

**WEST VALLEY SANITATION DISTRICT
SEWER SYSTEM MANAGEMENT PLAN**

**SECTION IV
OPERATIONS AND MAINTENANCE PROGRAM**

Operations and Maintenance Program

The Operation and Maintenance Program is critical to the fulfillment of the District's mission to serve the residents and businesses within its service area and a significant part of the District's effort in reducing the occurrence of SSOs and mitigating their impact. This program encompasses these major elements:

- a) Collection System Mapping
- b) Preventive Maintenance
- c) Rehabilitation and Replacement
- d) Staff Training and Certification
- e) Maintenance Equipment

a) Collection System Mapping

The use of accurate and up-to-date collection system mapping is essential for proper operation and maintenance of a wastewater collection system. The location, size, direction of flow, and other pertinent information of the system's components are utilized regularly by both maintenance and engineering staff. The District's mapping is generally very accurate and complete. However, a recent implementation of the District's Lateral Maintenance Program has prompted the need to map locations of sewer lateral cleanouts, none of which had been previously shown. Currently, there is an effort to transition to electronic mapping which has required staff to occasionally refer to both old and new mapping technologies. Another aspect of mapping is the need to properly map storm drainage systems as it relates to the sewer structure locations and determination of flow direction of SSOs.

Collection System Mapping

The District currently uses two forms of mapping; physical maps or Sewer Location Maps, which are the District's original "hand" drawn sewer maps and, electronic or Geographic Information System (GIS) mapping. The District will be transitioning away from the use of these Sewer Location Maps since there are a number of disadvantages associated with them including: excessive time required to hand draw corrections, difficulty in finding staff with the ability to ink draw, deterioration of original linen or mylar map sheets, placement of new information is difficult on a crowded sheet, and the cost and effort related to the duplication and distribution of revised sheets. Since accessibility to GIS mapping is currently unavailable in the field, maintenance staff refer to Sewer Location Maps for basic location information. A distinct advantage with using GIS maps is the accessibility to the entire database of information for the collection system as well as orthographic projection

of aerial images. The District's GIS is linked to a Computerized Maintenance Management System (CMMS) referred to as GBA Master Series (GBA), which has been in use by the District since 2003. In addition to location, the GBA database contains sewer structure attribute information including ID number, diameter, flow direction, segment length, material type, and age. Location and attribute information is updated on a continuous basis as new or updated information is obtained through field observations, upon completion of new sewer projects, and as locations are captured using Global Positioning System (GPS) survey equipment. The GIS mapping information is the default source for all up-to-date information as the 1,100 page Sewer Location Maps are no longer being updated. An example of a typical GIS Sewer Map sheet is shown in Appendix B.1.

Although the Sewer Location Maps have fairly accurate and complete main line mapping, the lower lateral (from main connection to property line cleanout) mapping is not as complete. It is estimated that the Sewer Location Maps only show approximately 75% of the lower laterals and very few cleanouts. Since the lower lateral is owned and maintained by the District, a preventive maintenance effort to clean lower laterals has begun as part of the recently initiated Lateral Maintenance Program. In order to make this maintenance effort more efficient, the cleanouts are first located and then surveyed using GPS. The location of cleanouts helps confirm the location of the lower lateral, but more importantly, determines whether the lower lateral can be serviced.

Storm Drain System

The District also has storm drain system mapping within its service area as part of its responsibility to perform annual storm drain maintenance for its member entities. This mapping was provided to the District from the respective cities and is currently used by maintenance staff for storm drain maintenance. The form and completeness of this mapping ranges from poor to fair and is very difficult to use. Recently, the District has begun transferring this storm drain system information to GIS and making the necessary updates and corrections. An example of the storm drain mapping overlaid on the sewer collection system (GIS Sewer Map) is included in Appendix B.1.

b) Preventive Maintenance

An effective preventive maintenance program will help maintain the integrity of the collection system by preventing excessive infiltration and inflow (I & I), eliminating blockages within the system, maintaining uninterrupted service, and preventing system failures. These results should lead to a reduction of the frequency, number, and volume of sanitary sewer overflows (SSOs). The District's preventive maintenance is discussed below through a description of its maintenance program, cleaning methods, and service call response procedures.

The prioritization and scheduling of the District's preventive maintenance program is facilitated by the capabilities of GBA. GBA is used to electronically store, track, and manage all operations and maintenance activities pertaining to the collection system. Maintenance history information, asset information, service call data, work order data,

cleaning schedules, and closed circuit television (CCTV) data are all kept in the GBA database. The linking of the District's GIS and GBA database is a powerful feature that allows staff to graphically represent any collection system information and historical maintenance data desired in order to facilitate analysis of this data.

Maintenance Program

The District's preventive maintenance program is a proactive program that is designed to locate, identify, and mitigate problems that may exist in the collection system prior to the occurrence of a failure of the system. The primary areas requiring sewer maintenance are main line, lower lateral, manholes, and pump station maintenance. This program is developed to be efficient in terms of resource utilization and effective in the reduction of SSOs. One way efficiency is achieved is by establishing activity guidelines for each maintenance activity, which identifies common staffing, equipment, materials, work methods and procedures. By creating large work orders that use the same maintenance crew and equipment, increased productivity is achieved through this continuity of resource utilization and repetitiveness in work activity. Efficiency is also gained through focused maintenance by geographic areas to minimize travel time. To address maintenance that are considered emergency or as-needed maintenance (service calls), the District has an established procedure in place.

There are approximately 412 miles of mainline sewer pipe within the District, ranging in diameter from 3 to 39 inches, with nearly 90% of these lines 8-inches in diameter or smaller. An inventory of main sizes within the District is shown in Appendix B.2. Mainline maintenance constitutes the largest maintenance activity in the District. Based on previous cleaning history and resource capabilities, it was determined that an effective cleaning frequency to be used for a majority of mainlines was twenty four (24) months. By dividing the District's service area into twenty four (24) geographic zones, or Geozones, mainlines in a particular zone would be cleaned at the desired frequency in a designated month. A specialty cleaning routine is also used for certain lines that need to be maintained on a more frequent basis. For example, siphons are cleaned every two months and heavy fats, oils and grease (FOG) problem areas may be cleaned every one to three months. A map of the District showing its 24 Geozones is included in Appendix B.3.

The District has approximately 37,000 lateral connections amounting to an estimated 200 miles of lower lateral. The maintenance of lower laterals has recently become a significant maintenance activity and, as previously mentioned, initiated the need to begin a lateral locating and mapping effort. Similar to the concept of Geozone cleaning for mainline maintenance, the laterals are also divided into its own geographic areas. In this case, the geographic areas are based on blocks of neighborhoods. By examining GIS mapping of historical backups and or SSOs, the number and frequency of such events are used to prioritize the order of maintenance. Since the Lateral Maintenance Program was initiated in mid-2009, there is little track record to suggest the most appropriate cleaning cycle. Given that a large number of laterals have not been serviced (by the District) for many decades, it appeared reasonable to establish an initial cleaning cycle of ten years. The

condition of a lateral will be monitored using CCTV inspection to verify the validity of the cleaning frequency selected. There are also laterals that have backup and overflow history that the District has maintained on a 6 month cycle. These are prioritized on repair lists and eventually will come off of this short cycle maintenance list. Another option to be implemented shortly is the use of chemical treatment on those lateral lines that have had historic root issues.

The District owns three small pump stations, two of which pump in tandem to lift wastewater from the Arroyo Del Rancho residential area, while the third serves the separate Alta Tierra residential area. Each pump station has two pumps (lead, lag) with the two tandem pump stations having 11Hp pumps, while the third pump station has 20 Hp pumps. Due to a condition evaluation of these pump stations, each pump station has recently been rehabilitated with new piping, valves, control panels, and manual transfer switches. A weekly inspection and testing is performed on each pump station to verify that all components are working properly. System vitals are monitored remotely and properly alarmed should a failure or fault occur. The location map of the pump stations and the associated pump information is included in Appendix B.4.

Cleaning Methods

The District utilizes a variety of tools and equipment to perform the required maintenance for mainlines and laterals, depending on the location, expected debris type, and accessibility. The two primary cleaning methods for mainlines are high velocity cleaning (HVC) and power rodding. Performing HVC cleaning requires the use of one of the HVC trucks that are outfitted with a complement of nozzles and cutters that enable the crew to clean a variety of different sizes of pipe as well as remove different types of debris. This method is utilized when access is available for the truck and where there is no history of high cleaning pressures backing up water into a building. The power rodding is performed using the continuous rodder truck. This truck is also equipped with a variety of cleaning tools and used in those areas where HVC is not used and where the primary debris to be removed are large roots. For mainlines located in easements where they are inaccessible by vehicle, the hand rod method or chemical root control method are being utilized. Whichever cleaning method is used, the estimated quantity and type of debris that was removed by the cleaning operation is documented and entered into the GBA database. This data is later analyzed to confirm the effectiveness of the cleaning operation used and also to determine whether the cleaning frequency is appropriate for that particular line.

Lower lateral cleaning is almost exclusively performed by using an electric power snake/cable, or "Spartan". This is a portable unit that is kept on each service truck and is manually rolled to the cleanout for use. The maintenance staff hand guides the cable with a 3 or 4-inch blade attachment through the lateral. Strong resistance or impassibility to this effort indicates the presence of an obstruction. If smaller blades are used without success, a CCTV inspection is performed to further investigate the problem. Other than debris remaining on the blades, there is no record available of debris type or amount.

Service Call Procedure

The District office is open Monday through Friday, except for District holidays, from 7:30 am to 4:30 pm. All regular business hour service calls are received by the administrative staff and is referred directly to the Operations Supervisor, or designated assistant. All after hour calls are automatically routed to the Santa Clara County Emergency Radio Communications Center who then directly notifies the District's On-call field operations staff via a pager system. The On-call field operations staff is available 24 hours a day during his on-call period and is furnished with a service truck, pager, and cell phone to facilitate a timely response. This truck is equipped to address lower lateral blockages and has some spill containment devices to prevent minor SSOs from entering a storm drain inlet or channel. Should the situation require larger equipment and staffing, the On-call person would contact secondary On-call staff and obtain the necessary equipment from the District yard. The circumstances of the Call-out and the activities executed are properly documented and recorded in GBA.

c) Rehabilitation and Replacement

The purpose of a sanitary sewer rehabilitation and replacement plan is to identify and prioritize system deficiencies and implement short and long-term rehabilitation actions to address each deficiency. The basic steps involved in this plan include inspection, condition and risk assessment, and the development of repair or rehabilitation programs.

Inspection

Inspection of the collection system is primarily performed by closed circuit television equipment (CCTV), but some inspections may be performed visually, while more detailed inspections may require the use of an infrared or sonar inspection, or possibly destructive inspection methods. The inspection method used is dependent upon the type and location of the structure being examined, and the purpose for which the examination is being made. The information obtained through inspection provides invaluable information that helps staff determine whether to focus additional maintenance effort, or define the scope of repair or rehabilitation efforts.

The District has a modern CCTV van that uses state of the art digital video equipment and conducts pipe and manhole inspections on a daily basis. The CCTV van is equipped with motorized main line cameras, easement or lateral (push) cameras, and a pole camera. The motorized main line camera has a complement of wheel sizes and types to allow it to traverse through pipe of varying grade, condition, and material type from 6 to 15 inches in diameter. Inspection of larger pipe requires the rental of a larger camera, or contracting with a consultant to perform this work. Nearly all of the CCTV inspection work for main line is performed on a planned schedule and is conducted within 42 separate drainage sub-basins, which was developed as part of the District's Strategic Basin Rehabilitation Plan (Carollo, April 2000). The complete cycle for televising the entire District's main line inventory is currently on an eight to ten year track. Lines which experience an SSO, prove to be difficult to clean, or are suspected to have some abnormality, are televised as necessary to determine the cause of the problem.

Performing regular CCTV inspections on the collection system is the primary approach to identifying significant structural deficiencies that are developing or have occurred, and is a proactive approach to the rehabilitation and repair of pipe through the District's Capital Improvement Program and annual Sewer Repair Program.

Condition and Risk Assessment

The rating of sewer main condition is performed using a standardized set of "defect coding" system that identifies structural defects and or maintenance conditions and provides a relative ranking of its vulnerability to failure and blockages. The District utilizes Flexidata software as part of its CCTV program and NASSCO's Pipeline Assessment and Certification Program (PACP) coding system. The use of PACP is becoming a more universal and standardized coding system throughout the industry. Although the sewer laterals are not currently rated as part of the CCTV program, NASSCO is developing a lateral rating system, or LACP. The PACP defect coding from Flexidata is exported into GBA where the overall rating of each pipe is calculated. The numerical rating of each pipe within the collection system is then translated into a simplified condition ranking (severe, poor, fair, and good) allowing for the prioritization of needed repairs.

The determination of repair priority, other than in imminent failure or emergency situations, can be subjective in nature. To provide a more objective approach to prioritization, the District has tasked RMC Water and Environment to develop a risk-based prioritization model to help in the District's decision making. This prioritization process is based on guidelines recommended by the National Association of Clean Water Agencies (NACWA) in their publication "Implementing Asset Management: A Practical Guide" and quantifies risk as a product of the consequence of failure and likelihood of failure. The factors used in consequences of failure are primarily centered around the impacts to the community and environment, while the likelihood of failure factors generally involve system condition, maintenance history, and hydraulic capacity. It should be noted that the model provides a significant element in the prioritization process, but that it is not the only criteria to be considered. Other factors (project scoping, timing, budget allocation, resource availability, infiltration and inflow susceptibility, etc.) must still be considered when formulating a final prioritization order. The risk-based prioritization study was completed in October 2010 and the matrix being utilized along with Risk Based Prioritization map are shown in Appendix B.5.

Repair and Rehabilitation

The repair or rehabilitation of the collection system, is addressed through the District's Five-Year Capital Improvement Program (CIP). The District has consistently budgeted an aggressive rehabilitation and repair program. Within the last five fiscal years (July 2005 through June 2010) the District has expended approximately \$8.5 million and \$1 million, respectively, for rehabilitation and repair projects. In the current Five-Year CIP it is expected that this trend will continue in both categories, increasing the total budget to approximately \$10 million.

d) Staff Training and Certification

The District's training program covers a number of areas within the realm of wastewater collection system operations and maintenance and serves to develop and maintain highly qualified and dedicated staff. This training is provided through a variety of modes (self-study, seminars, conferences, on-the-job, etc.) and begins from the first day on the job and continues regularly thereafter. Since safety training constitutes a significant portion of the total training received each year, the District utilizes the services of a safety consultant to monitor, track, and provide this training.

The CWEA Technical Certification Program provides certification in a variety of wastewater disciplines to promote and enhance the education and effectiveness of the wastewater professional. The District encourages its maintenance staff to obtain CWEA certification to demonstrate their level of competency in the area of collection system maintenance. By providing adequate staff training and establishment of certain grade level requirements as a condition of career advancement, the District reinforces the importance it places on certification.

Training Frequency and Subject Matter

Although all ongoing training is considered to be important and necessary, the initial orientation training for maintenance staff is especially important to establish a sound knowledge base for equipment, safety, and maintenance procedures. Maintenance staff is provided many training opportunities in a number of subject matter pertaining to collection system operation and maintenance. Within the first six months of hire, all new maintenance staff are enrolled in the Office of Water Programs, CSU Sacramento (Ken Kerri) "Operation and Maintenance of Wastewater Collections Systems – Volume I and II" course. These individuals must also indoctrinate themselves with basic safety and collection equipment operation by viewing training movies prior to fully participating on work crews in the field. On a regular basis, safety training is received weekly through tailgate safety meetings, web-based or instructor led safety meetings. A less structured, but valuable training is received on-the-job through mentoring by senior staff. There are also a number of seminar training opportunities provided by local CWEA, at regional or state CWEA conferences, and through CSRMA.

There is a wide variety of training subject matter that is provided or offered for maintenance staff. To maintain brevity, only a few sample training topics are shown for the major subject areas.

Wastewater Collection System Operation and Maintenance

- Sewer Cleaning Equipment O & M
- Collection System Toolbox
- CCTV Operation and Maintenance
- NASSCO/PACP Certification

- SSO and Backup Response
- Pump Station O&M
- Electrical Basics and Troubleshooting

Collection System Management

- GBA Master Series (CMMS)
- GIS Mapping
- Global Positioning System (GPS)

Safety

- Confined Space
- Lockout/Tagout
- Traffic Safety
- CPR/AED
- Hazmat
- Ergonomics

Personnel and Other

- Supervision and Management Training
- Communication
- MS Office

CWEA Certification

In line with the District's emphasis on certification, generally all maintenance staff are certified in Collection System Maintenance at Grade 2, or higher level. Currently, a majority of staff have attained Grade 3 or 4 certification level. The District further encourages maintenance staff by offering pay incentives to those wishing to exceed the certification grade requirements for their position, including the acquisition of the Plant Maintenance Certification. Staff CWEA certifications are presented in Appendix B.6

e) Maintenance and Contingency Equipment

The District maintains a host of equipment for both regular maintenance and for contingency or emergency operations. For specific emergency situations, the District has several types of equipment stored at the District yard and are kept in a prepared state for immediate service. Included in this discussion is the availability of parts, supplies, and contractor services. A list of the District's primary maintenance vehicles and emergency equipment is included in Appendix B.7.

Emergency Equipment

The District relies on the use of its maintenance fleet in emergency situations. The primary equipment available includes two (2) combination HVC/Vacuum truck units and one (1) HVC truck that are outfitted with a complement of nozzles and cutters that enable the truck to be used to clean a variety of different pipe sizes and remove different types of debris

blockages. The District has one (1) continuous rodder truck that is equipped with a variety of cleaning tool. For smaller lines and sewer laterals the District has four (4) service trucks equipped with power snakes that are utilized for customer service calls and servicing laterals. These service trucks also carry spill containment mats and sandbags to contain an SSO and prevent sewage from entering storm drains.

In an emergency where sewage bypass pumping is required, the District has several pump options depending upon the particular situation and flow requirements. These pumps include a trailer mounted 1,500 gpm 6-inch self-priming pump, and four smaller portable trash pumps ranging from 3-inch to 4-inch with capacities of approximately 400 gpm. Associated suction and discharge hoses with Camlock type connectors are kept with the pumps. For emergency power supply to run any of the District's three pump stations, a trailer mounted 60 kW generator is available for service through a forty foot cable with quick connect plugs and use of manual transfer switches.

Replacement Parts and Supplies

The District maintains an inventory of replacement parts for each of the pump stations and a modest supply of material for the repair of pipe and manholes. Although each pump station has more than adequate capacity to handle incoming flow with just one of the two pumps installed at each station, spare pumps and significant components (impellers, bearings, etc.) are kept on hand. Since the repair of pipelines, other than manhole frame replacements, are performed by outside contractors, the District maintains a small supply of clay and plastic pipe of various diameter and their associated couplings should they be needed on short notice.

Emergency Repairs

Repairs to pipelines and manholes, or electrical issues at the pump stations, are typically performed by outside contractors. These contractors are on an on-call open service contract with the District to provide emergency and routine service when requested. Although these contractors have the capacity to perform most all of the emergency repairs normally encountered, should an extraordinary event take place that requires a substantial effort, a list of locally available large contracting companies and vendors would be used to solicit construction services.