

Element 8 – System Evaluation and Capacity Assurance Plan

SWB Requirements:

The Enrollee shall prepare and implement a capital improvement plan (CIP) that will provide hydraulic capacity of key sanitary sewer system elements for dry weather peak flow conditions, as well as the appropriate design storm or wet weather event. At a minimum, the plan must include:

- a. **Evaluation:** Actions needed to evaluate those portions of the sanitary sewer system that are experiencing or contributing to an SSO discharge caused by hydraulic deficiency. The evaluation must provide estimates of peak flows (including flows from SSOs that escape from the system) associated with conditions similar to those causing overflow events, estimates of the capacity of key system components, hydraulic deficiencies (including components of the system with limiting capacity) and the major sources that contribute to the peak flows associated with overflow events;*
- b. **Design Criteria:** Where design criteria do not exist or are deficient, undertake the evaluation identified in (a) above to establish appropriate design criteria; and*
- c. **Capacity Enhancement Measures:** The steps needed to establish a short- and long-term CIP to address identified hydraulic deficiencies, including prioritization, alternatives analysis, and schedules. The CIP may include increases in pipe size, I/I reduction programs, increases and redundancy in pumping capacity, and storage facilities. The CIP shall include an implementation schedule and shall identify sources of funding.*
- d. **Schedule:** The Enrollee shall develop a schedule of completion dates for all portions of the capital improvement program developed in (a)-(c) above. This schedule shall be reviewed and updated consistent with the SSMP review and update requirements as described in Section D. 14.*

RWB Requirements:

Capacity Assessment: *Each wastewater collection system agency shall establish a process to assess the current and future capacity requirements for the collection system facilities.*

System Evaluation and Capacity Assurance Plan: *Each wastewater collection system agency shall prepare and implement a capital improvement plan to provide hydraulic capacity of key sewer system elements under peak flow conditions.*

Introduction

The City periodically conducts flow monitoring and hydraulic modeling analysis to anticipate future growth or increased demand on the system as well as to determine if excessive I&I is impacting the capacity of the system. The nature of the demographics of the City is such that the City has not experienced growth or demand on the system that has necessitated updating the

hydraulic capacity model since the last assessment in 1995. Woodard & Curran has completed a Technical Memo based on Modeling and Flow Monitoring for the southwest portion of the City and the flow leading to the C Street pump station.

Capacity Assessment

The capacity assurance process is used to determine estimated peak flows associated with wet weather conditions causing overflow events, estimates of the capacity of key system components, hydraulic deficiencies (including components of the system with limiting capacity) and the major sources that contribute to the peak flows associated with overflow events.

The latest Woodard & Curran modeling efforts have led to CIP projects to address hydraulic issues. The final modeling report for the southwest portion of the City will be used in the Sewer System master Plan anticipated in 2021. The presence of an urban growth boundary has resulted in little or no utility expansion since the early 1990's.

System Evaluation and Capacity Assurance

The capacity assurance program is based on a capacity assessment that relates short term and long term capacity requirements to a capital improvement program for providing the hydraulic capacity of key sewer system elements under peak flow conditions. The following are the program components:

- Evaluation – Evaluate portions of the collection system experiencing SSOs due to hydraulic deficiency.
- Capacity Enhancement Measures – Establish a short- and long-term capital improvement program to address identified hydraulic deficiencies.
- Plan updates – Update the plan on a regular basis as specified in the SSMP. Capital improvement requirements will be consistent with current planning objectives. Capacity assurance and modeling will be done periodically.

Flow Projections

Flow projections are based on historical flow rate data combined with calculated flow rates for growth areas, septic tank conversions and infill development. To estimate the sanitary flow impact of these areas, the results of actual metering and flow monitoring are used to define base sanitary flow, groundwater infiltration and RDI/I values in of the tributary sub basins. To see the effect of the development over time, the flow impacts were added into the model in three equal five-year phases until built out.

In this manner an allotment for I&I is also incorporated for new laterals and mains in the new areas. Residential infill I&I assumes that existing sewers will be used to convey wastewater flows to the treatment plants, without added I/I volumes for new work. The City currently specifies allowances of 1000 gpd/acre for pipes installed since 1975, 2500 gpd/acre for installations between 1962 and 1975, and 6000 gpd/acre for pipes installed prior to 1962. Non-residential I&I were calculated based on the City standard of 1000 gpd/acre.¹

Hydraulic Analysis

The hydraulic model evaluates the primary "back bone" of the system i.e. lines greater than or equal to 10" in diameter. The City's GIS files are used to spatially define the system topology including geometry and network connectivity. Each individual structure data is maintained in the system database. The data maintained includes pipe types (gravity or pressure pipe), manhole types (split, diversion, outfall or standard manhole), pipe diameters, rim and invert elevations, pipe lengths and slopes.

Diversion manholes are also incorporated into the model. Diversion manholes split the incoming flow into two components, one that continues through the main line, and another that is diverted to an overflow line. Flow is divided according to predicted performance curves that should be calibrated as more flow data becomes available in the future.

Flow Allotments

Based on the City's design standards, initial projected flows are "injected" into the hydraulic model. These are allocated based on the individual parcels to represent geographic regions that inject flows to particular pipes along the system. Each parcel is associated with its respective Land Use designated as one of three distinct types of Sanitary Service Areas: Residential, Commercial, or Open Space/Parkland.

Residential areas generate flows based on population. For design purposes, typically the average family unit is considered 3.5 persons that generate 90 gallons per person per day for a total of 315 gallons per parcel per day.

The Commercial areas generate flows based on volume. Typically the total commercial water consumption is summed from the latest report and proportioned to each parcel by acreage in gallons per day. The Open Space/Parkland areas are assumed to generate no sanitary flow.

These areas are assigned to specific pipes in the collection system. The sanitary flows are injected into the system throughout a 24-hour day based on flow study diurnal curves for each type of use. Diurnal curves were derived from two flow monitoring areas of the flow study, one a predominately Residential area and another predominately Commercial area. Since no flow is generated for Open Space / Parkland areas, a third diurnal curve is not needed.

Once completed, the initial flow data is adjusted to the results of the flow metering and monitoring study and the allocation of GWI, BSF & RDI/I to the sub-basins. BSF & GWI values are calibrated to the metered values found during dry weather periods. Results of this analysis provide the loading parameters for the model are included in the Woodard & Curran documents.

Capital Improvement Program (CIP)

The CIP process includes a system for preparing, evaluating, and reporting the CIP budgets. The City's collection system requires a continuing number of improvements including collection system capacity upgrades, correcting structural problems, and modifications to pump stations and the treatment plants. A construction schedule for the capital projects is developed based on the project priorities and to support payment of all capital improvement program and equipment replacement expenditures. The schedule for the projects (in current dollars) is presented in the collection system master plan, rate studies, and 8 year CIP replacement program.

CIP Planning

The CIP includes increases in pipe size, I/I reduction programs, Grade 4 & 5 pipe failures, increases and redundancy in pumping capacity, and storage facilities. The City has put into place the steps needed to establish a short-and long-term CIP to address identified hydraulic deficiencies, including prioritization, alternatives analysis, and schedules.

The City has prepared and is implementing a Capital Improvement Program (CIP) that will provide hydraulic capacity of key sanitary sewer system elements for dry weather peak flow conditions, as well as the appropriate design storm or wet weather event. The CIP includes an implementation schedule and identifies sources of funding.

Cyclic Replacement Program

A Cyclic Replacement Program is intended to provide for the long-term gradual replacement of the sewers in the City system. Such a program is needed because many of the City sewers are 50 years old and greater and the design life of a sewer pipe is generally considered to range from 50 to 100 years.

Historically, Bay Area communities such as the cities of Berkeley and Oakland and the older portions of the cities in Contra Costa County, the condition of many of the sewers has been found to be poor and rehabilitation and replacement programs have been recommended. The age and type of pipe materials in the City system are similar to many other community collection systems in the Bay. Over time the City sewers may exhibit many of the same problems of physical deterioration as have been found in these other systems. Therefore TV inspection of the sewers to determine and monitor their actual condition is being followed. A Cyclic Replacement Program involves a systematic program to televise each sewer in the City's sanitary sewer system and identify those in need of rehabilitation or replacement. The results of the continued inspection program will be used to identify specific rehabilitation / replacement projects to be included in future capital improvement programs and the specific method of rehabilitation or replacement that is best suited for each project.