



**Sanitary Sewer
Preventive Maintenance Program**

City of Placentia
Sanitary Sewer Preventive Maintenance Program

TABLE OF CONTENTS

Preventive Maintenance Program

General.....	1
System Overview	1
Preventive Maintenance.....	1
Cleaning Requirements	2
Hot Spots	2
Fats, Oil, Grease (FOG) Control.....	2
Root Control Program.....	2
Infiltration/Inflow (I/I) Reduction Plan.....	2
Pilot Programs.....	2
Predictive Maintenance.....	3
Corrective Maintenance	3
System Mapping	3
Record Keeping	3
Funding	3
Appendix A – Sewer Line Cleaning Guide	5
Appendix B – Sewer Line Inspection Guide	11
Appendix C – Hot Spot List	15
Appendix D – I & I Reduction Plan	17

CITY OF PLACENTIA Preventive Maintenance Program

General:

The preventive maintenance program is a key element of the City of Placentia's Sanitary Sewer Management Plan (SSMP). The preventive maintenance program's goal is to establish the proper type and amount of sanitary sewer collection system routine preventive and predictive maintenance to reduce and eventually eliminate preventable sanitary sewer overflows (SSOs) from occurring within the City's sanitary collection system. As part of the SSMP, the preventive maintenance program provides part of the asset management framework required to operate and maintain the City's sanitary collection system at its optimal level of performance today and into the future.

System Overview:

The Placentia sanitary sewer collection system consists of approximately 76 miles of pipelines and manholes. Piping sizes range from 8" to 21" in diameter. Pipe construction is mostly VCP with sizes above 15" being both VCP and RCP. There are no lift stations or force mains as the entire system is a gravity flow system. Private laterals connect private properties to the City's collection system but are not part of the City's collection system. Maintenance and repair of all private laterals are the responsibility of the private property owner up to the point of connection with the City's collection system. Line cleaning, hot spot cleaning and response to plug-ups, of the City's collection system, are provided for the City via contract. City personnel provide first response, cleanup and assistance should a sanitary sewer overflow occur. Unique to the City is that the Yorba Linda Water District (YLWD) has the sewerage jurisdiction within approximately 35% to 40% of the area within city limits. This sanitary collection system, although within city limits, is wholly owned and operated by the YLWD and is not part of the City's SSMP or preventive maintenance program.

Preventive Maintenance:

The City's sanitary collection system is a network of various sized gravity pipelines and manholes that collect domestic sewerage from throughout the City's jurisdiction. The City does not have the necessary equipment or trained personnel to maintain this system on its own. Maintenance for this system is provided via contract where the City has the administrative oversight. Under its current contract with YLWD (which expires in 2005), one third or approximately 25 miles of the collection system, are cleaned annually. Under the new contract, the City's desire is to have the entire system cleaned at least once every 18 months.

Cleaning Requirements:

Since the City is currently, and for the foreseeable future, going to utilize contract services for the cleaning, maintenance and repair of its sanitary collection system, the City has developed a standard by which cleaning shall be accomplished. This standard is included as Attachment A of the preventive maintenance program. Any contractor providing line cleaning for the City must, at a minimum, provide services compatible with the City's line cleaning standard.

Hot Spots:

Hot spots are areas within the City's collection system that are designated as needing addition attention beyond the normal routine maintenance program. Hot spots are areas of known problems or of prior SSOs. Hot spots are currently cleaned quarterly, or more frequently if needed. Attachment C is a current list of the City's hot spots.

Fats, Oils and Grease (FOG) Control:

The City is currently working in conjunction with Orange County Sanitary District (OCSD) in their cooperative effort to develop a region wide FOG control program. This program is to be implemented by December 2004. Included would be the development of a cooperative program with private plumbing contractors to notify the City anytime a private lateral is cleaned so any resulting debris can be removed from the collection main prior to it resulting in the probability of an SSO.

Root Control Program:

The City currently does not have a significant problem with roots causing SSOs. This does not mean the potential for blockages due to roots is not there. Should video inspection reveal areas where root intrusion is problematic, appropriate means to remediate the problem will be incorporated. This would include the Best Management Practices (BMPs) for root control including enhanced cleaning methods or chemical additives. Included would be the development of a cooperative program with private plumbing contractors to notify the City anytime a private lateral is cleaned so any resulting debris can be removed from the collection main prior to it resulting in the probability of an SSO.

Infiltration/Inflow (I/I) Reduction Plan:

The City has developed an I/I program to be implemented in conjunction with the SSMP. The I/I program is designed to identify and eliminate sources of I/I within the City's sanitary collection system. The City's I/I Reduction Plan is included as Attachment D.

Pilot Programs:

The City has been, and is currently, experimenting with chemical and enzyme grease control additives to prevent fats, oils, and grease (FOG) buildup within the collection system. This program has shown some success and will be part of the City's overall FOG program currently under development.

Predictive Maintenance:

The predictive maintenance program is a subset of the preventive maintenance program and is essentially scheduled inspection tasks designed to determine the effectiveness of the preventive maintenance program as well as the overall condition of the sanitary collection system. Inspections are both manual, for manholes and short sections of pipe, and closed circuit television (CCTV) for a more detailed examination of the interior of the collection system pipelines. Additionally, CCTV provides videotape for future reference and comparison. Aside from determining the effectiveness of the preventive program, the predictive maintenance program will assist in asset management related to future system rehabilitation or replacement. The City has developed a standard for pipeline inspection including CCTV and is included as Attachment B of this document.

Corrective Maintenance:

As part of the preventive maintenance program, corrective maintenance is designed to respond to a failure in the system, such as a blockage. Additionally, corrective maintenance would provide for system rehabilitation, repair or replacement based upon the regular condition assessment of the collection system. Hot spots or other problem areas for which an engineering solution is possible are also considered corrective maintenance.

System Mapping:

The City maintains a system of paper atlas maps of its sanitary collection system. These maps are housed in the Engineering Division of the Public Works Department for the City. The maps include the locations of manholes and their ID tags, siphons, easements, property parcels, pipelines, their depth and direction of flow. These maps are currently being reviewed and updated by the City's engineering consultant with the goal of eventual incorporation into a City wide GIS system. Map books, which contain paper copies of both the sanitary collection system and the storm drain system, are available to maintenance personnel and are in those vehicles utilized for first response in the event of an SSO.

Record Keeping:

As part of this program, the City will be upgrading its record keeping to more accurately track line cleaning segments, manual and CCTV inspections, manhole and pipeline rehabilitation, repair and replacement, hot spots and problem areas, and SSOs and their causes. Records will be both written and maintained in a computerized database.

Funding:

Currently, all funding for the sanitary collection system is provided by the City's general fund. This funding source is no longer adequate for the enhanced operating and

maintenance required by the SSMP. As of January 2004, the City will be implementing a sanitary sewer service fee to all residences and businesses that receive sewer service from the City. This fee is structured to gather the required revenue to fund all aspects of operating and maintaining the sanitary collection system. Funds acquired from this fee will only be utilized for the operation and maintenance of the sanitary collection system. Additionally, a dedicated reserve fund will be established for future rehabilitation and replacement of the collection system. Details of the collection system funding will be incorporated into the SSMP as they are developed.

CITY OF PLACENTIA Sewer Line Cleaning Guide

Purpose:

To meet the requirements of the Waste Discharge Orders established by the California State Regional Water Quality Control Board, Region 8, and to operate its sanitary collection system at its maximum efficiency, the City contracts all sewer line cleaning of its sanitary collection system to a qualified service provider. Outside contracts are utilized for sewer line cleaning, as the City does not maintain the required equipment or personnel needed to properly clean the pipelines and manholes of the sanitary collection system. The purpose of this Sewer Line Cleaning Guide is to establish the minimum standards for the sewer line cleaning of the City's sanitary collection system. Any service provider utilized for the sanitary collection system sewer line cleaning is expected, at a minimum, to provide a level of cleaning compliant with this Sewer Line Cleaning Guide.

General:

The Placentia sanitary collection system consists of approximately 76 miles of pipelines and manholes. Piping sizes range from 8" to 21" in diameter. Pipe construction is mostly VCP with sizes above 15" being both VCP and RCP. There are no lift stations or force mains as the entire system is a gravity flow system. Private laterals connect private properties to the City's collection system but are not part of the City's collection system.

The service provider is required to furnish all labor, equipment, materials and incidentals necessary for the proper cleaning of the City's sanitary collection system sewer pipelines and manholes. It is the responsibility of the service provider to remove any and all debris from the pipelines. All debris must be removed and not passed from manhole to manhole. Debris consists of, but is not limited to, sludge, dirt, sand, rocks, gravel, grease, roots, solid or semi-solid materials. All debris collected must be properly disposed of. Liquid and may be drained back into the collection system; all solid or semi-solid material must be transported to the Orange County Sanitary District's (OCSD) treatment facilities. Additionally, the service provider must ensure that no spills occur during the cleaning process. At no time is the service provider to engage in any activity that is unsafe, or that may result in damage to either private or public property, while providing sewer line cleaning of the City's sanitary collection system.

Cleaning Equipment:

The preferred method of cleaning is the utilization of a high velocity hydro-cleaning and vacuum removal unit (combo unit). A high velocity hydro-cleaning unit may also be used provided that a safe, efficient method of debris removal at each manhole is

incorporated. It is not permissible pass debris from manhole to manhole during the cleaning process.

Hydro-cleaning units or combo units must meet the following specifications to meet the intent of the sewer line-cleaning guide:

- Hydro unit must be capable of providing an adequate supply of water and have a pump capable of producing adequate pressure and flow to sufficiently scour the pipe sizes being cleaned. All operating controls must be located topside and within easy access to the operator.
- Sufficient length of one-inch high-pressure hydro flushing hose to clean the longest reaches of the collection system (minimum 900 feet recommended) and be equipped with a hydraulically operated hose reel.
- Two or more high velocity cleaning nozzles capable of producing a scouring action from 15 to 45 degrees in all size lines within the City's collection system. Nozzle skirts are to be used for the appropriate size line being cleaned. Nozzle jet orifices must be maintained within manufacturer's recommendations. Nozzles with worn out orifices may not be used.
- At least one root cutter appropriate to the size pipes being cleaned must be available.
- The hydro unit must be equipped with a high-pressure handgun for cleaning manhole walls, channel, benches and cover frames.
- Combo units must have a centrifugal or positive displacement blower vacuum equipment capable of removing all debris at the down stream manhole while hydro flushing operations are in progress.

Flushing or using a sewer ball is permissible provided the operation is conducted safely and in accordance with accepted sewer line cleaning procedures and that all debris is removed from the system.

As required, or as an option, mechanical rodding equipment may be used for sewer line cleaning provided that any debris is safely and efficiently removed at the down stream manhole and not passed down the system. Likewise, if a rod should break in the sewer line, it is the responsibility of the service provider to remove the broken rod at no additional expense to the City. It is not permissible for the service provider to leave any rodding segments in the sewer line regardless of their condition. At a minimum, rodding equipment must meet the following criteria:

- Rodding machine must have continuous or sectional rods capable of extending the entire distance of the line segment being cleaned (minimum 900 feet recommended) and be capable of spinning the rod(s) in a clockwise or counter clockwise direction.
- The rodding machine must be capable of pushing or pulling the rod(s) without rotating the machine.

- The rodding machine must be capable of utilizing any necessary tools such as, but not limited to, root cutters, corkscrews, augers, brushes, swabs, etc. required to properly clean the sewer line.

Regardless of the type of cleaning equipment used, it must be specifically designed and constructed for sewer line cleaning. Line cleaning equipment must be properly maintained and operated as per manufacturer's recommendations. The use of equipment that is defective, inoperative, deficient or unsafe to use does not meet the requirements of this Sewer Line Cleaning Guide. The service provider must satisfactorily demonstrate to the City that their personnel are proficient in both the methods utilized for sewer line cleaning and in the operation the equipment being used. California Water Environment Association (CWEA) certification may be used to demonstrate operator efficiency.

Cleaning Precautions:

While cleaning the City's sanitary collection system, the service provider shall take satisfactory precautions while using the cleaning equipment to ensure that no damage occurs to the sewer lines, and public or private property. When using hydro-cleaning units, nozzle skids are required to prevent accidental entry into the service laterals. Care must be taken to prevent water pressure or head from flooding any properties served by the sewer. Should flooding or other damage occur, the service provider shall be responsible for the costs of all repairs and / or clean up to the satisfaction of the City. All debris is to be removed from the sewer and not passed down through the system. It is the responsibility of the service provider to remove any broken sewer rods or any other sewer cleaning equipment that becomes dislodged within the sewer pipe during cleaning operations.

Should the service provider encounter misaligned joints, broken pipes, intruding lateral connections that prevent the proper cleaning of a line segment, the service provider is to cease the cleaning of that segment and immediately notify the City's Maintenance Services Superintendent (714) 238-2421, or the Maintenance Supervisor (714) 238-2423. Likewise, if the service provider encounters large quantities of fresh soil or pieces of sewer pipe, or if the cleaning equipment encounters a blockage that cannot be cleared, cleaning in that segment of pipe should be terminated and the City notified.

Safety Precautions:

The service provider is required to be compliant with all applicable safety regulations while performing the sewer line cleaning function for the City. This is particularly important as it relates to manhole entry and traffic control. Prior to initiating service, the service provider is to submit a copy of their written confined space entry program and demonstrate to the City's satisfaction that the program, safety equipment, and trained personnel being used are compliant with the current Title 8 or the California Code of Regulations, Sections 5156, 5157, and 5158. Additionally, the service provider is to practice proper traffic control consistent with city, county or Cal-Trans regulations as appropriate. Adequate traffic control must be utilized to prevent injury or property

damage to the service provider, the City or the general public. All sewer line cleaning operations, emergency or routine, must be performed in the safest possible manner.

Line Cleaning Procedures:

Sewer line cleaning is divided into two basic categories, routine scheduled line cleaning and emergency blockage cleaning. For routine scheduled line cleaning, the service provider will coordinate with City for the line segments to be cleaned the following week. The service provider shall acquire any required permits or access permission prior to the cleaning of an affected segment. This would include any required access to private properties or easements. Upon request, the City will provide the service provider with a printed sewer atlas, list of hot spots and siphons. Routine scheduled cleaning shall be conducted during the normal workweek, Monday through Friday, during the City's normal business hours. For emergency blockage cleaning, the service provider will make every effort to respond to the City's request for assistance as rapidly as possible, regardless of time of day. Emergency blockage cleaning will be consistent with the City's Sanitary Sewer Overflow Response Plan (SSORP).

For routine scheduled cleaning, using a combo unit, the cleaning equipment is normally located at the downstream manhole to jet towards the upstream manhole, thereby pulling any debris to the downstream manhole where it can be removed with the vacuum unit. If no debris is present, then a single pass shall be considered sufficient. If debris is present, additional passes shall be made until no debris exists indicating the line is clean. Should excessive amounts of dirt, gravel, or broken pipe pieces be present in the debris, or if a significant amount of dirt appears on the jet nozzle, the service provider is to cease operation and immediately notify the City of a possible pipeline failure. Likewise, if the entire length of pipe cannot be traversed from the downstream manhole, the service provider should try from the upstream manhole to the downstream manhole. If this is still unsuccessful, the service provider should cease operations and notify the City of a possible blockage, misalignment or pipeline failure. Before moving to the next pipe segment, manholes are to be thoroughly washed with the high-pressure water gun and inspected. Any deficiencies to the manhole structure, channel, bench or ring and cover assembly are to be noted and reported to the City. While washing the manhole, care must be taken to avoid spraying nearby vehicles or pedestrians.

Normally, 1 to 3 passes is considered light cleaning, 4 to 6 passes is medium cleaning, with 7 or more passes considered heavy cleaning. Most routine cleaning is considered light cleaning. If a pipeline segment is being prepared for close circuit television (CCTV) inspection or relining, a more thorough scouring of the pipeline is required and may require medium to heavy cleaning. It shall be the responsibility of the service provider to secure a source of water for line cleaning.

Grease Removal: Should grease buildup be encountered during the cleaning process, the service provider shall utilize the proper equipment to scour the grease from the pipeline and to remove it from the collection system. It is not permissible to breakup the grease

and flush down the system. All areas where grease buildup is encountered are to be noted and reported to the City.

Root Removal: Should a root buildup be encountered during the cleaning process, the service provider shall utilize the proper equipment to cut the roots from the pipeline and to remove them from the collection system. It is not permissible to cut up the roots and flush down the system. All areas where root buildups are encountered are to be noted and reported to the City.

Hot Spot Cleaning: Hot spots are areas within the collection system where blockages or other problems have historically occurred. Hot spots are cleaned and inspected more frequently than other areas of the system. Procedures for cleaning of hot spots is to be consistent with normal line cleaning practices but on a more frequent basis.

Material Removal and Disposal:

All debris encountered during the cleaning process must be removed from the system. It is not permissible to flush debris down from manhole segment to manhole segment. Liquids may be carefully drained back into the collection system. Solid or semi-solid materials must be removed and properly disposed of. If debris removal is by methods other than a vacuum unit, the process must be submitted to the City for review. If debris removal requires entry into the manhole, the process must be consistent with the current Cal-OSHA Confined Space Entry regulations and submitted to the City for review. All debris removed must be properly disposed of. Disposal is not to be made into another part of the collection system but taken to the OCS D treatment facility.

Spill Reporting and Handling:

The service provider is not to engage in any activity that could possibly result in a sewage spill. This includes, but is not limited to, blocking the normal sewage flow, diverting the normal sewage flow, using improper cleaning equipment, using the cleaning equipment in a manner for which it was not designed, improperly using the cleaning equipment, or any other process or procedure that would result in sewage being backed up or spilled on private or public property. Should a spill occur, the procedures outlined in the City's SSORP shall be adhered to, paying particular attention to containment and recovery of the spill. All reporting specified in the SSORP shall be adhered to.

Line Cleaning Reports:

At the end of each week of line cleaning, the service provider shall provide to the City a report of the line segments cleaned the previous week. The report shall include, but not be limited to: the manholes, by ID number, that were cleaned and their condition; the pipeline segments that were cleaned, their location and the type of debris removed by pipeline segment (roots, grease, grit, etc.); the type of cleaning required (light, medium, heavy) and the number of passes required by segment; the reason for cleaning (routine,

for inspection, blockage removal, etc.); problems encountered (such as limited or unavailable access, poor pipeline conditions that prevented cleaning, complaints from residents, etc.); and other comments and recommendations that are appropriate for the line segments cleaned during that time period. These reports are to be written and in a format acceptable to the City or on a form provided by the City.

Cleaning Verification:

At the end of each month to verify that the service provider has properly and completely cleaned the City's collection system, the City, at its option, may require up to 10% of the cleaned lines be inspected with CCTV to ensure that the cleaning meets the City's standards for sewer line cleaning. This is in addition to manual visual inspections of manholes and pipelines by mirroring or other devices. If the CCTV inspection reveals inadequate cleaning, additional segments may be inspected beyond the initial 10%. The service provider will be required to clean any unsatisfactorily cleaned lines to the City's satisfaction prior to receiving full payment for service.

CITY OF PLACENTIA Sewer Line Inspection Guide

Purpose:

To meet the requirements of the Waste Discharge Orders established by the California State Regional Water Quality Control Board, Region 8, and to operate its sanitary collection system at its maximum efficiency, the City contracts its closed circuit television (CCTV) inspections of its sanitary collection system to a qualified service provider. Outside contracts are utilized for CCTV inspections as the City does not maintain the required equipment or personnel needed to properly inspect the interior of the pipelines of the sanitary collection system. The purpose of this Sewer Line Inspection Guide is to establish the minimum standards for the sewer line CCTV inspection of the City's sanitary collection system. Any service provider utilized for the sanitary collection system sewer line inspection is expected, at a minimum, to provide a level of CCTV inspection compliant with this Sewer Line Inspection Guide.

General:

The Placentia sanitary collection system consists of approximately 76 miles of pipelines and manholes. Piping sizes range from 8" to 21" in diameter. Pipe construction is mostly VCP with sizes above 15" being both VCP and RCP. There are no lift stations or force mains as the entire system is a gravity flow system. Private laterals connect private properties to the City's collection system but are not part of the City's collection system.

The service provider is required to furnish all labor, equipment, materials and incidentals necessary for the proper CCTV inspection of the City's sanitary collection system sewer pipelines and manholes. As enhanced line cleaning is normally required to ensure the proper CCTV inspection of the pipeline interiors, the service provider may provide this service to the City or the City may have this action provided by its normal collection system pipeline cleaning service provider. The City and the service provider, prior to the start of the CCTV inspection will agree upon the method utilized. Any cleaning of the pipelines prior to the CCTV inspection, must be in compliance with the City's Sewer Line Cleaning Guide. Additionally, the service provider must ensure that no spills occur during the cleaning or CCTV inspection process. At no time is the service provider to engage in any activity that is unsafe, or that may result in damage to either private or public property while providing sewer line cleaning or CCTV inspection of the City's sanitary collection system.

Inspection Methods:

There are several inspection methods that may be utilized by the City on a case-by-case basis for collection system pipelines and manholes. Manual inspections are used to

inspect manholes or short lengths of pipe and may be performed by City personnel or the pipeline cleaning service provider. CCTV inspections without use of video recording equipment are sometimes utilized to get a quick look at a potential trouble spot. This guide does not pertain to these types of inspections but is specifically for CCTV inspections that include a video archive to document and allow an internal assessment of the condition of the City's sanitary collection system pipelines.

Service Provider Qualifications:

The service providers CCTV operators must be certified by the National Association of Sewer Service Companies (NASSCO) and have passed the three-day Pipeline Assessment and Certification Program (PACP). Supervisors, in addition to having the same qualifications as the operators, must have at least 5 years experience in videotaping sewer pipeline inspections. Supervisors must also be able to communicate with the City's staff, as well as his own crew, and be able to demonstrate the ability to understand all Cal-OSHA requirements, plans, drawings, and specifications as necessary. NASSCO certification shall be the standard for evaluation, data collection and reporting for CCTV inspections. All work, procedures, personnel training and equipment must be compliant with current Cal-OSHA specifications.

Service Provider CCTV Equipment:

All of the equipment used by the service provider for CCTV inspections is to be designed and constructed specifically for operation within a sanitary sewer system and compliant with current Cal-OSHA regulations. The camera shall be capable of operating in an atmosphere with 100% humidity and be capable of performing Pan-and-Tilt (with a minimum 360X270 degree rotation) operations. The camera must have illumination sensitivity of 3 lux or less and be capable of focusing from a minimum of 1 inch to infinity. Lighting intensity shall be adjustable to minimize reflective glare and picture quality shall be adjustable to provide a clear, sharp picture of the entire periphery of the pipeline. Equipment necessary for the movement of the camera through the pipeline shall not interfere with the documentation or inspection process of the sewer pipeline. Camera cables, power cords and ancillary equipment shall be long enough to complete the longest pipe segments in one direction. The camera and monitor must be capable of producing a color picture with a minimum 460-line resolution. A color video recording of the inspection shall be created on high quality VHS videotape for presentation to the City.

Types of CCTV Inspections:

The City utilizes two basic types of CCTV inspections, preliminary and standard. The preliminary inspection is normally conducted prior to any cleaning of the pipeline and is used to accurately assess the pipeline in its natural working environment. A preliminary inspection may also be used to determine the extent of root intrusion, grease buildup or blockages. A preliminary inspection may or may not include a videotape requirement.

The standard inspection is conducted after the pipeline has been sufficiently cleaned to enable a comprehensive evaluation of its interior condition.

Inspection Process:

Once the camera is inserted into the pipe in the manhole, the camera cable shall have the slack removed and the cable footage counter is to be reset to the distance between the centerline of the manhole and the front of the camera lens. The camera is to move in a downstream direction whenever possible, at a uniform rate of approximately 30 feet per minute. The cable footage counter shall measure each pipeline segment from manhole centerline to manhole centerline with accuracy of less than 1% error over the measured distance. The service provider shall adjust the camera height so that the camera lens is always centered at least one-half the inside diameter of the pipeline being inspected. Should the water level be greater than 20% of the inside pipeline diameter, the service provider should resume inspection at the low flow period or engage in a flow reduction activity that is acceptable to the City without creating a sewage spill. Videotapes made while floating the camera are not acceptable unless approved by the City. Pausing the video recording during periods of inactivity is permitted to eliminate unnecessary recording. Any time a significant defect is noticed, the camera shall stop to provide a clear, focused view of the pipeline condition. An audio narration shall accompany each defect. Significant defects include but are not limited to: laterals (open, sealed, protruding or defective), cracks, offset joints, open joints, sags, line deviations, siphons, missing sections, debris, grease, roots, vermin, and infiltration. If the defect is due to active infiltration, the service provider shall estimate the gallons per minute flow rate at the point of the infiltration. The service provider shall provide a 360-degree pan of all manholes. All manhole numbers used for identification shall be those assigned by the City correlating to the City's sewer atlas maps. The camera lens must be kept clear of condensation and debris.

Video Recording and CCTV Inspection Report:

Video Recording: The purpose of the video recording is to create a visual and an audio record of the problem areas within the collection system pipelines that may be replayed. The videotape shall be a high quality VHS tape-recorded in 2-hour standard mode. Playback shall be at the same speed at which it was recorded. The recording shall be in color and shall be clear and in focus. Recordings are to be continuous between manholes. Do not leave gaps between segments and do not show a single segment on more than one tape without the City's approval. Recordings showing steam, inadequate lighting, excessive distortion, discoloration or general poor picture quality shall be cause for rejection.

Each pipe segment (manhole to manhole) shall be identified by text on the initial screen at the beginning of the segment, on the running screen during the inspection and on the ending screen. The initial screen text and voice recording shall identify the current time and date, weather conditions, service provider, operator's name, street name, upstream and downstream manhole ID numbers, direction of camera movement, pipeline materials,

length of segment, pipe size and tape number. Located at the bottom of the screen, the running screen text shall include the running footage, upstream and downstream manhole ID numbers, pipe size, pipe length, date and time. At the end of the segment, the ending screen shall state the end of the segment or reason for an incomplete inspection if applicable. The City shall approve these screens prior to the CCTV inspection. Text may be temporarily turned off during the inspection to facilitate a clearer view of a defect.

Each videotape shall include a complete audio narration. The audio narration shall be clear, concise and complete made in real time as the video is being recorded and not an overdub after the video recording has been completed. The service provider shall take steps necessary to reduce or eliminate all background chatter that could detract from the audio quality. The audio track shall describe the parameters of the pipeline being inspected and shall include, but not limited to, pipeline location, depth, diameter and pipeline material as well as a description of all connections, defects and unusual conditions observed during the inspection.

Each tape shall be permanently labeled on both the spine and the tape face. The spine label shall include the name of the service provider, type of inspection (preliminary or standard), tape number, date recorded, and date submitted. The label on the tape face shall include the starting and ending manhole numbers (all manhole numbers used for identification shall be those assigned by the City correlating to the City's sewer atlas maps), pipe diameter, pipe or segment length and street name. Video recording shall be submitted and become the property of the City.

CCTV Inspection Report: The CCTV inspection report or log shall be a written report and shall include segment location (manhole numbers for upstream and downstream manholes), street name, date, time, service provider and operator's name, pipeline information (size, shape, material, depth, age, slope, joint lengths), tape number and include points of significance including lateral locations, unusual conditions, roots, grease, sludge, broken or missing pipe, defect descriptions, etc. and shall accompany the videotape to be supplied to the City. The City may also request digital still photographs of defects or other areas of significance. As with the videotape, the inspection report and any still photographs shall become the property of the City.

Frequency of Inspection:

After an initial video inspection of the entire City owned and operated collection system, consistent with the SSMP's condition assessment requirement, the City endeavors to conduct CCTV inspections at a rate of 10% of the system per year. Trouble areas may require more frequent inspections.

Sanitary Sewer Hot Spot List

Map No.	Street or Easement	From Manhole #	To Manhole #	Footage	Comments
19	Kraemer Blvd.	4187	4188	225	
19	Kraemer Blvd	4186	4187	225	
19	Kraemer Blvd	4179	4186	75	
19	Kraemer Blvd	4178	4179	150	
19	Sheffield	4176	4178	150	
18	Sheffield	3940	4176	250	
18	Sheffield	3939	3940	165	
18	Sheffield	3932	3939	150	
18	Sheffield	3931	3932	45	
18	Sheffield	3229	3931	175	
18	Essex	3229	3930	200	
18	Sheffield	3928	3229	350	
18	Newcastle	3925	3928	260	
19	Easement	4102	4103	165	
18	Bradford	3914	No#	300	Heavy Grease
31	Alley	6411	6410	500	
31	Center	6462	6411	165	Medium Grease
31	Center	6424	6462	165	Medium Grease
31	Alley	6423	6424	450	Medium Grease
31	Alley	6423	No#	125	Medium Grease
30	Alley	6258	6260	340	Medium Grease
30	Alley	6258	6259	210	Medium Grease
30	Alley	6257	6258	235	Medium Grease
30	Alley	6254	6257	255	Medium Grease
39	Vincente	4112	4300	130	Lite Grease
39	Vincente	4111	4112	175	Lite Grease
39	Vincente	4110	4111	218	Lite Grease
39	Vincente	4109	4110	273	Lite Grease
39	Vincente	4108	4109	305	Lite Grease
39	Vincente	4107	4108	314	Lite Grease
40	Vincente	4106	4107	296	Lite Grease
40	Van Buren	4105	4105	65	Lite Grease
40	Van Buren	4104	4105	124	Heavy Sludge
30	Monterey Cir.	6210	6211	150	Heavy Grease
30	Alley	6203	6210	175	Heavy Grease
30	Alley	6202	6203	120	Heavy Grease
30	Easement	6201	6202	310	Heavy Grease
30	Easement	6200	6201	100	Heavy Grease
29	Easement	6201	6200	310	Heavy Grease

City of Placentia Infiltration/Inflow Reduction Plan

Introduction:

Infiltration and inflow (I/I) is common in sanitary collection systems and can be a major factor in collection system failures during times of inclement weather. Infiltration is normally groundwater that enters the collection system at a more or less steady rate through cracked or broken pipes, misaligned joints, root intrusion, defective manholes, etc. The amount of infiltration normally increases as the ground surrounding the collection system becomes saturated. Inflow, on the other hand, is the rapid increase in flow as storm water enters the collection system. Nationally, it is estimated that up to 50% of the inflow into a collection system can be associated with manhole covers. Water can enter through the vent or pick holes and/or around the frame and cover. Manholes located in areas that traditionally flood during heavy rains can create inflow. Other sources of inflow include storm drains connected to either a private or the public sanitary collection system. Figure 1 graphically illustrates the type of conditions that can contribute to I/I.

Left unchecked, I/I presents increased and unnecessary treatment and collection costs and can surcharge the system beyond its designed capacity resulting in sewage spilling into the environment. Whatever the source, I/I must be identified and eliminated, or to the greatest extent possible, severely reduced. To this end, the City of Placentia has developed this Infiltration/Inflow Reduction Plan (IIRP) as part of its Sewer Master Plan with the goal to significantly reduce or

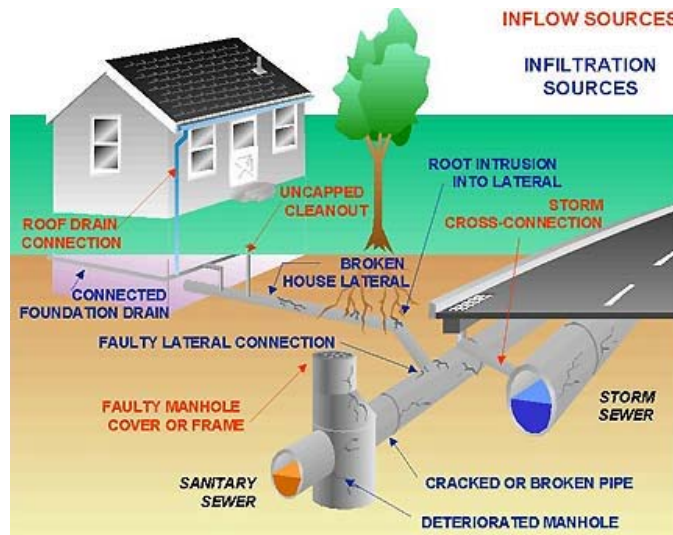


Figure 1

eliminate, where possible, all I/I in the sanitary collection system. As part of the Master Plan, the IIRP becomes part of the operational guidelines for the ongoing operation and maintenance of the City of Placentia's sanitary collection system.

Plan Overview:

The IIRP is a phased approach for the reduction or elimination of sources of I/I within the City's sanitary collection system. The first phase is an assessment of the collection system to determine where, and to what extent, I/I is occurring. This phase will include a review of maintenance records, sewer overflow reports, review of areas

that traditionally flood during rain storms, rainfall monitoring and analysis, long term flow monitoring, comprehensive cleaning and videoing (CCTV) of the sanitary collection system. Phase 2 provides for the determination of where within the sanitary collection system I/I is occurring. After careful analysis of the data accumulated during Phase 1, a prioritized list is developed based upon areas where the heaviest amounts of I/I are occurring. During Phase 2, individual reaches within the service area will be analyzed to determine the exact source of the I/I and methods of remediation will be determined. Phase 3 is the actual remediation. This phase may include pressure grouting, sliplining, line replacement, manhole plugging or raising, etc. Phase 4 is to evaluate the success of the IIRP and its remediation methods. Comparisons will be made to baseline flows to determine the effectiveness of the program. Since this is an ongoing program, different portions of the City's collection system may be in different phases at different times.

Phase 1:

Phase 1 is an assessment to determine to what extent I/I has affected the City's sanitary collection system. This phase primarily relies on flow monitoring to determine I/I flow increases. Rainfall monitoring is an important element combined with the flow monitoring. Existing maintenance records and sewer overflow reports will be used to target trouble spots. The storm drain system will be evaluated to establish its ability to remove storm runoff without impacting the sanitary collection system. Comprehensive line cleaning and CCTV of the collection system will be used to assess the overall condition of the sanitary collection system.

- Flow Monitoring – Initially, the six monitoring locations utilized to compile the sanitary collection system model for capacity will be used for long term monitoring for I/I assessment. The flow meters utilized shall be capable of monitoring both flow depth and velocity. Data from the monitoring shall be used to create a new model and establish baseline flows over time. Based upon data received, more monitoring points may be required or the monitoring points may need to be relocated to more accurately reflect I/I into the system. As data is gathered throughout the year, an accurate assessment can be made of the amount of I/I entering the system and from what areas in the City it is being introduced.
- Rainfall Monitoring – To assist in accurately determining inflow, rainfall-monitoring stations will be placed, approximately one per every two to four flow monitoring sites, to measure rainfall in the areas being monitored. Soil saturation is another component of rainfall monitoring. Soil saturation and a rising groundwater table will effect infiltration into the system.
- System Cleaning and CCTV – A comprehensive cleaning program of the sanitary collection system is essential to allow the system to flow at its designed capacity, reduce system overflows due to debris buildup, and allow for more accurate flow monitoring. As per Orange County Sanitation District's recommendations, collection lines 12 inches in diameter and smaller shall be cleaned at least once every 18 months. Lines 15 inches in diameter and greater shall be cleaned at least once every 5 years. Trouble spots shall be cleaned more frequently as conditions dictate to keep the system free flowing without overflows. CCTV shall be done

in conjunction with line cleaning offering an accurate assessment of pipeline condition and possible sources of I/I.

- Review of Records – Review of maintenance and overflow records will assist in determining trouble spots that may have a negative effect on gathering accurate data related to I/I. These areas may require additional cleaning or monitoring.

After sufficient data has been gathered to indicate the presence and levels of I/I and from which portions of the City it is originating, a report will be created prioritizing affected areas and in what order they are to proceed to Phase 2. Those areas with the highest levels of I/I are to be addressed first.

Phase 2

After it has been determined that I/I is entering the sanitary collection system and at what levels, Phase 2 is to establish the sources of I/I and determine the most cost effective form of remediation that will eliminate or substantially reduce the amount of I/I. Remediation can range from plugging manhole vents to pipeline rehabilitation or replacement. Investigating the sources of I/I requires the careful analysis of data gathered in Phase 1, review of maintenance records, review of CCTV videos, and review of manhole locations and their susceptibility to ponding or flooding, as well as their overall condition. Private sewer service laterals are another source of I/I. This could include private drainage systems that are tied to the collection system, deteriorated service laterals or faulty lateral connections. Any direct connections to the storm drain system most also be corrected.

- Review Maintenance Reports and Sewer Overflow Reports – Carefully review maintenance reports and sewer overflow reports of areas shown to have sources of I/I. Particular attention should be paid to those incidents that occurred during the rainy season.
- Review CCTV Videos – Careful review of the CCTV videos of areas of known I/I may reveal the source of the I/I. Review should be in conjunction with the review of the maintenance and overflow reports.
- Smoke Testing – Smoke testing can be used in areas of suspected I/I to further assist in determining the source. This can be especially useful in detecting sources in service laterals.
- Flooding – Review areas that have a tendency to flood during rainstorms. Review drainage in these areas to insure that drainage is not into the sanitary collection system.
- Manholes – Inspect manholes for their integrity. Interior walls should be inspected for signs of I/I. The ring and lid should be inspected for fit. The level of the manhole should be inspected to insure it has not settled to create a low spot subject to ponding. Manholes in low-lying areas or in intersections prone to flooding should be plugged or sealed to prevent I/I.

Once the sources of I/I have been discovered, create a report outlining recommended methods of remediation, anticipated effect, and cost. Pipeline remediation may consist of various types of relining, pressure grouting, pipe bursting and replacement. Manhole remediation may consist of various types of relining, pressure grouting, frame realignment or replacement, vent plugging or sealing, manhole raising, diversion of runoff, or manhole replacement. The property owner should be notified and directed to make necessary repairs for I/I entering the sanitary collection system from private property.

A project list should be created to establish the order that remediation projects are to be completed. A cost benefit ratio should be established. Those projects that offer the greatest cost benefit should receive the highest ranking for assignment. Cooperative funding should be investigated. Funding opportunities, grants, low or no interest loans from local, state or federal agencies should be pursued.

Phase 3

Phase 3 is the actual assignment of projects based upon the order of priority established in Phase 2. City forces may complete some projects while others will require the services of outside contractors. Normal City protocol will determine how projects and contracts are assigned.

Phase 4

Phase 4 evaluates the effectiveness of the overall IIRP and the effectiveness of individual remediation projects. Individual projects are best evaluated through long term flow and rainfall monitoring compared to baseline data. The overall program effectiveness is evaluated in the amount of citywide I/I reduction based upon long-term flow and rainfall monitoring compared to baseline data. Adjustments to the program will be necessary to achieve the goal of the most cost effective I/I reduction possible.