

**ENGINEER'S REPORT**

**SANITARY SERVICE**

FOR THE

**NEW MIDDLETOWN ELEMENTARY SCHOOL  
MIDDLETOWN ENLARGED CITY SCHOOL DISTRICT  
MIDDLETOWN, NEW YORK**

December 10, 2009  
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PREPARED BY



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## **Project Description**

This project involves the construction of a new Elementary School building and site improvements to replace the Chorley Elementary School at 55 Roosevelt Avenue in the City of Middletown, Orange County, New York. This project includes a new sanitary sewer service to collect sewage from three building sewers and transport it to the City of Middletown collection system.

## **Existing Service**

Sewage from the existing elementary school is conveyed from the building by an 8-inch diameter vitrified clay pipe to the southwest boundary of the school's property where it discharges into the City's manhole. An 8-inch diameter vitrified clay pipe sewer carries the sewage from the school together with sewage from approximately 112 homes, which enters the 8-inch diameter sewer from the south at Clemson Park Drive, to a larger trunk sewer at Cantrell Avenue.

## **Proposed Service**

A new 6-inch diameter polyvinyl chloride (PVC) pipe service main will be installed to convey the sewage from the new elementary school to the City's 8-inch collection main at the manhole near the southwest property line. A new manhole will be installed at the connection.

## **Design Flows**

The following calculations are based on a student population of 1,200.

Average Daily Flow = 1,200 students x 16 gpd = 19,200 gpd

Peak Daily Flow = 1.5 x 19,200 gpd = 28,800 gpd

Peak Hourly Flow = 1.5 x 28,800 gpd / 8 hours = 5,400 gph

Peak Minute Flow = 5,400 gph / 60 minutes = 90 gpm

For Design of the sewer the peak daily sewage flow of 28,800 gpd plus an estimate of groundwater infiltration based on the allowable rate for new sewers of 100 gpd/inch diameter/mile (ASCE MOP 60) was used.

### **System Design**

The proposed 6-inch diameter service main was analyzed using Haestad Methods SewerCAD computer program. The capacities of each section of sanitary sewer service were compared to the design flows from the school. The results of this analysis are included in Appendix A following this report.

The minimum capacity of the sewer service will be 328,872 gallons per day (gpd) versus the maximum design flow from the school of 29,013 gpd. Therefore, the 6-inch diameter service main as designed is adequate to handle the peak flow with normal infiltration from the school.

### **System Cost**

The estimated cost of construction of the proposed sanitary sewer service is \$345,000. A breakdown of the estimate is included in Appendix B following this report.

### **Downstream Sewer Analysis**

The City's existing 8-inch diameter sanitary collection main between the school's property and the 10-inch diameter trunk sewer at Cantrell Avenue was analyzed using Haestad Methods SewerCAD computer program. The capacities of each section of collection sewer were compared to the design flows from the school, the 112 homes connected to it and a high amount of groundwater infiltration. The peak wet weather infiltration unit rate was calculated from the

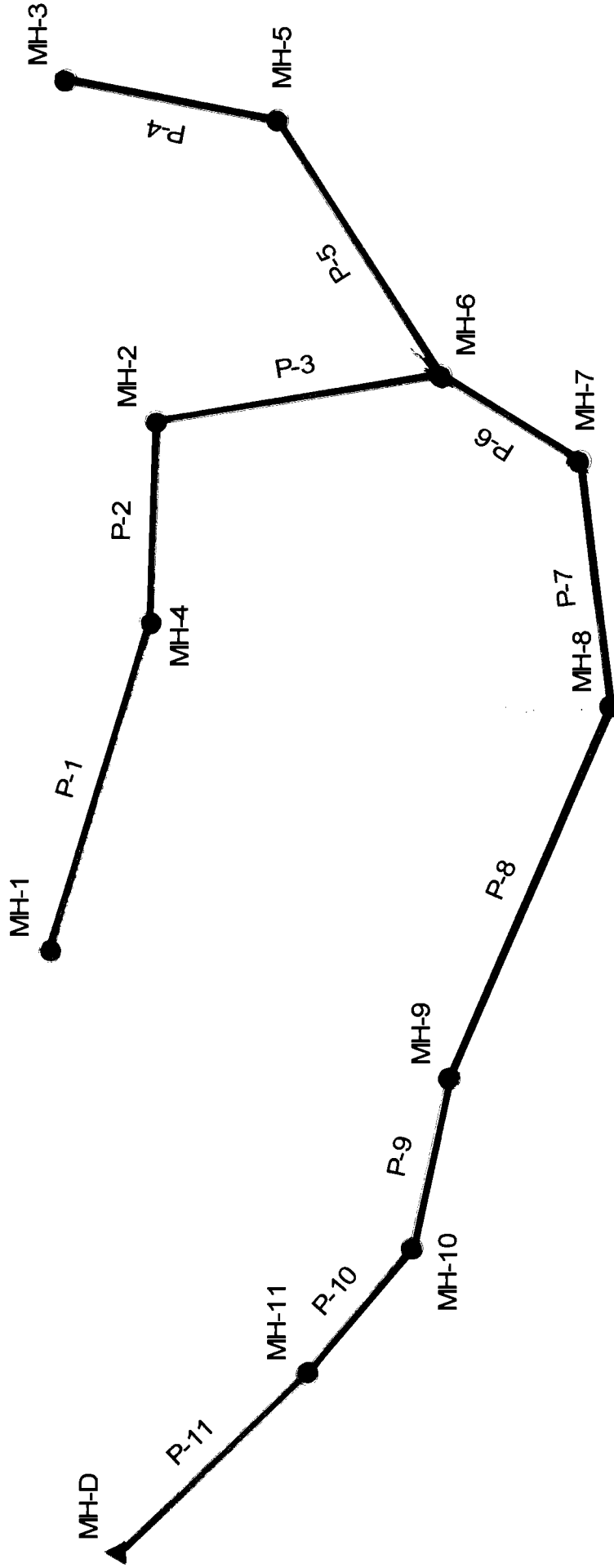
data presented in the Sewer System Evaluation Survey for the City of Middletown prepared by Clark Patterson Associates, dated January 2004. The results of this analysis are included in Appendix C following this report.

The minimum capacity of the collection main is 922,970 gallons per day (gpd) versus the total design flow of 129,816 gpd consisting of peak day flows from the school and 112 homes connected to it and peak wet-weather groundwater infiltration. Therefore, the existing 8-inch diameter collection main is adequate to handle the peak design flows from the school and homes with a very high amount of groundwater infiltration.

**APPENDIX A**  
PROPOSED SYSTEM ANALYSIS

Scenario: Base

New Sanitary Service



Scenario: Base  
Node Report

Label	Ground Elevation  (ft)	Rim Elevation  (ft)	Structure Diameter  (ft)	System Known Flow (gpd)	Total Flow  (gpd)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
MH-1	488.6	488.60	4	9,600	9,600	484.93	484.93
MH-4	489.8	489.80	4	9,600	9,630	483.53	483.53
MH-3	490.3	490.30	4	9,600	9,600	484.78	484.78
MH-2	488.8	488.80	4	19,200	19,247	482.73	482.73
MH-5	488.6	488.60	4	9,600	9,614	483.47	483.47
MH-6	485.1	485.10	4	28,800	28,902	480.85	480.85
MH-7	481.6	481.60	4	28,800	28,912	475.72	475.72
MH-8	483.7	483.70	4	28,800	28,927	474.35	474.35
MH-9	475.5	475.50	4	28,800	28,954	468.36	468.36
MH-10	471.5	471.50	4	28,800	28,968	467.12	467.12
MH-11	469.2	469.20	4	28,800	28,983	465.86	465.86
MH-D	465.9	465.90	4	28,800	29,013	463.56	463.56

Scenario: Base  
Pipe Report

Label	Length (ft)	Section Shape	Material	Section Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Designed Slope Slope (ft/ft)	Design Capacity (gpd)	Total Flow (gpd)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)
P-1	267	Circular	PVC	6 inch	484.87	483.55	0.0049	331,468	9,630	484.93	483.61	1.32
P-2	150	Circular	PVC	6 inch	483.47	482.74	0.0049	328,872	9,647	483.53	482.80	0.73
P-4	127	Circular	PVC	6 inch	484.73	483.50	0.0097	463,373	9,614	484.78	483.55	1.23
P-3	183	Circular	PVC	6 inch	482.66	480.87	0.0098	466,242	19,268	482.73	480.94	1.79
P-5	170	Circular	PVC	6 inch	483.42	480.87	0.0150	577,825	9,634	483.47	480.91	2.55
P-6	90	Circular	PVC	6 inch	480.79	475.72	0.0563	1,118,905	28,912	480.85	475.78	5.07
P-7	132	Circular	PVC	6 inch	475.64	474.36	0.0097	464,225	28,927	475.72	474.44	1.28
P-8	238	Circular	PVC	6 inch	474.28	468.36	0.0249	743,503	28,954	474.35	468.43	5.92
P-9	120	Circular	PVC	6 inch	468.28	467.12	0.0097	463,499	28,968	468.36	467.20	1.16
P-10	130	Circular	PVC	6 inch	467.04	465.78	0.0097	464,113	28,983	467.12	465.86	1.26
P-11	264	Circular	PVC	6 inch	465.70	463.40	0.0087	440,020	29,013	465.86	463.56	2.30

**APPENDIX B**  
SYSTEM COST ESTIMATE

**SANITARY SEWER SERVICE  
MIDDLETOWN ELEMENTARY SCHOOL**

ITEM	QUANTITY	UNIT	UNIT COST	COST
Mobilization & Demobilization	1	EA.	\$12,420.00	\$12,420
Excavation	4900	C.Y.	\$15.00	\$73,500
Unclassified Backfill	1850	C.Y.	\$20.00	\$37,000
Special Backfill	2500	C.Y.	\$37.00	\$92,500
Pipe Bedding	875	C.Y.	\$40.00	\$35,000
6" Polyvinyl Chloride Sewer Pipe	1872	L.F.	\$15.00	\$28,080
4' Diameter Standard Manholes	10	EA.	\$3,000.00	\$30,000
4' Special Connection Manhole	1	EA.	\$4,000.00	\$4,000
Connections To Building Sewers	3	EA.	\$500.00	\$1,500
CONSTRUCTION SUBTOTAL =				\$314,000
Contingency (10%±) =				\$31,000
<b>TOTAL CONSTRUCTION ESTIMATE =</b>				<b>\$345,000</b>

Note: This Estimate is Based on Construction in 2010

Barry L. Pickard  
6/15/2010

**APPENDIX C**  
DOWNSTREAM SEWER ANALYSIS

WET WEATHER INFILTRATION  
MIDDLETOWN, NY

Calculation of Wet Weather Groundwater Infiltration in Subarea TM7-4 in GPD/Inch/mile as Measured by Meter #27 from Sewer System Evaluation Survey by Clark Patterson Associates, dated January 2004:

Total Inch-Miles in Subarea TM7-4-1:

Size in	Length ft	Length mi	Inch-Miles
8	1,320	0.250	2.000
8	580	0.110	0.879
8	600	0.114	0.909
8	860	0.163	1.303
8	870	0.165	1.318
10	1,120	0.212	2.121
15	1,440	0.273	4.091
Total			12.621

Total Inch-Miles in Subarea TM7-4-3-1:

Size in	Length ft	Length mi	Inch-Miles
8	1,450	0.275	2.197
8	1,250	0.237	1.894
8	920	0.174	1.394
8	950	0.180	1.439
8	1,350	0.256	2.045
10	1,220	0.231	2.311
Total			11.280

Total Inch-Miles in Subarea TM7-4-3-2:

Size in	Length ft	Length mi	Inch-Miles
8	797	0.151	1.208
8	1,050	0.199	1.591
8	450	0.085	0.682
8	1,450	0.275	2.197
8	1,320	0.250	2.000
8	1,450	0.275	2.197
8	210	0.040	0.318
Total			10.192

Total Inch-Miles in Subarea TM7-4-3-3:

Size in	Length ft	Length mi	Inch-Miles
8	710	0.134	1.076
8	1,450	0.275	2.197

WET WEATHER INFILTRATION  
MIDDLETOWN, NY

8	1,130	0.214	1.712
8	1,920	0.364	2.909
8	1,520	0.288	2.303
Total			10.197

Total Inch-Miles in Subarea TM7-4-4-1:

Size in	Length ft	Length mi	Inch-Miles
8	580	0.110	0.879
8	1,120	0.212	1.697
8	670	0.127	1.015
8	700	0.133	1.061
8	780	0.148	1.182
Total			5.833

Total Inch-Miles in Subarea TM7-4-4-2:

Size in	Length ft	Length mi	Inch-Miles
8	980	0.186	1.485
8	3,440	0.652	5.212
8	2,430	0.460	3.682
Total			10.379

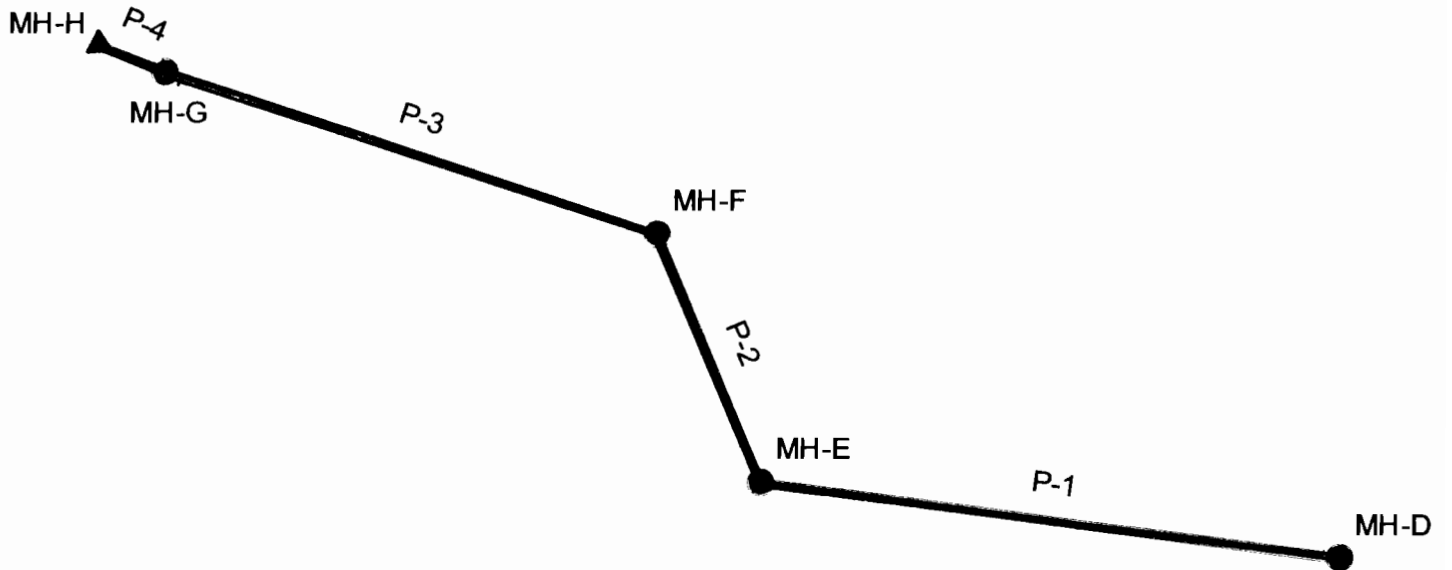
Total Inch-Miles in Subarea TM7-4 = 60.503

Wet Weather Groundwater Infiltration in Subarea TM7-4:

Total GPD	Unit GPD/in/mi
820,000	13,553

Scenario: Base

Downstream Sanitary Sewer Analysis



Scenario: Base  
Downstream Sanitary Nodes Report

Label	Ground Elevation (ft)	Rim Elevation (ft)	Structure Diameter (ft)	Residential Flow (gpd)	School Flow (gpd)	Total Flow (gpd)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
MH-D	465.90	465.90	4	-	29,013	29,013	463.56	463.56
MH-E	465.60	465.60	4	113,368	-	119,652	457.35	457.35
MH-F	455.74	455.74	4	-	-	121,828	451.86	451.86
MH-G	450.90	450.90	4	-	-	129,632	444.30	444.30
MH-H	451.03	451.03	4	-	-	129,816	444.17	444.17

Scenario: Base  
Downstream Sanitary Pipes Report

Label	Length (ft)	Material	Section Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Designed Slope (ft/ft)	Design Capacity (gpd)	Wet Weather Flow (gpd)	Total Flow (gpd)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)
P-1	306	VCP	8 inch	463.40	457.10	0.0206	1,324,334	6,284	35,297	463.56	457.35	6.21
P-2	106	VCP	8 inch	457.10	451.70	0.0509	2,083,204	8,460	121,828	457.35	451.86	5.49
P-3	380	VCP	8 inch	451.60	444.10	0.0197	1,296,662	16,264	129,632	451.86	444.30	7.56
P-4	9	VCP	8 inch	444.00	443.91	0.0100	922,970	16,448	129,816	444.30	444.17	0.13