

MidAtlantic

Engineering Partners

March 5, 2020
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Project # APR-184

**SANITARY SEWER REPORT
FOR
HERITAGE AT WEST WINDSOR**

**BLOCK 28, LOTS 15 & 21
WEST WINDSOR TOWNSHIP, MERCER COUNTY, NEW JERSEY**

**PREPARED FOR:
AMERICAN PROPERTIES AT WEST WINDSOR, LLC**

**PREPARED BY:
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TABLE OF CONTENTS

<u>TABLE OF CONTENTS</u>	
I. INTRODUCTION	1
II. PROPOSED PROJECT	1
III. SANITARY SEWER SYSTEM DESIGN	2
IV. CONCLUSION	3

<u>APPENDICES</u>	
APPENDIX A – USGS MAP	
APPENDIX B – COST ESTIMATE	
APPENDIX C – TECHNICAL SPECIFICATIONS	

I. INTRODUCTION

The subject property to be developed is known and designated as known as Block 28, Lots 15 & 21, located in the Township of West Windsor, Mercer County. The site is bound to the east by the East Windsor municipal boundary line, to the south by Old Trenton Road, to the southwest by an mosque, and to the northeast by an existing office complex. The site consists of 66.74 Acres; the proposed development will be on primarily undeveloped farmland and will disturb approximately 35.1 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 the Township of West Windsor as the collection entity, and Stony Brook Regional Sewerage Authority 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 forty-four (44) two-story residential buildings consisting of a mix of 194 townhouse units and 60 apartment units, one 4-bedroom group home (by others) one (1) clubhouse building and amenity area, proposed internal roadways, associated parking, stormwater management measures and associated grading. The sanitary sewer collection system includes the construction of 6,282 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 West Windsor Township.

It is the purpose of this report to show that the proposed onsite sanitary sewerage infrastructure will safely convey the require sewage volumes to the existing sanitary sewer main owned and operated by the Township of West Windsor. 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 Old Trenton Road. 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 (12 one bedroom units, 36 two bedroom units, 12 three bedroom units):

$$\begin{aligned} 1 \text{ Bedroom Units: } Q_{\text{avg.}} &= 12 \text{ units} \times 150 \text{ GPD/unit} = 1,800 \text{ GPD} \\ 2 \text{ Bedroom Units: } Q_{\text{avg.}} &= 36 \text{ units} \times 225 \text{ GPD/unit} = 8,100 \text{ GPD} \\ 3 \text{ Bedroom Units: } Q_{\text{avg.}} &= 12 \text{ units} \times 300 \text{ GPD/unit} = 3,600 \text{ GPD} \\ \hline \text{Total Proposed Flow} &= 13,500 \text{ GPD} \approx 0.014 \text{ MGD} \end{aligned}$$

Residential Townhouse Units (194 three bedroom units):

$$\begin{aligned} 3 \text{ Bedroom Units: } Q_{\text{avg.}} &= 194 \text{ units} \times 300 \text{ GPD/unit} = 58,200 \text{ GPD} \\ \hline \text{Total Proposed Flow} &= 58,200 \text{ GPD} \approx 0.058 \text{ MGD} \end{aligned}$$

Group Home (4 bedroom single-family home):

$$\begin{aligned} 4 \text{ Bedroom: } Q_{\text{avg.}} &= 1 \text{ units} \times 300 \text{ GPD/unit} = 300 \text{ GPD} \\ \hline \text{Total Proposed Flow} &= 300 \text{ GPD} \approx 0.0003 \text{ MGD} \end{aligned}$$

$$\text{Total Proposed Average Daily Flow: } 72,000 \text{ GPD} = 0.072 \text{ MGD}$$

2. Sewer Main Capacity Analysis

The existing 8-inch PVC sewer main will be sufficient to convey the flows from proposed development (0.072 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 = 0.00300 ft/ft.

$$Q_d = \frac{1.486}{0.010} \times 0.175 \times 0.167^{2/3} \times 0.00300^{1/2} = 0.432 \text{ cfs}$$

$$Q_d = 0.432 \text{ cfs} \times 0.6463 \text{ mgd/cfs} = 0.279 \text{ mgd}$$

Minimum Design Capacity = 2 x Q_{avg} . (flowing 1/2 full)

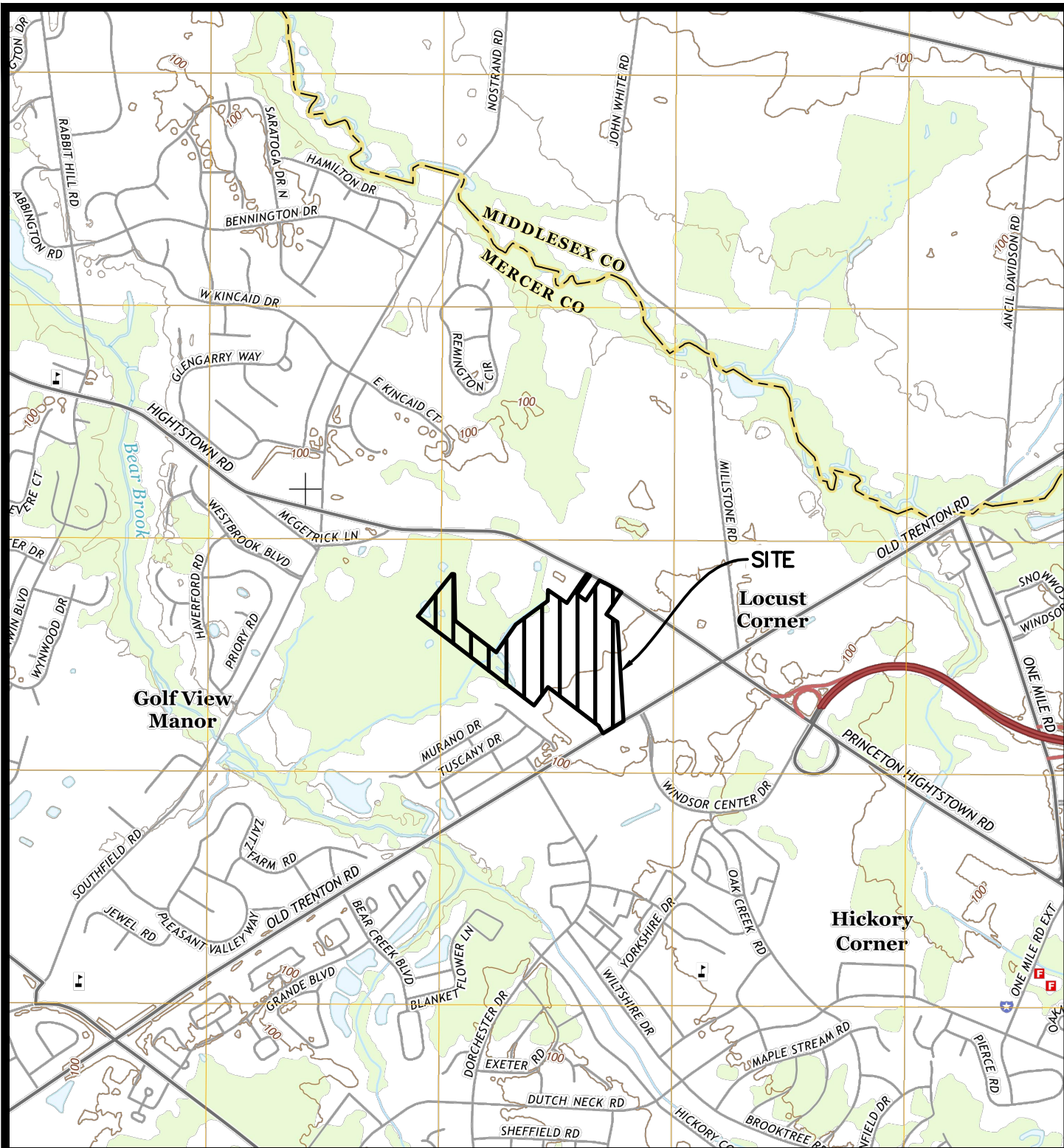
$$\frac{Q_d}{Q_{avg.}} = \frac{0.279 \text{ mgd}}{0.072 \text{ mgd}} = 3.875 > 2 \quad \therefore \text{OK}$$

(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 Old Trenton Road.

APPENDIX A
USGS MAP



MidAtlantic
Engineering Partners, LLC

**HERITAGE AT WEST WINDSOR
BLOCK 28, LOT 15 & 21
QUAD MAP EXHIBIT**

SITUATED IN
TOWNSHIP OF WEST WINDSOR, MERCER COUNTY, NEW JERSEY

DRAWN BY: EMD	CHECKED BY: MVW	RELEASED BY: MVW	PROJECT No.: APR-184
DATE: 03/22/19	HORIZONTAL SCALE: 1"=2000'	VERTICAL SCALE: AS SHOWN	DRAWING NAME: 99-Map Exhibits.dwg

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APPENDIX B
COST ESTIMATE

MidAtlantic Engineering Partners

Cost Estimate of Improvements

Heritage at West Windsor

West Windsor Township, Mercer County, New Jersey

Job Number: APR-184

Date: March 05, 2020

Ref.	Description	Units	Qty.	Cost	Total
1	Pipe (8" PVC SDR 35)	L.F.	6282	\$18.00	\$113,076.00
2	Man Hole	Each	38	\$2,250.00	\$85,500.00
3	4" PVC SDR 35 Lateral (Including Cleanouts)	LF	5824	\$15.00	\$87,360.00
4	Tie in to Existing	Each	1	\$2,000.00	\$2,000.00

Total: \$287,936.00

APPENDIX C
TECHNICAL SPECIFICATIONS

1.0 MATERIALS

1.1 Concrete:

Concrete shall consist of Portland Cement, washed sand and coarse aggregate, and shall be mixed in such proportions to yield a minimum compressive strength of 4,500 pounds per square inch (Class B) at 28-days.

1.2 Non-Shrink Mortar:

All non-shrink mortar caulking to be used for pipe joints and manhole walls as indicated on the drawings or as specified herein, shall consist of Master Builder's Embeco mortar or equal. Premixed, ready-to-use, non-shrink metallic mortar shall be applied to counter-act drying shrinkage and develop high bond strength.

The mortar will be used in strict compliance with the manufacturer's directions applicable thereto. Mortar shall contain Type II Portland Cement which is waste water resistant.

1.3 Concrete Block and Manholes:

Concrete blocks to be used in the construction of manholes shall be manufactured in accordance with New Jersey State Highway Department Standard Specifications

1.4 Manhole Castings:

Manhole castings shall be cast iron of the dimensions shown on the drawings, and shall be free from imperfections and thoroughly cleaned. All inequalities and/or projections on the cover or frame surfaces shall be removed to allow a close fit between the cover and frame, without jamming.

1.5 Ladder Rungs:

Ladder rungs shall be solid aluminum and must meet the requirements of ASTM C-478 specifications. All embedded portions of aluminum shall be coated with alumastic paint or approved equal.

1.6 Sewer Pipe:

Pipe for sewers shall be SDR-35 polyvinyl chloride (PVC) pipe with bell and spigot ends of the size shown on the drawings. O-ring rubber gasketed joints as specified herein and plastic pipe and fittings shall conform to ASTM D-1785. The plastic 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 ASTM D 2466, latest edition. Pipe shall be free from defects, bubbles and other imperfections in accordance with accepted commercial practice. The adequacy of the gasketed joint shall be demonstrated, if required, by a test at the manufacturing plant in accordance with ASTM D 2444 for impact and ASTM D 2412 for deflection and pipe stiffness. Joints for SDR35 PVC shall be of a material suitable for transporting domestic and industrial wastes.

Stubs and fittings for sewer pipe shall be SDR 35 PVC sewer pipe fittings and shall have the same type joints as the SDR 35 PVC sewer pipe herein above specified.

1.7 Backfill Materials:

All backfill material must be imported and meet New Jersey Residential Direct Contact soil criteria. Fabric liners or approved equal are to be installed in all excavations and trenches and shall remain in place to minimize soil contact. Backfill materials around the sides of the pipe and over the top of the pipe for a distance of at least 8 inches should consist of approved fill and compacted by hand. All backfill material shall be free of stumps, brush, weeds, roots, rubbish, wood, and other materials that may decay. Above this level, controlled compacted fill should be placed to attain the final design grades.

Imported fill material required to complete the backfill operations should consist of relatively well-graded granular soils containing less than 15% by weight passing a U.S. standard No. 200 sieve and having a maximum particle size of 3 inches. All backfill should be placed in layers on the order of 8-inches in loose thickness and uniformly compacted using vibratory compaction equipment to at least 92% of its maximum dry density as determined by the ASTM D-1557 test procedure. In addition, the upper 3 feet of backfill below roadways, sidewalks, and other structural areas should be compacted with a heavy vibrating drum compactor to at least 95% of its maximum dry density as determined by the ASTM D-1557 test procedure.

1.8 Pipe Foundation Material

An 8-inch thick layer of $\frac{3}{4}$ inch clean stone shall be placed below the proposed sanitary sewer piping up to the spring line to provide a uniform bed for support.

1.9 Road Materials:

Road materials shall be in accordance with the construction drawings.

1.10 Precast Manholes:

Precast manholes shall be of the sizes and details shown on the plan conforming to the requirements of ASTM Designation C 478.

1.11 Shop Drawings:

Shop drawings, material specifications and catalogue information for all pipe, manholes, materials, and appurtenances must be submitted to the Engineer for review and approval prior to purchase or delivery of any items for installation. The Engineer reserves the right to reject any items not meeting the requirements of the specifications and construction drawings.

2.0 CONSTRUCTION

2.1 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.

2.2 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 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.

2.3 Excavation - Trench:

No trench excavation shall be started until all materials and equipment necessary to complete the sewer main, house connections, manholes, etc., are on the job site and ready for installation and operation, including, among other items, sewer pipe, branches, tees, plugs, manholes, blocks, castings, steps, pumps, cranes, mechanical tampers, etc. The Contractor shall also satisfy the Engineer that he has made arrangements for acquiring road gravel and bituminous patch material and that it will be delivered as soon as required.

The Contractor shall do all excavation of whatever substances encountered to the depth shown on the drawings. Excavated material shall be placed and leveled where directed by the Engineer and not used for backfill. Only imported fill material meeting the requirements noted in Section 1.7 above may be used. No excavated material shall be removed from the site.

Excavation for manholes and other accessories shall have 12-inch minimum and 24-inch maximum clearance on all sides. Ground adjacent to all excavations shall be graded to prevent water running in.

Trenches for house connections shall not be opened on both sides of the street at the same time unless permission is granted by the Engineer to close the street. The interior to the sewer and house connections shall be carefully freed from all dirt, cement or foreign material of every description as the work progresses. Pipe shall be thoroughly flushed at the completion of the work of laying and jointing. All connections or stubs which are for future use shall be properly capped, with a fitting manufactured for this purpose.

No trench shall be opened more than 100 feet in advance of the completed sewer, and not more than 50-feet shall be left uncovered in the rear of same without the written consent of the Engineer. Trenches shall be excavated to the depths required for the foundations of the sewers and appurtenances shown on the drawings.

The sewers must be laid and all appurtenances constructed to conform to the lines and grades as indicated by stakes or other points set by the Contractor. The Contractor shall furnish all necessary materials such as stakes, spikes and other items to transfer and maintain the points set.

2.4 Preparation of Trenches

Trenches will at first be excavated only to a depth of 4-inches above the final grade, the remaining earth being taken out and the bottom of the trench dressed to fit the grade of the pipe to be laid therein, not more than 10 feet in advance of the pipe laying. If soil conditions warrant fabric liners (at discretion of project engineers), fabric liners or approved equal should be installed in the trench and shall remain in place to minimize soil contact. The Contractor shall then install a pipe foundation of broken stone 8-inches in depth for the full width of the trench. The top of the foundation shall be dressed to form a bed for the pipe and bells. The trench then will be backfilled with stone to the spring line of the pipe and the approved backfill material above. Fabric liners shall be non-woven geotextile such as Geotex 401 by Propex, or approved equal.

2.5 Plugging of Laterals:

All abandon laterals serving the subject property shall be permanently abandoned at the sewer main. Lateral connections to the existing main can be excavated and the main repaired or can be plugged with the use of short liners, to the satisfaction of the engineer.

2.6 Laying of Pipe:

All pipes must be laid in a straight grade between manholes and shall be graded by measurements from an overhead grade line or other system approved by the Engineer set parallel to the grade of the sewer by direction of the Engineer.

All sheathing and bracing which may not be left in place under the foregoing pro-visions of the agreement shall be removed in such manner as not to endanger the constructed sewer or other structures, utilities or property whether public or private.

2.7 Inspection of Pipe Laying:

The pipe laying, brick laying and the first two feet of backfill shall be under the special supervision of the Engineer or his Inspector, and whenever any work of this character is done in the absence of the Engineer or Inspector, they shall have the right to cause it to be reconstructed and re-laid, or uncovered and refilled, as the case may be, at the Contractor's expense.

2.8 Sheathing and Shoring:

Sheathing and shoring shall be used to support the sides of the trench wherever, in the opinion of the Engineer, it is necessary. Said sheathing shall be removed as the work of backfilling progresses, except as herein provided.

The Contractor shall furnish, implement and maintain such sheathing, bracing, etc. as may be required to support the sides and roof of the excavation and to prevent any movement which can in any way injure the masonry; diminish the necessary width of the excavation; or otherwise injure or delay the work or endanger adjacent buildings or other structures. If the Engineer is of the opinion that any point is insufficient or proper supports have not been provided, he may order additional supports put in at the expense of the Contractor; furthermore, the compliance with such orders shall not release the Contractor from his responsibility for the sufficiency of such support.

The Contractor shall leave in place to be embedded in the backfill of the trench all sheathing, bracing, etc., which the Engineer may direct in writing, to be left in place. The Engineer may direct termination of timber used for sheathing and bracing in trenches as specified elevations.

For the purpose of preventing injury to persons, corporations or property, whether public or private, the liability for damages on account is to be assumed entirely and solely by the Contractor under his contract. The Contractor may also leave in place to be embedded in the backfill of the trench, any and all sheathing, bracing, etc., in addition to that ordered in writing by the Engineer to be left in place, except that no sheathing and bracing which is within four (4) feet of the surface of the street may be left in place in the trench without written permission of the Engineer.

The right of the Engineer to order sheathing and bracing left in place shall not be construed as creating any obligation on his part to issue such orders. His failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from, or work of constructing the sewer occasioned by, negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place in the trench sufficient sheathing and bracing to prevent any caving or moving of the ground adjacent to the banks of the trench.

2.9 Care of Water, Gas and Other Pipes:

In digging near water pipes, gas or drain pipes, house connections, or service pipes, workmen must exercise special care to provide proper timber or chain

supports. The cost of such work and the repairs made necessary by injury to said pipes shall be paid for by the Contractor. Where such pipes or conduits form an obstruction to the line and grade of the sewer, the Contractor shall, at his own cost and in the manner prescribed by the Engineer, make such removals, alternations or rearrangements as may be required by said Engineer.

The location of utilities is shown on the drawings in their approximate location from information supplied by the utility companies to the Engineer. The Contractor is required to investigate and inspect the site of the work including calling for underground utility markouts as required by law and include the cost of doing the things specified herein in the price bid for pipe laid.

2.10 Joints:

All joints in sewer pipe shall be made in accordance with the instruction of the manufacturers of the pipe as hereinabove specified.

2.11 Pumping Ground Water:

The Contractor shall at his expense provide machinery, underdrains, and any equipment necessary to remove ground water from all excavation. No payment will be made for removing ground water as the cost thereof is to be included in the price bid for pipe laying. All sewerage improvements shall be installed in a dry trench which must remain dry until backfilling has been completed.

2.12 Backfilling

Backfill materials around the sides of the pipe and over the top of the pipe for a distance of at least 8 inches should consist of approved imported fill meeting New Jersey Residential Direct Contact soil criteria and compacted by hand. All backfill material shall be free of stumps, brush, weeds, roots, rubbish, wood, and other materials that may decay. Above this level, controlled compacted fill should be placed to attain the final design grades.

The imported fill material required to complete the backfill operations should consist of relatively well-graded granular soils containing less than 15% by weight passing a U.S. standard No. 200 sieve and having a maximum particle size of 3-inches. All backfill should be placed in layers on the order of 8-inches in loose thickness and uniformly compacted using vibratory compaction equipment to at least 92% of its maximum dry density as determined by the ASTM D-1557 test procedure. In addition, the upper 3 feet of backfill below roadways, sidewalks, and other structural areas should be compacted with a

heavy vibrating drum compactor to at least 95% of its maximum dry density as determined by the ASTM D-1557 test procedure.

2.13 Manholes:

Precast manholes shall be installed along the sewer line where shown on the drawings, and at such other places as directed by the Engineer. The manholes shall correspond to the detail shown on the drawings. All manholes shall be water-tight and shall be founded on a minimum of 12-inch thick $\frac{3}{4}$ " crushed stone modified crushed stone as indicated on the drawings. Invert channels shall be smooth, accurately shaped and in accordance with the drawings. Manholes shall be constructed as the pipe laying progresses and completed promptly.

2.14 Branches:

All branches and other fittings shall be laid and jointed in the same manner as prescribed for straight pipes, and in laying wye branches the invert of the branch shall be slightly above the horizontal diameter of the connecting pipes. In all sewers where the depth of sewer does not exceed 10-feet, wye branches shall be installed at locations designated by the Engineer.

Where the depth of the sewer exceeds 10 feet, riser pipes for house connections shall be installed at all locations designated by the Engineer by inserting a tee in the main sewer connected to a riser pipe extending to a height as shown on the plan. A tee shall be installed at the upper end of the riser pipe with a cement pipe plug or clay pipe plug closing the upper end of the tee.

2.15 Building Connections:

Building connections shall be constructed from the branch connection to the location shown on the drawings or as directed by the Engineer. The ends of all building connections must be closed with a PVC cap or a "tear out" aluminum stopper.

2.16 Quality Control:

Test for watertightness shall be made by the Contractor in the presence of the Engineer. Under exterior normal ground water pressures, sewer connections and appurtenances shall not leak in excess of 100 gallons per inch of pipe diameter per mile of sewer per day. The tests and the measurement of infiltration shall be conducted in the presence of the Engineer in a manner approved by the Engineer. As the work on the sanitary sewer progresses, each

line shall be tested from manhole to manhole for leakage and alignment, by the Contractor providing the necessary watertight plugs.

Where the groundwater is 18-inches or more above the top of the pipe, the Contractor shall perform infiltration tests. As detailed above, the conduit, connections, and appurtenances shall not leak under exterior groundwater pressure in excess of a rate of 100 gallons per inch of pipe diameter per mile of sewer per day. The tests and the measure of infiltration shall be conducted in a manner approved by the Engineer.

Where the groundwater level is less than 18 inches above the top of pipe, the Contractor shall perform exfiltration tests as directed by the engineer:

Infiltration Test:

Upon completion of the sewer and manholes, and other appurtenances, the Contractor shall dewater the sewer and conduct a satisfactory test to measure infiltration for at least 24-hours. The contractor shall construct such weirs or means of measurement as required to enable proper infiltration testing. The rate of infiltration shall not exceed 100 gallons per mile of sewer per 24 hours per inch diameter of sewer. There shall be no gushing or spurting streams entering the sewer. The Contractor shall be held responsible for the satisfactory watertightness of the line and shall affect repairs to ensure same and then shall make additional tests of the infiltration until same conforms to the requirements given herein.

The tests shall be conducted on lengths of sewers of not to exceed 2,000 linear feet, unless otherwise determined by the Engineer. The rate of infiltration for each section shall not exceed the unit rates given above. In the event that the groundwater level is lower than the top of the pipe, an exfiltration test shall be substituted for the infiltration test. It is the Contractor's responsibility to determine the groundwater elevations at the time of testing. Same can be accomplished by means of sight tubes within the manhole. The exfiltration test shall be conducted between manholes. The pipe shall be filled with clean water and additional water introduced to raise the level two feet above the top of the pipe in the upstream manhole. The Contractor shall furnish all water required for exfiltration tests. The quantity of water to maintain this level is to be measured. The test shall be maintained for a 4-hour period. The rate of exfiltration shall not exceed 100 gallons per inch of pipe diameter per mile of sewer per twenty-four hours. The Contractor shall be held responsible for the satisfactory watertightness of the line and shall satisfactorily repair all joints or other parts not sufficiently watertight, and then shall make additional tests of the exfiltration, until the exfiltration conforms to the requirement given herein.

Water Exfiltration Test:

The pipe shall be filled with water, provided by the Contractor, to a depth of 18 inches above the top of the pipe at the highest point of the line being tested. The water level in the upstream manhole shall be carefully monitored. Measured amounts of water shall be added during the period of the test to maintain water level. The test shall be conducted in a manner approved by the Engineer, and the sewer, connections, and appurtenances shall not leak under such conditions in excess of the amount of specified for infiltration tests.

Low Pressure Pneumatic Test:

The test shall be performed between manholes and subsequent to completion of backfill but prior to replacement of pavement. The following procedure shall be implemented as a method of test:

2.17 Foundation Under Pipe:

As indicated on the drawings, the Contractor shall excavate below the bottom of the proposed pipe and install the pipe on a bed of broken stone a minimum of 8 inch thick with stone up to the spring line of the pipe.

2.18 Removal and Restoration of Existing Surface:

Where the Contractor removes, destroys or damages existing surfaces, paved or unpaved, they shall be returned to a condition similar to that found at the beginning of the work in accordance with the drawings.

Upon completion of the work, the Contractor shall replace all fences, curbs, gutters, sidewalks, driveways, and all other items disturbed by his operations. Concrete surface such as driveways, curbs and walks shall be replaced with new concrete and the said replacement shall extend from joint to joint in the original work.