Special Order No. 006-0691 Date: June 6, 1991

Subject: **Planning Period, Flow, and Design Criteria for Gravity Sanitary Sewers and Pumping Plants**

Purpose

This Special Order provides revised criteria and guidance to include wet weather peak flow in the design of gravity sewers and pumping plants. It is required to implement the City-adopted goal of no overflows or diversions from the wastewater collection system. The criteria is designed to upgrade sewerage service to a level necessary to meet the City goal.

Effective Date

This criteria is effective immediately and should be used in the determination of design flows for all gravity sewers including replacement sewers and for pumping plant upgrade and expansion projects and for subsequent designs until the Sewer Design Manual is updated.

Sewer rehabilitation projects shall be reviewed considering the appropriateness of installing a new larger sewer to meet this new design criteria in lieu of sliplining a deteriorated pipe.

Impacts of the revised criteria for projects in design, or with design complete but not yet constructed, should be discussed with the Wastewater Program Management Division and the Wastewater Planning/Design Deputy.

Planning Period

Sewers, pumping plants and their components should be designed for at least the following planning periods subsequent to their being placed into operation (actual service life may be longer).

Facility or Component of a Facility	Planning Period
Trunk, interceptor, outfall, and relief sewers - sewers 18 inches in diameter and greater	60-100 years
Lateral sewers - sewers less than 18 inches in diameter	100 years
Storage reservoirs and pumping plant structures	60 years
Mechanical, electrical, and control equipment	20 years
Electrical wiring conduits	60 years
Force mains	60 years

Design Flows/Sizes

Gravity Sewers

Sewers shall be sized so that the peak dry weather flow (PDWF) depth, projected for the planning period, shall not exceed one-half the pipe diameter (d/D - 0.5). Where upstream treatment and/or storage reservoirs are planned or available to attenuate flows, their effect on reducing peak flows shall be considered in sizing downstream sewers. In addition, sewers shall be sized so that full pipe capacity of the trunk, interceptor, outfall or relief sewer, including any parallel sewers which are to remain active, is at least equal to the aggregate full pipe capacity of the directly tributary sewers.

Gravity sewers shall be designed for a minimum velocity of three feet per second at the projected peak dry weather flow for the planning period. Deputy approval must be obtained to use design velocities less than three feet per second.

Force Mains

Force mains must be sized in conjunction with the sizing of the pumps. The desired flow velocity range in force mains is between three and eight feet per second. To maintain minimum velocities in the force main, a dual force main system may be necessary. Initially only one pipe may be needed; the second, may be added when the higher velocities are reached. The second pipeline could be installed initially and used for backup until flows necessitate using both pipes.

Pumping Plants

Pumping plants shall be designed for two times PDWF for the planning periods of the various facility components.

Pumping Plant Design Goals

The following design goals have been established to ensure design consistency and continuity in satisfying City objectives.

Dual Power Feeds

For the larger capacity pumping plants, dual power feeds from two completely independent systems (transformers, feed poles, substations) with automatic transfer switch capability are preferred.

The cost of providing a second independent feed should be compared to purchasing, installing and operating a standby generator over a 20-year period and the less costly alternative selected.

Standby Power Generation

The need for onsite standby power generation should be considered on a case by case basis. Depending on the pumping plant spill susceptibility, standby power generation may also be provided as a backup source to a dual

power feed.

The power generator should have an automatic start mode of operation and an automatic transfer switch. Generator capacity should allow maintaining pump capacity sufficient to handle peal wet weather flow. Onsite fuel storage capacity for the generator power source should be sufficient for a minimum of eight hours continuous operation. Additional fuel capacity for up to 24 hours continuous operation should be considered.

Pumping plants should have a provision for a portable generator plug for requirements up to 300 kw.

Pump Redundancy

Pumping plants should have the capacity to handle the peak wet weather flows with the largest two pumps out of service (i.e., tow standby pumps). The number of operating pumps (excluding the two standby pumps) is dependent upon the flow range.

Containment Capacity

If feasible and prudent, each pumping plant in conjunction with the influent sewer should provide a minimum of three hours storage capacity above the high water alarm point at peak wet weather flow.

Peak Wet Weather Flow Accommodation

Pumping plant structure, piping, power feed, bussing and transformers should all be designed to accommodate the equipment required to meet the projected peak flow during the planning period.

Intermediate Flow Accommodation

Pumps and controllers should be designed to accommodate the projected flow range from the present to 20 years in the future.

Wet Pit/Dry Pit Configuration

Pumping plants which are susceptible to flooding shall be designed with submersible pumps in a dry pit.

Force Main Taps

Connector sizes should be standardized to ensure ease of connection. Temporary submersible pumps should have an easy access to the force main tap and wet well.

Telemetry Monitoring

Conditions to be monitored should be standardized between pumping stations. Hardware to interface with existing equipment should be standardized.

The current system has the capacity of transmitting 28 status bits and four analog measurements from each station.

Status Bit	Function
1	Power fail
2	High water in wet well
3	Water in dry well
4	Entry
5	Generator run
6	Low air
8	Plant entry acknowledgement
9	Plant entry acknowledgement
17	Pump #1 ON
18	Pump #2 ON
19	Pump #3 ON
20	Pump #4 ON
21	Pump #5 ON
22	Pump #6 ON
25	Watt Hour Meter Pulse (1 KW-HR/PULSE)
29	FLOW 3-12/15 sec pulse (Labeled Analog #1 on system print)

Level Monitoring

Pumping plants should be provided with a reliable compressor system to support bubbler systems. Aquarium compressors now in operation shall be replaced with a more durable, reliable system. A secondary level monitoring system shall be provided to replace a failure of the primary system.

High Flow/Low Flow Rates

Pumps designed to accommodate the high end of the flow range are susceptible to clogging and excessive cycling at low flows. To avoid excessive cycling, pumps should be designed for a maximum of three starts per hour for pump motors 50 HP and over, six starts per hour for motors less than 50 HP. Design should consider a constant speed jockey pump to specifically handle minimum flow periods.

Flow Metering Devices

The design goal is to install accurate, reliable meters at all the pumping plants. Flow meter data output should be telemetered in conjunction with level/operation monitoring output.

Electrical Equipment Location

All electrical equipment should be located above a level susceptible to sewage and/or storm flooding, or high tides along coastal locations.

Sulfide Control

Pumping plants should be designed to minimize the negative impact of sulfide corrosion and odor.

Ventilation

All wet wells should be provided with positive ventilation. Motor and pump rooms, control rooms, etc., should have negative ventilation.

Spare Parts

A sufficient spare parts inventory should be provided. Equipment selection should consider previously selected manufacturers so that inventories are more easily maintained and personnel are more familiar with equipment.

Energy Conservation

Energy conservation should be a design goal. Reduced voltage start or partial winding displacement motors should be specified for the larger installations.

(BMS BHR)