

ELEMENT 4 - OPERATION AND MAINTENANCE PROGRAM

The City's operation and maintenance of its collection system ensures that the system is kept in good working condition. Sewer lift station operations and maintenance work is contracted to and performed by Monterey Regional Water Pollution Control Agency (MRWPCA). Sewer line operations and maintenance is primarily conducted by City of Pacific Grove Staff with the support of some additional contract services. This SSMP Element 4 outlines the work that is conducted to accomplish the optimal operation and maintenance of the City's collection system.

The sewer collection system consists of approximately fifty-eight (58) miles of pipelines: fifty-seven (57) miles of gravity pipelines, which vary in size from four (4) to eighteen (18) inches in diameter and one (1) mile of force mains. The majority of the original sewers were built in the early 1900s. The predominant pipe material is clay pipe. Table 4-1 illustrates the current age of sewer lines in the system, and Figure 4-1 gives a general overview of the location of these lines.

Table 4-1: Age of Sewer Lines

Sewer Line Age	Percent of Sewer System
Year 2000 to Present	10.32%
1980 to 1999	6.66%
1960 to 1979	17.84%
1940 to 1959	13.51%
1920 to 1939	17.07%
1900 to 1919	34.60%

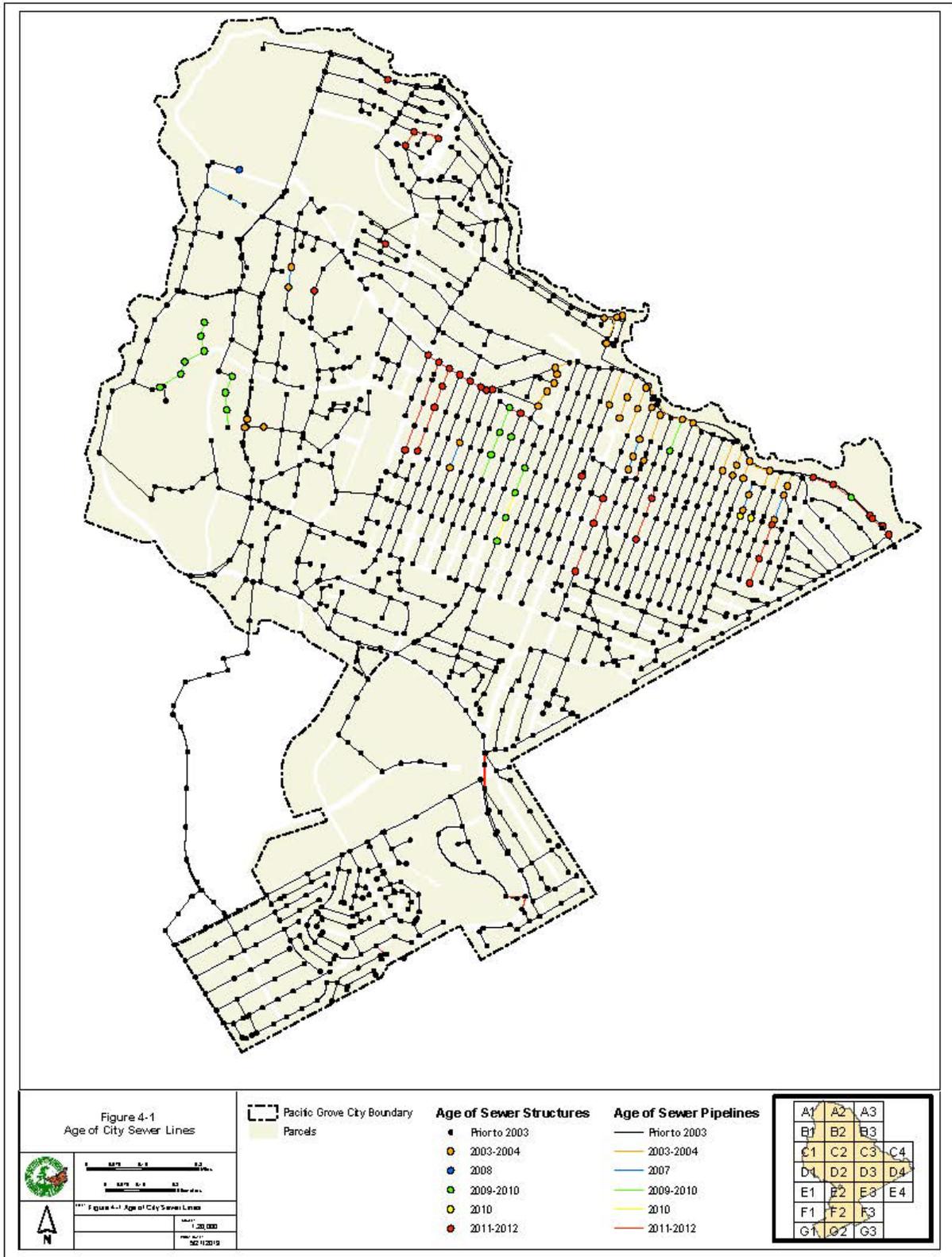


Figure 4-1: Age of City Sewer Lines

There are nine (9) sewer lift stations located in the City's service area. All lift stations are operated and maintained by MRWPCA. Seven (7) are owned by the City and the two (2) largest, LS #13 and #15, are owned by MRWPCA. Lift stations #13 and 15 are not addressed in this SSMP as they are owned and operated by MRWPCA. There are one mile of force mains immediately downstream of these lift stations. The City owns and maintains 5,000 feet of these force mains, and MRWPCA owns and maintains the remaining 280 feet. Lift station locations are referenced in Figure 4-2 below.

Maintenance access to the gravity sewers is provided by 904 manholes and a number of structures such as clean outs and inspection holes. The collected wastewater is conveyed to the MRWPCA wastewater treatment plant for treatment, recycling, and disposal. Figure 4-2 depicts a general overview of the existing system.

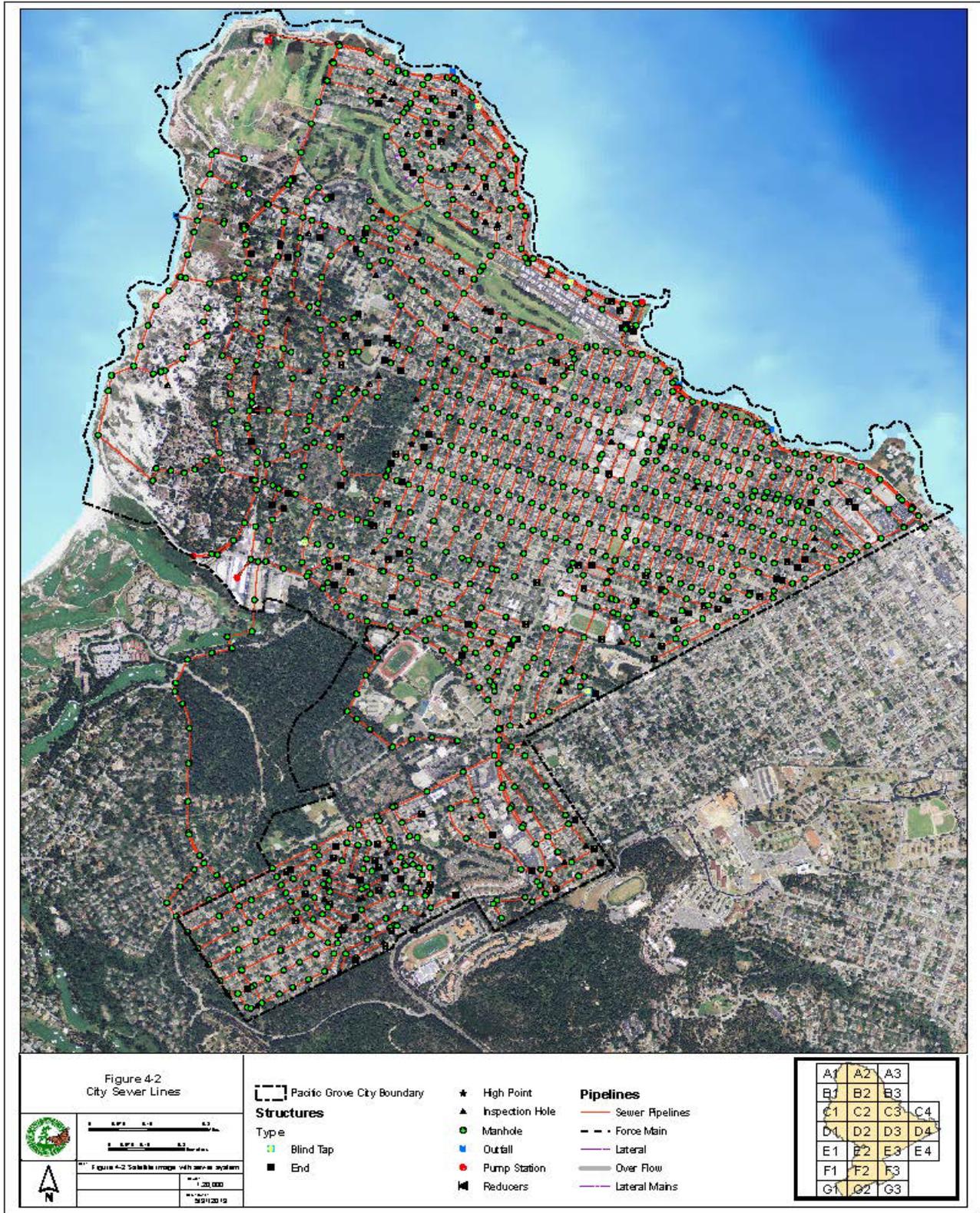


Figure 4-2: Sewer System Atlas

4.1 Regulatory Requirements

WDR Order No. 2006-0003-DWQ Section D.13(iv) states:

The SSMP must include those elements listed below, which are appropriate and applicable to the Enrollee's system:

- (a) Maintain an up-to-date map of the sanitary sewer system, showing all gravity line segments and manholes, pumping facilities, pressure pipes and valves, and applicable stormwater conveyance facilities;
- (b) Describe routine preventive operation and maintenance activities by Staff and contractors, including a system for scheduling regular maintenance and cleaning of the sanitary sewer system with more frequent cleaning and maintenance targeted at known problem areas. The Preventative Maintenance (PM) program should have a system to document scheduled and conducted activities, such as work orders;
- (c) Develop a rehabilitation and replacement plan to identify and prioritize system deficiencies and implement short-term and long-term rehabilitation actions to address each deficiency. The program should include regular visual and TV inspections of manholes and sewer pipes, and a system for ranking the condition of sewer pipes and scheduling rehabilitation. Rehabilitation and replacement should focus on sewer pipes that are at risk of collapse or prone to more frequent blockages due to pipe defects. Finally, the rehabilitation and replacement plan should include a capital improvement plan that addresses proper management and protection of the infrastructure assets. The plan shall include a time schedule for implementing the short- and long-term plans plus a schedule for developing the funds needed for the capital improvement plan;
- (d) Provide training on a regular basis for Staff in sanitary sewer system operations and maintenance, and require contractors to be appropriately trained; and
- (e) Provide equipment and replacement part inventories, including identification of critical replacement parts.

4.2 Collection System Map [WDR D.13(iv)(a)]

The City of Pacific Grove maintains up-to-date electronic collection system maps created and maintained by Contract Staff, Cary Stiebel, using Geographic Information System (GIS). These maps are overlain onto aerial imagery and provide detailed locations of the system's components with references to roads, homes, trees, etc. within the City boundary.

In addition to providing general location mapping, the electronic map is updated as needed to include precise information relating to the general characteristics of the system components. This information includes: material composition, pipe diameters, segment lengths, slopes, grade elevations, invert elevations, drain field system, and survey data. The City plans to include interactive links incorporated into the electronic maps to provide immediate access to system photos, closed circuit television (CCTV) inspection videos, and the trunk system's record drawings and construction drawings over the course of the next two years. The contract for GIS services is located in Appendix 4A.

Collection system maps are printed to hard copy and provided to the City's Staff and contractors for use during routine maintenance and operations and during capital improvement projects. As-built plans and construction drawings are maintained as the system is improved through each capital improvement project. This data will also be routinely integrated back into the collection system GIS mapping system as this system is upgraded. The GIS system map used for daily operations is located in Figure 4-3 below.

GIS system maps also include stormdrain locations throughout the City. The GIS system map for sanitary sewer and stormwater is depicted in Figure 4-3 below.

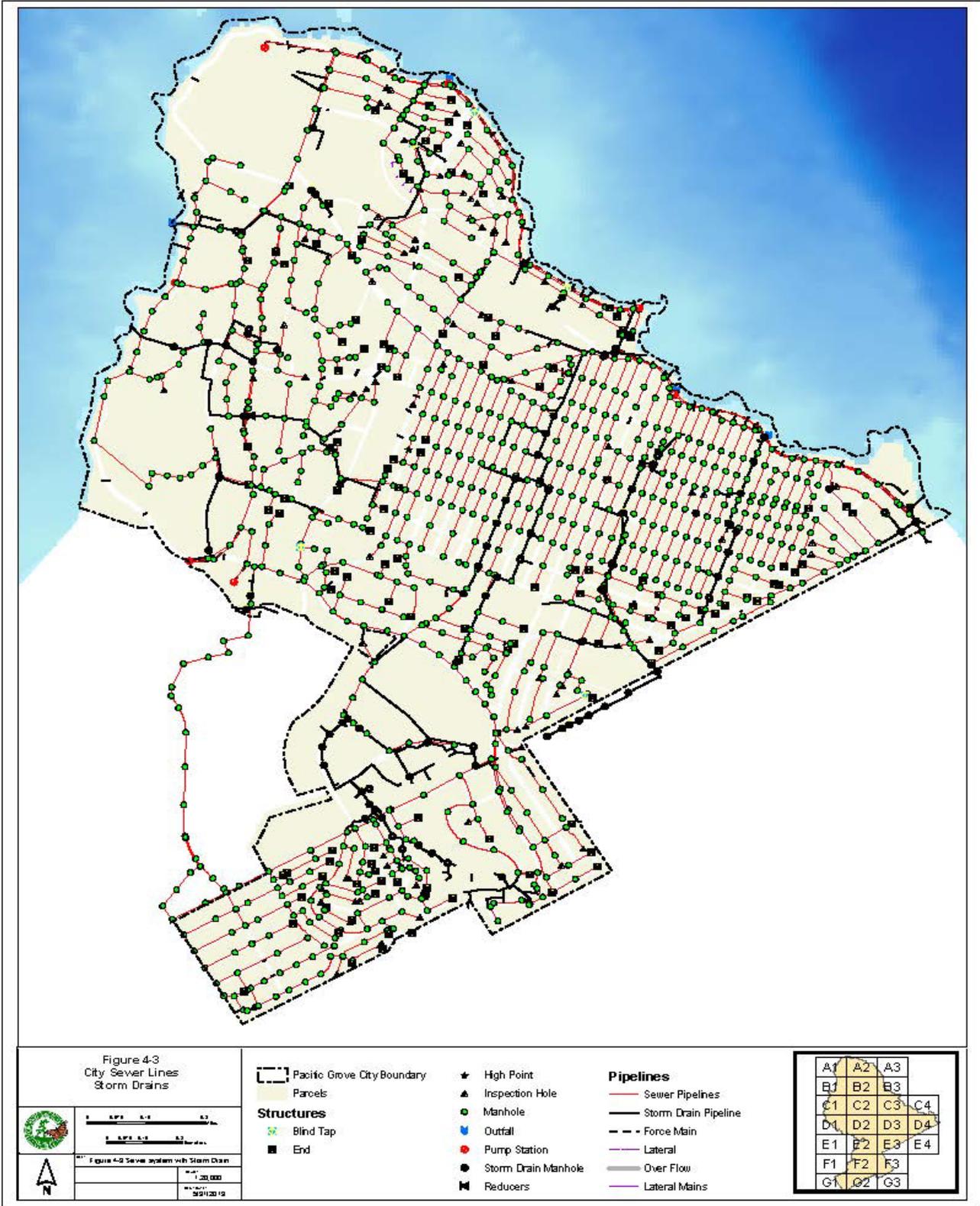


Figure 4-3: GIS System Atlas

4.3 Preventative Maintenance Program [WDR D.13(iv)(b)]

The City's manhole inspection, sewer line inspection, and cleaning program are all integral components of preventative maintenance. The City addresses non routine work requests with the use of work order forms. These maintenance tasks are performed individually and tracked in the City's computer based maintenance reporting system, iWorQ.

4.3.1 CCTV Inspection

Closed circuit television (CCTV) inspections are performed by contracted services under the authorization of the City Council and with administration by Public Works Staff. The City completed a system wide CCTV inspection of all gravity sewer mains in 2006.

As part of the 2006 inspection project, the City received narrated color videos and detailed written logs of the conditions observed at the time of the inspections. The City Engineer reviewed the 2006 videos and logs received from these inspections. General conditions and system deficiencies and/or abnormalities were analyzed and quantified in a 2007 summary report by Larson Engineering and documented for planning future rehabilitation and replacement projects. This report ranks and prioritizes structural pipeline conditions using an alphanumeric system, S1 – S5, with the S5 designation identifying sections of sewer line in greatest need of repair or replacement. Table 4-2 summarizes the structural priority rankings found in this report.

Table 4-2: Summary of CCTV Sewer Line Condition Assessment

Structural Priority Ranking	Percent of Total Lines Inspected
S1	8%
S2	14%
S3	17%
S4	26%
S5	8%
No Defects Observed	26%

This CCTV summary report has been the basis for the majority of sewer line replacements between 2008 and 2012 and planned replacements in 2013. A spreadsheet detailing the results of this CCTV analysis is provided in Appendix 4B.

In 2013, approximately 17,250 linear feet of the system was videotaped by CCTV. Staff identifies additional line segments to add for future CCTV inspection based on routine and emergency observations in the field. Additional inspections will be included as part of interim SSMP Updates over the next 2 years. The results of these inspections will be summarized and integrated into any capital improvement projects identified in the Sewer Collection System Master Plan to be completed in 2013. A table identifying the locations of sewer lines planned for 2013 CCTV investigation is provided in Appendix 4C. Future CCTV Inspections will be incorporated into Appendix 4C when identified and completed.

4.3.2 Cleaning

The City's sewer cleaning plan is to clean the entire gravity collection system annually and to clean problematic sewer lines on a 3, 6, and 9 month interval based on Staff's assessment of the internal condition of these lines. Sewer line assessments are based on; the analysis of the 2006 CCTV inspections conducted by Larson Engineering, sewer cleaning logs, Staff's visual observations in the field, and more recent CCTV inspections. The City maintains adequate staffing to accomplish annual cleaning objectives with the assistance of contracted sewer line cleaning services, which are used on an as needed basis. The contract for these services is provided in Appendix 4D. The City has identified twelve (12) distinct areas or tributary basins, A-1 to A-12, for cleaning of the sewer system. Each tributary basin is scheduled and cleaned in order from the top of the City down to the lower elevations. Sewer tributary basins A-1 through A-12 are provided in Figure 4-4.

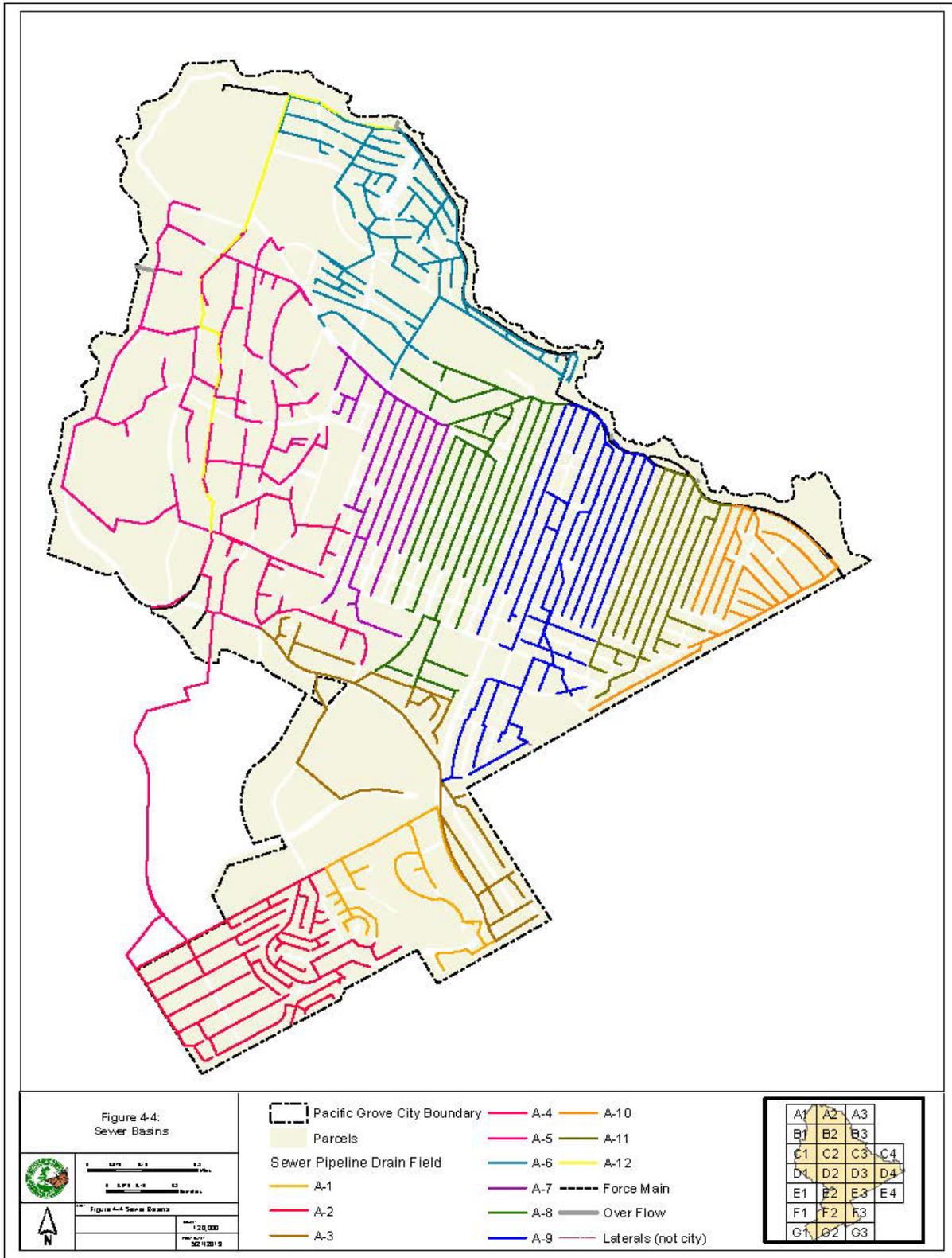


Figure 4-4: Sewer Tributary Basins

Sewer cleaning schedules and sewer cleaning work history are tracked in the City's computerized maintenance and management system (CMMS); iWorQ. Work order forms are generated from iWorQ for Staff to populate during cleaning activities. Staff notes the physical attributes of the asset being maintained, logs the results of observed cleaning results, and makes recommendations for future maintenance activities for the section of line being cleaned. Printed copies of the City's sewer atlas are used in the field for Staff to highlight as part of a weekly cleaning record. This information is then entered into iWorQ as a work history record and to create future cleaning schedules. The City has updated the sewer system database and maps to link and integrate iWork and the City's GIS mapping system information for easy reference and use over the course of the next two (2) years.

The following line cleaning documents are provided in Appendix 4E:

- Weekly Sewer Line Cleaning Report and Work Order
- Sewer Line Maintenance Tracking Report

4.3.3 Visual Inspection

Visual manhole inspections have occurred at four (4) year intervals which represent "one inspection cycle" between 2006 and 2012 by City Operations Staff. The City's 904 manholes will continue to be inspected over a four (4) year period during each inspection cycle. Inspection data is entered into a manhole inspection form which denotes structural, hydraulic, and other physical attributes of the manhole. A condition ranking and recommendations for repair, maintenance, or replacement are logged and entered into the City's iWorQ maintenance tracking system. This system is also planned to be linked to City GIS this year. The City maintains adequate staffing to accomplish manhole inspections during each inspection cycle. Staff's approach to inspecting manholes is similar to line cleaning; inspections are conducted one (1) basin at a time. Examples of manhole inspection forms and manhole maintenance reports are found in Appendix 4F.

4.3.4 High Maintenance Areas

The City has identified fifty-two (52) high maintenance areas (HMAs) throughout the system, which are cleaned at varying intervals. Cleaning intervals depend on observed conditions in the line at each location using a City-owned CCTV push camera or by other visual observations during line cleaning activities. These HMAs are generally the result of two (2) contributing factors in the City's sewer system: root intrusion and accumulation of non-biodegradable materials. An overview of these 52 HMAs is found in Figure 4-5.

This HMA list is updated as necessary when Staff observes sewer line conditions that require an increased cleaning frequency. Future sewer line rehabilitation and replacement projects may allow Staff to modify and reclassify cleaning schedules based on the internal condition of these lines.

The City works with a contractor to address HMAs caused by root intrusion and is in the process of issuing a request for proposals for a new root cleaning contract. This contract should be included in this SSMP as part of any future interim SSMP Updates over the next two (2) years. An example of a Weekly Chemical Root Control Log and list of HMA's or hot spots is found in Appendix 4G. A summary of HMA cleaning frequencies is illustrated in Table 4-3. HMA line cleaning activities are tracked in the City's iWorQ system.

Table 4-3: HMA Cleaning Breakdown

Cleaning Frequency	Number of HMAs
9 months	43: 83%
6 months	9: 17%
2 months	1: <1%

Figure 4-5 below depicts HMA areas addressed by chemical root control.

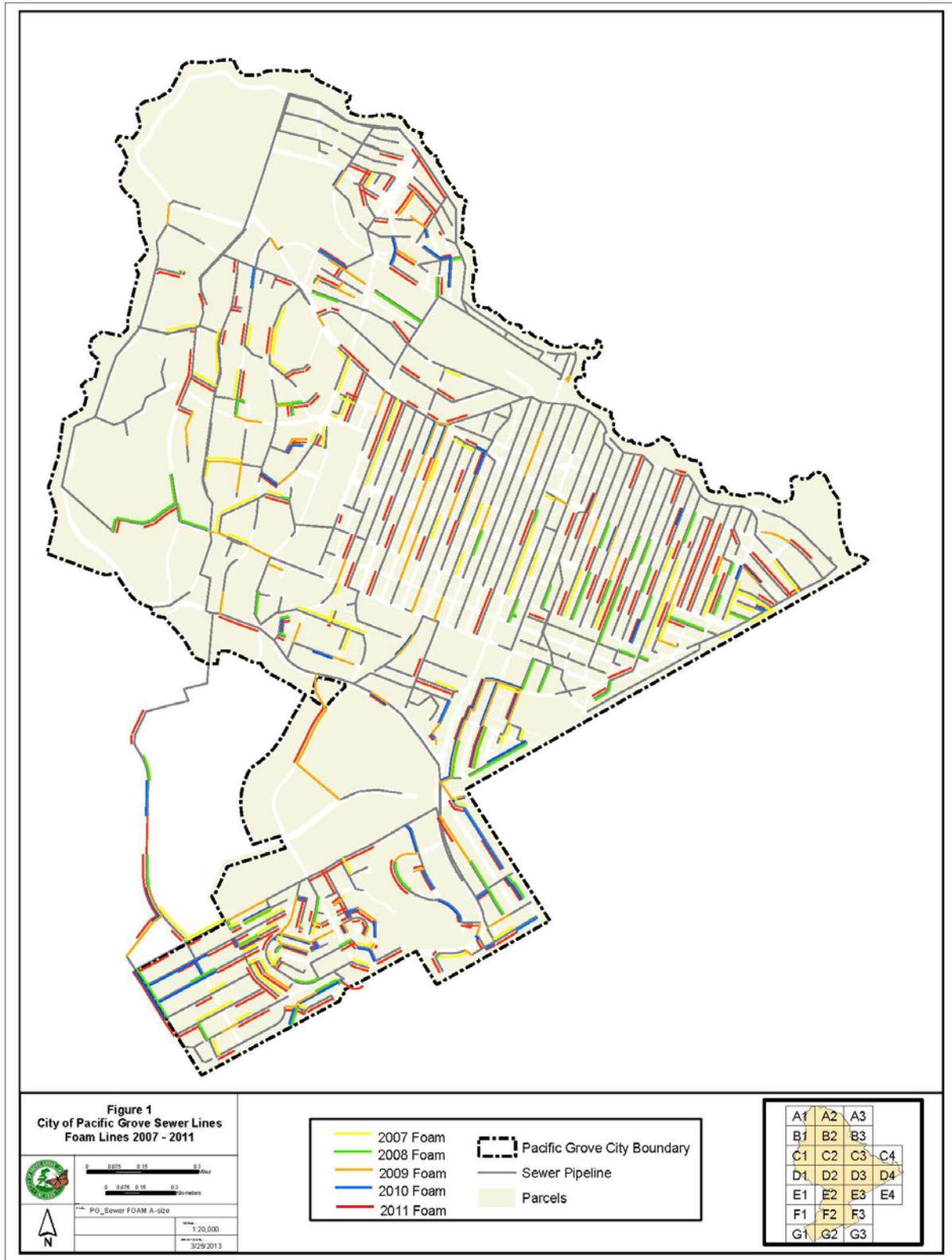


Figure 4-5: High Maintenance Area - Chemical Root Control

The City has routinely conducted public outreach in an effort to educate the public about the hazards associated with flushing these items down the drain through the distribution of flyers identifying “non-flushable items” and through local radio announcements, T.V. announcements, and local newspapers. Examples of these public outreach efforts are provided in SSMP Element 11 – Communication Plan.

4.3.5 Lift Station Operation and Maintenance

As previously referenced in the introduction to this SSMP Element, there are nine (9) lift stations located in the City's service area. These stations are provided with a duplex pumping system for redundancy and reliability. This duplex system allows for continued operation of a lift station in the event of pump failure. Stations are monitored and can be controlled remotely through a Supervisory Control and Data Acquisition (SCADA) system.

All nine (9) lift stations are operated and maintained by MRWPCA. Seven (7) are owned by the City and the two largest, LS #13 and #15, are owned by MRWPCA. There are one mile of force mains immediately downstream of these lift stations. The City owns and maintains 5,000 feet of these force mains, and MRWPCA owns and maintains the remaining 280 feet. The agreement between the City and MRWPCA for maintenance of sewage lift stations is provided in Appendix 4H. The aforementioned lift stations are identified below in Table 4-4.

Table 4-4: Lift Station Numbers and Names

Lift Station Number	Lift Station Name	Ownership
11	Eardley	City
12	9 th Street	City
13	Fountain Avenue	MRWPCA
14	Lovers Point	City
15	Coral Street Station	MRPWCA
15.5	Crespi Pond	City
16	Arena	City
17	Beachcomber	City
18	17.5 or Russell Service	City

Lift stations are inspected by MRWPCA on a weekly basis. Inspections consist of logging weekly pump run times and performing a general inspection of major critical components of the station, such as pump operation, station controls, alarms, check valves, and emergency power supplies. The majority of these stations are equipped to operate under emergency conditions utilizing emergency backup generators. Stations #12 and #16 are equipped with onsite generators, and stations #11, #14, #17, and #18 are equipped with manual transfer switches and generator receptacles. Station #15.5 is not equipped to operate utilizing an emergency power supply. Information on Stations 13 and 15 are not included in this SSMP as they are owned and operated by MRWPCA. When routine or minor maintenance is required, it is addressed and documented on weekly pump station logs. Minor maintenance tasks found on



these weekly logs are designated as Code 1 work tasks. Major maintenance tasks, such as emergency response, significant system adjustments, repairs, and replacements, are identified as Code 2 work tasks and recorded on a separate Code 2 form.

Records are maintained by MRWPCA and forwarded to the City as part of a monthly billing invoice. MRWPCA maintains a preventative maintenance work order system to help ensure pump station components are running and maintained based on industry and manufacturers recommendations. Examples of daily, monthly, and Code 2 pump station logs and scheduled preventative maintenance work orders are provided in Appendix 4I.

4.4 Rehabilitation and Replacement Plan [WDR D.13(iv)(c)]

As sewer collection systems age, the risk for deterioration, blockages, and collapse increases considerably. In an effort to mitigate those risks, the City has conducted several investigative efforts and analyses to ensure sewer system assets are assessed and replaced when necessary.

The City completes engineering reviews and assessments on the information obtained from CCTV inspections, manhole inspections, and pump station evaluations to prioritize noted system deficiencies. Short-term and long-term rehabilitation actions are implemented to address each deficiency.

Near-term and long-term rehabilitation actions are funded through the City's sewer enterprise fund and capital budget. Capital projects and annual operating budgets are funded by wastewater user fees. Long-term rehabilitation actions are incorporated into upcoming fiscal year budgets as capital improvement projects. Work for near-term projects, such as manhole rehabilitation/replacement and sewer spot repairs are performed by City Staff and/or area contractors, depending on the complexity of the project. Long-term rehabilitation actions are performed by area contractors through publicly bid service contracts awarded by the City. Near-term projects are included in the Fiscal Year 2012/2013 Operating and Capital Budgets, which are included in Appendix 4J. Future funding and identification of long term capital projects beyond this fiscal year will be provided through a Sewer Collection System Master Plan and Rate Analysis conducted in 2013.

In 2006 the City completed system-wide CCTV inspection of the collection system. Assessment of these inspections resulted in the development of a capital improvement project in which 17,509 linear feet of sewer lines were rehabilitated or replaced between 2007 and 2012. Approximately 1,720 linear feet of sewer lines are scheduled to be replaced in 2013 based on these assessments.

The City employs other methods in addition to CCTV inspection to assess the condition of the collection and conveyance system and develop rehabilitation and replacement plans. Manhole inspections are conducted at varying intervals during and inspection cycle to assess areas requiring manhole rehabilitation or replacement. Between 2011 and 2012 every manhole in the City was inspected and received a condition assessment. Examples of manhole inspection forms and associated assessments are located in Appendix 4F.

In addition to manhole inspections, the City contracted with Dodson Engineering to develop a Pump Station Master Plan, which was completed May 2006. This Master Plan provides a review of all seven (7) of the City's pump stations and associated force mains. This analysis provides

the basis for pump station rehabilitation and replacement projects for the seven (7) pump stations owned by the City. The Pump Station Master Plan Executive Summary is located in Appendix 4K. This report identified Lift Stations #11 and #12 as priority projects. Lift Station #12 was reconstructed during the 2011/2012 Fiscal Year and Lift Station #11 is scheduled for reconstruction by the end of 2013. Additional analysis and recommended improvements for the City's remaining Lift Stations will be addressed in the 2013 Sewer Master Plan conducted by Wallace Group.

A map of all Rehabilitation and Replacement projects completed between 2008 and 2012 is located in Figure 4-6.

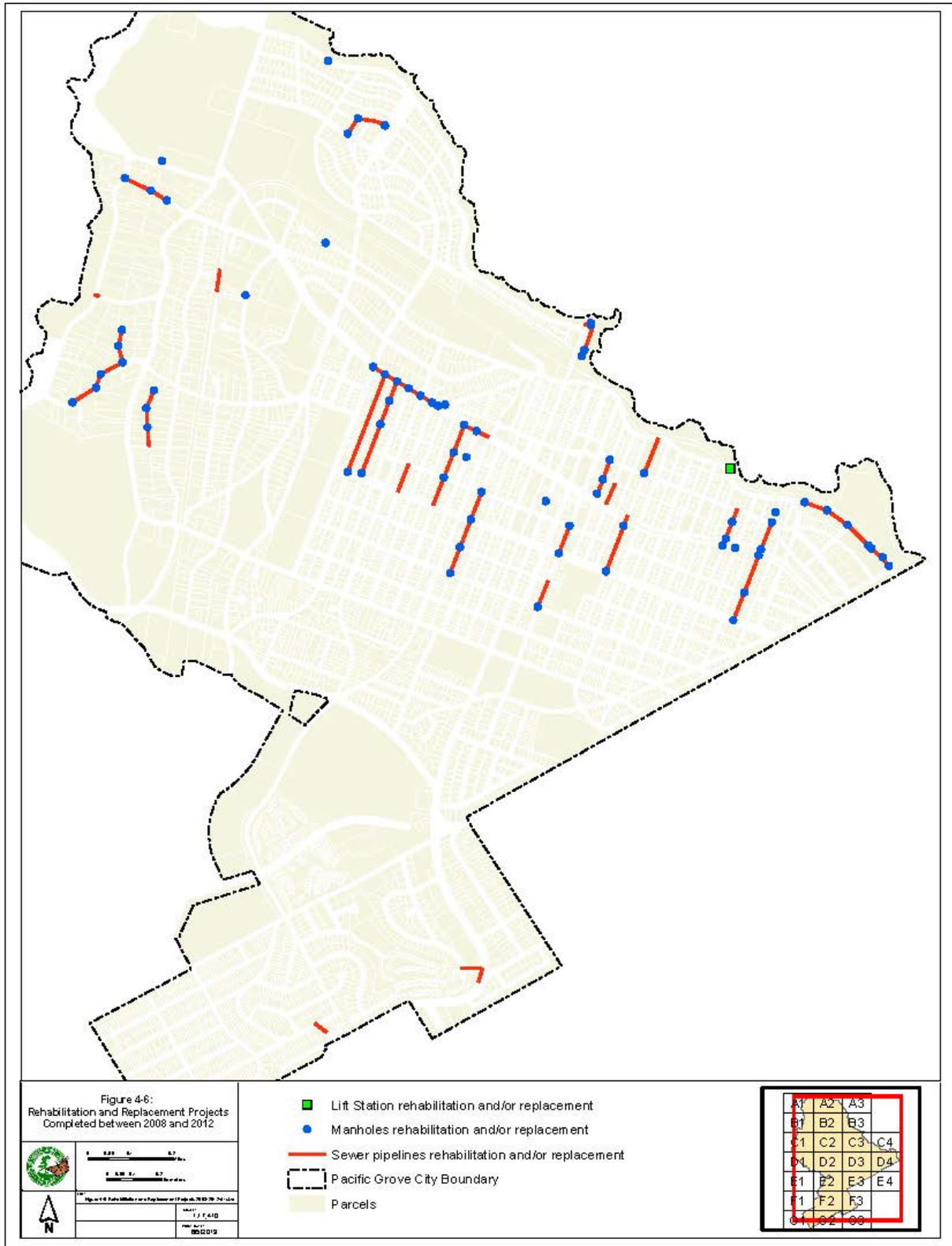


Figure 4-6: Rehabilitation and Replacement Projects

In addition to the City’s rehabilitation and replacement efforts in the publicly owned portions of the sewer system, the City sponsors a Sewer Lateral Loan Program for individual property owners that are required to replace their sewer lateral in accordance with Pacific Grove Municipal Code Chapter 9.20. Table 4-5 summarizes the City’s Lateral Loan Program between 2004 and 2013.

Table 4-5: History of Sewer Lateral Replacement Loans

Year	Number of Loans	Amount Loaned
2004	1	\$6,464
2005	6	\$42,129
2006	7	\$46,428
2007	6	\$37,399
2008	4	\$29,575
2009	5	\$32,610
2010	2	\$8,606
2011	1	\$8,877
2012/2013	3 Interested Applicants	City waiting for completed applications
Total		\$212,088

By offering this program and requiring property owners to repair or replace defective sewer laterals, the City is helping to reduce the occurrence of private sewer lateral SSOs. Rehabilitation and replacement of sewer laterals also helps mitigate problems that contribute to SSOs in sewer main lines such as root intrusion and inflow and infiltration. The City has allocated \$40,000.00 annually to this loan program. Sewer lateral loan guidelines, application forms, inspection and repair requirements, loan history, and an example of enforcement activities regarding defective sewer laterals are located in Appendix 4L.

4.5 Training [WDR D.13(iv)(d)]

Training programs include formal classroom training and on-the-job training. Training is facilitated by both City Staff and outside training workshops. On-the-job cross training is pursued to ensure Staff has a proficient working knowledge of the sanitary sewer system and that critical tasks can be performed without interruption. Task proficiency is a requirement for all job positions and promotions. Training records are maintained by the Sewer Field Supervisor and further training is scheduled as needed.

Operations and Maintenance Staff are initially trained in the proper operation and maintenance of all new major mobile equipment and facilities by the respective contractor or manufacturer. Written operation and maintenance manuals are used as resource material for start-up training and new Staff training.



Safety training is an integral aspect of the City's program. Every Staff member receives formal safety training. This training consists of; hazardous materials management and response, underground service alert, traffic control, and emergency response. Safety training records are found in Appendix 4M. The City has adopted training best management practices (BMPs) for sewer line cleaning and manhole inspection and rehabilitation, which are the primary focus of Staff's operation and maintenance (O&M) related work duties. These procedures are located in Appendix 4N.

Additional BMPs or standard operating procedures should be developed and adopted to address the following:

- GIS Maps and Annual Updates
- Underground Service Alert
- Collection System Training Requirements
- WDR/SSMP Tracking and Training
- Customer Contact/Customer Complaints
- Annual Collection System and High Maintenance Area Cleaning and Reporting

The City will develop a formal training program that incorporates O&M and safety procedures. Annual training on all procedures and Element 4 – Operation and Maintenance Program will be conducted with City Staff and any contractors implementing portions of this O&M program. Training will be documented and tracked in the City's iWorQ system. This program will be in place by September 2013.

Contractors working on the sewer system are also required to be properly trained to perform the work associated with a specific task or project. Contractor training is ensured by the City's Public Works Agreement for Professional Services which requires all contractors working on the sanitary sewer system to meet the following Performance Standards:

5. PERFORMANCE STANDARDS

5.01. CONTRACTOR warrants that CONTRACTOR and CONTRACTOR's agents, employees, and subcontractors performing services under this Agreement are specially trained, experienced, competent, and appropriately licensed to perform the work and deliver the services required under this Agreement and are not employees of the City, or immediate family of an employee of the City.

5.02. CONTRACTOR, its agents, employees, and subcontractors shall perform all work in a safe and skillful manner and in compliance with all applicable laws and regulations. All work performed under this Agreement that is required by law to be performed or supervised by licensed personnel shall be performed in accordance with such licensing agreements.

4.5.1 Staffing and Future Training

The City currently staffs its wastewater department with two (2) full-time employees and one (1) part-time employee who works 20 hours per week. A portion of wastewater operation and maintenance activities are covered by contract Staff.

The City currently has three (3) part time Maintenance Worker vacancies in the Wastewater Division which total 60 hours per week.

It is recommended that the City consider filling the vacancies in the wastewater division by choosing one of two strategies:

1. Consolidate two (2) of the part time Maintenance Worker positions and hire one (1) full-time Maintenance Worker in the Wastewater Division which would total 40 hours per week; or
2. Hire two (2) part-time Maintenance Workers who work 20 hours per week.

Filling the Maintenance Worker position(s) will ensure the transfer of “institutional knowledge” from existing staff and prepare the City for any potential changes in staffing caused by retirement or attrition. This will additionally ensure that the City has experienced wastewater staff with the knowledge to complete upcoming rehabilitation, replacement, and capital improvement projects.

It is recommended that the City leave one (1) part-time Maintenance Worker position open to determine if replacing three (3) part-time Maintenance Workers with one full-time Maintenance Worker has been effective.

Additionally, it is recommended that the City add a new position in the Public Works Division who would be titled as an Environmental Compliance Specialist for thirty (30) hours per week. This position would assist the Public Works Manager and the Environmental Programs Manager in the continued development, pursuit and management of obtained grant funding, and documentation of the implementation of wastewater and stormwater programs associated with:

- The Pacific Grove Area of Special Biological Significance (ASBS);
- The Monterey Bay National Marine Sanctuary;
- The Pacific Grove State Marine Conservation Area;
- The Hopkins Marine Reserve;
- The City of Pacific Grove Annual Stormwater Report;
- The Monterey Regional Stormwater Management Program; and
- The City of Pacific Grove Sewer System Management Plan.

The Environmental Compliance Specialist should have the following experience and skill set:

- Computerized Management Systems
- Knowledge of State and Federal Environmental Law
- Implement Programs directed by State and Federal Environmental Law
- Develop and Conduct Training
- Microsoft Office (Excel, Word, Access, and PowerPoint)
- E-Mail and the Internet

4.6 Equipment and Replacement Parts Inventory [WDR D.13(iv)(e)]

Equipment and replacement parts inventories is divided into two (2) categories, sewer lift stations and sewer lines and appurtenances, as explained below.

4.6.1 Sewer Lift Stations

The City does not operate the nine (9) lift stations in their collection system and therefore it does not keep a stock of critical replacement parts for lift station emergency maintenance. MRWPCA is responsible for lift station operation and maintenance, however, and does keep an inventory of critical parts, such as; repair clamps for pressurized lines, portable backup generators, submersible pumps for lift station bypass procedures, and electrical supplies such as fuses and breakers. This critical parts list was generated based on correspondence from MRWPCA. A formal list of critical parts and equipment for Pacific Grove lift stations should be developed, maintained, and kept on file in iWorQ with the City's existing equipment and parts inventory within three (3) months of the adoption of the City's SSMP.

4.6.2 Sewer Lines and Appurtenances

Critical parts and equipment, such as tools, pipe, hydro vac parts, and portable pumps, are tracked through the City's computer-based maintenance system, iWorQ. A list of these critical equipment and replacement parts is found in Appendix 4O. The City will be working over the course of the next year to update this list to account for new parts and equipment as it they are purchased and to account for parts and materials used for emergency sewer line repairs.

In the event of an emergency, local retailers are available to supply additional needed equipment and parts on short notice.

Ferguson Enterprises is recognized in Monterey County as the largest distributor of plumbing and builder products. Ferguson Enterprises is located a short distance from the City. They were contacted in early 2013 and confirmed that the majority of the items required for repair and replacement are currently stocked and available for immediate purchase. Contact information for the two (2) retailer locations is provided below:

- Ferguson Enterprises: Sand City, 666 Redwood Avenue (831) 899-4500
- Ferguson Enterprises: Salinas, 66 Tarp Circle (831) 424-3330

Additional equipment and emergency support is also provided by Green Line Services, which is contracted for emergency call-out services.