to improved lots. The lateral shall terminate 12" beyond the cleanout and shall be capped for future use.

Residential Service Connections

Individual connections to the sanitary sewer main in the street shall be provided for each individual family dwelling or fee simple townhouse proposed for connection. Each connection shall be provided with a clean out two (2) feet from the face of curb line or edge of pavement. All lateral connections shall be made perpendicular to the sewer main, and shall be labeled by station along the run from the upstream manhole.

Connections from the cleanout to the dwelling are under the jurisdiction of the Building Department through its Plumbing Inspector. His/her approval will be required before the Township will accept discharge of sewage into its mains.

Commercial and Industrial Service Connections

Connections to commercial and industrial sites shall be DIP heavy duty CIP or PVC, manufactured in accordance with ASTM D-1785. Fittings shall conform to the requirements of ASTM D-2467 for socket type. Socket type connections shall be joined with a primer and PVC solvent cement in accordance with ASTM D-2564.

SECTION 5.0 - Testing and Televising

Sanitary sewer systems must be complete before testing is witnessed by the Township. This includes finished manholes inside and out, cleanouts in proper location, and base course pavement (or completed stone access road) over lines to be tested.

All gravity sewer facilities shall be subjected to air pressure testing and televising. Prior to testing all lines and manholes shall be cleaned.

The tests shall be performed between two (2) manholes or as otherwise directed by the Township Engineer and shall include all related sewerage including laterals and cleanouts.

The Applicant's contractor shall furnish all labor, material and equipment necessary for the testing.

The sewer pipe shall be tested under a 5.0 psi pressure and shall be maintained for a period of five (5) minutes with no drop in pressure.

HOPEWELL TOWNSHIP SANITARY SEWER DESIGN STANDARDS

All sewer mains will be televised by the applicant's contractor. The video camera shall be specifically designed for sewer inspections, with its own light source suitable to provide a clear picture of the entire periphery of the pipe. The camera shall be self-propelled and not be pulled by means of a water jetting nozzle. Two (2) copies of the televising on CD, or other approved digital media format compatible with standard/conventional computer equipment such as a portable document or similar format with audio log superimposed on the visual log, shall be submitted to the Township Engineer and shall be accompanied by two (2) copies of a legible log. The CD and case or other digital equivalent as applicable shall be labelled clearly, indicating the project name, date and sewers inspected. The label shall correspond to the log sheet. The audio log and written log shall contain the following information (as a minimum): project name, section, video inspection firm and crew chief's name, name of the Owner representative, date, manhole to manhole designation, direction of camera, type of pipe, type of joints, joint spacing, cleanliness, manhole conditions, pipe conditions, section length, pipe size, depth of pipe, clarity of flow, continuous distance measurement, and location of all connections to the sewer line. All televising work shall be witnessed by the Township Engineer. Video inspection work shall be performed immediately following the sewer cleaning operations such that the highest quality inspection can be made. Water used during cleaning shall be allowed to drain by natural gravity flow before starting this work.

Force mains shall be subjected to a hydrostatic pressure test in accordance with AWWA C600, with the test equal to two (2) times the maximum operating pressure or 100 psi (minimum) for a two-hour period. The test shall be performed on all portions of the force main.

All force main cleanout assemblies and air release assemblies shall be included in the tests. The air release valve assembly shall be observed for expulsion of air during the filling operation. After the force main is full, the lower outlet valve on the release valve shall be opened to verify the presence of water up to that level.

Sanitary sewer lines require mandrel testing with a nine (9) point mandrel with a diameter of ninety-five percent (95%) of the pipe diameter. If directed by the Township Engineer, the Applicant shall furnish a proving ring to verify the mandrel size.

Any piping found to have deflected excessively or be out-of-round, as determined by the Township Engineer shall be replaced or repaired as directed.

Any pipe, joint or other part of the sewer construction found to show leakage shall be repaired, or removed and replaced in accordance with latest revision of "Repair Guidelines" published by Utility Contractor's Association of New Jersey.

As-Built

Provide an "AS-BUILT" of all sanitary sewer mains, manholes, laterals, and clean outs installed. Include plan view and invert elevations.

Provide "AS-BUILT" in CAD and GIS format for all work covered in this section. CAD and GIS files to be provided on CD/DVD or other compatible digital media with clear labeling.

The "AS-BUILT" shall identify and describe any unexpected variations to subsoil conditions or discovery of uncharted utilities when encountered.

May 11, 2023

Project # APR-2203

**ENGINEER'S REPORT
FOR WATER SERVICE CONNECTION
HERRITAGE AT HOPEWELL
2500 PENNINGTON ROAD**

**BLOCK 78, LOT 17
HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY**

**PREPARED FOR:
AMERICAN PROPERTIES AT HOPEWELL II, LLC**

**PREPARED BY:
MidAtlantic Engineering Partners
2026B Briggs Road, Suite 300
Mount Laurel, New Jersey 08054**



**William J. Parkhill, P.E.
Licensed Professional Engineer
New Jersey License No. GE04753800**

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I. INTRODUCTION

The proposed project consists of 55 market rate townhomes as well as one affordable housing apartment building with 12 units and internal roadways, parking stalls, and an on-site sanitary sewer conveyance system. The site is located at State Route 31, Hopewell Township, Mercer County and is known as Block 78, Lot 17. The site contains a total of 11.08 acres.

This report analyzes the on-site water system design and establishes the proposed water demand for the project. This report is intended to further support applications for approval of the water system improvements by Trenton Water Works.

II. PROPOSED PROJECT

The project consists of approximately 3,052 LF of 8" C-900 PVC looping water main extension within the proposed streets, which will extend and connect to the existing water main located near the intersection of Pennington Road and Diverty Road, south of our proposed site. The proposed townhomes will connect to the proposed water main extension via 3/4" Type K Copper pipe, which will provide domestic services. The proposed affordable units will connect to the proposed water main extension via 2" DIP domestic services and 2" DIP fire services. The proposed water service connections will be constructed in compliance with the Standards of the New Jersey Department of Environmental Protection, Bureau of Water System Engineering ("New Jersey Safe Drinking Water Act, N.J.A.C. 7:10-11.1 et seq. – Standards for the Construction of Public Community Water Systems") and the requirements of New Jersey American Water. Water services and plumbing shall conform to the requirements of the Plumbing Subcode of the State of New Jersey Uniform Construction Code, N.J.A.C. 5:23-3.15.

As previously referenced, fire protection for the proposed affordable units will be provided by a 2" service, respectively, that connects to internal sprinkler systems in accordance with applicable requirements of the municipal fire bureau. Further, two (2) fire hydrants will be proposed within the development. The proposed services will provide adequate pressures for domestic service (including peak periods) and during a single fire event.

II. PROJECT DEMAND

The daily water demands were based on N.J.A.C. 5:21-5.1 – Table 5.1 and all units are classified as follows:

- Low and Mid-Rise: Affordable
- Townhouse: Townhouse

The demand is calculated as follows:

Proposed Average Daily Demand :

$$\begin{aligned} 1 \text{ Bedroom Affordable: } & Q_{\text{avg.}} = 2 \text{ units} \times 95 \text{ GPD/unit} = 190 \text{ GPD} \\ 2 \text{ Bedroom Affordable: } & Q_{\text{avg.}} = 6 \text{ units} \times 140 \text{ GPD/unit} = 840 \text{ GPD} \\ 3 \text{ Bedroom Affordable: } & Q_{\text{avg.}} = 4 \text{ units} \times 215 \text{ GPD/unit} = 860 \text{ GPD} \\ 3 \text{ Bedroom Townhouse: } & Q_{\text{avg.}} = 55 \text{ units} \times 200 \text{ GPD/unit} = 11,000 \text{ GPD} \\ \text{Total Proposed Residential Flow} & = 12,890 \text{ GPD} \approx 0.013 \text{ MGD} \end{aligned}$$

Total Proposed Average Daily Demand: 12,890 GPD = 0.013 MGD

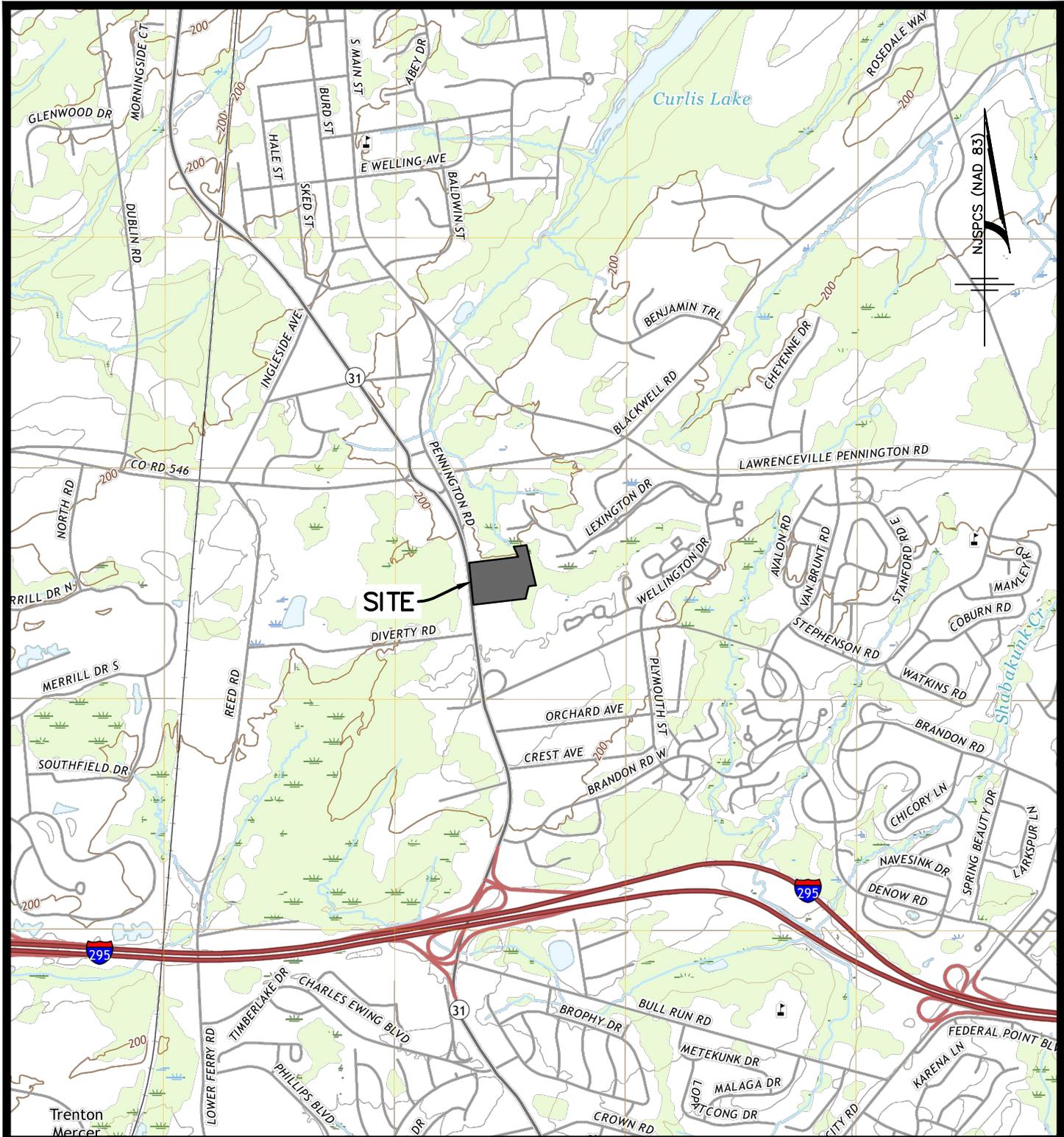
Peak Daily Demand:

Peak Demand: 0.013 MGD x 3 = 0.039 MGD

IV. CONCLUSION

Based upon project design and planning, the water distribution system will meet projected peak demands and fire flows imposed by the proposed project.

APPENDIX A
USGS MAP



MidAtlantic
Engineering Partners, LLC

**USGS QUAD MAP EXHIBIT
BLOCK 78; LOT 17
2500 PENNINGTON ROAD**

SITUATED IN
HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY

| | | | |
|-------------------|-------------------------------|-----------------------------|--------------------------------------|
| DRAWN BY: MJB | CHECKED BY: | RELEASED BY: | PROJECT No.: |
| DATE: 05/11/23 | HORIZONTAL SCALE: 1"=2000' | VERTICAL SCALE: AS SHOWN | DRAWING NAME: 99-Map Exhibits.dwg |

Certificate of Authorization No. 24GA28184000
 Louis L. Zuegner IV P.E. PE No. GE04226500
 William J. Parkhill II P.E. PE No. GE04753800
 MidAtlantic Engineering Partners
 2026B Briggs Road, Suite 300
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 609-910-4450

APPENDIX B
TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

1.0 MATERIALS

1.01 Pipe and Fittings

Pipe material to be used in construction of water mains shall be Class 53, cement lined ductile iron pipe manufactured in accordance with ANSI A21.5 AWWA C151 and installed in accordance with manufacturer's recommendation.

Ductile iron pipe shall be centrifugally cast in metal or sand molds in accordance with the latest ANSI Specification A21.51(AWWA C-101), thickness Class 53, unless otherwise required. The joint shall conform with the requirements of ANSI A.21.11 (AWWA C-111) and shall be of a type that employs a single elongated grooved gasket to effect a joint seal, such as United States Cast Iron Pipe Company's "Tyton" joint, James B. Clow and Sons, Inc. "Bell-tite" or approved equal.

The outside of all pipe and fittings shall be coated with a uniform thickness of a bituminous coating and the inside of the pipe shall be lined with a double thickness of cement mortar and bituminous seal in accordance with the American Standard Specifications for cement mortar lining for cast iron pipe fittings, ANSI A21.4 (AWWA C-104).

All fittings shall be ductile iron Class 350, suitable for use with DIP and conforming to ANSI A21.10 (AWWA C-110). Fittings shall be mechanical joint; end plugs shall be set screw type.

1.02 Gate Valves

Gate valves shall be AWWA non-rising stem type with valve box, M&H metropolitan mechanical joint gate valves as manufactured by Dresser Company or approved equal, conforming to the latest AWWA Standard for Gate Valves - 3 in. through 48 in. - for Water and Other Liquids, AWWA Designation C-500. Sizes up to and including 12" shall be 200 p.s.i. working pressure; 16" shall be 150 p.s.i. working pressure with bypass provisions. The valves must have "O" ring seals, inside screw and parallel seats and be so constructed that they will give an unobstructed passage of at least the full pipe area. They shall be perfectly tight when closed. The ends of the valves shall correspond in type and dimension with those of the pipe. All valves shall be arranged to open in clockwise (open right) direction unless otherwise indicated on the Plans and operating nuts shall be 2" square. The valves shall be tested to a pressure of not less than 400 lbs. per

square inch. All valves shall be 100% solid heat cure epoxy coated and holiday free within the waterway and shall be suitable for locations intended.

1.03 Service Loop

A house service connection shall be comprised of a corporation stop at the main, a curb stop located two feet (2') on the street side of the property line, and an inside compression stop; in that order.

House service connection pipe shall be not less than 4' deep and a minimum of 3/4" in diameter, Type K copper.

1.04 Tapping Sleeves & Valves

Tapping sleeves shall be ductile iron or cast iron dual compression type and extra heavy pattern of the sizes suitable for use on the pipe on which the respective sleeve is to be installed and for use with the tapping valves. They shall be designed for a working pressure of 200 p.s.i. and the same manufacturer as the tapping valves. Cast iron tapping sleeves shall be as manufactured by Mueller Company or an approved equal.

Tapping valves shall conform to the applicable requirements of AWWA C507. Tapping valves shall have flanged inlet with mechanical joint outlets, enclosed bevel gears, bypass valve, rollers, tracks and scrapers.

Installation of the tapping sleeves, tapping saddle, and tapping valve is to be in accordance with the manufacturers instructions. The tapping procedure is to be in accordance with the tapping machine manufacturer's instructions. After installation of the tapping sleeve and valve assembly but prior to making the tap the assembly shall be pressure tested hydrostatically to the test pressure specified in Section 3.07 with no allowable pressure prop.

1.05 Valve Boxes

Valve boxes shall be Wall Township standard as manufactured by Bingham and Taylor, or approved equal. Boxes shall have a minimum of 5-1/4 inch diameter and shall be an adjustable screw type with the box extending from the surface to three (3") inches above the valve bonnet base. Valve box shall be cast iron with a standard coal tar foundry dip with cast iron water drop cover and the word "water" cast in cover. Valve box cover shall be installed flush with the existing grade elevation.

1.06 Broken Stone

Unless otherwise approved by the engineer, broken stone shall be installed as bedding for all piping, valves and hydrants. Broken stone shall be nominal 3/4" size and shall be installed a minimum of 6" thick under ductile iron piping and minimum to spring line of polyvinyl chloride pipe.

1.07 Backfill Material

Material for backfill may consist of run of the bank sand and gravel containing not more than two percent (2%) elutriable clay.

1.08 Road Material

1.08.1 Stone and Gravel

Stone for base course shall conform to New Jersey Department of Transportation Standards for Broken Stone and be of the size known commercially as 1-1/2" Quarry Blend, of which 100% shall pass a 2-1/4" screen with round openings. Not less than 20% nor more than 30% shall pass a #4 sieve, and not more than 10% shall pass #200 sieve.

Gravel for base course shall be placed at the grade and contour shown on the plan. Gravel shall be Type 2, Class A or Class B.

1.08.2 Bituminous Concrete

For temporary surfacing, the commercial mixtures of Bituminous Concrete known as Cold Patch may be used only as approved by Engineer. The final surfacing shall be done with Bituminous concrete Type FABC, mixed in accordance with applicable standards of the New Jersey Department of Transportation.

1.08.3 Concrete

Concrete for gutter, curb, sidewalk, and drives shall have a 28 day strength of 4,500 psi, shall match the color of the existing concrete as nearly as possible and shall be finished so that the surface texture matches the original.

1.09 Polyethylene Encasement

Piping shall be encased in polyethylene to prevent contact with surrounding backfill and bedding material in areas shown or designated by the Engineer. Polyethylene material shall be installed in accordance with ANSI/AWWA C105/A21.5 Standards. Any protective coating in contact with water shall comply with ANSI/NSF Standard 61.

Polyethylene material will deteriorate rapidly when exposed to direct sunlight. Store all polyethylene encasement out of the sunlight. If during the installation period it is anticipated that the polyethylene encasement will be exposed to sunlight for more than two weeks (i.e., an open trench) Type C (black) polyethylene material must be used.

Service taps for polyethylene encased pipe shall follow the procedure described in AWWA Standard C600-87 Section 7.1.

2.0 EXISTING UTILITIES AND STRUCTURES

2.01 Scope Of Work

Attention to the Contractor is directed to the fact that the approximate locations of known utility structures and facilities (including but not limited to sanitary sewers, storm sewers, potable water lines and appurtenances, natural gas lines, electric, telephone and CATV lines and underground storage tanks) that may be encountered with and adjacent to the limits of the work are shown on the plans. The accuracy and completeness of this information is not guaranteed by the Engineer, and the Contractor is advised that he shall verify in the field all the facts concerning the location of these utilities or other construction obstacles prior to construction. The Contractor shall notify the Engineer, in writing, prior to construction, of any discrepancies which may affect the project design.

2.02 Notifications Of Utilities

Contractor shall notify all utility companies through, the NJ One Call System, that construction of the work under this Contract will pass through the areas where their services exist. Notification to the utilities must be made in a sufficient amount of time in advance (min. 72 hours) prior to start of any construction work in the affected areas.

2.03 Materials

Materials for temporary support, adequate protection, and maintenance for all underground and surface utility structures, drains, sewers and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his own expense.

2.04 Obstructions By Other Utility Structures

Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduits, ducts, pipes, branch connections to main sewers, or drains, the obstruction shall be permanently supported, relocated, removed or reconstructed by the Contractor in cooperation with the owners of such utility structures. Before proceeding the Contractor must reach an agreement with the Engineer on method to avoid obstruction.

No deviation shall be made from the required line or depth except with the consent of the Engineer.

2.05 Repairs

Existing pipes or conduits crossing the trench, or otherwise exposed, shall be adequately braced and supported to prevent trench settlement from disrupting the line or grade of the pipe or conduit, all in accordance with the direction of the Engineer. Utility services broken or damaged shall be repaired at once to avoid inconvenience to customers. Storm sewers shall not be interrupted overnight. Temporary arrangements, as approved by the Engineer, may be used until any damaged items can be permanently repaired. All items damaged or destroyed by construction and subsequently repaired must be properly maintained by the Contractor.

2.06 Relocation

Where it is necessary to relocate an existing utility or structure, the work shall be done in such a manner as is necessary to restore it to a condition equal to that of the original facility. No such relocation shall be done until approval is received from the owner of the utility or structure being changed.

2.07 Separation Of Water Mains, Sanitary Sewer And Storm Sewers

A. General

The following factors should be considered in providing adequate separation:

- (1) Materials and type of joints for water and sewer pipes,
- (2) Soil conditions,
- (3) Service and branch connections into the water main and sewer line,
- (4) Compensating variations in horizontal and vertical separations,
- (5) Space for repair and alterations of water and sewer pipes,
- (6) Off-setting of pipes around manholes.

B. Parallel Installation

Water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, the New Jersey Department of Environmental Protection may allow deviation on a case-by-case basis, if

supported by data from the Engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.

C. Crossings

Whenever water mains must cross building drains, storm drains, or sanitary sewers, the water main shall be laid at such an elevation that the bottom of the water main is 18 inches above the top of the drain or sewer. This vertical separation shall be maintained for the portion of the water main located within 10 feet horizontally of any sewer or drain it crosses. The 10 feet is to be measured as a perpendicular distance from the drain or sewer line to the water line.

D. Exception

When it is impossible to obtain the proper horizontal and vertical separation as stipulated above the Engineer is to be notified. If directed by the Engineer both the water main and sewer line shall be constructed of cast iron, ductile iron, galvanized steel or protected steel pipe having mechanical joints. Other types of joints of equal or greater integrity may be used at the discretion of the Engineer after consultation with the New Jersey Department of Environmental Protection. Thermoplastic pipe may be used provided mechanical or solvent weld pipe joints are used. These shall be pressure-tested to assure water tightness before backfilling. Where water mains must cross under a sewer, additional protection shall be provided by:

- (1) A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water line.
- (2) Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line.
- (3) That the length of the water line be centered at the point of the crossing so that the joints shall be equidistant and as far as possible from the sewer.

Through the Engineer the New Jersey Department of Environmental Protection shall be consulted when any of the above conditions cannot be met to discuss the use of double casing or concrete encasement of sewer and/or water lines as possible alternatives.

3.0 CONSTRUCTION

3.01 Piling of Materials

All materials shall be neatly piled, and the excavated material shall be banked on one side of the trench and stabilized to leave a clear footway of two feet between the bank and the trench to create as little inconvenience to owners of neighboring properties and to the public as possible. Gutters, driveways and street crossings must be kept clear, except when the latter are unavoidably obstructed by the open trench.

3.02 Precautions

All excavations, embankments, materials, rubbish and heaps of other obstacles incident to the work must be enclosed with barricades and well-lit to prevent accidents. Special precautions must be taken to secure buildings and property near the excavation. All ordinances relating to such precautions and the safeguards must be faithfully observed by the Contractor, as he shall be held personally amenable for any disregard or violation of them by his employees or agent.

The Contractor shall specifically comply with the OSHA Standards for Excavations (29 CFR Part 1926, Subpart P), "OSHA Standards". As such, the Contractor shall be responsible for providing a "competent person" as defined in the OSHA Standards and as required by the standards. The Contractor shall be solely responsible for the selection, design, installation, and implementation of all "protective systems" as defined in the OSHA standards. The pipeline design by the Engineer does not include the design of the "protective systems" since the design of the "protective systems" is the responsibility of the Contractor.

3.03 Dewatering

The dewatering of all areas where work must be performed under this Contract is the responsibility of the Contractor and no additional sum will be allowed for any dewatering operation, overtime, equipment rental or any other expense incurred due to the occurrence of groundwater, surface water or water from possible leakage of existing buildings, structures and piping in the vicinity of the CONTRACTOR'S operations.

Should water be encountered, the Contractor shall furnish and operate suitable pumping equipment of such capacity adequate to dewater the trench. The trench shall be sufficiently dewatered so that the laying and joining of the pipe is made in the dry. the Contractor shall convey all trench water to a natural drainage channel

or storm sewer without causing any property damage and in strict accordance with state and/or local requirement.

Disposal of silt and debris which accumulates during construction shall be performed in strict accordance with state and/or local requirements.

3.04 Permits

The Contractor shall be responsible for obtaining and paying for any permits required for dewatering and disposal.

3.05 Pipe Bedding and Trenching

The minimum depth of cover shall be four feet (4') from the top of the pipe to the finished grade.

The trench shall be dug to the required depth and alignment shown on the plans. The trench shall be braced and drained when necessary so that workmen may work therein safely and efficiently in compliance with current OSHA requirements.

The trench width at the ground surface may vary with and depend upon its depth and the nature of the ground encountered. Unless otherwise authorized by the Engineer in writing, the trench width shall be ample to permit proper installation of the pipe or accessories and proper placing and compacting of backfill. Unless otherwise authorized by the Engineer, the minimum clear width of sheeted or unsheeted trench shall be 18 inches (18") or one foot greater than the outside diameter of the barrel of the pipe, whichever is greater, and maximum width of trench at the top of the pipe shall not be greater than the outside diameter of the barrel of the pipe plus two feet.

In cases where use of special equipment designed to cut narrow trenches is permitted in writing by the Engineer, precaution shall be exercised to insure bearing for the full length of the barrel of the pipe. When ordered by the Engineer, the backfill shall be compacted by puddling with water.

The trench, unless otherwise specified, shall have a flat bottom conforming to the grade to which the pipe is to be laid. The pipe shall be laid upon sound soil cut true and even, so that the barrel of the pipe will have a bearing for its full length. When any part of the trench is excavated below grade by the Contractor's inadvertence or where, in the opinion of the Engineer, the use of a machine excavator has rendered unfit an otherwise suitable bottom, the trench shall be corrected with approved material, thoroughly compacted. When the bottom material uncovered at subgrade is soft and in the opinion of the Engineer, cannot support the pipe, further depth and/or width shall be excavated and refilled to pipe foundation grade as required.

Ledge rock, boulders and large stones shall be removed to provide a clearance of at least six inches below all parts of the pipe, valves or fittings. Excavations below grade in rock or in boulders shall be refilled to grade with chocked stone no larger than one inch in size, thoroughly compacted to provide support for the pipe.

Wherever necessary to prevent caving, the trench shall be adequately sheeted and braced. The sheeting shall remain in place until the pipe has been laid and the earth around it compacted to a minimum depth of two feet (2') over the top of the pipe. All pipe and accessories shall be carefully lowered into the trench pieces by

piece in such a manner as to prevent damage. Under no circumstances shall the pipe and accessories be dropped or dumped into the trench.

Every precaution shall be taken to prevent foreign material from entering the pipe. During laying operations no debris, tools, clothing or other material shall be placed in the pipe.

At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means satisfactory to Engineer.

Whenever it is necessary to deflect pipe from a straight line either in a vertical or horizontal plane, the amount of deflection in each joint shall not exceed four degrees.

3.06 Setting Fittings

Reaction or thrust backing shall be placed at bends and tees, and where changes in pipe diameter occur at reducer or in fittings. The size and shape of concrete thrust backing shall be as indicated on the appended detail sheet.

Reaction or thrust backing shall be placed at plugs and caps unless another method of restraint shall be directed by the Engineer.

Reaction or thrust backing shall be or a concrete mix not leaner than 1 cement, 2-1/2 sand, 5 stone, having compressive strength of not less than 4,000 psi at 28 days when using standard cement. Backing shall be placed between solid ground and the fitting. The backing shall be placed so that the pipe and fitting joints will be accessible for repair unless otherwise directed by the Engineer.

Valve boxes shall be firmly supported and maintained centered and plumb over the operating nut or the valve, with box cover flush with the surface of the finished pavement or at such other level as may be directed by the Engineer.

Hydrants shall be placed in locations designated on the plans. When placed behind curbs the hydrant shall be set so that no portion of the hydrant on the street side is less than six inches (6") or more than twelve inches (12") from the vertical faces of the curb, unless otherwise directed by the Engineer.

Whenever directed by the Engineer, a drainage pit two feet (2') in diameter and two feet (2') deep shall be excavated below each hydrant. The pit shall be filled compactly with coarse gravel or broken stone mixed with coarse sand, under and around the base of the hydrant to a level six inches (6") above the waste opening. No hydrant drainage pit shall be connected to a sewer.

A reaction or thrust backing shall be provided at the base of each hydrant and shall be provided at the base of each hydrant and shall not obstruct the drainage outlet of the hydrant, or the base of the hydrant shall be tied to the pipe line as directed by the Engineer.

3.07 Inspection of Water System

All construction of water systems shall be under the jurisdiction of the owner's Engineer and the Engineer for the Wall Township Water Department, either directly or through inspectors under his supervision. He shall enforce compliance with the approved plans and specifications. He shall have the authority to stop work in the event of non-compliance.

The Contractor shall give 48 hours notice to the Owner and the Wall Township Water Department prior to construction of water systems at all times during the construction period for the project. Should any water construction be performed wherein a qualified inspector is absent due to the Contractor's failure to provide the proper notification, the Owner may require said work to be uncovered at the Contractor's expense. Failure to do so may result in non-acceptance of the work.

3.08 Testing of Completed Water System

All pipe lines shall be pressure and leakage tested prior to construction of permanent pavement repair, a minimum of seven days after the last concrete thrust block has been cast if constructed with normal Portland cement. All materials and equipment required for testing shall be supplied by the Contractor.

Hydrostatic of the testing of ductile iron pipe shall conform to AWWA Standard C-600 Section 13.

The pressure test shall be performed by increasing the hydrostatic pressure to a specified value and maintaining the pressure for a period of one hour. Any pipe, fittings, or valves found defective shall be replaced. Prior to performing the test, all air pockets and bubbles must be eliminated. Hydrostatic test pressure shall be 250 psi for ductile iron and polyvinyl chloride pipe.

The leakage test shall be performed after the pressure test has been satisfactorily completed and shall be accomplished by increasing the hydrostatic pressure to a specified value and maintaining that pressure for a period of two hours. Leakage is the quantity of water that must be supplied into the newly laid pipe, or any valued section thereof, to maintain the specified leakage test pressure after the air in the pipeline has been expelled. The hydrostatic pressure for the leakage test shall be 150 psi. The leakage from each portion of the pipeline being tested shall not exceed 25 gallons per inch of internal diameter per mile of pipe per day for ductile iron or polyvinyl chloride pipe. If any test of pipe laid discloses a greater leakage than specified, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance.

3.09 Disinfection

All pipelines shall be disinfected in conformance with AWWA Standard C651-86 for disinfection water mains prior to being put into service. Hypochlorite and liquid for use in disinfection shall conform to AWWA Standards B-300 and B-301, respectively.

All pipelines shall be thoroughly flushed before introduction of chlorinating materials which shall be done in an approved manner. The amount of chlorine shall be such as to provide a dosage of not less than 50 parts per million. the chlorinated water shall be retained in the main for at least 24 hours during which time all hydrants and valves in the section treated shall contain no less than 25 parts per million chlorine throughout the length of the main.

After the applicable retention period, heavily chlorinated water should not remain in contact with pipe for more than 48 hours. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system or is acceptable for domestic use. Contractor shall contact the local sewer department to arrange for disposal of the heavily chlorinated water to the sanitary sewer.

The chlorine residual of water being disposed shall be neutralized by treating with one of the chemicals listed in the Table below. If a sanitary sewer system is unavailable for disposal of the chlorinated water an alternative disposal site must be selected.

The proposed alternative disposal site to which the chlorinated water is to be discharged shall be inspected and approved by the Engineer. A reducing agent shall be applied to the chlorinated water to be wasted to completely neutralize the chlorine residual remaining in the water. (See Table 5 for neutralizing chemicals). Where necessary, federal, state and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

TABLE

Pounds of chemical required to neutralize various residual chlorine concentrations in 100,000 gallons of water.

| Residual Chlorine Concentration mg/L | Sulfur Dioxide (SO₂) | Sodium Bisulfate (NaHSO₃) | Sodium Sulfite (NaSO₃) | Sodium Thiosulfate (Na₂S₂O₃·5H₂O) |
|---|--|---|--|--|
| 1 | 0.8 | 1.2 | 1.4 | 1.2 |
| 2 | 1.7 | 2.5 | 2.9 | 2.4 |
| 10 | 8.3 | 12.5 | 14.6 | 12.0 |
| 50 | 41.7 | 62.6 | 73.0 | 60.0 |

After flushing, the Contractor shall then have samples taken by an approved testing laboratory and bacteriological analysis made. Should the initial treatment prove ineffective, disinfection shall be repeated until satisfactory samples have been obtained.

3.10 Backfilling and Cleaning Up

Selected backfill material approved by the Engineer, unfrozen and free from rock, large stones, boulders or other unsuitable substances, shall be deposited in the trench uniformly on both sides of the pipe for the full width of the trench. This backfill material shall be tamped in four inch (4") layers and shall be sufficiently damp to permit thorough compaction under and on each side of the pipe to provide support free from voids to a cover of twelve inches (12") over the barrel of the pipe. After the pipe barrel has a twelve inch (12") cover fully compacted, the backfill shall be placed in layers not exceeding eight inches (8') until the entire trench is backfilled. No layer shall be placed until the prior layer is thoroughly and fully compacted.

The Contractor shall restore and /or replace paving, curbing, sidewalks, gutters, shrubbery, fences, sod or other disturbed surfaces or structures to a condition equal to that before the work began and the satisfaction of the Engineer.

In paved streets or roads, the edges of the paved areas to be excavated shall be cut vertically with an approved cutting tool prior to the excavation of the trench. At the end of each work day temporary paving shall be installed on all trenches excavated during the day in all residential, commercial and industrial areas, as well as any main thoroughfares, as required by governmental regulations, as necessary to protect persons and property and to the satisfaction of the Engineer.

All existing lawn areas shall be restored with sod unless otherwise specified by the Engineer.

Tools, temporary structures, and rubbish shall be removed by the Contractor and the construction site shall be left clean to the satisfaction of the Engineer. Any excess dirt shall be swept up and removed from the developed areas, and the construction site shall be left with a neat and clean appearance to the satisfaction of the Engineer.

4.0 Traffic Protection

4.01 General

The Contractor shall provide and install any and all traffic barricades, markers, signage and controls and furnish flagmen, traffic police, and other facilities required by the federal, state or other local government authorities and the Engineer to protect the general public and maintain the existing roads, streets and highways.

Competent uniformed traffic directors shall be required at every location where the Contractor's equipment is working immediately adjacent to, entering, leaving, and or is crossing active traffic lanes. The traffic directors shall be continuously employed for the entire time such conditions exist.

Special attention shall be given to the protection of pedestrians, especially children going to and coming from school. A means of ingress and egress shall be maintained for all properties abutting the worksite at all times.

The Contractor shall notify the Federal, State and Local Police, fire departments, and ambulance services of any and all traffic diversions.

The Owner or Engineer makes no guarantee or representation that the Contractor will be permitted to divert traffic and the Contractor shall be fully responsible to comply with all obligations of the Contract regardless of any restrictions which may be imposed by Federal, State, of Local Authorities.

4.02 Maintaining Traffic

Whenever it becomes necessary to divert traffic from its design flow channel into another channel, such diversion shall be clearly marked out with the use of cones, drums, barricades, signage or the use of temporary guardrail. If the diversion is to remain into the evening hours, suitable lighting shall be provided and maintained.

Whenever one way traffic is established, at least two flagmen shall be employed.

When and where permitted by jurisdictional agencies, the Contractor may close streets for minimal periods of time. The Contractor must notify and acquire the permission of local police and fire departments, local public authorities, and if so require by any law, regulation or ordinance, occupants or owners of all premises bordering the streets. The Contractor must provide adequate notice to all occupants and owners with respect to the closing of any street, in whole or in part, even when not required by any law, ordinance, or regulation. The Contractor shall

schedule his work to keep the duration of the street closing to a minimum, and wherever possible, during off peak hours. The Contractor shall provide access for police, fire, ambulance, and emergency vehicles at all times. Fire hydrants and other public utility valves shall remain accessible at all times.

4.03 Traffic Controls and Signals

The installation of all traffic control devices shall conform to the requirements of all federal, state and local government highway departments.

To protect persons from injury and to avoid potential property damage, adequate barricades and guards as required will be placed and maintained during the course of the construction work and until it is safe for traffic and pedestrians to use the trenched area.

When the Contractor is permitted to close a street or road to traffic, the Contractor shall furnish, erect, maintain and remove barricades, lights, and other traffic diversion devices at the limits of the project, where side streets intersect, and at other points of public access to the project site.

The Contractor provide and maintain advanced warning and barricades on side streets at the first street intersection beyond the one closed by construction stating “ Street Closed. One Block Ahead”. In addition, the Contractor shall remove detour signs on temporary routes when appropriate.

Before the completion of each day’s work, in traveled areas, the pipe trench shall be completely backfilled and tamped, and a necessary temporary paving installed. 3/4/ inch stone base will be used in the sidewalk and walkways and blacktop in driveways. These areas are not to be left open, impassable or unsafe through the night. In the event the trench can not be completely backfilled and tamped, temporary bridges and crossings shall be used to accommodate the general publics need for through traffic. The job site will be left in a neat and satisfactory condition at the end of each day. These requirements are in conjunction with and federal, state or local laws, rules, regulations, or ordinances or any requirements found elsewhere in the Contract Documents.

Any and all equipment stored on the site shall be clearly marked at all times. In the evening, any such material and equipment to be stored between side ditches or between the lines five feet behind raise curbs, must be outlined or clearly marked with an appropriate warning device and be approved by the Engineer. The Contractor shall also provide and maintain any and all lighting, barricades, signage, or other necessary devices that may be needed for the protection of pedestrian traffic.

4.04 Additional Requirements

If the regulation of traffic controls and devices are not being provided in accordance with these specifications, and the public is being inconvenienced or its welfare is being endangered, in the judgment of the Engineer, the Owner may take such steps as he/she deems advisable to provide such services and all costs in providing such services will be deducted from any payment which may be due of may thereafter become due to the Contractor.

APPENDIX C
COST ESTIMATE

MidAtlantic Engineering Partners

Cost Estimate of Improvements

Heritage at Hopewell

Hopewell Township, Mercer County, New Jersey

Job Number: APR-2203

Date: May 11, 2023

| Ref. | Description | Units | Qty. | Cost | Total |
|------|--|-------|------|------------|-------------|
| 1 | Connect to Existing Main | Each | 2 | \$2,500.00 | \$5,000.00 |
| 2 | Fire Hydrant | Each | 3 | \$4,000.00 | \$12,000.00 |
| 3 | 8" C-900 PVC Water Main | L.F. | 3052 | \$30.00 | \$91,560.00 |
| 4 | 2" DIP Service (lateral w/conn & valves) | Each | 2 | \$1,000.00 | \$2,000.00 |
| 5 | Fittings - Valves, Tees, Bends | L.S. | 1 | \$1,500.00 | \$1,500.00 |
| 6 | 3/4" Copper Service (lateral w/conn & valve) | Each | 55 | \$400.00 | \$22,000.00 |

Total: \$134,060.00