SEWERAGE AND WATER BOARD

OF

NEW ORLEANS

PREVENTIVE MAINTENANCE (PM)

PROGRAM

Revised 11/07/97
11/17/97
11/18/97
12/02/97
12/17/97

SEWERAGE AND WATER BOARD OF NEW ORLEANS
PREVENTIVE MAINTENANCE PROGRAM
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EXPLANATION OF SECTION CONTENTS

The Preventive Maintenance Report for the collection system of the Sewerage and Water Board (S&WB) of New Orleans was developed from extensive research and data collection, and revised based on field experience. This plan has been reviewed by the S&WB's EPA Operational Implementation Review Team under the guidance of the General Superintendent's Office. The Team is composed of operational experts from all areas of preventive maintenance involvement.

Summary of Contents

Section 1 - Introduction explains the scope of the plan and its basic elements, the tools to be used to implement and monitor the plan, and the quantifiable measures/goals to be achieved by the plan.

Section 2 - Data Collection describes the data sources used to establish a base line condition of data and the basis for data revision.

Section 3 - Staffing identifies the staffing structure for operation and maintenance of the Sewerage and Water Board of New Orleans' Sewer Collection System using Tables of Organization to support preventive maintenance requirements, Infiltration/Inflow Reduction, and Sewage Collection System Rehabilitation Program.

Section 4 - Gravity Department discusses the departmental resources to be used in support of preventive maintenance. Supporting information is provided in the form of work flow charts, routinely scheduled preventive maintenance procedures, and inspection checklists used by the Gravity Department. Schedules have been included to show projected frequency of cyclic maintenance. Auditable goals for preventive maintenance sewer cleaning are established based on engineering estimates and actual contract cleaning performance. The initial sewer cleaning program reflects a twelve year cleaning cycle.

Section 5 - Operations Department discusses the use of departmental resources to be used in support of scheduled preventive maintenance. Supporting information is provided in the form of work flow charts, routine scheduled preventive maintenance procedures, and inspection checklists used by the Operations Department in eighty-three (83) sewage pumping stations. Projected preventive maintenance schedules are summarized in tables. Auditable goals are established in this section.

Section 6 - Facility Maintenance Department summarizes the comprehensive maintenance program and tracking system used by the Facility Maintenance Department for major mechanical, electrical and instrumentation equipment. The preventive maintenance schedules have been summarized in tables. Auditable goals are established in this section.

Section 7 - Pressure Department summarizes the preventive maintenance program for the force mains and air release valves, which are installed at specific points in the system. Auditable goals are established in this section.

SECTION 1.0
INTRODUCTION

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INTRODUCTION

The Sewerage and Water Board of New Orleans ("Board") is responsible for providing water, sanitary sewer and storm drainage services throughout the City of New Orleans. The Sewerage and Water Board of New Orleans operates and maintains an extensive network of water and sewer lines, canals, electrical power generators and dispatchers, drainage and sewage pumping stations, and water and wastewater treatment plants. The document explains the preventive maintenance plan for the sanitary sewer collection system.

This preventive maintenance plan is intended to establish specific preventive maintenance tasks, procedures and auditable performance indicators for the wastewater collection system including sewer lines, sewer trunk lines, sewer pumping stations and sewer force mains. The goal of this plan is to improve the consistency of performance of the wastewater collection system and pumping stations. By improving the consistency of system operation, the plan is intended to reduce the number and severity of untreated wastewater overflows, reduce customer complaints and lower operating costs.

Preventive maintenance procedures and checklists shown in this document have been developed from a review of Sewerage and Water Board of New Orleans' wastewater facilities, equipment manufacturers' recommendations and accepted industry practices. Work flow charts have also been prepared showing step-by-step procedures to be used by Board's personnel when performing routine preventive maintenance.

The activities of the Networks and Operations Departments are to be tracked using RJN CASSWORKS™ computer software. CASSWORKS™ is being set up to generate routine (preventive) maintenance work orders for the sewage pumping stations and to track specific gravity sewer lines, manholes and force mains where preventive maintenance has been performed. Figure 1.1 identifies the stated, overall quantifiable measures/ goals established for the preventive maintenance program.

QUANTIFIABLE MEASURES/GOALS

Gravity Systems

Sewer Cleaning .....(1) Inspection of at least 9% of the system every year and 100% in 8 years
(2) Clean at least 7% of the system every year and 100% in 10 years

Sewer Manhole Inspections .....(1) Inspection of at least 25% of the sewer manholes per year
(2) Completion of sewer manhole inspections in 3.3 years

Operations and Gravity Systems

Perform all Preventive Maintenance work within two weeks of scheduled date for accomplishment

Pressure System

Perform inspection maintenance of air release valves quaterly.

Inspect and exercise sewer force main isolation valves annually.

Visually inspect all force main alignments annually.

Conduct cathodic protection surveys annually.

FIGURE 1.1

SECTION 2.0

DATA COLLECTION, CATHODIC PROTECTION AND QUALITY CONTROL

Revised 12/02/97

DATA COLLECTION

Data to document the maintenance procedures contained in this manual was gathered through an inventory of Sewer Collection System equipment and facilities through interviews with Department Heads, Superintendents, and Supervisors, in addition to reviews of equipment vendors' operation and maintenance manuals. This data is or will be incorporated into the CASSWORKS™ Plant Maintenance Module and Work Order Infrastructure Management Package.

It is important to stress that the data contained in this document will change over time, as equipment is replaced, as new equipment or systems are installed, and as the computer software is updated and modified. Therefore, this manual should be viewed as a "living document", the contents of which will be modified as necessary to stay current.

To the maximum extent possible, all maintenance related data will be embodied into the CASSWORKS™ Plant Maintenance Module and Work Order Infrastructure Management Packages. The generation of work orders will be done on a weekly basis for all P.M.s scheduled for the work.

CATHODIC PROTECTION

The Sewerage and Water Board installs and maintains cathodic protection systems to prevent corrosion damage to underground coated steel water and sewer mains, elevated water storage tanks, and submerged discharge structures. Aggressive application of cathodic protection has been a S&WB standard practice in pipeline construction dating back to the 1940's.

The Cathodic Protection systems consist of sacrificial anode attachment to the structure to be protected or Impressed Current systems. The anode method is used on sewer and draining discharge structures and on short sections of coated steel pipe. When the length of pipeline to be protected increases, as for a steel sewer force main, the positive Impressed Current systems utilizing a deep well ground bed and Rectifier assembly is employed. At present, the Sewerage and Water Board operates 22 Impressed Current systems which are also anode protected to prevent corrosion if the Rectifier should fail.

All systems are checked, inspected, and maintained on a regular schedule with all Rectifiers and pipelines tested weekly for proper operation. A yearly survey is conducted on all ground beds to record their effective remaining life and to plan for replacement prior to failure. Water Towers undergo yearly inspections by Cathodic Protection Services Co., a Division of Wallace & Tierman, Inc., to ensure proper operation of the Rectifier/anode system and to inspect interior condition of the towers. The Sewerage and Water Board has no record of pipeline failure due to exterior corrosion.

QUALITY CONTROL

The responsibility for quality control lies with Sewerage and Water Board management and supervision. Quality control has a direct relationship to the long term cost to maintenance and operation of the sewer collection system. The CASSWORKS system will be checked by management in addition to onsite field visits to ensure that programmed maintenance is accomplished. The SCADA system will be monitored to ensure that monitored system maintenance trends are improving or steady.

SECTION 3.0
STAFFING AND
RESOURCE COMMITMENTS

Revised 11/7/97

STAFFING AND RESOURCE COMMITMENTS

The Board is responsible for the operation and maintenance of the wastewater collection and storm drainage collection systems within the City of New Orleans. The wastewater collection system maintained by the Board includes house service connections (to the property line), gravity sewers, trunk sewers, sewage lift and pumping stations and sewer force mains.

The Organization and Manpower charts shown in this Section are current. These charts are continually updated and will be replaced as newer versions become available.

Figure 3-0 is the overall Table of Organization for the Sewerage and Water Board of New Orleans. Key departments for the operation and maintenance of the wastewater collection system are:

1. Operations Department (Sewerage Operations and Pumping and Power Divisions) – Responsibilities include the operation of the Sewerage and Water Board of New Orleans' sewage pumping stations. See Figure 3-1.
2. Facility Maintenance Department – Responsibilities include providing maintenance to mechanical, electrical and instrumentation components of the sewage pumping stations. See Figure 3.3.
3. Networks Department – Among other duties, this Department's responsibilities include maintaining gravity sewer lines, sewer house service connections, manholes, sewer force main air release valves and sewer force mains. See Figures 3.8 and 3.7.

These departments are responsible for all in-house preventive and corrective (unscheduled) maintenance. Other maintenance is obtained through outside service contracts for operations, maintenance and construction.

OPERATIONS DEPARTMENT

The Operations Department Organization Chart is shown in Figures 3-1 and 3-2 Figure 3-1 shows the overall organization of the Department, while Figure 3-2 shows a more detailed view of the Division of Drainage and Sewerage Pumping, the largest Division in the Operations Department.

The Division of Drainage and Sewerage Pumping is responsible for the operation of sewage pumping stations throughout the service area. Three (3) of the large sewage pumping stations: "A", "C", and "D" are manned continuously by a watch-standing organizational staff. Unmanned sewer pumping stations are visited daily or every other day during the normal five (5) day work week by a two (2) man work crew.

SEWERAGE AND WATER BOARD OF NEW ORLEANS
1997 ORGANIZATION CHART

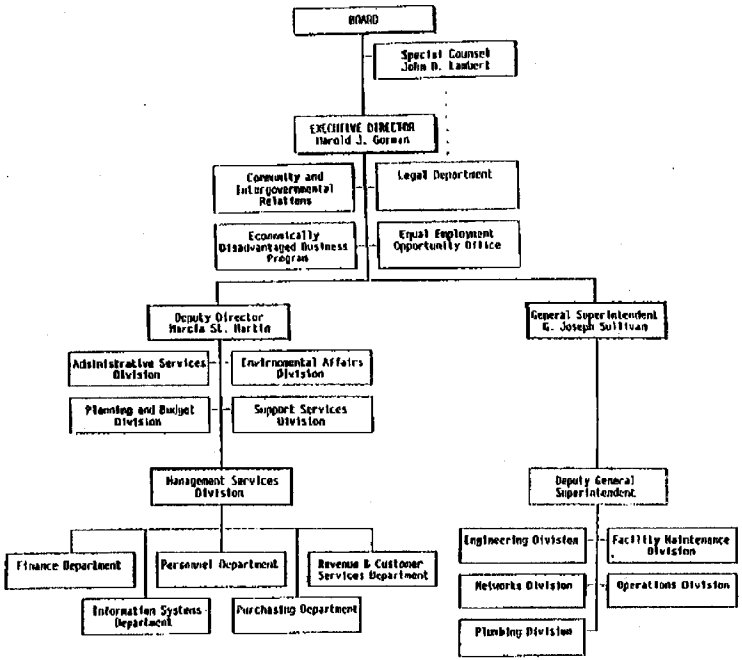

FIGURE 3-0
Revised 11/7/97

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1997
DEPARTMENT OF OPERATIONS
ORGANIZATIONAL CHART

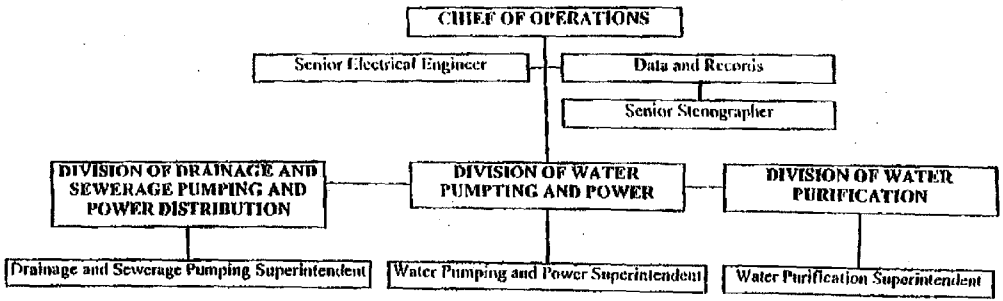
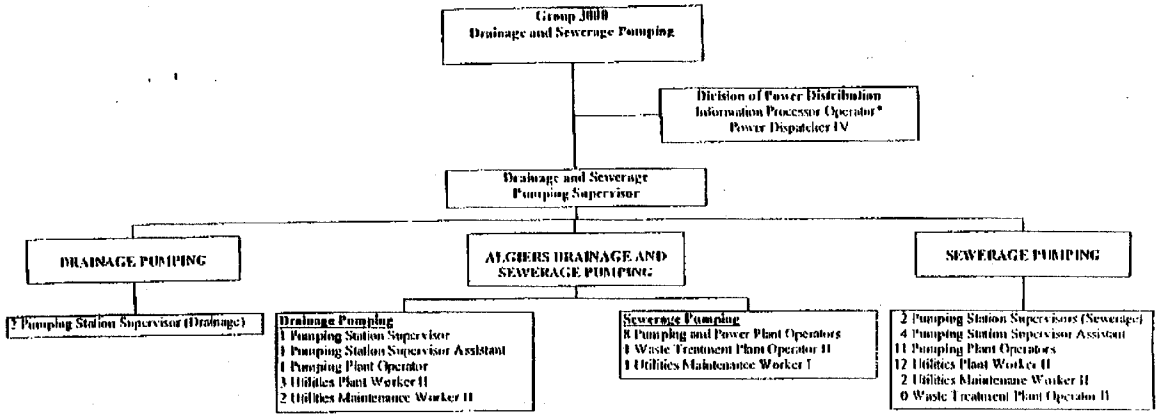


FIGURE 3-1
Revised 11/7/97

1997
DIVISION OF DRAINAGE AND SEWERAGE PUMPING
ORGANIZATIONAL CHART



*Additional positions requested for
Preventative Maintenance Program

FIGURE 3-2
Revised 11/7/97

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Critical sewage pumping stations are inspected daily (during the five day work week). Critical sewage pumping stations are or those which have experienced problems leading to sewage pumping station outages and untreated wastewater overflows in the past two years from the best data set available. All other stations are visited at least every other day. Crews are assigned preventive maintenance work orders (from CASSWORKS™) to be performed at the station. Their work orders include, but are not limited to:

- Seal packing adjustment and replacement;
- Alternating pump usage;
- Monitoring equipment vibration and temperatures;
- Monitoring and cleaning probes and instruments for the SCADA System;
- Performing yard maintenance.

These tasks have been loaded into self generating work orders on the CASSWORKS™ work order system. New items of maintenance will be added to this list of work orders as necessary.

Virtually all electrical maintenance is referred to the Facility Maintenance Department. Exceptions to this include resetting of tripped circuit breakers, locking out and tagging of equipment for maintenance, and relamping of the stations.

FACILITY MAINTENANCE DEPARTMENT

The Facility Maintenance Department is further divided into three (3) Divisions, as shown in Figure 3-3:

1. The Division of Electrical Maintenance
2. The Division of Mechanical Maintenance
3. The Division of Plant Maintenance

The Facility Maintenance Department Shop is located at the Carrollton Water Purification Plant. All major maintenance and repairs are performed at the maintenance yard or at the stations. The preventive maintenance work orders for the Department are generated by CASSWORKS™. Corrective maintenance work orders for the Facility Maintenance Department are generated by CASSWORKS™ from input from the Operations Department derived during their routine inspection visits, or from input from the Facilities Maintenance Department.

Figure 3-5 shows the organization of the Electrical Maintenance Division. This Division is responsible for all major preventive and corrective maintenance for electrical equipment and instrumentation in the sewage pumping stations. Some elements of electrical and instrumentation maintenance may be "contracted out" by the Electrical Maintenance Division to outside contractors.

ORGANIZATIONAL CHART
DEPARTMENT OF FACILITY MAINTENANCE

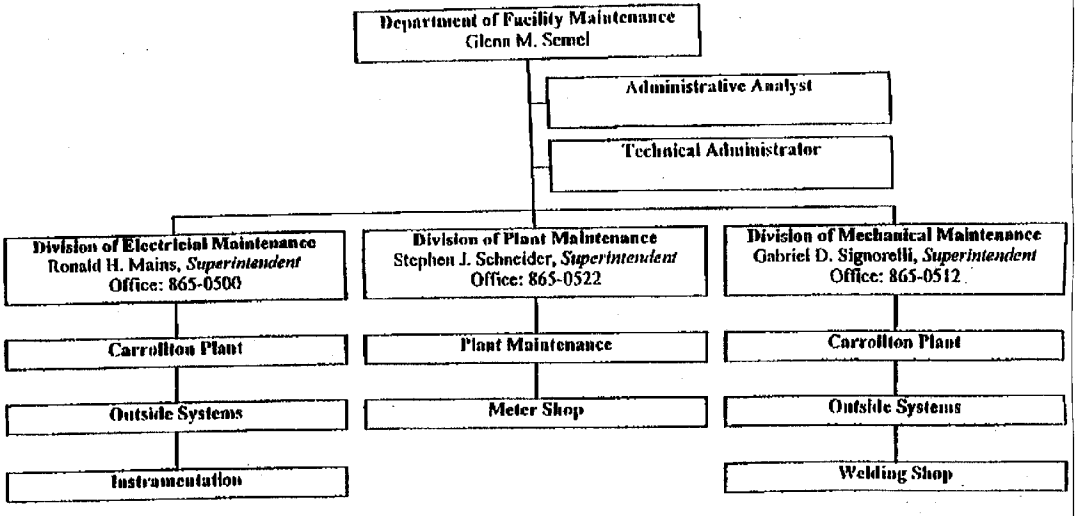

FIGURE 3-3
Revised 11/7/97

Figure 3-6 shows the organization of the Mechanical Maintenance Division. This Division is responsible for all major preventive and corrective maintenance for mechanical equipment in the sewage pumping stations. This includes all pump rebuilding, bearing replacement, coupling alignment, and motor and pump replacement.

The Division of Plant Maintenance plays a lesser role in the maintenance of the wastewater collection system, primarily in performing painting and minor structural repairs at the sewage pumping stations. The organization for the Plant Maintenance Division is shown in Figure 3-4.

NETWORKS DEPARTMENT

The organization of the Networks Department consist of three (3) Divisions:

1. **Gravity Systems** – Sanitary sewer responsibilities include the maintenance of house service connections (to the property line), gravity sewers, trunk sewers and manholes.
2. **Pressure System** – Sanitary sewer responsibilities include the maintenance of sewer force mains and air release valves;
3. **Support Activity** – Responsibilities include pavement replacement and paving contractor supervision. [This Division does not perform preventive maintenance activities]

Figure 3-7 shows the organization of the Gravity Systems Division. Because of the nature of this Division, it has been divided into two (2) departments: Maintenance and Repair.

Maintenance

The Maintenance Department focuses on preventive maintenance and minor corrective maintenance that does not involve repairs to the system. The preventive maintenance program for Gravity Systems consists of crews which are assigned to designated areas for sewer cleaning, manhole inspections, TV Inspection and other related activities. The initial strategy of the preventive maintenance program is to focus on those problem areas where sewer blockages and overflows have been most common. Cleaning and inspection of the entire sewer system will be completed as shown on attached plans for cleaning. The other activities under the Maintenance Department deal with response to reported blockages: unblocking and flushing sewer chokages, unblocking sewer service connections, and cleaning manholes and wetwells related to responses outlined in the Sewer Overflow Action Plan.

Repair

The Gravity Repair Department provides point repairs, manhole repairs and pipe replacement from manhole to manhole.

1997
DIVISION OF PLANT MAINTENANCE
ORGANIZATIONAL CHART

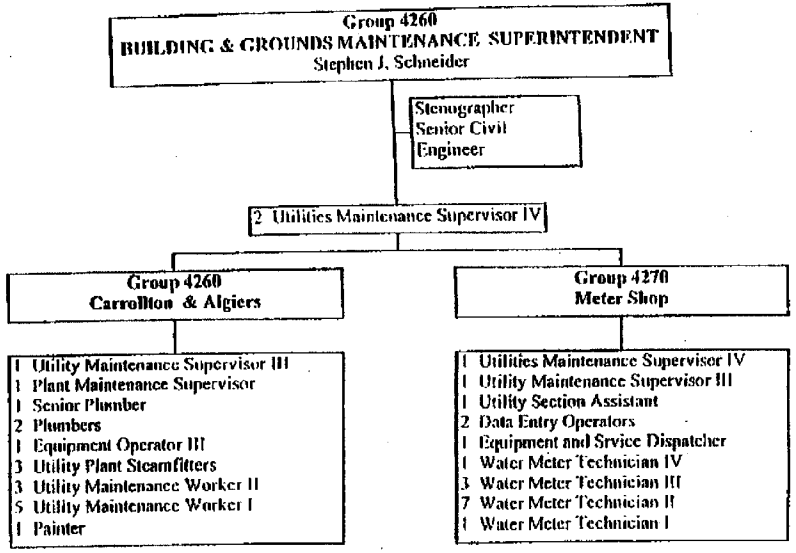

FIGURE 3-4
Revised 11/7/97

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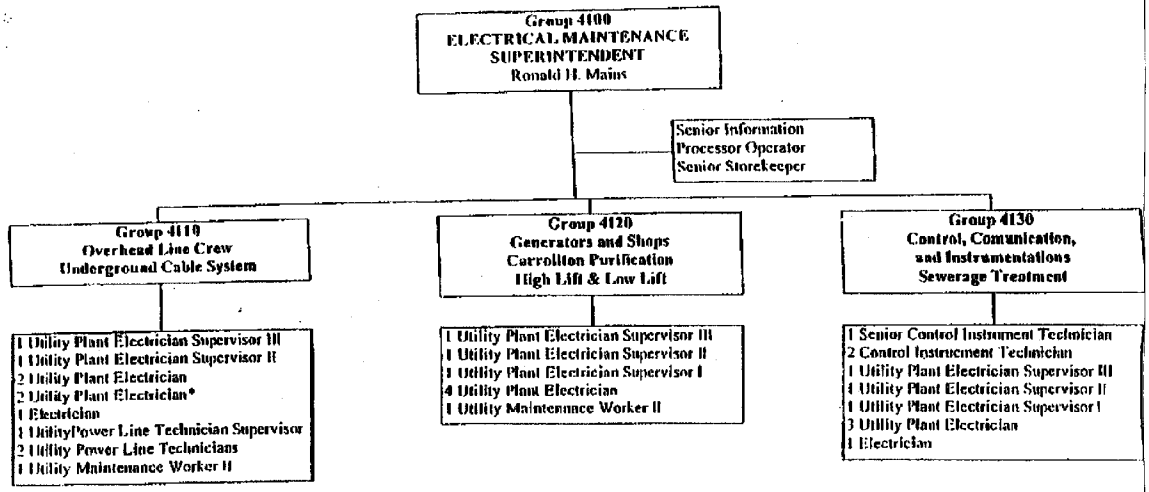
1997
DIVISION OF ELECTRICAL MAINTENANCE
ORGANIZATIONAL CHART



*Additional positions requested for Preventative Maintenance Program.

FIGURE 3-5
Revised 11/7/97

1997
DIVISION OF MECHANICAL MAINTENANCE
ORGANIZATIONAL CHART

Group 4300
MECHANICAL MAINTENANCE SUPERINTENDENT
Gabriel D. Signorelli

- Senior Information Processor Operator
- Senior Storekeeper
- Mechanical Engineer-In-Training II
- Engineering Technician

Group 4310
Carrollton Plant

- 1 Utility Plant Machinist Superviosr III
- 2 Utility Plant Machinist Supervisor II
- 1 Utility Plant Machinist Supervisor I
- 9 Utility Plant Machinist
- 1 Machinist
- 2 Equipment Operator IV
- 2 Utility Maintenance Worker II
- 2 Utility Maintenance Worker I

Group 4320
Field Crews

- 1 Utility Plant Machinist Supervisor III
- 2 Utility Plant Machinist Supervisor II
- 2 Utility Plant Machinist Supervisor I
- 9 Utility Plant Machinist
- 2 Utility Plant Machinist*
- 1 Machinist
- 1 Deisel Maintenance Supervisor
- 1 Plant Diesel Mechanic
- 3 Utility Maintenance Worker II
- 2 Utility Maintenance Worker I

Group 4330
Welding

- 2 Utility Plant Welding Supervisor II
- 1 Utility Plant Welding Supervisor I
- 9 Utility Plant Welder
- 1 Welder
- 1 Utility Maintenance Worker II
- 2 Utility Maintenance Worker I

*Additional positions requested for Preventative Maintenance Program

FIGURE 3-6
Revised 11/7/97

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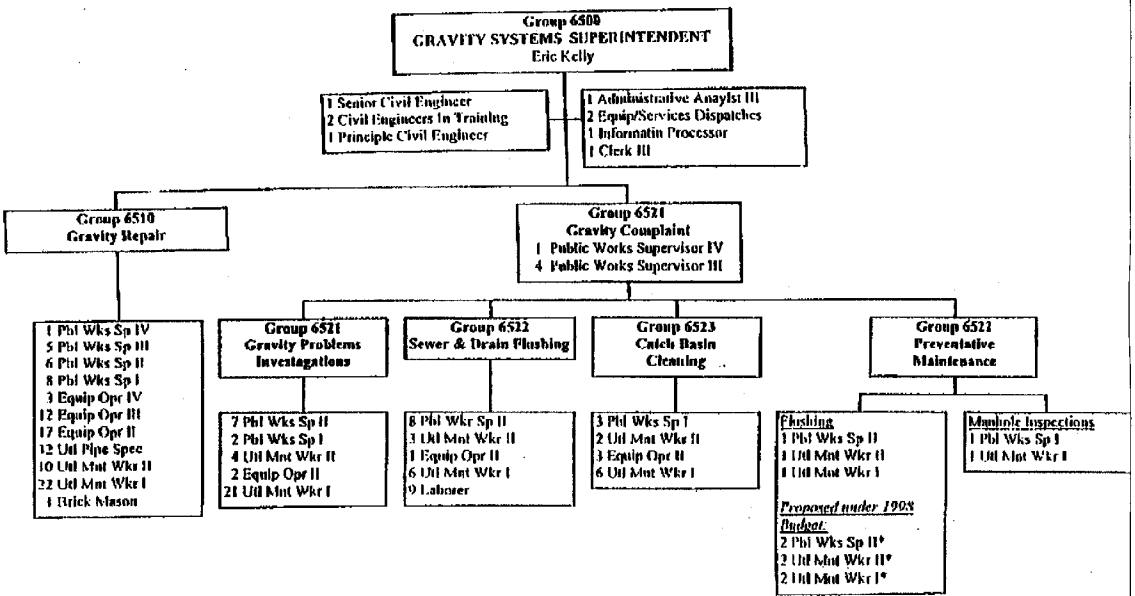
1997
DIVISION OF GRAVITY SYSTEMS
ORGANIZATIONAL CHART



* Additional positions requested for Preventative Maintenance Program

FIGURE 3-7
Revised 11/7/97

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Figure 3-8 shows the organization for the Pressure Systems Division. The primary sewer-related task for the Pressure System Division is in the maintenance and repair of sewer force mains and air release valves. Much of the sewer force main work is emergency in nature: responding to and correcting sewer force main breaks if they occur. A maintenance crew is assigned to exercise and bleed the air release valves.

The Support Activity Division's role in the maintenance of the wastewater collection system involves the restorations required as a result of system pavement repairs. This work is performed both by in-house crews and by outside contractors. In the case of contract paving, this department is responsible for providing inspection of the work performed by the contractors.

1997
PRESSURE SYSTEM
ORGANIZATIONAL CHART

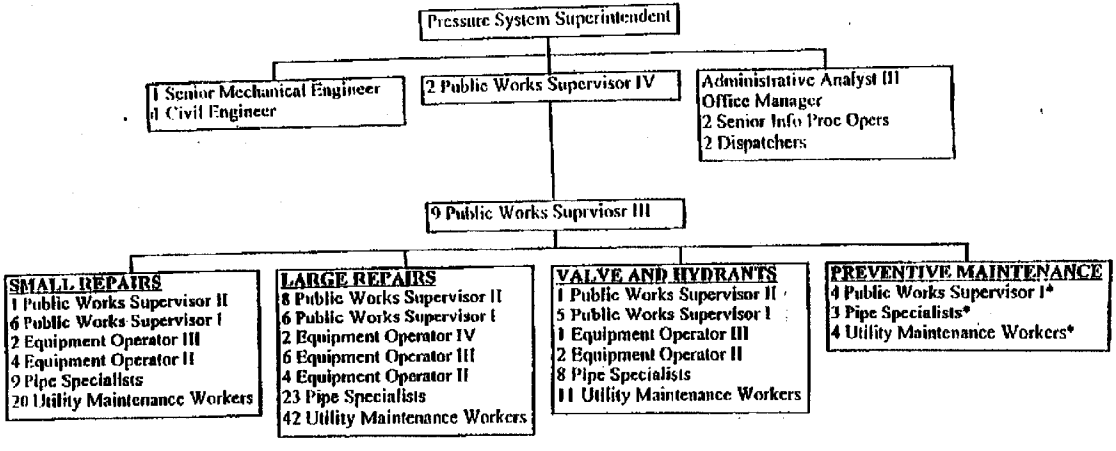

FIGURE 3-8
Revised 11/7/97

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SECTION 4.0

GRAVITY DEPARTMENT

Revised 11/7/97

GRAVITY DEPARTMENT

Three (3) types of scheduled preventive maintenance activities are performed under the direction of Networks Gravity Department, either by contract or by in-house crews. Specifically these activities include:

- Gravity Sewer Cleaning
- Sewer Manhole Inspection
- Sewer Television Inspection

Gravity Sewer Main Cleaning

The Sewerage and Water Board of New Orleans is committed to implementing a Preventive Maintenance Program for its collection system including gravity sewers, pumping stations and force mains. A major component of the "Plan" is the preventive maintenance cleaning of the gravity system. The gravity system consists of over 8 million feet of sewer pipe, the majority of which (over 5.5 million feet) is eight inch or less. In order to provide the most significant improvement in system performance in the initial stages of the program, the S&WB will prioritize the schedule of cleaning.

The S&WB currently has several tools to provide the necessary information for prioritizing the sewer system cleaning. State of the art technology was employed in conjunction with the Sewer System Evaluation and Rehabilitation Program and provided confirmation of the conditions in 22,000 feet of the Clara Street sewer line from Broadway and Plum Street to Sewage Pump Station "A". The purpose was to internally inspect, survey and evaluate the line which ranges in size from 36 inches to 72 inches in diameter. Due to the fact that the Clara Street sewer is very difficult to dewater for normal Closed Circuit Television Inspection (CCTV), sonar inspection and Totally Integrated Sonar and CCTV Inspection Techniques (TISCIT) were utilized.

The Sonar system was used specifically for the survey of submerged and semi submerged segments of the sewer line. A short range/high resolution sonar head provides a cross sectional view of the pipe every second in "real time". A color display is used to denote the type of surface. The TISCIT method was applied when the pipeline was partially submerged, and combines the CCTV and Sonar systems resulting in a 360 degree survey of the pipeline.

The results of this evaluation revealed that approximately 21,000 feet of this line contained no appreciable accumulation (less than 5%) of silt. Since this line has not been cleaned in recent history, these findings lead the S&WB to conclude that this line does not require cleaning on a frequent basis.

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In contrast, the Palmyra Street Sewer was also evaluated utilizing the same technology; however, it yielded quite different results. Of the approximately 11,000 feet of sewer evaluated ranging in diameter from 18" to 33", the majority (about 7,000 feet) contained appreciable quantities of silt/debris, in excess of 20% of the pipe diameter in some places.

This direct and extremely accurate information will provide the basis to dispatch either S&WB crews, direct existing S&WB contractors, or develop site specific contracts for the timely cleaning of significantly impacted areas while conserving resources in areas not requiring attention.

Another tool providing information for the prioritization of the sewer cleaning effort is information obtained during the SSES Basin Evaluations. It is anticipated that approximately 10% of each SSES basin will be CCTV inspected and will require cleaning prior to the inspection. This program is currently ongoing and is additionally providing the basis for the remediation program which, when completed, will, to a considerable degree, minimize the required cleaning efforts in those areas impacted by structural deficiencies.

In addition, the S&WB is correlating information relating to sewer manhole overflows, house connection overflows, chokes, odors, and other complaints, in an effort to identify sewer sections which have a high probability to be most positively infinenced by cleaning. Historical information, as well as recent information currently available within CASSWORKS™ will be utilized in a statistical approach. Where relationships exist relative to age of pipe, materials of construction, types of chokes, soil conditions, etc., they will also be used to prioritize the sewer cleaning program and develop cleaning frequencies.

The S&WB utilizes high velocity jet cleaners and has recently procured and is currently utilizing two new sewer cleaning combination trucks in addition to an existing combination truck specifically for preventive maintenance. High velocity cleaners can either be truck mounted or trailer mounted and are designed as self-contained units for maximum efficiency. Different nozzle configurations are available for use in dealing with specific types of problems encountered in the sewers. All tools and equipment required to route traffic, remove manhole covers, and for safety of the job site are carried on the truck, as are the various nozzles and hoses required for proper operation.

The larger machines that operate at higher pressures and deliver higher volumes of water use more water but are capable of handling tougher blockages or more severe buildups of grease, roots, or sludge in the sewer lines.

An enhancement to the high-velocity machine is the addition of a vacuum unit for removal of debris from the manhole. When sand, silt, and other material is brought

back to the manhole, it can be removed easily with the vacuum unit instead of manually removing it. When a vacuum unit is combined with a high-velocity cleaner on the same vehicle, it is frequently referred to as a combination truck.

The S&WB now has a total of eight combination trucks, as well as two new skid mounted high pressure cleaning rigs (See Figure 4.0 for a complete list of all vehicles on order for the Networks Department). In addition, the S&WB is currently utilizing contractors to clean and televise the sanitary sewer mains within the system. Also, in almost all cases where S&WB crews respond to chokes or manhole overflows, they proceed to clean an entire manhole to manhole section as a part of their response. This is a usual procedure followed by the Board when servicing smaller diameter sewer lines and mains.

In such cases the results of this coincident preventive maintenance will be recorded in CASSWORKS™ and will be used to aid in the prioritization of subsequent sewer cleaning activity.

Furthermore, additional cleaning is now being directed and being accomplished by mechanical cleaning crews as a part of their routine activities. Our mechanical power rodders are equipped with a reel to carry the sectional steel rods and an engine to provide the force to rotate, push, and pull the steel rods. Rodders use either continuous or sectional rods. Sectional rodders use rods of various lengths and diameters which are coupled together. An advantage of sectional rods is that when a rod bends or breaks, it is only necessary to replace the one or two damaged sections. The repair is quick, efficient and far easier than repairing a damaged continuous rod. Power rodders are available in both truck-mounted and trailer-mounted models, and a variety of different engine sizes are available for each type of unit.

Power rodders can clear most obstructions in a sewer main. The rodder is effective in cleaning roots and grease, as well as cleaning or opening stoppages in the main line. The power rodder is not as effective when working with deposits of solids such as sand or gravel because the tools do not have the ability to move the material. The tools are designed to cut or scrape materials from the pipe walls and are most effective on hardened grease and roots.

For a complete list of typical solutions to cleaning and maintenance problems and their effectiveness see Tables 4-1 and 4-2.

At this time, all choke remediation activities also include manhole to manhole mechanical cleaning as a standard procedural activity. These activities typically address those areas of the sewer system that have been and continue to be recurrent problems and therefore are only recognized to contribute fractionally to system preventive maintenance. It is anticipated that many of these recurrent activities will be reduced as system rehabilitation is accomplished under the basin SSES program. These crews

EQUIPMENT ORDERED

REQ	QTY	EQUIPMENT	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	VENDOR
970042	2	VACTORS	BID	BID & APR						BID 10/15					CRESCENT
970100	2	VANS FOR JET MACHINES				BID	BID & APR			BID 10/12					CRESCENT
[illegible]	2	SEWER JET MACH SKID MOUNT				BID	BID & APR								JET MAX
970105	1	CAB & CHASSIS VALVE TRUCK				BID	BID & APR			BID 10/23					CRESCENT
970107	1	VALVE TRUCK COMPLETE				BID	BID & APR			BID 10/31					CRESCENT
970166	1	VALVE MACHINE SKID MOUNT				NO BID		BID & APR	BID & APR						B. HARRISON
970181	1	VALVE MACHINE(REPAIR)						BID & APR		BID 10/14					K. H. WACH'S
970169	2	3/4 TON EXTD CAB UTILITY BODY				BID	BID & APR			BID 10/25					LAMARQUE

	BID, BOARD APPROVAL AND DELIVERY SCHEDULE
	EQUIPMENT PREP TIME OR WAITING ON TRUCK DELIVERY

NOTES:

Revised 11/7/07

FIGURE 4.0
4-4

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will therefore typically be reduced in subsequent years and be replaced with preventive maintenance crews as the positive effects of improvements are recognized.

In order to provide the most immediate improvement to the performance of the Sanitary Sewer System, the S&WB intends to address those areas which can be identified as having the greatest detrimental effect on the system. It is the Board's intention to ultimately address all affected sewer mains. In processing many of these mains and structural defects creating blockages and deposition of silt or debris, the initial cleaning effort is anticipated to take significantly longer than lines having received periodic cleaning. To illustrate this point Table 4.4 shows the anticipated quantity of silt or debris per thousand feet, along with the percent reduction in pipe cross sectional area given a known silt depth. To take a realistic example using the findings of the Clara Street evaluation, assuming a one thousand foot length of 36" pipe with 12" of silt/debris, the cleaning process would produce approximately 2,100 cubic feet of silt/debris. Recognizing this material will be in a slurry form, increasing its total volume, a significant level of effort and time will be required to clean and dispose of silt/debris from such a section.

It is reasonable to expect these initial efforts to result in a comparably low rate of cleaning as the most severe conditions are addressed in the early years of the program. Table 4.3 illustrates the anticipated schedule for cleaning the sanitary sewer system. This table is based, in part, on the current rate of cleaning being accomplished by contractors and S&WB personnel. With the completion of the improvements resulting from the sewer system remediation efforts, it is anticipated that sewer cleaning will outperform these estimates. Associated with this table is Figure 4-1 "Sewer Cleaning Crew Configuration Analysis" and Table 4-4 which provides the basis of the calculations utilized for Table 4-3.

Work Flow Chart – The following page shows a work flow chart for preventive maintenance gravity sewer cleaning. This chart displays the procedures as outlined below.

1. The area to be cleaned will be identified by the Department Superintendent.
2. Map(s) and the appropriate corresponding work orders are generated to the Gravity Flushing Department.
3. The Gravity Flushing Department Supervisor receives the map(s) and work orders, and schedules the preventive maintenance cleaning crews.
4. The cleaning crews perform the cleaning authorized by the work orders received. In most cases the work will be performed by in-house personnel utilizing combination cleaners.
5. The cleaning crew supervisor records a description of the activities performed on site, noting any unusual circumstances involved. This record is entered on the "Action Taken" portion of the work order authorizing the work.
6. At the end of the shift, the completed work orders are delivered to the Gravity

Table 4-1. Cleaning and Maintenance Problems and Solutions

Identification of Problem	Source or Cause	Solution Method	Section	Comments
1. Stoppages - Emergency a. Manhole Overflowing	a. Grease	Hand rods Power rodder	6.22	Rod from downstream manhole with a 4-inch auger into stoppage. When clear, then run 6-inch or larger auger through restricted area. Write work request to high-velocity clean or ball line as soon as possible. Hand rods and power rodders will usually unplug most grease stoppages. If cannot open with hand rods, or they are not available, use a high-velocity cleaner.
b. Flooding of residences or businesses		High-velocity cleaner	6.11	A high-velocity cleaner will open most grease stoppages.
	b. Roots	Hand rods	6.22	Rod from downstream manhole with 4-inch auger or saw. Be cautious in opening stoppages if there is a high head on the upstream manhole. Remove as much of the root mass as possible. Request TV inspection for root concentration; schedule power rodding to open line and chemically treat to control future root growth. Hand rods are effective 90 percent of the time. If cannot clear roots with hand rods, try high-velocity cleaner.
		High-velocity cleaner	6.11	High-velocity cleaner will usually open stoppage and restore service. Schedule TV check and chemical treatment. If unable to clear roots with high-velocity cleaner, try power rodder.
		Power rodder	6.21	Power rod line to clear stoppage. Schedule TV check, cleaning, and chemical treatment.
	c. Debris stoppage such as rocks, lumber, caused by broken lines, open manholes, vandalism.	High-velocity cleaner	6.11	Clean line with high-velocity cleaner.
		Power rodder	6.21	Use caution. May jam tool in line requiring a dig up to clear line and remove broken rod and tool.

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2. Grease	a. Restriction on blocked segment of sewer	a. High-velocity cleaner	6.11	High-velocity cleaner is an effective tool in removing grease buildups in line sizes up to 15 inches. High-velocity cleaner becomes ineffective in larger diameter pipes.
a. Stoppage causes grease buildup	b. Low velocity allowing grease buildup from home disposal unit. Problems often develop where high velocities are suddenly slowed down.	b. Balling (or tire)	6.10	Balling will remove grease deposits from pipe walls, but will not clean as effectively as properly used high-velocity cleaner.
b. TV report on routine inspection		c. Scooter (or kite)	6.13	More effective in lines above 12-inch diameter than high-velocity cleaner.
c. Observe buildup on side walls of sewer		d. Power rodder	6.21	Extensively used, but not as effective in grease removal as high-velocity cleaner and balling; usually ineffective in lines above 10-inch diameter.
d. Past records		e. Chemicals	6.43	Be sure to insist on a performance contract. Do not pay until the chemical or material performs as claimed.
		f. Bacteria cultures	6.43	Specific cultures are required for collection system maintenance.
e. Grease trap		a. Clean trap regularly	6.43	A regular maintenance program must be established and continued.
		b. Bacteria cultures	6.43	specific cultures are required for collection system maintenance.
3. Roots	a. Trees and shrubs	a. Chemicals	6.4	For long-term control, chemical treatment provides the best solution with up to three years between applications.
b. Poor joints or damaged pipe allow root entry		b. Power rodder	6.21	May be used to clean an opening so that flow may pass. Cutting roots is like pruning shrubs, it stimulates root growth. If power rodding is only control used, must frequently rode that segment of line.
		c. High-velocity cleaner	6.11	Special root cutters are available.

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3. Roots (Continued)				
c. Past records	d. Repairs			If TV report shows only one section of broken line or a few bad joints, dig up and repair. If a great number of defects are observed, consider pressure sealing or relining the pipe by insertion of a liner.
4. Sand, Grit, Debris	Eggshells, coffee grounds, bones from residential disposal units	a. High-velocity cleaner	6.11	For light concentrations of grit in small lines; not effective cleaner in lines above 15-inch diameter.
a. TV report				
b. Grit settles during low flows	Broken china, bones, and glass from restaurant disposal units	b. balling (or tire)	6.10	The workhorse for cleaning. Large volumes can be removed at a reasonable cost. Requires careful control in shallow lines.
c. Grit sticks to grease or slimes		c. Scooters and kites	6.13	More effective in larger lines. Removes some dangers of flooding in shallow lines that balling may create if not properly controlled.
d. Routine inspection	e. Sand, silt from poor joints and broken lines	d. Bucket machines	6.20	Used where extreme concentrations of grit and sand have loaded the line to extent that above methods are ineffective due to cost and handling of material to be removed.
e. Past records	d. Lines with low flows or velocities permitting solids deposition solids			
5. H_2O and Odor Control	a. Force mains	a. High-velocity cleaner	6.11	Fast cleaning of slimes in lines up to 15-inch diameter.
a. Odor complaints	b. Low flows and velocity	b. Balling	6.10	Best for sewers with bellies and offset joints, but expensive operation for odor control only.
b. Manhole inspection reveals line deterioration	c. Offset joints	c. scooter	6.13	Fast for larger lines.
	d. Bellies in line	d. Flushing	6.12	Small lines. Usually not effective for more than one week.

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5. H_2O and Odor Control (Continued)	e. Drop manholes	e. Plug lifting and vent holes in manhole covers		Roofing cement makes a satisfactory hole sealer.
	f. Manhole where trucks dump septic tank contents	f. Control program	6.5	Develop program using combination of solutions.
6. System Inspection	Detects problem areas and permits realistic scheduling of preventive maintenance program	a. Closed-circuit TV	5.3	Permits thorough inspection of system. Pinpoints damaged areas such as broken pipe segments, offset joints, lines not to grade, collapsed pipes, protruding service taps, root intrusion, deterioration of lines, and grease deposits. Informs you of required cleaning and the effectiveness of the cleaning method. If a stoppage reoccurs or you are curious regarding cause of problem, TV the line. The most useful tool in collection system maintenance.
		b. Air and water testing	3.3	Detection of sources of infiltration and exfiltration.
		c. Smoke testing	5.4	Identification of illegal connections and location of overflowing or leaking manholes and sewers.
		d. Dye testing	5.5	Locates leaks when groundwater table is below sewer. Also used to determine if buildings and residences are properly connected to collection system and to identify illegal connections.
		e. Pipeline tamping	5.6	Inspection of sewers for condition, including alignment and obstructions.
		f. Visual	5.2	Lift manhole covers and observe conditions.

Table 4-2. Effectiveness of Solutions

Solution to Problem	Type of Problem				
	Emergency Stoppage	Grease	Roots	Sand, Grit, Debris	Odors
Balling[a]		4		4	3
High-Velocity Cleaning	1	5		4	3
Flushing					2
Sewer Scooters		3		3	
Bucket Machines, Scrapers				2	
Power Rodders	4	1	3		
Hand Rods	5[c]	1	2		
Chemicals[b]		2	5		1
Bacteria[d]		4			

EFFECTIVENESS SCALE: 1=LOW, 5=HIGH

[a] Kites, tires, bags, parachutes, scooters, and cones are commonly used instead of balls in large sewers (greater than 24 inches in diameter) with similar results

[b] Effectiveness depends on type of chemical and its intended use

[c] Power rodders and high-velocity cleaners may be faster (if available) under certain conditions

[d] Effectiveness depends on formulation of cultures

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Sewerage and Water Board of New Orleans

Preventive Maintenance Plan

Schedule for Cleaning Sanitary Sewer Mains

Linear Feet X 1000

Program YEAR	S&WB PM Crews	S&WB On-Call Crews	S&WB Rodding Crew	S&WB Contractors	BSES Contractors	Annual Total	Annual %	Cumulative Total	Cumulative %
1998	247.5	148.5	104.5	170	80	750.5	9.4%	750.5	9.4%
1999	247.5	148.5	104.5	170	80	750.5	9.4%	1501	18.7%
2000	247.5	148.5	104.5	170	80	750.5	9.4%	2251.5	28.1%
2001	247.5	148.5	104.5	170	80	750.5	9.4%	3002	37.5%
2002	330	148.5	104.5	170	80	833	10.4%	3835	47.8%
2003	330	148.5	104.5	170	80	833	10.4%	4668	58.2%
2004	330	148.5	104.5	170	80	833	10.4%	5501	68.6%
2005	330	148.5	104.5	170	80	833	10.4%	6334	79.0%
2006	412.5	123.8	104.5	170	80	890.8	11.1%	7224.8	90.1%
2007	412.5	123.8	104.5	170	0	810.8	10.1%	8035.6	100.3%

Calculations (Based on 8,015,000 linear feet of sewer mains)

S&WB PM Crew:

Three crews @ 375 lf/day/crew @ 220 shifts/yr =231,000 lf/yr

Additional crew in 2001 & 2005

S&WB Regular Maintenance Crew Crew:

Six crews @ 375 lf per day/crew @ 30%utilization @ 220 shifts/yr = 92,400 lf/yr

Reduced crew in 2001 &2005

S&WB Rodding Crew:

Five crews @ 475 lf per day/crew @20% utilization @ 220 shifts/yr = 49,500 lf/yr

S&WB Contractors:

Contracted 170,000 lf/yr

BSES Contractors:

Contracted 80,000 lf/yr

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TABLE 4-11

Revised 12/17/97

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Sewerage and Water Board of New Orleans
Preventive Maintenance Plan

APPROXIMATE CUBIC FEET OF SILT IN VARIOUS PIPE SIZES
For 1000 Linear Feet of Pipe

	Pipe Size in Inches													
Silt Depth	8		12		18		24		36		48		72	
	cubic feet	% silted	cubic feet	% silted	cubic feet	% silted	cubic feet	% silted	cubic feet	% silted	cubic feet	% silted	cubic feet	% silted
1"	17	6%	20	3%	21	1%	22	1%	21	0.3%	25	0.2%	28	0.1%
3"	122	35%	148	19%	164	9%	173	6%	177	3%	188	2%	198	0.7%
6"			393	50%	523	30%	590	19%	657	9%	691	6%	707	3%
12"							1,570	50%	2,091	30%	2,361	19%	2,628	9%
18"									3,533	50%	4,421	35%	5,313	19%
24"											6,280	50%	8,365	30%
36"													14,130	50%

TABLE 4.4

SEWER CLEANING CREW CONFIGURATION ANALYSIS

1 - Jet Cleaning Truck, 2 man crew to clean sewer lines or
1 - Vac Truck, 2 man crew for debris removal on troubled lines
Total Crew
Hours used per crew per week .....80 hours
- Administrative time ..... (4 hours)
- Transit Time (30 min range x 10 times per 5 day week x 2 crews) ..... 10 hours
- Available crew hours to clean sewers 80 hours gross=>..... 66 hours
- Setup Time (cleaning) ..... 30 min/275 ft. cleaned

From World Environmental Federation (WEF) materials it has been suggested that the theoretical upper limit of 2980, linear feet of sewer cleaning per 8 hour crew day is possible. If so, then 10.8 crew setups per day would take place on that length of sewer. Given this, there would be (10.8 x 30 min=>) 5.4 hours per day taken away from the available time to do work, leaving approximately 60 hours per week per crew to do cleaning work. Equipment availability is 65%. Thus, only (0.65 x 60 hours) 39 hours are available.

From SSES Surveys debris accumulations vary, but are heavy in many of the sewers not designed or constructed to be self scouring. It is estimated that this will reduce the productive time by 75% as time is taken to remove and dispose of sewer debris. Thus, only (39 hours x 0.25) 19.5 hours are available to do work. It is felt that only 350 linear feet of line can be cleaned on the worst sections of sewer per crew day. Figure 4.4 is used to support these findings.

FIGURE 4-1

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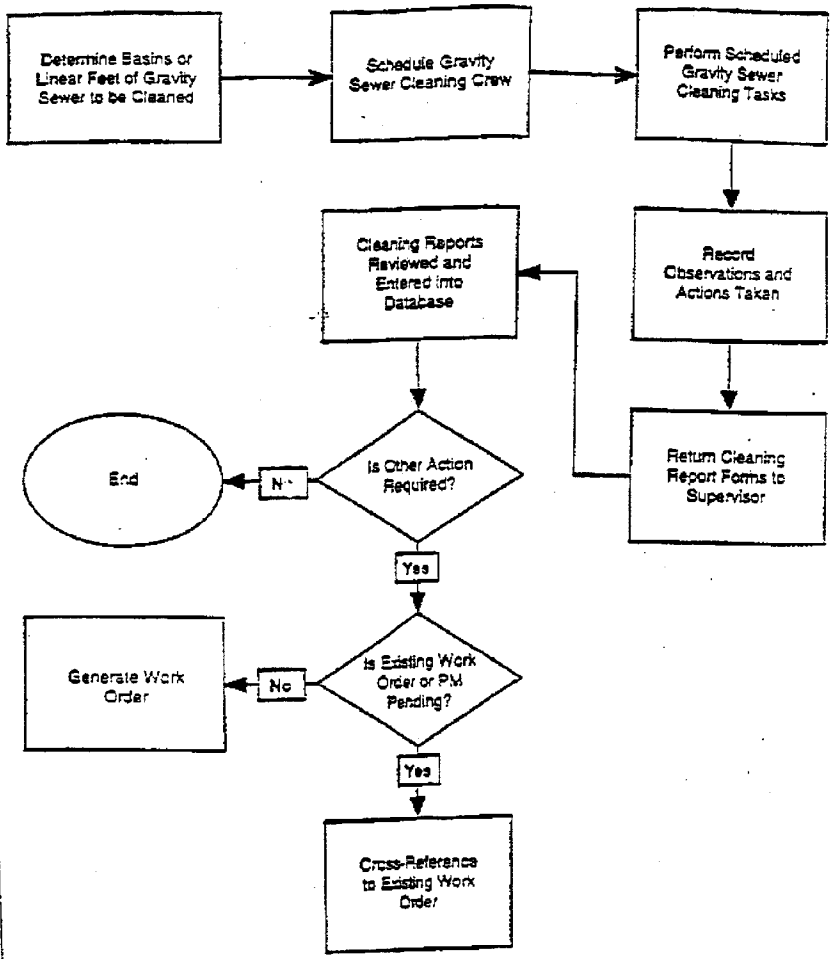

WORK FLOW CHART FOR ROUTINE GRAVITY SEWER CLEANING

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Flushing Department Supervisor for review. The work order is reviewed for content, completeness of information, as well as any abnormalities or problems encountered by the cleaning crew.

7. If no other action is required after a review of the report, the work is complete and the work order is closed out after being recorded in the CASSWORKS™ system. Similar work performed by contractors will be entered into the CASSWORKS™ system.
8. If other action is required, (for example, repairs or TV inspection), the designated supervisor checks if there is an outstanding work order for the problem. If not, a work order is issued and the appropriate crew is scheduled.

The Sewerage and Water Board of New Orleans has designed the sanitary sewer system so that the gravity sewer mains will be self-scouring. The assumption is that there will be some areas of the City that will not require (remedial) intensive cleaning on a frequent basis. Once these mains have been cleaned, they will be able to function as a self-scouring system as designed. There will be some areas that will require cleaning on a more frequent basis. These areas will be considered problem areas and will require more intensive preventive maintenance cleaning. The areas that do not require frequent cleaning maintenance will be identified by a lack of complaints or overflows in conjunction with the results of the manhole inspection program. Therefore sewer cleaning rates will initially suffer low production rates as more critical areas are addressed first.

As cleaning progresses and the worst sewers are cleaned, the rate of cleaning is expected to increase. It has been assumed that an additional truck, now assigned to corrective maintenance, will be freed up in later years to work on preventive maintenance, as a result of the preventive cleaning work performed. Other corrective maintenance trucks have been assumed to be freed up in future years.

The cleaning units carry a supply of water, generally one thousand (1000) to two thousand (2000) gallons. The pump has a capacity of fifty (50) to one hundred (100) gallons per minute (g.p.m.) delivering water at a pressure of one hundred (100) to two thousand (2000) pounds per square inch (psi). The cleaner is supplied with five hundred (500') to six hundred (600') feet of high-pressure hose.

The nozzle provides the cleaning action. The nozzle has a backward spray that propels the hose up the sewer to be cleaned. When the operator retrieves the hose, the water jets scour the sewer and move the debris to the downstream manhole.

The vacuum function is used for removal of materials from manholes when other cleaning equipment is used to dislodge and transport the materials to the access point. Some vacuum machines can remove heavy materials such as bricks. Most machines can separate solid materials from cleaning water and transport the debris to the wastewater treatment facility.

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Selection of Cleaning Equipment and Accessories. Cleaning equipment differs in capacity to handle debris in the sewer lines, depending on applicable pipe size ranges, manhole accessibility requirements and methods of operation. To select the proper type of cleaning equipment and accessories for the preparatory cleaning of a sewer system, many factors have to be considered, including:

- Access to manholes
- Condition of manholes
- Size of pipe
- Depth of deposition
- Type of solids to be removed
- Degree of root intrusion
- Amount of flow
- Structural integrity of pipe
- Availability of hydrant water
- Degree of cleanliness required

Sewer Cleaning Procedure

1. Identify the sewer line segments for preventive maintenance sewer cleaning.
2. Prepare a work order with the necessary information for activity (location, line segment identification, manhole numbers, etc.).
3. The Supervisor assigns a cleaning crew to complete the work order.
4. Check inventories to ensure that proper supplies and equipment are available.
5. Prior to departure, perform daily maintenance on the cleaning equipment and/or vehicles, in accordance with the Operators Manual.
6. Obtain work order forms for the day's activities from the field supervisor.
7. Upon arrival at the work site, park all vehicles in the most unobstructive manner to traffic while filling the tank with water.
8. Remove the cap on the fire hydrant and flush the fire hydrant until water is clear and no scaly or rusty water appears.
9. Fill the water tank in accordance with the level gauge on the tank.
10. Locate the manholes to be opened on the line segment to be cleaned.
11. Follow all precautions regarding traffic safety and manhole entry (Refer to Sewerage and Water Board of New Orleans' Safety Manual).
12. Set up the cleaning equipment and/or vehicle at the operating manhole in accordance with the Operators Manual. All sanitary sewer line segments should be cleaned from upstream manhole to downstream manhole whenever possible.
13. Select the proper type of nozzle or cleaning tool for the debris to be removed and pipe size to be cleaned.
14. If necessary, use a rake or screen to remove debris from the operating manhole. The sewers cleaned should be free of grease, sludge, debris roots and other obstructions to provide an unobstructed passage.
15. Never operate the equipment in excess of its rated capacity (speed, pressure, etc.). Exceeding or abusing the equipment's intended use can only result in

failure of equipment, damage to pipes, and subsequent work delay.

16. If the nozzle is to be inserted in a pipe through the surcharged manhole, use extreme caution when applying pressure to the hose. The nozzle could hit an obstruction and deflect upward through the water and out of the manhole. This could cause injury to the persons close to the manhole before pressure on the hose could be relieved by the operator.
17. Perform the cleaning operation in a step-wise manner if the sections are heavily loaded with debris. This may be done by first cleaning 25-100 feet; then 100-200 feet, etc. When the return of the cleaning tool fails to bring additional debris to the manhole, the line is clean.
18. Always use a hydraulic water pressure root-cutter in sections suspected of having heavy root and grease problems.
19. Attempt to clean the line in reverse when obstructions prevent the passage of the cleaning tool or root-cutter through the entire line. During reverse cleaning it is necessary to reduce the pressure and speed. Extreme care should be taken to avoid equipment failure and pipe damage.
20. If the line cannot be cleaned with the hydraulic cleaning equipment, contact the field supervisor to determine what should be done.

Cleaning Precautions. The crew should be aware of several precautions to be taken during cleaning operations.

Occasionally a blockage in the line during high velocity jet cleaning causes a pressure build up that is released through a service lateral into a consumer's home. If this does occur, the crew should alert the supervisor immediately and call the Claims Department. The consumer needs to be assured that any problem or damage will be addressed by the Claims Department of the Sewerage and Water Board of New Orleans.

Eroded, corroded, or otherwise structurally deteriorated piping may collapse during cleaning operations. Visible inspection must be used to ascertain the advisability of cleaning. Sometimes a television inspection should be made prior to cleaning in such situations.

Clean soil and pieces of broken tile observed in a manhole trough are strong indications of broken, crushed, or collapsed pipe in the upstream section.

Variables Which Affect the Difficulty of Sewer Cleaning. The crews are familiar with the many variables which impact the performance, production and cost on any particular sewer cleaning job. Some variables apply to each line segment to be cleaned.

- Locating, exposing, and removing manhole covers.

- Access to manholes, terrain, traffic control requirements.
- Condition of the manholes -- steps, cleanliness, structure.
- Depth of the sewer -- difficulty of entry and debris removal.
- Structural integrity of the pipe.
- Off-set joints, intruding service connections, curved pipes.
- Availability of hydrant water upstream of the site.
- Depth and density of deposition in the pipe.
- Type of solid materials to be removed are sludge, mud, sand, gravel, rocks, grease, bricks, and roots. Roots are difficult to remove completely and may be a significant factor.
- Productivity differences in cleaning successive vs. random manhole sections.
- Requirements for transportation and disposal of solid materials and distance to the disposal site.
- Weather conditions -- rain can affect the production rate.

Grease Chokages. The Sewerage and Water Board of New Orleans recognizes that the reduction of grease in the sanitary sewer system will have a positive impact on the ability of the sewer mains to function as a self scouring system, and will eliminate some chokes from occurring in the system. Towards that end, the Sewerage and Water Board of New Orleans has established rules and enforcement procedures for dealing with chokes, such as grease or other obstructive material.

Enforcement Authority. The prevention of grease from introduction into the sewerage system will be enforced by the Board's Environmental Affairs Division in accordance with the Plumbing Code of the Board, specifically Section 16, entitled "Rules Governing Discharges Into the Sanitary/Sewerage System," as well as the "Enforcement Response Plan" of the Sewerage and Water Board of New Orleans. Both of these documents have been previously approved by the Environmental Protection Agency (EPA), and the authority set out in Louisiana R.S. 33:4081, et seq.

Investigation. Upon notification of a grease chokage problem, the Environmental Affairs Division personnel will investigate to determine the source of grease or other obstructive material. This investigation will include:

- a review of the local collection system design;
- determination of patterns of flow in the area of the chokage;
- determination of the location and/or source of the obstructive materials including the possible sources of grease, such as, garbage grinders, pot sinks, floor drains, garbage can wash areas, etc.;
- the location of grease traps, if they exist as required by the Plumbing Code, and inspection to determine whether they are in working order, as required by the Plumbing Code;
- completion of an "Interceptor Inspection" form indicating the nature of the chokage, the causes, and the deficiencies;

- identification of the remedies available and action taken to remove the obstruction;
- sampling and retention of samples of the discharge from the site, if necessary, to determine compliance with the Plumbing Code discharge limits for oil and grease, and in order to confirm the source of the grease for purposes of evidence should court or disciplinary action be required to prove responsibility;
- a review of all receipts of grease trap cleaning to confirm that the trap is being serviced frequently enough to prevent grease from passing into the main sewer, whenever grease is the cause of a sewer chokage.

Statistical Data. All information obtained in the above investigations shall be reviewed for the purposes of establishing the location and nature of chronic chokages due to violations of existing plumbing code requirements.

Enforcement. If an establishment has been found responsible for two (2) or more incidents of grease chokages in a twelve (12) month period, that establishment will be notified in writing of the seriousness of the violation. The written notice will require all deficiencies to be corrected within thirty (30) days, and enforcement shall advise that failure to comply with the directive will result in an escalating response as described in the Enforcement Response Plan. In addition, the establishment may also be charged for any and all work performed under Sewerage and Water Board of New Orleans' direction in order to remedy the problem.

Staffing. The Environmental Affairs Division has developed and implemented a Grease Action Squad (GAS). This Squad consists of two (2) Environmental Enforcement Technical I's, supervised by an Environmental Enforcement Technician II, all of whom will be qualified and trained in the procedures for investigating the above and the authorities set out in Chapter 16 and R.S. 33:4081 and as certified in their positions. They will report to the Environmental Supervisor responsible for the Sewerage and Water Pretreatment Program. GAS has available to it as necessary rod trucks for clearing chokages, and flushing crews who clean lines and remove obstructions. In the event the chokages persist, the Sewerage and Water Board of New Orleans shall rely on its own repair crews to excavate down to the line for the purpose of relieving obstructions. As many as one hundred fifty (150) Sewerage and Water Board of New Orleans' personnel will be available to support GAS.

Root Removal. Roots are removed in the designated line segments where root intrusion is a problem. Special attention is given during the cleaning operation to maximize the removal of roots. It may become necessary to use procedures that include the use of mechanical equipment such as rodding machines, root cutters, root saws, and jet machines equipped with hydraulically driven cutters. Note that in most cases roots are not a problem in New Orleans because the water table is so high as to make roots in sewers not a significant problem.

Disposal of Materials. Solids or semi-solids resulting from the cleaning operations are removed from the site and disposed of at a site designated by the Sewerage and Water Board of New Orleans. All materials are removed from the site at the end of each workday.

MANHOLE INSPECTION The Sewerage and Water Board of New Orleans will perform a surface inspection on all sanitary sewer manholes at a minimum of once (1) every 3.3 years to determine if there is any defect with the sanitary system requiring any maintenance activity by Sewerage and Water Board of New Orleans' forces. This inspection will not replace any current maintenance activity.

Reporting and Data Entry. Crews performing the manhole inspection will be required to fill out a checklist for each manhole inspection. This information will then be turned over to the Data Entry Department for inclusion in the CASSWORKS™ database. A copy of manhole inspection checklist and the CASSWORKS™ Manhole Inspection Screens are attached at Pages 4-21 through 4-29 as an example. The inspection will entail examinations of:

- Manhole Location
- Cover
- Ring and Frame
- Cone
- Riser
- Shelf
- Channel Level of Flow
- Type and Amount of Debris in the Manhole

This information will be recorded in the CASSWORKS™ database system.

As a result of the inspection, any required maintenance will be performed on a priority basis. An analysis of the results of the inspection will be performed and that information will be utilized to prioritize preventive maintenance activities.

The Sewerage and Water Board of New Orleans will dedicate one existing rod truck and crew to the Preventive Maintenance Program. This crew will be responsible for performing the manhole inspections and for providing support for the preventive maintenance cleaning crews as required. In addition, as corrective maintenance equipment and crews are available, they will assist the existing preventive maintenance staff in performing manhole inspections.

SEWER TELEVISION INSPECTION

Television inspection of sewer lines is currently performed extensively by contract to the Sewerage and Water Board of New Orleans. References within this document to selection of a TV crew may instead involve authorization to the contractor.

WORK ORDER NUMBER _____

MAP NUMBER _____ MANHOLE NUMBER _____

DATE OF INSPECTION _____ INSPECTED BY _____

PRECIPITATION .....
01=NONE 02=LIGHT RAIN 03=HEAVY RAIN
GROUND CONDITIONS .....
01=DRY 02=WET 03=DAMP 04=STANDING WATER

MANHOLE INITIAL INSPECTION

LOCATION .....
01=ROADWAY 02=GUTTER 03=SIDEWALK\DRIVEWAY 04=ALLEY
05=PAVED EASEMENT 06=GRASS EASEMENT 07=DITCH
MANHOLE COVER TYPE .....
01=BOLTED 02=PICK 03=CONCEALED 04=STORM/VENT
MANHOLE COVER TO RIM FIT .....
01=POOR 02=FAIR 03=SEALED
DISTANCE ABOVE/BELOW GRADE .....
EVIDENCE OF INFILTRATION Y/N .....

STRUCTURAL INSPECTION

FRAME CONDITION .....
01=SOUND 02=BROKEN
FRAME ADJUSTMENT .....
01=PRE CAST 02=BRICK 03=BLOCK 04=OTHER 05=NONE
FRAME TO CHIMNEY SEAL .....
01=SOUND 02=OFFSET 03=CRACKED 04=NONE 05=DETERIORATED
EVIDENCE OF INFLOW .....

CHIMNEY CONSTRUCTION TYPE.....
01=BRICK 02=PRE CAST 03=BLOCK 04=FLAT TOP 05=NONE
CHIMNEY CONSTRUCTION.....
01=SOUND 02=CRACKED 03=DETERIORATED 04=ROOTS
05=LEAKING JOINTS
EVIDENCE OF INFLOW .....

WALL CONSTRUCTION .....
01=BRICK 02=PRECAST 03=POURED
WALL CONDITION .....
01=SOUND 02=CRACKED 03=DETERIORATED
EVIDENCE OF INFILTRATION .....

TROUGH CONSTRUCTION .....
01=BRICK 02=PRE CAST 03=POURED 04=NONE
TROUGH CONDITION .....
01=SOUND 02=CRACKED 03=RAISED 04=DEPRESSED 05=UNFINISHED
BENCH DEPOSITS .....
01=NONE 02=MUD 03=DEBRIS 04=GREASE 05=SLUDGE
EVIDENCE OF INFILTRATION .....

PIPE SEAL CONDITION .....
01=SOUND 02=CRACKED 03=NONE
EVIDENCE OF INFILTRATION .....

STEPS CONDITION .....
01=SAFE 02=UNSAFE 03=LOOSE 04=NO STEPS
SURCHARGED AT TIME OF INSPECTION .....
EVIDENCE OF SURCHARGING .....
COMMENTS

_____

_____

_____

PM0049.TIF

RJN Computer Services, Inc. <Record 1 of 15

MANHOLE INSPECTION Page: 1 of 4

Manhole Number.....
Inspection Date.....

Inspected By.....
Precipitation.....
Ground Condition.....

Manhole Location.....
Subject to Ponding.....
Ponding Area Drained..... (sq. ft.)

Cover Type.....
Cover to Rim Fit.....
Diameter of Clear Opening..... (in.)
Number of Holes in Cover.....
Pick Hole Diameter..... (in.)
Distance Above/Below Grade.....
Evidence of Inflow.....
Rate of Inflow..... (gpm.)

<Alt-F6 Manhole Inventory> <SF1 HELP><F10 EXIT>

PM0050.TIF

RJN Computer Services, Inc. <Record 1 of 1>

MANHOLE INSPECTION Page: 2 of 4

Manhole Number.....

Inspection Date.....

Frame Condition.....

Frame Adjustment.....

Frame to Corbel Seal.....

Offset By..... (in.)

Evidence of Inflow.....

Rate of Inflow..... (gpm.)

Corbel Construction.....

Corbel Condition.....

Evidence of Inflow.....

Rate of Inflow..... (gpm.)

Wall Construction.....

Wall Condition.....

Evidence of Infiltration.....

Rate of Infiltration..... (gpm.)

<Alt-F6 Manhole Inventory> <SF1 HELP><F10 EXIT>

<List of Values>

PM0051.TIF

```
RJN Computer Services, Inc.                    <Record    1 of    1>
                    MANHOLE INSPECTION                  Page: 3 of 4

Manhole Number.......................
Inspection Date......................

Trough Construction..................
Trough Condition.....................

Bench Deposition.....................
Depth of Deposits....................  (in.)
Evidence of Infiltration.............
Rate of Infiltration.................  (gpm.)

Pipe Seals Condition.................
Evidence of Infiltration.............
Rate of Infiltration.................  (gpm.)

Steps Condition......................
Steps Missing........................

<Alt-F6 Manhole Inventory>                    <SF1 HELP><F10 EXIT>
                    <List of Values>
```

RJNe Computer Services, Inc. <Record 1 of 1>

MANHOLE INSPECTION Page: 4 of 4

Manhole Number.....

Inspection Date.....

Manhole Inside Diameter.....

Surcharged At Time Of Inspection....

Depth From Rim To Water Level..... (ft.)

Evidence Of Surcharging.....

Deposits On.....

Height Above Invert..... (ft.)

Indication of Groundwater Level....

Height Above Invert..... (ft.)

Comments.....

<ALT-F6 Manhole Inventory> <SF1 HELP><F10 EXIT>

Routine TV inspection of sewer lines by the Networks Gravity Department within the Sewerage and Water Board of New Orleans' collection system may be performed for, but are not limited to, the following purposes:

- Inspect new pipe construction prior to acceptance.
- Assure sound pipes prior to paving.
- Find problems in troubled areas.
- Pinpoint the cause, source and magnitude of infiltration.
- Ascertain the applicability of various rehabilitation methods.

TV inspection provides detailed information of manhole to manhole sections of pipe not available using other inspection methods. The technique is well suited for determining joint condition, root intrusion, sources of infiltration, and locating structural deficiencies. Inspection documentation is made on log forms which are input into a computerized tracking system and may be supplemented with videotape or photographs of the TV picture.

Since TV inspection is live, precarious conditions in the pipe should be approached with due caution. Control of the inspection is achieved by the ability to stop and position the camera as desired. Problems can be discussed, analyzed, photographed and the footage noted during the course of the inspection. TV inspection enables the identification of infiltration/inflow sources and is the only practical method to monitor flow from building sewers.

Equipment and TV Picture Quality. The TV camera must be specifically designed for sewer inspection - small, rugged, and waterproof. The camera must have its own light source suitable to provide a clear picture of the entire periphery of the pipe.

The camera, television monitor, and other components of the video system must be capable of producing a picture quality which is adequate for the purpose of the inspection.

Television Inspection Procedures

1. Schedule routine sewer inspection for several gravity sewer line segments using closed circuit TV camera equipment.
2. Prepare a work order with necessary information for this activity.
3. The Supervisor assigns a TV Crew or contractor to complete the work order.
4. Check inventories of supplies and equipment to ensure availability as required.
5. Upon arrival at the work site, observe all traffic control and safety precautions as outlined in the Sewerage and Water Board of New Orleans' Safety Manual as well as adherence to all City of New Orleans ordinances. Notify Fire and Police Departments if the street will be blocked or traffic lane is to be closed. Also, notify the communication center of the work being done.
6. Clean the line segment to be inspected using the high velocity jet machine as

discussed in the cleaning procedures.

7. Thread the camera pull line through the line segment to be inspected using the high velocity jet machine.
8. Set up the winch at the downstream manhole and the TV truck at the upstream manhole.
9. Stop any flow coming into the stream manhole using inflatable plugs.
10. After all the TV gear is set up and ready to use, lower the camera into the manhole and connect the winch pull line. The winch is operated remotely from the TV truck.

Two methods of documentation which are often used in combination:

1. **Television Inspection Logs:** Written records that show the location in relation to an identified manhole of each infiltration point observed during inspection. In addition, other points of significance such as locations of building sewers, unusual conditions, roots, storm drain connections, broken pipe, presence of scale and corrosion, and other discernible features are recorded and a copy of the records is supplied to data input personnel for computerized maintenance tracking.

   The Sewerage and Water Board of New Orleans uses a series of code numbers to identify conditions inside the pipes see Table 4-5.

2. **Videotape Recordings:** The purpose of tape recording is to obtain a visual and audio record of the pipe conditions that may be replayed at a later time.

TV inspection logs should contain the following information at a minimum:

Operator ID No.
Date
From MH No. Located at _____
To MH No._____ Located at _____
Direction of Flow
Type of Pipe
Type of Joints, if apparent
Joint Spacing
Cleanliness
Manhole Conditions
Section Length
Pipe Size
Depth of pipe
Direction of Inspection (camera movement)

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TABLE 4-5 TV INSPECTION DEFECT CODE GUIDELINES	
CODE	DESCRIPTION
01	UPSTREAM MANHOLE
02	DOWN STREAM MANHOLE
03	BEGIN OBSERVATION
04	END OBSERVATION
05	CROWN
06	INVERT
07	TO RIGHT
08	TO LEFT
09	CAMERA SUBMERGED
10	CAMERA BLOCKED
11	REVERSE SET-UP
12	BURIED MANHOLE
13	LIGHT ROOTS IN JOINT
14	MEDIUM ROOTS IN JOINT
15	HEAVY ROOTS IN JOINT
16	LIGHT OFFSET JOINT
17	MEDIUM OFFSET JOINT
18	HEAVY OFFSET JOINT
19	INFILTRATION
20	LIGHT CRACKED JOINT
21	MEDIUM CRACKED JOINT
22	HEAVY CRACKED JOINT

TABLE 4-5 TV INSPECTION DEFECT CODE GUIDELINES	
CODE	DESCRIPTION
23	GASKET EXPOSED
24	TYPICAL JOINT PICTURE
25	CIRCULAR CRACK
26	LONGITUDINAL CRACK
27	OPEN CRACK
28	MULTIPLE CRACKS
29	BROKEN PIPE
30	COLLAPSED PIPE
31	HOLE IN PIPE
32	LONGITUDINAL CRACK ENDS
33	CRACKED PIPE ENDS
34	SAG BEGINS
35	SAG ENDS
36	GREASE BEGINS
37	GREASE ENDS
38	CHANGES TO TRUSS
39	CHANGES TO CLAY PIPE
40	CHANGES TO CONCRETE
41	CAN'T PASS, CONCRETE
42	26-50% FLOW
43	51-75% FLOW
44	76-100% FLOW
45	SERVICE CONNECTION
46	SERVICE CONNECTION WITH BREAK-IN

TABLE 4-5 TV INSPECTION DEFECT CODE GUIDELINES	
CODE	DESCRIPTION
47	SERVICE CONNECTION WITH DEFECT
48	ABANDONED CONNECTION
49	DOMESTIC FLOW
50	INTRUDING > 1 INCH
51	ROOTS
52	LATERAL INFILTRATION
53	CONNECTION INFILTRATION
54	CATCH BASIN LEAD
55	CAPPED OFF
56	BROKEN AT THE MAIN
57	ERROR CODE

Variables which Affect TV Inspection. The inspection crew is familiar with the many variables which impact the performance, production, and cost on any particular sewer TV inspection job. Some variables apply to each main line section to be inspected.

- Locating, exposing and removing manhole covers.
- Access to manholes, terrain, traffic control requirements.
- Condition of the manholes...steps, cleanliness, structure.
- Depth of the sewer...difficulty and safety of entry.
- Availability of water for threading the sewer line.
- Plugging requirements...ability to plug, necessity to bypass.
- Presence of explosive gas or combustible liquid.
- Offset joints, intruding joint materials, intruding service connections, curved pipe, crushed pipe, and other obstructions which could prevent the passage of the camera.
- Cleanliness of the pipe and the presence of root curtains or grease, which could foul the camera lens.
- Sags in pipes causing the camera to become submerged.
- Size of the pipe: 6-inch to 8-inch pipe is tight and may involve equipment clearance problems due to offset joints, crushed pipe, protruding house services, etc.; 10-inch to 21-inch pipe is easiest to inspect; 24-inch to 36-inch pipe may require special lights and skids.
- Production is sensitive to the number of setups required; it is possible to televise one thousand feet (1,000') in one (1) direction from a single location when inspecting successive manhole sections. Random inspection of single manhole sections is more time consuming.
- Requirements for documentation by means of data logging and videotape recording.
- Weather...Rain lowers production rate.

Television Inspection Database. All data collected during TV inspections is entered into the CASSWORKS™ Physical Inspection Module Television Inspection Menu. This information will be used to log out or close the work order and schedule future TV inspections of the line segments. The data will also be used to generate work orders for repairs to line segments that have defects identified during TV inspections.

I/I - Reduction and Rehabilitation Program. The Sewerage and Water Board of New Orleans has established a program to conduct sewer system evaluations and to rehabilitate the system by eliminating sources of groundwater, storm water, or any other water not requiring treatment. Many of the program activities will be perpetually required to maintain the Department's sewer system integrity and to keep I/I amounts within an acceptable level.

To understand how the I/I reduction program works, it is important to understand the conditions needing to be corrected. The first is infiltration. Because the water table is close to the surface virtually all of the sanitary gravity sewer pipelines are installed

below the water table. As pipes deteriorate and cracks form, the groundwater drains into the sanitary sewer system. This is known as infiltration.

Exfiltration is the reverse of this situation. It occurs when the same deteriorated, sanitary sewer pipelines seep sewage into the ground, or deteriorated adjacent storm drains during sewer system surcharging. This surcharging can be due to a line chokage, or a sewage pumping station malfunction.

Inflow occurs when rainwater is introduced into the sanitary sewers through manhole covers, house lateral clean outs, house down spouts, and connections between storm drains and sanitary sewers.

The program is made up of the following elements:

- Flow Monitoring
- Manhole Inspection
- Sewer Cleaning
- Smoke Testing
- Dye Water Flooding
- TV Inspection
- Manhole Repair
- System Rehabilitation
- System Performance / Cost Effectiveness Evaluation, and other data collection as required

Basin Prioritization. Basins are prioritized for the purpose of scheduling detailed evaluations which include inspections, testing and possible rehabilitation. Flow monitoring will establish an estimated volume of flow entering the system from within a particular basin.

Detailed Basin Evaluation. The purpose of a detailed basin evaluation is to identify and quantify inflow and infiltration sources.

The basin ranking will be used on:

- Final Characterization Report
- Flow Measurement plan and results of temporary flow monitoring
- Supplemental cross-connection investigation and reports
- Other relevant information known about the collection system, including data based upon the design and development of the Collection System Model

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Task protocol of detailed basin evaluations are as follows:

TV Inspection:

1. Sections of sewer in the basin are cleaned and televised to identify defects. All defects are logged and a copy of the video tape is prepared for follow-up evaluation.
2. Infiltration from open joints and pipe defects such as cracks, corrosion, and broken or collapsed pipe are prioritized rehabilitation by various techniques.

Flow Monitoring:

1. A flow monitoring program is completed prior to sewer rehabilitation to document pre-rehabilitation flow I/I conditions.
2. Velocity/depth flow meters are installed for inspection activities.
3. Meters are installed upstream of the sewage pumping station wet well. The intent is to meter flow from the entire basin.
4. Once all inspections, testing, and rehabilitation are completed, the meters are installed at the same location and post-rehabilitation monitoring program is performed. Post rehabilitation flows are compared to pre-rehabilitation flows, and the actual reduction in I/I water flows is determined.

   Post rehabilitation flow monitoring is typically performed after all in-house and contracted rehabilitation work is completed. In some cases, if only a few sections of contracted work remain, the post rehabilitation monitoring could be done immediately for intermediate evaluation and reporting, and redone after all rehabilitation is complete.

Manhole Inspections:

Manhole structures are inspected for infiltration and general overall condition. If manhole defects are identified, the infiltration is quantified and a work order is issued for repair work.

Smoke Testing:

1. Smoke testing is utilized as the primary inflow investigation technique. Smoke will migrate to and escape from major pipe defects and direct connections to storm water structures and roof drains. All sewer sections under the Sewerage and Water Board of New Orleans' jurisdiction will be smoke tested at least once (1) during the I/I Reduction Program.
2. All defects identified by smoke testing are prioritized for repair. Based on jurisdictional authorities, repairs may be completed or verified as follows:
   a. Smoke observed escaping along the line of the sewer will generate a work order for an internal inspection.
   b. Smoke observed from a storm water inlet or catch basin will generate a work order for repair of the sanitary sewer and storm drain system if it can be determined that a direct connection exists. In cases where a direct

connection between the storm drain and sanitary sewer does not exist, dye water flooding will be conducted with the internal inspection to locate the system defects that resulted in smoke entering the storm drain.

c. Observations of smoke from private property defects and/or private property connections will be forwarded to the Plumbing Department.

Dye Water Flooding Testing:

In some cases smoke may be detected, but the source is not identifiable by the above described procedures. In this case, the storm water system will be flooded with dyed water and the sanitary system televised to locate the point or points where I/I is entering the sanitary sewer.

Rehabilitation Program Element Descriptions. The Rehabilitation Program includes the analysis of rehabilitation methods and the implementation of the rehabilitation requirements.

The purpose of the Rehabilitation Program is to repair defects that allow groundwater and storm water access to the sanitary sewer system. The repairs will reduce the quantity of wastewater transported and treated, and thereby reduce the possibility of system overflows and treatment plant malfunctions. The following rehabilitation methods are utilized:

- Main Line Replacement
- Point Repairs
- Cured-In-Place Sewer Lining
- Fold and Form Sewer Lining
- Manhole Rehabilitation/Reconstruction
- Manhole Inflow Covers
- Others

Rehabilitation Protocol

1. Work orders generated by the detailed basin evaluation activities are forwarded to the Networks Gravity Department. Defects are scheduled for repair by the Sewerage and Water Board of New Orleans, or by an outside contractor.

   Typical repair programs are as follows:

   a. **Point Repairs:** Point repairs consist of repairing small sections of cracked, corroded, or broken gravity sewers or sewer force mains. This work typically includes excavating to the location of the break, removal of broken pipe section(s), and replacement with new pipe. All identified structural problems are scheduled for repair/replacement. Sewer sections having more than one (1) structural repair (requiring excavations) per one hundred feet (100') or more than three (3) structural repairs per line section are generally completely replaced. Locations requiring complete

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line section replacement are generally contracted to outside contractors.

b. **Manhole Repairs:** Manhole repairs consist of repairing structural defects or leakage in individual manholes or castings. This work may include replacement of castings (lid and frame), replacement of defective adjusting rings or top sections, complete manhole replacement, or relining the existing manhole to eliminate leakage. Manholes within areas where main line repairs are being contracted to outside contractors are generally included in the contracted work.

c. **Sewer Television Inspections:** Video tapes are produced and evaluated in the office. The protocol for selecting the sewer line rehabilitation method is as follows:

   1) Point or spot repairs are recommended to be performed where a major structural problem is observed, such as broken pipe, cracked pipe, corroded pipe, misaligned joints, and where trenchless repair technology is not practical.
   2) Complete replacement is generally performed when the sewer line section has lost its structural integrity and other methods are not appropriate. This type of repair requires open excavation.
   3) Sewer lining is performed when there are multiple cracks and/or multiple leaking joints and where lining would be more cost effective than replacement. Lining is usually more cost effective when the sewer is deeper than five feet (5'), the surface is paved, or where there are soil and groundwater concerns. The systems currently being utilized include fold and formed, or cured-in-place lining.

2. Private sector repairs are referred to the property owner for correction of any defective service lateral or disconnection of any illegal storm water connection.

3. System repairs are performed by the Sewerage and Water Board of New Orleans or outside contractors depending upon the type of repair required and backlog of work. Any defect the Networks Gravity Department is not equipped to repair or which would overload the Department's resources are referred to the appropriate outside contractor.

Annual I/I Evaluation. As infiltration and inflow sources are identified and eliminated, clear water flows will decrease. However, as the pipe repairs are completed, exfiltration will also be reduced, possibly causing an increase of flow to the plant. This combination of influences will complicate overall evaluation of the reduction in I/I to the system because the Sewerage and Water Board of New Orleans will not be able to simply monitor flows at the treatment plants and determine the reduction achieved.

Using the three (3) sets of data, the Sewerage and Water Board of New Orleans will be able to:

- Track I/I reduction.
- Evaluate I/I removal with beneficial impact on treatment plant capacity.

- Quantify total I/I in the system.

Cost Effective Considerations. As more I/I is removed from the system, the cost to remove additional I/I will increase. This is because the larger defects have been repaired and the remaining defects will be smaller flow contributors. The Sewerage and Water Board of New Orleans will be able to perform a cost versus I/I reduction evaluation based on the reduction values derived in the analysis described previously.

Using this analysis, the cost of I/I removal achieved, and the cost to transport and treat the flow can be evaluated to determine cost-effective I/I programs.

Sewer Line Inspection

The inspection of sewer lines will be accomplished using several methods and sources of accomplishment. Table 4-3b outlines the Board's proposed schedule for inspection of sanitary sewer mains. Inspection is planned to come from the Sewerage and Water Board Preventive Maintenance Crews, Sewerage and Water Board Contractors, and the SSES Contractors. Inspection of all sewer lines is expected to be completed in eight years. Inspection of the lines will come from visual inspections, tv inspections, sonar inspections, and other non-destructive observation methods. The result of all inspections will be input into the CASSWORK system. An annual progress report will be generated to summarize the progress toward complete inspection of the sewer system.

Sewerage and Water Board of New Orleans
Preventive Maintenance Plan

Schedule for Inspection of Sanitary Sewer Mains
Linear Feet X 1000

Program YEAR	S&WB PM Crews	S&WB Contractors	SSES Designers / Contractors	Annual Total	Annual %	Cumulative Total	Cumulative %
1998	462	275	200	937	11.7%	937	11.7%
1999	462	275	200	937	11.7%	1874	23.4%
2000	462	275	200	937	11.7%	2811	35.1%
2001	462	275	200	937	11.7%	3748	46.9%
2002	616	275	200	1091	13.6%	4839	60.5%
2003	616	275	200	1091	13.6%	5930	74.1%
2004	616	275	200	1091	13.6%	7021	87.8%
2005	616	275	200	1091	13.6%	8112	101.4%

Calculations

S&WB PM Crews

Three crews @ 700 lf/day/crew @ 220 shifts/yr = 462,000 lf/yr

Additional crew in 2001

S&WB Contractors:

Contracted 275 lf/yr

SSES Contractors / Designers:

Contracted 200 lf/yr

TABLE 4 3(b)

QUANTIFIABLE MEASURES
GOALS
GRAVITY SYSTEMS

- **Sewer Cleaning.....Inspection of at least 9% of the system every year and 100% in 8 years**
  Clean at least 7% of the system every year and 100% in 10 years

- **Sewer Manhole Inspections .....Inspection of at least 25% of the sewer manholes per year**
  All system manholes will be completed in 3.3 years

- **Perform all Preventive Maintenance work within two weeks of scheduled date for accomplishment.**

SECTION 5.0
OPERATIONS DEPARTMENT

Revised 11/7/07

OPERATIONS DEPARTMENT

SEWAGE PUMPING STATION INSPECTIONS

The Operations Department of the Sewerage and Water Board of New Orleans operates and maintains eighty-three (83) sewage pumping stations. Currently Sewage Pumping Stations "A", "C", and "D" are manned continuously, while all other stations are visited on either a daily or an alternate day basis during the normal five (5) day work week. Operation Department personnel perform the majority of the preventive and some of the minor corrective maintenance tasks. All major electrical, mechanical and instrumental maintenance is performed by the Facility Maintenance Department.

Pump Station Inspection System Flow Chart. Routine pumping station inspections are conducted by Operations Department personnel to check station operation. Inspection functions include looking and listening for malfunctioning equipment, observing wear, and checking operation. Care functions performed during inspections include cleaning, lubricating, exercising, and adjusting equipment.

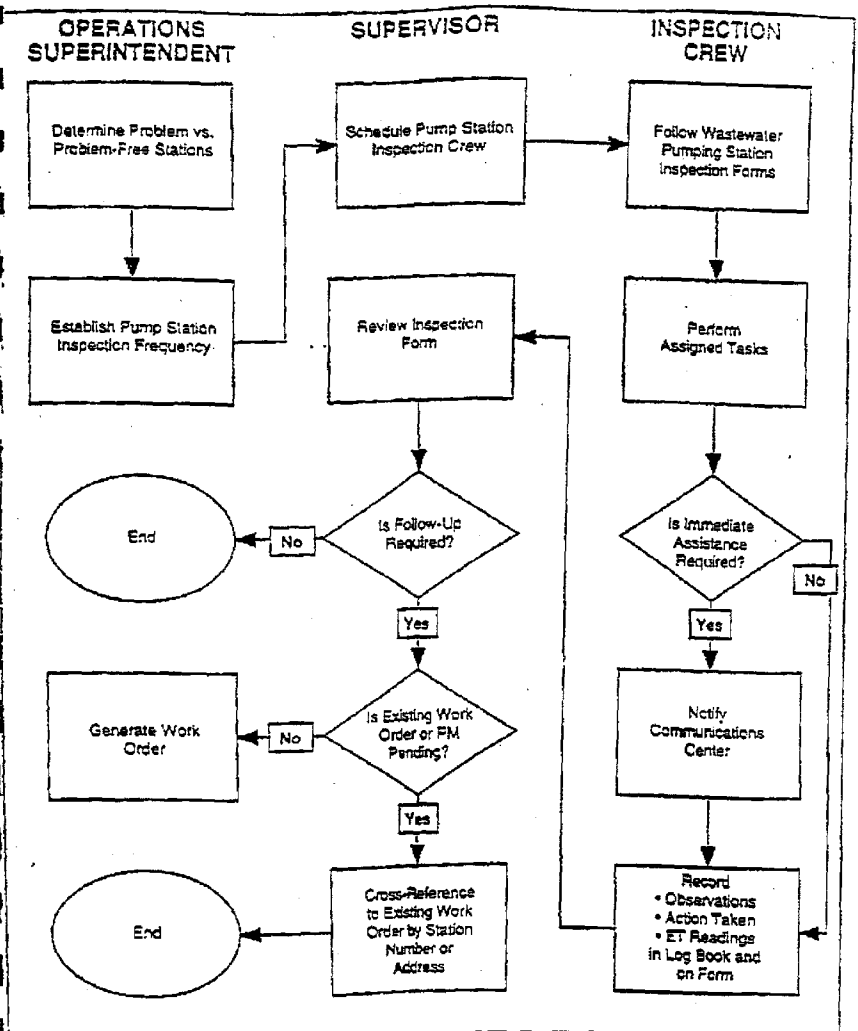
The following is a narrative description of the Sewage Pumping Station Inspection System as outlined in the flow chart presented as Figure 5-1:

1. The Sewerage and Water Board of New Orleans has established a priority system for determining frequency of routine sewage pumping station inspections. Critical stations are priority 1 and noncritical stations are priority 2. These are also know as "Problem" and "Problem Free" stations.

   Sewage pumping stations which have experienced two (2) or more failures or outages in the past two (2) years have been designated as Priority 1 stations. Sewage pumping stations which are more reliable and have experienced fewer than two (2) outages are Priority 2 stations.

Station	Inspection Frequency
Priority 1	Daily (Monday - Friday)
Priority 2	Alternate Days (Monday - Friday)

   As more experience is gained with the SCADA system, it may be possible to reduce the frequency of sewage pumping station inspections.
2. The Operations Department Supervisor schedules sewage pumping station inspection crews and determines assignments.
3. The inspection crew follows the Sewage Pumping Station Inspection Checklist shown as Figure 5-2.
4. Each crew performs the tasks and inspections which are applicable to their specific sewage pumping stations. The inspectors are responsible for completing the checklist.



OPERATIONS DIVISION
SEWER PUMP STATION INSPECTION
Flow Chart

FIGURE 5-1
Revised 11/7/97

5. If immediate action is required, the inspector notifies the proper Operations Department Supervisor.
6. Before leaving the sewage pumping station, the inspectors record station information on the inspection form and in the station log book including: observations, action taken, and station elapsed time meter readings.
7. The inspection form is routed to the supervisor for review.
8. If additional maintenance is required as a result of the findings during the inspection, the Supervisor will generate the appropriate work orders.
9. If the maintenance items can wait until the next scheduled preventive maintenance date, or if a work order to address the item is already open, the Supervisor cross references the maintenance item noted in the inspection with the existing work order.

Sewage Pumping Station Inspection Form. Sewage Pumping Station Maintenance Inspectors follow a comprehensive checklist as shown in Figure 5-2.

SEWAGE PUMPING STATION PREVENTIVE MAINTENANCE

Preventive maintenance (referred to as "PM") is the scheduled work performed to prevent equipment breakdown, reduce wear, improve efficiency, and extend the life of the equipment. The key to preventive maintenance is scheduling; preventive maintenance is scheduled maintenance.

Recurring preventive maintenance activities include inspection and care. Checking, cleaning and adjusting are performed both during routine sewage pumping station inspections and during annual scheduled preventive maintenance. The inspection and care functions are necessitated by the specific service requirements and are recurring in nature and frequency.

Cyclical preventive maintenance is a defined period within which a piece of equipment is evaluated by testing or by measuring wear, performance, or service life. The evaluation may result in overhaul or replacement of the component in accordance with Sewerage and Water Board of New Orleans' experience or industry standards.

All sewage pumping stations preventive maintenance tasks are scheduled using the CASSWORKS™ Plant Maintenance Module Software. The maintenance tasks and frequencies shown in the work orders are taken directly from manufacturers' equipment manuals, from industry practice and from Sewerage and Water Board of New Orleans' experience.

☐ Inspection day

☐ Maintenance day

Page: _____

DRAINAGE & SEWERAGE OPERATIONS

DAILY CHECK LIST FOR UNMANNED STATIONS

PUMPS ON "AUTO" (LEAD/LAG SEQUENCE) _____

DATE: _____ ROUTE: _____ FACILITY: _____

WETWELL ELEV. _____ ft. DISC. PRESS. _____ psi WATER PRESS. _____ psi

TIME IN: _____ OUT: _____ CREW: _____

N/A	OK	PRBM	VERIFY:
☐	☐	☐	1. Blowers
☐	☐	☐	2. Exhaust fans (including control room)
☐	☐	☐	3. Condition of lights (inside/outside)
☐	☐	☐	4. Position of transfer switches
			SUMP PUMPS: (Primary and Backup)
☐	☐	☐	5. Operation on "hand" and "auto"
☐	☐	☐	6. Condition of sump pit (keep clean)
			MOTORS:
☐	☐	☐	7. Verify operation in "hand/auto" mode
☐	☐	☐	8. Audible check for foreign sound
☐	☐	☐	9. Brush condition
☐	☐	☐	10. Arcing of brushes
☐	☐	☐	11. Collector ring condition
☐	☐	☐	12. Check upper oil level
☐	☐	☐	13. Check lower oil level
☐	☐	☐	14. Grit banks/Control room (general inspection)
			PUMPS:
☐	☐	☐	15. Check packing (adjust/replace if needed)
☐	☐	☐	16. Check oil levels in reservoir
☐	☐	☐	17. Check oil cups, grease cups, grease fittings
☐	☐	☐	18. Check belts and guards
☐	☐	☐	19. Visual and audio check
			VACUUM PUMPS:
☐	☐	☐	20. Check packing (adjust if needed)
☐	☐	☐	21. Verify operation in "hand/auto" mode
☐	☐	☐	22. Check oil levels in reservoir
☐	☐	☐	23. Visual and audio check
			AIR COMPRESSORS / BUSHELFIN:
☐	☐	☐	24. Bleed tank
☐	☐	☐	25. Check and bleed filter regulator
☐	☐	☐	26. Verify system air flow
			GAUGES/INSTRUMENTATION
☐	☐	☐	27. Compressor, regulator, elevation
☐	☐	☐	28. Amps, kilowatts
☐	☐	☐	29. Vacuum
			PIPING AND VALVES:
☐	☐	☐	30. Visual inspection for leaks, cracks
☐	☐	☐	31. Check proper valve position
☐	☐	☐	32. Condition of backflow preventer

N/A	OK	PRBM	SITE AND STRUCTURE:
☐	☐	☐	33. Remove debris from site (inside & outside)
☐	☐	☐	34. General visual inspection (building: building structure, ceilings, ladders, hatch, doors, windows, roof, gutter cons, lawn, fence, etc.

Motor	Amps	RW	Speed
#			
#			
#			
#			
#			

EQUIPMENT OUT OF SERVICE AND REASON:

_____

_____

_____

OTHERS WORKING IN STATION:

_____

_____

_____

NOTE: ALL LINE ITEMS CHECKED AS PROBLEMS ARE TO BE LISTED BY NUMBER AND DESCRIBED.

Line #	Description/Nature of problem noted

Additional comments/notes

_____

_____

_____

_____

_____

_____

☐ VERIFY THAT ALL EQUIPMENT CONTROL SWITCHES ARE SET T THE PROPER POSITION, AND STATION IS SECURE BEFORE LEAVING

Supervisor reviewing: _____

FIGURE 5-2
Revised 11/7/97

Sewage Pumping Station Maintenance Procedures and Schedules. A master schedule of maintenance activities (tasks) has been developed for major sewage pumping station equipment. More detailed preventive maintenance tasks are being generated for each sewage pumping station utilizing CASSWORKS™ Plant Maintenance Module. This module was implemented June of 1997, only PM work orders will be generated by January 9, 1998.

Table 5-1 Mechanical Maintenance Schedule
Table 5-2 Electrical Maintenance Schedule
Table 5-3 Instrumentation Maintenance Schedule
Table 5-4 Structural Maintenance Schedule

Instructions for Using Tables 5-1 through 5-4. The following information provides instructions for using and understanding the Table Schedules:

EQUIPMENT
Equipment is listed in alphabetical order by major equipment type as found in Sewerage and Water Board of New Orleans sewage pumping stations. The schedules are master lists. Refer to the Sewage Pumping Station Inventory Database for specific equipment in each station.

ACTIVITY TASK DESCRIPTION
The work activity (or task) is described in a brief phrase for simplifying generation of checklists and work orders.

ACTIVITY CODE
A code system is used for recording activities in the database management system.

ACTIVITY TYPE
Identifies the type of maintenance to be performed and defines the maintenance section which will be assigned to the task.

SI = Station Inspection
PM = Cyclical Preventive Maintenance

Revised 11/7/97

TABLE 5-1
MECHANICAL MAINTENANCE SCHEDULE - OPERATIONS

Equipment	Activity (Task Description)	Activity Type	Minimum Frequency	Man-hrs/Year Operations	Man-hrs/Year Fac.Mtc. Electrician	Man-hrs/Year Fac.Mtc. Mechanic	Total Man-hrs
Air Compressor - Bubbler System	Check Operation	SI	W	6.5	0.0	0.0	6.5
	Clean Air Inlet Filter	SI	W	6.5			6.5
	Drain Condensate	SI	W	6.5			6.5
	Check Oil Level	SI	W	6.5			6.5
	Clean Exterior	SI	W	6.5			6.5
	Check Belt Tension	SI	M	3.0			3.0
	Operate Safety Valve	SI	M	3.0			3.0
	Tighten Bolts	SI	M	3.0			3.0
	Change Oil	PM	Q	4.0			4.0
	Inspect compressor Valves	PM	Q	2.0			2.0
	Lubricate Motor Bearings	PM	A	1.0			1.0
Blowers - Ventilation	Check Operation	SI	W	5.2			5.2
	Check Belt Tension	SI	M	3.0			3.0
	Inspect/Clean Wheel	PM	S/A	1.0			1.0
	Lubricate Motor Bearings	PM	A	1.0			1.0
Couplings	Check Coupling	SI	W	5.2			5.2
	Lubricate Coupling	SI	W				0.0
Crane - Bridge (Pumping Stations "A" & "D")	Lubricate Bearings	PM	M	6.0			6.0
	Lubricate Wheels & Gears	PM	M	6.0			6.0
	Check Controls	PM	M	6.0			6.0
	Check Wiring/Contacts	PM	M	6.0			6.0
	Check Load Brake	PM	M	6.0			6.0
	Inspect Hook	PM	M	6.0			6.0
	Inspect Wire Rope	PM	M	6.0			6.0
	Inspect Bearings	PM	M	6.0			6.0
	Inspect Hardware	PM	M	6.0			6.0

TABLE 5-1 (Continued)
MECHANICAL MAINTENANCE SCHEDULE - OPERATIONS

Equipment	Activity (Task Description)	Activity Type	Minimum Frequency	Man-hrs/Year Operations	Man-hrs/Year Fac.Mtc. Electrician	Man-hrs/Year Fac.Mtc. Mechanic	Total Man-hrs
Pumps - Main Centrifugal	Check Operations	SI	W	26.0			26.0
	Check Packing/Seals	SI	W	26.0			26.0
	Lubricate Bearings	SI	Q	26.0			26.0
	Inspect Driveshafts	SI	M	6.0			6.0
	Inspect Belts/Sheaves	SI	M	3.0			3.0
	Check for Vibration	PM	W	4.0			4.0
Pumps -- Sump	Check Operation	SI	W	13.0			13.0
	Inspect/Clean	SI	W	13.0			13.0
	Inspect Impeller	PM	A	4.0			4.0
	Inspect Bearings	PM	A	1.0			1.0
Vacuum -- Pump	Check Packing/Seals	PM	W	8.7			8.7
	Check Switches/Screen	PM	W	8.7			8.7
	Check Gauges	PM	W	8.7			8.7
Valve -- Check	Inspect/Clean	SI	W	13.0			13.0
Valve -- Discharge	Inspect Packing/Seals	SI	W	13.0			13.0
	Lubricate	SI	W	3.0			3.0
	Exercise	M	M	2.0			2.0
Valve -- Suction	Inspect Packing/Seals	SI	W	13.0			13.0
	Lubricate	SI	W	3.0			3.0
	Exercise	M	M	2.0			2.0
TOTAL - MECHANICAL				315.0	0.0	0.0	315.0

TABLE 5-2

ELECTRICAL MAINTENANCE SCHEDULE - OPERATIONS

Equipment	Activity (Task Description)	Activity Type	Minimum Frequency	Man-hrs/Year Operations	Man-hrs/Year Fac.Mtc. Electrician	Man-hrs/Year Fac.Mtc. Mechanic	Total Man-hrs
Lighting	Check	SI	W	3.0			3.0
	Operation	PM	S/A	1.0			1.0
	Clean	PM	S/A	0.5			0.5
	Relamp	PM	W	0.5			0.5
Variable -- Speed Drive	Clean Exterior/Interior	PM	Q	2.0			2.0
	Inspect Ring/Magnet	PM	Q	4.0			4.0
	Inspect Brushes	PM	Q	2.0			2.0
	Check Rotor Bearings	PM	Q	4.0			4.0
	Tighten Connections	PM	Q	1.0			1.0
	Inspect for Overheating	PM	Q	1.0			1.0
	Lubricate Bearings	PM	Q	2.0			2.0
Transformer -- Power (Dry Type)	Record Load Current	SI	W	7.8			7.8
	Record Voltage	SI	W	7.8			7.8
	Record Temperature	SI	W	7.8			7.8
	Record Pressure/Vacuum	SI	W	7.8			7.8
TOTAL -- ELECTRICAL				52.2	0.0	0.0	52.2

TABLE 5-3

INSTRUMENTATION MAINTENANCE SCHEDULE - OPERATIONS

Equipment	Activity (Task Description)	Activity Type	Minimum Frequency	Man-hrs/Year Operations	Man-hrs/Year Fac.Mtc. Electrician	Man-hrs/Year Fac.Mtc. Mechanic	Total Man-hrs
Gauges	Check Operation	SI	W	8.7			8.7
Level Control -- Bubbler	Check Operation	SI	W	8.7			8.7
	Inspect Tubing	SI	W	8.7			8.7
	Replaced Tubing	PM	A	2.0			2.0
Level Control -- Float	Check Operation	SI	W	8.7			8.7
	Inspect Float Balls	SI	W	8.7			8.7
	Test Level Alarm	SI	W	8.7			8.7
Lights -- Indicating	Check Operation	SI	W	8.7			8.7
Switch -- Pump Control	Check Operation	SI	W	1.0			1.0
Transmitter -- Pressure	Check Operation	SI	W	1.0			1.0
SCADA Remote Monitoring	Clean & Test Probes	PM	W	40.0			40.0
TOTAL - INSTRUMENTATION				104.9	0.0	0.0	104.9

I-1

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TABLE 5-4
STRUCTURAL MAINTENANCE SCHEDULE - OPERATIONS

Equipment	Activity (Task Description)	Activity Type	Minimum Frequency	Man-hrs/Year Operations	Man-hrs/Year Fac.Mtc. Electrician	Man-hrs/Year Fac.Mtc. Mechanic	Total Man-hrs
Station Building	Check Locks	SI	W	4.0			4.0
	Check Lights	SI	W	4.0			4.0
	Check Man-Doors	SI	W	4.0			4.0
	Check Paint Condition	SI	W	4.0			4.0
	Check Landscaping	SI	W	4.0			4.0
	Check Housekeeping	SI	W	4.0			4.0
	Inspect Structural Steel	SI	M	2.0			2.0
	Inspect Ladders	SI	M	2.0			2.0
	Inspect Flooring/Grating	SI	M	2.0			2.0
	Inspect Roof	SI	M	2.0			2.0
	Inspect Fencing	SI	M	2.0			2.0
	Inspect Masonry Walls	SI	M	2.0			2.0
	Inspect Windows	SI	M	2.0			2.0
Wet Well	Inspect Access Hatch	SI	W	4.0			4.0
	Inspect Ladder	SI	W	4.0			4.0
	Inspect Guide Rails	SI	W	4.0			4.0
	Inspect Cracks/Leaks	PM	A	2.0			2.0
TOTAL - STRUCTURAL				52.0	0.0	0.0	52.0

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MINIMUM FREQUENCY

The minimum frequency for scheduling each task is based upon one (1) of the following: manufacturer recommendations, code and association guidelines, industry standards, and Sewerage and Water Board of New Orleans' experience. Some activities are performed more frequently than as listed in the schedule.

W	= Weekly	S/A	= Semi-Annually
M	= Monthly	A	= Annually
Q	= Quarterly	B	= Bi-Annually

MECHANICAL PREVENTIVE MAINTENANCE

Cyclical preventive maintenance for mechanical equipment is performed during station preventive maintenance visits (PM).

The Mechanical Section of the Operations Department includes the following job classifications:

- Pumping & Power Plant Operators
- Pumping Plant Operator
- Utility Plant Worker II

Mechanical preventive maintenance includes:

- Pump Maintenance
- Pump Drive Maintenance and Coupling Alignment
- Pump Testing
- Bearing Maintenance
- Valve Exercising and Maintenance
- Hydro Pneumatic System Maintenance
- Air Compressor Maintenance
- Blower Maintenance

ELECTRICAL PREVENTIVE MAINTENANCE

Limited preventive maintenance for electrical equipment is also performed during station PM visits by the Operations Department.

Electrical preventive maintenance by the Operations Department includes:

- Electrical Service Equipment Inspection.
- Control Panel Inspection, Cleaning and Testing.
- Motor Inspections to Check Connections, Vibration, Temperature and Lubrication.
- General Electrical System Inspection at each station.

Revised 11/7/97

STRUCTURAL PREVENTIVE MAINTENANCE

Structural preventive maintenance includes repairs to or replacement of:

- Concrete Structures
- Building Roofs
- Walls and Structural Supports
- Windows
- Doors, Hatches and Locks
- Metal Grating and Flooring
- Ladders and Access Platforms
- Site Fencing
- Paint

The condition of structural items listed above is checked during routine sewage pumping station inspections. Cyclical preventive maintenance may be required for structural items like roofing at specific locations.

QUANTIFIABLE MEASURES
GOALS
OPERATIONS

- **Perform all P. M. Maintenance work within two weeks of scheduled date for accomplishment.**

SECTION 6.0
FACILITY MAINTENANCE

Revised 11/7/97

FACILITY MAINTENANCE

The Facility Maintenance Department of the Sewerage and Water Board of New Orleans performs all major mechanical, electrical and instrumentation maintenance on eighty-three (83) sewage pumping stations.

SEWAGE PUMPING STATION PREVENTIVE MAINTENANCE

Preventive maintenance (referred to as "PM") is the scheduled work performed to prevent equipment breakdown, reduce wear, improve efficiency, and extend the life of equipment. The key to preventive maintenance is scheduling; preventive maintenance is scheduled maintenance.

Recurring preventive maintenance activities include inspection and care. Checking, cleaning and adjusting are performed both during routine sewer pumping station inspections and during annual scheduled preventive maintenance. The inspection and care functions are necessitated by the specific service requirements and are recurring in nature and frequency.

Cyclical preventive maintenance is a defined period within which a piece of equipment is evaluated by testing or by measuring wear, performance, or service life. The evaluation may result in overhaul or replacement of the component in accordance with Sewerage and Water Board of New Orleans' experience or industry standards.

All sewage pumping station preventive maintenance tasks are scheduled using the CASSWORKS™ Plant Maintenance Module Software. The maintenance tasks and frequencies shown in the work orders are taken directly from manufacturers' equipment manuals, from industry practice and from Departmental experience.

Sewage Pumping Station Procedures and Schedules. A master schedule of maintenance activities (tasks) has been developed for major sewage pumping station equipment. More detailed preventive maintenance tasks have been generated for each sewage pumping station by CASSWORKS™ and are found in Appendix A. The tabular schedules are summarized below with instructions for using the tables:

Table 6-1 Mechanical Maintenance Schedule
Table 6-2 Electrical Maintenance Schedule
Table 6-3 Instrumentation Maintenance Schedule

Instructions for Using Tables 6-1 through 6-3. The following information provides instructions for using and understanding the Table Schedules:

EQUIPMENT
Equipment is listed in alphabetical order by major equipment type as found in Sewerage

TABLE 6-1

MECHANICAL MAINTENANCE SCHEDULE - FACILITY MAINTENANCE

Equipment	Activity (Task Description)	Activity Type	Minimum Frequency	Man-hrs/Year Operations	Man-hrs/Year Fac Mtc. Electrician	Man-hrs/Year Fac Mtc. Mechanic	Total Man-hrs
Couplings	Align Coupling	PM	A			1.0	1.0
Crane - Bridge (Pumping Stations "A" & "D")	Inspect Gearing	PM	Q			8.0	8.0
	Inspect Brake Discs	PM	Q			8.0	8.0
	Inspect Lifting Devices	PM	A			4.0	4.0
	Inspect Sheaves/Drums	PM	A			4.0	4.0
	Perform Load Test	PM	A			4.0	4.0
Pumps - Main Centrifugal	Inspect Bearings	PM	A			8.0	8.0
	Inspect Rotating Elements	PM	A			8.0	8.0
	Inspect Wear Rings	PM	A			8.0	8.0
	Replace Packing/Seals	PM	S/A	8.0		8.0	16.0
	Test Pump Operation	PM	A			4.0	4.0
TOTAL - MECHANICAL				8.0	0.0	65.0	73.0

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TABLE 6-2
ELECTRICAL MAINTENANCE SCHEDULE - FACILITY MAINTENANCE

Equipment	Activity (Task Description)	Activity Type	Minimum Frequency	Man-hrs/Year Operations	Man-hrs/Year Fac.Mtc. Electrician	Man-hrs/Year Fac.Mtc. Mechanic	Total Man-hrs
Cables -- Low Voltage Power (600 v Maximum)	Check Condition	PM	A		0.5		0.5
	Inspect Connections	PM	A		1.0		1.0
	Inspect Raceway	PM	A		0.5		0.5
	Test Insulation Resistance	PM	A		1.0		1.0
Cables -- Medium Voltage Power (6.6 kv Maximum)	Check Condition	PM	A		0.5		0.5
	Inspect Connections	PM	A		1.0		1.0
	Inspect Raceway	PM	A		0.5		0.5
	Test DC High -- Potential	PM	A		1.0		1.0
Circuit Breakers	Inspect/Clean	PM	A		0.5		0.5
	Tighten Connections	PM	A		1.0		1.0
	Exercise Mechanism	PM	A		0.3		0.3
	Test Overcurrent Trip	PM	A		0.5		0.5
Contactors/Starters	Inspect for Overheating	PM	A		0.3		0.3
	Tighten Connections	PM	A		0.5		0.5
	Inspect/Clean Contacts	PM	A		0.5		0.5
Fuses	Inspect/Clean	PM	A		0.3		0.3
	Tighten Connections	PM	A		0.3		0.3
	Clean Contacts	PM	A		0.3		0.3
Pumps -- Submersible Centrifugal <= 25 HP	Inspect cables	PM	A		1.0		1.0
	Check Sensors	PM	A		1.0		1.0
	Test Insulation Resistance	PM	A		1.0		1.0
Relay -- Control	Inspect for Overheating	PM	A		0.5		0.5
	Tighten Connections	PM	A		1.0		1.0
Relay - Protective	Inspect/Clean	PM	A		0.5		0.5
	Perform Pickup Test	PM	B/A		2.0		2.0
	Perform Timing Test	PM	B/A		2.0		2.0
	Test Target and Seal-in Unit	PM	B/A		2.0		2.0
	Test Circuit Trip	PM	B/A		2.0		2.0

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TABLE 6-2 (Continued)

ELECTRICAL MAINTENANCE SCHEDULE - FACILITY MAINTENANCE

Equipment	Activity (Task Description)	Activity Type	Minimum Frequency	Man-hrs/Year Operations	Man-hrs/Year Fac.Mtc. Electrician	Man-hrs/Year Fac.Mtc. Mechanic	Total Man-hrs
Transformer -- Power (Dry Type)	Inspect Case Exterior	PM	A		0.3		0.3
	Inspect Equipment Ground	PM	A		0.3		0.3
	Inspect Bushings	PM	A		0.3		0.3
	Inspect Cooling System	PM	A		0.5		0.5
	Test Grounding Electrode Resist	PM	A		0.5		0.5
	Test Insulation Resistance	PM	A		0.5		0.5
Transfer Switch (20 Stations)	Check Connections	PM	A		0.3		0.3
	Check Relays/Timers	PM	A		0.3		0.3
	Test Switch	PM	A		0.3		0.3
TOTAL -- ELECTRICAL				0.0	26.5	0.0	26.5

TABLE 6-3

INSTRUMENTATION MAINTENANCE SCHEDULE - FACILITY MAINTENANCE

Equipment	Activity (Task Description)	Activity Type	Minimum Frequency	Man-hrs/Year Operations	Man-hrs/Year Fac.Mtc. Electrician	Man-hrs/Year Fac.Mtc. Mechanic	Total Man-hrs
Switch -- Pressure	Inspect/Clean	PM	A		1.0		1.0
Transmitter -- Pressure	Check Calibration	PM	S/A		2.0		2.0
SCADA Remote Monitoring	Test Alarm Functions	PM	S/A		1.0		1.0
	Test Control Functions	PM	S/A		1.0		1.0
TOTAL - INSTRUMENTATION				0.0	5.0	0.0	5.0

I-1

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and Water Board of New Orleans sewage pumping stations. The schedules are master lists. Refer to the Sewage Pump Station Inventory Database for specific equipment in each station.

ACTIVITY TASK DESCRIPTION
The work activity (or task) is described in a brief phrase for simplifying the generation of checklists and work orders.

ACTIVITY CODE
A code system is used for recording activities in the database management system.

ACTIVITY TYPE
Identifies the type of maintenance to be performed and defines the maintenance section which will be assigned to the task.

SI = Station Inspection
PM = Cyclical Preventive Maintenance
OH = Overhaul (Replacement or "Corrective Maintenance")

MINIMUM FREQUENCY
The minimum frequency for scheduling each task is based upon one of the following: manufacturer recommendations, code and association guidelines, industry standards, and Sewerage and Water Board of New Orleans experience. Some activities are performed more frequently than as listed in the schedule.

W	= Weekly	S/A	= Semi-Annually
M	= Monthly	A	= Annually
Q	= Quarterly	B	= Bi-Annually
MFR	= As per Manufacturer		

MECHANICAL PREVENTIVE MAINTENANCE
Major preventive maintenance work for mechanical equipment is performed during station preventive maintenance (PM) visits by Facility Maintenance machinists and electricians. These PM work orders are generated for the Sewerage and Water Board of New Orleans by the CASSWORKS™ system.

The Mechanical Section of the Facility Maintenance Department includes the following job classifications:

- Utility Plant Machinist
- Diesel Mechanics
- Utility Plant Welder
- Utility Maintenance Worker II

Mechanical preventive maintenance includes:

- Pump Drive Maintenance and Coupling Alignment
- Pump Testing
- Bearing / Wear Ring Inspection
- Bridge Crane Inspection / Load Testing

ELECTRICAL PREVENTIVE MAINTENANCE

Preventive maintenance for electrical equipment is also performed by the Facility Maintenance Department.

Electrical preventive maintenance performed by the Facility Maintenance Department includes:

- Power Cable Inspection
- Circuit Breaker and Starter Inspection
- Testing of Electrical Relays
- Testing the Electrical Transfer Switch (20 Stations)
- Transformer Inspection at each station

SECTION 7.0
PRESSURE DEPARTMENT

Revised 11/7/97

PRESSURE DEPARTMENT

INTRODUCTION

The Sewerage and Water Board of New Orleans' sewer collection system consists of one hundred and two (102) miles of sewer force mains, maintained by the Pressure Department (See Figure 7-1). Some of these sewer force mains, particularly those made of steel, have experienced corrosion problems and pipe failures leading to wastewater discharges and sewage pumping station shutdowns.

Also, air and other gases accumulate at the high points within the sewer force mains, reducing sewage pumping station output capacity. This accumulated air also contributes to the pipe corrosion problems. Many of the sewer force main high points are located at or near canal crossings. Both automatic and manually operated air release valves are installed at selected high points along the sewer force mains to eliminate accumulated air from the sewer force mains. Scheduled maintenance, including opening, closing and flushing of the valves, must be performed. The automatic valves must be inspected on a regular basis to ensure that grease buildup does not interfere with the automatic float operation.

In addition to the air release valves, the system also has approximately one hundred sixty-eight (168) valves installed on the sewer force mains to isolate the sewage pumping stations and sections of the lines in the event that repairs or preventive maintenance are necessary.

AUTOMATIC AIR RELEASE VALVES

The Sewerage and Water Board of New Orleans has installed automatic air release valves in selected locations in the system, principally on the Dwyer Sewer Force Main. Historically, automatic air release valves are prone to plugging with grease, making them ineffective. Automatic valves in the system have been provided with backwash fittings to allow the valve to be flushed with high-pressure water to remove grease and solids from the float mechanism.

AUTOMATIC AIR RELEASE VALVE OPERATION AND CLEANING PROCEDURES

NOTE: Observe all traffic control and safety procedures as outlined in the Sewerage and Water Board of New Orleans' Safety Manual when performing valve maintenance in roadways or over canals.

1. Obtain CASSWORKS™ work orders for scheduled maintenance on automatic valves.
2. Check inventory on truck to ensure that proper supplies are available.
3. Once the air release valve to be serviced is located, remove any manhole cover and set aside in a safe place.
4. Refer to Figure 7-2

SEWER FORCE MAIN MAP

ORIGINAL MAPS ON FILE AT
SEWERAGE AND WATER BOARD:

625 St. Joseph Street, New Orleans, LA 70165

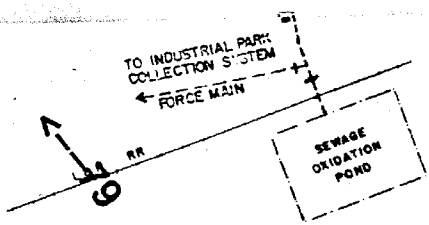
Director's Office:	Room 233
Gen. Superintendent's Office:	Room 311
Purchasing Department:	Room 133

8800 S. Claiborne Avenue, New Orleans, LA 70118

Network Engineering Department

FIGURE 7-1

Rev.11/7/97



ALL VALVES ARE GATE VALVES UNLESS OTHERWISE NOTED
ON PLUG VALVES, USE INDICATOR TO DETERMINE POSITION OF VALVE; VALVES MAY CLOSE CLOCKWISE

SEWERAGE & WATER BOARD OF N O

MAJOR SEWER MAINS

AIR RELEASE VALVE INSPECTION SITES

SCALE: 1" = 1000'

0 1 2 3 4 5
THOUSAND FEET

PV: PLUG VALVE
PUMPING STATION
LIFT STATION
SEWER FORCE MAIN
GRAVITY SEWER

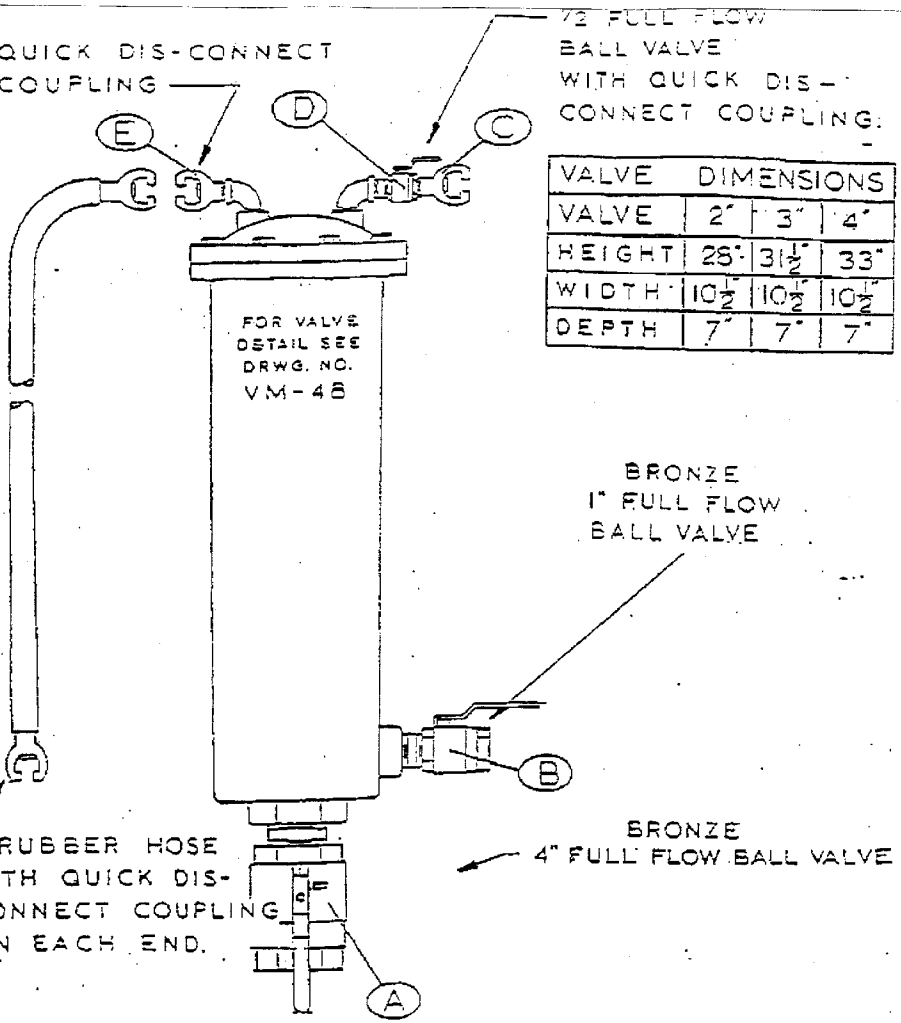
S: STEEL
C: PRESTRESSED CONC.
AC: ASBESTOS CEMENT
CI: CAST IRON
3000: CONTRACT NO.

1A: AIR RELEASE - AUTOMATIC
B: AIR RELEASE - MANUAL
: PAST FORCE MAIN PROBLEM AREAS

FIGURE 7-1

ORIGINAL MAPS ON FILE AT
SEWERAGE AND WATER BOARD:

625 St. Joseph Street, New Orleans, LA 70165
Director's Office: Room 233
Gen. Superintendent's Office: Room 311
Purchasing Department: Room 133
8800 S. Claiborne Avenue, New Orleans, LA 70118
Network Engineering Department



VALVE	DIMENSIONS		
VALVE	2"	3"	4"
HEIGHT	28"	31½"	33"
WIDTH	10½"	10½"	10½"
DEPTH	7"	7"	7"

SEWAGE AIR RELEASE VALVE w/ ACCESSORIES	DATE 5.2.68
VAL-MATIC VALVE and MANUFACTURING CORP.	DRWG. NO VM-AREW-1

FIGURE 7-2 Revised 11/7/97

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a. Close corporation cock "A" isolating the valve from the sewer force main.
b. Install drain from Valve "B" to tank on truck.
c. Open valve "B."
d. Connect water supply from truck to Quick Connector "E" and backwash. This procedure will wash the seat and float mechanism area.
e. Repeat procedure by connecting the water supply to Quick Connector "C" and opening Valve "D." This will wash the body area.
f. Once backwashing is completed, close Valves "B" and "D."
g. Open corporation cock "A" to place unit back in service.

5. Annually remove the top valve cover and inspect the float and seat mechanism to ensure that it functions properly.
6. Record the valve number, location, work performed and any comments to be entered into CASSWORKS™.
7. The maintenance frequency for the automatic valves is quarterly.

MANUAL AIR RELEASE VALVE OPERATION AND CLEANING PROCEDURES

NOTE: Observe all traffic control and safety procedures as outlined in the Sewerage and Water Board of New Orleans' Safety Manual when performing valve maintenance in roadways or over canals.

1. Obtain CASSWORKS™ work orders for scheduled maintenance on manual valves.
2. Check the inventory on the truck to ensure that proper supplies are available.
3. Open the corporation cock slowly, listen for air being released and continue opening the valve until it is approximately half-open to allow for fast closing.
4. When all of the air has been expelled from the sewer force main, water will appear at the valve. At this point, quickly close the valve.
5. Record the valve number, location and any comments to be entered into CASSWORKS™.
6. The maintenance frequency for the manual air release valves is quaterly.

ISOLATION VALVE MAINTENANCE

The one hundred sixty-eight (168) sewer force main valves are intended to isolate portions of the sewer force main in the event that repair or preventive maintenance is required. These valves will be needed infrequently, but they must be capable of being operated at all times. Therefore, they must be exercised and maintained on a regular basis.

NOTE: Before closing or adjusting valves for maintenance, check with the Operations Department to coordinate sewage pumping station shut downs. Also, manual air release valves must be bled after this maintenance procedure.

1. Coordinate with Operations Department to shut down sewage pumping station.

2. Move valve through the range of movement to the full-closed position.
3. Reopen to the full-open position.
4. Restore sewage pumping station operations.

The above procedure will be performed on an annual basis. However, during the initial implementation of this program, it is anticipated that there will be significant delays due to:

1. greater care required when operating the isolation valves, and
2. increased frequency of valve repairs as a result of implementation of exercise program.

For these reasons, the first cycle of operational inspections is anticipated to be completed in two years.

As more isolation valves are identified or installed, the cycle for operational inspections may need to be increased.

SEWER FORCE MAIN ALIGNMENT INSPECTION

While not strictly a preventive maintenance procedure, one method which can spot possible sewer force main failures before they occur is driving along the sewer force main routes and looking for possible changes in the sewer force mains' vertical alignment. New depressions in the ground along the sewer force main route may indicate differential settlement of the ground and imminent pipe failure.

Inspection of sewer force main alignment will be performed annually and integrated into Cassworks™ If unusual conditions are spotted, notify the Field Supervisor immediately for follow-up investigation.

QUANTIFIABLE MEASURES
GOALS
PRESSURE SYSTEMS

- Perform all P. M. Maintenance work within two weeks of scheduled date for accomplishment.
- Perform inspection/maintenance of air release valves quarterly.
- Inspect and exercise sewer force main isolation valves annually.
- Visually inspect all force main alignments annually.
- Conduct cathodic protection surveys annually.

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