TECHNICAL MEMORANDUM 2

Summary of Sewer Planning and Design Criteria

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This technical memorandum is one of a series being prepared for the Water and Sewer Master Plan project. The purpose of this technical memorandum is to summarize the approach and sewer planning and design criteria used in the Master Plan and identify the location in the Master Plan for the supporting documentation.

CONTENTS

2.1 METHODOLOGY FOR PREDICTING SEWER FLOWS

Note to Reader: Refer to Technical Memorandum 3 (Water Demands and Sewer Flows) for a detailed discussion of the information in this section.

Wet weather flows are used to assess the hydraulic capacity of sewer systems and are composed of three components:

- Sanitary base flow generated by homes, businesses, etc.,
- Infiltration due to normal groundwater levels (dry weather infiltration), and
- I/I due to rainfall and high groundwater levels (rainfall-dependent I/I)

The formula for calculating the sewer loads for wet weather conditions is as follows:

Peak Wet Weather Flow (PWWF) = Average Dry Weather Flow (ADWF) + Rainfall-Dependent I/I (RDI/I)

Where:

Peak Wet Weather Flow (PWWF) equals the peak hourly flow during wet weather conditions.

Average Dry Weather Flow (ADWF) is the average flow that occurs in sanitary sewers on a daily basis with no evident reaction to rainfall. The ADWF is composed of sanitary base flow and groundwater infiltration. For Stafford, sanitary base flows are roughly equal to 65% to 80% of the average day water demand which approximates the customers' water demand that is returned to the sanitary sewer. Groundwater infiltration (GWI) is an allowance that is added to the sanitary base flow (derived from sewage flow factors) to obtain the dry weather flow. GWI represents flow that is separate and distinguished from inflow resulting from storm events during wet weather conditions. The allowance used in this Master Plan for GWI is estimated to be 500 gpd/inch diameter-mile (gpdidm).

Rainfall-Dependent I/I consists of rainfall that enters the collection system through direct connections (roof leaders, manholes, etc.) and causes an almost immediate increase in wastewater flows. RDI/I data was used to establish an overall sewer system peaking factor of 3.5 in the 2006 Master Plan. The 3.5 peaking factor for the overall sewer system was also used in this Master Plan to reflect RDI/I.

To define the design flow conditions for the sewer system, the equation presented above was modified as follows:

Peak Wet Weather Flow (PWWF) = (Sanitary Base Flow x Peak Factor) + Groundwater Infiltration

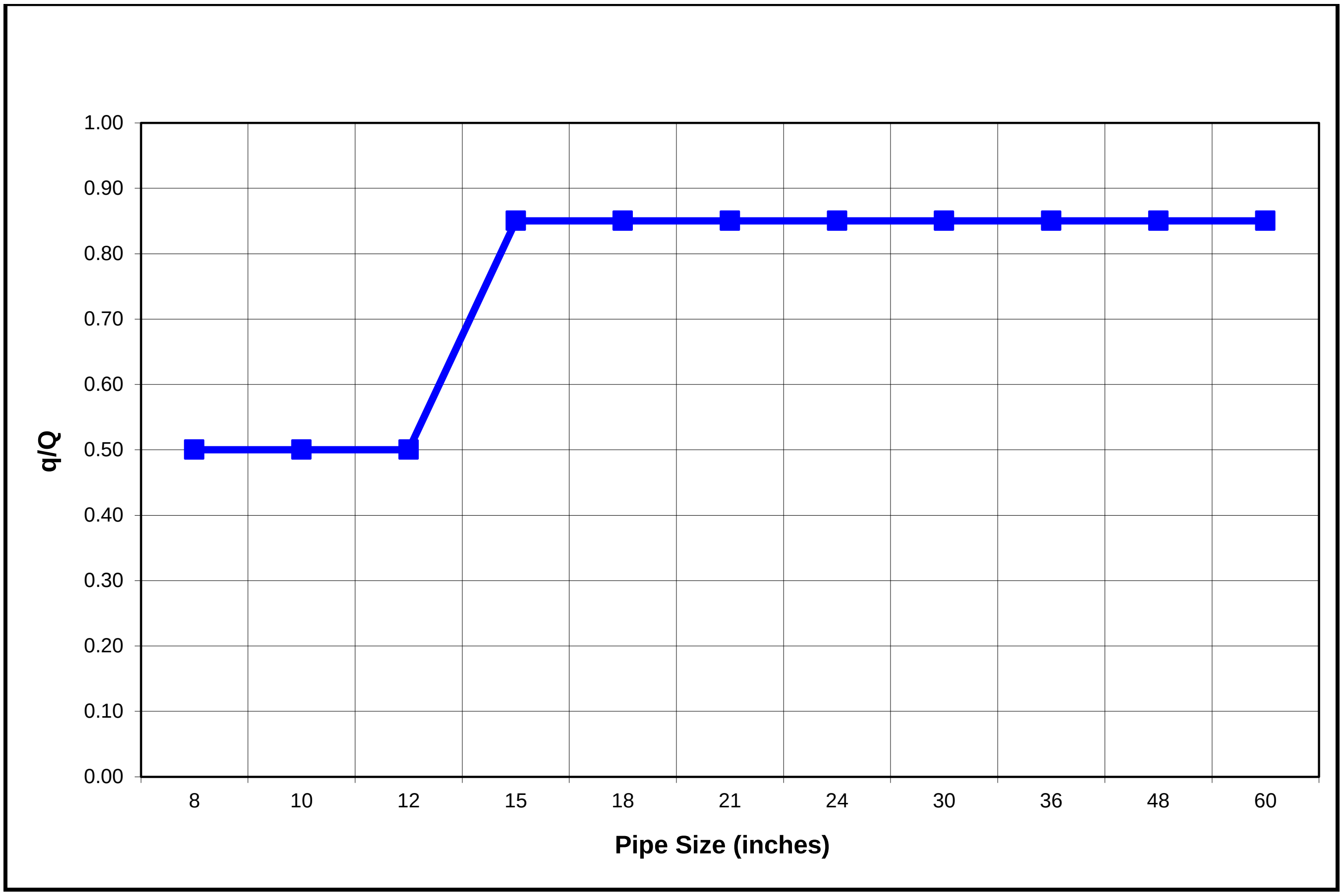
In the sewer model, a global peak factor is multiplied by the sanitary base flow at each manhole in the sewer system and the GWI component (500 gpdidm) is subsequently added to the computed manhole flow as the flow is routed through the downstream sewer piping.

2.2 SEWER SYSTEM DESIGN CRITERIA

"n" value	0.013 for all pipe materials
Minimum Velocity	2.25 ft/sec
Maximum Velocity	15 ft/sec

Criteria were developed for this study to define the "threshold" values at which point capacity enhancement measures for pipelines within the sanitary sewer system should be evaluated and rehabilitated or replaced. The partial flow-to-full flow ratios used to develop the analysis criteria curve are shown in Figure 2.2.1 and were less conservative for the large diameter sewer pipelines (15 inches and larger in diameter). The q/Q ratio of 0.85 (d/D ratio of 0.75) for the large diameter pipelines reflects the desire to maximize flow in the existing interceptor sewers. The q/Q ratio for small diameter pipelines maintains some reserve capacity and reflects the uncertainty in the spatial distribution of sewer loads served by the smaller piping in the sewer system. By applying relatively conservative q/Q ratios for the analysis curve, pipelines will be identified prior to reaching full capacity and thus reduce the likelihood of surcharge and/or overflow conditions. It should be noted that existing pipelines that exceeded the design criteria and were less than full through buildout conditions (q/Q less than 1.0) were not recommended for replacement. Rather, these pipelines were flagged for future investigation and possible flow monitoring during the planning period.

Figure 2.2.1 - Pipeline Capacity Criteria



2.3 SUMMARY

The approach and criteria outlined in this technical memorandum are based on sound engineering and give reasonable projections of future sewer flows and design flow conditions.