

# CMOM ANNUAL REPORT CY2019



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## **Capacity, Management, Operations and Maintenance (CMOM) Plan Overview**

In accordance with National Pollutant Discharge Elimination System (NPDES) Permit No. NM0022250 (Permit), the Albuquerque Bernalillo County Water Utility Authority (Water Authority) prepared this Capacity, Management, Operations and Maintenance (CMOM) Plan. The Permit was renewed in CY2019 with an effective date of December 1, 2019.

The CMOM Plan consists of the following documents:

1. FOG Policy
2. CMOM Annual Report
3. CMOM Program Self-Assessment

The CY2019 CMOM Annual Report follows previous FY2013-17 and CY2017-18 reports. The previous reports, as well as the most recent, can be accessed at [http://www.abcwua.org/Sewer\\_System.aspx](http://www.abcwua.org/Sewer_System.aspx).

Appendix 4 provides a summary of goals established in this CY2019 CMOM Report.

### **Report Purpose**

As indicated by its name, the CMOM Annual Report will be reissued to describe CMOM activities in the previous calendar year (January 1 to December 31). The CMOM Annual Report provides summary descriptions of CMOM activities (past and planned) and is intended to be a communication tool. The report is intended for Water Authority staff, regulatory authorities, customers, and the general public.

## Permit Requirements

The Water Authority discharges to the Rio Grande under authority of NPDES Permit No. NM0022250 (Permit). Under this Permit, the Water Authority operates the Southside Water Reclamation Plant (SWRP) and the Collection System.

The Permit was renewed effective December 1, 2019. The following are the Permit requirements that impact the collection system.

1. The Water Authority shall report all overflows with a (monthly) Discharge Monitoring Report (DMR). (Part I, Paragraph D).
2. Overflow reporting requirements were unchanged for EPA and NMED. (Part I, Paragraph D).
3. Overflow reporting requirements were modified for spills impacting the Pueblo of Isleta (POI) were modified in accordance with the “Pueblo of Isleta Reporting Requirement” which were a subsection of the renewed Permit. (Part I, Paragraph D and “Pueblo of Isleta Reporting Requirement”.)
4. The Water Authority shall continue to implement and update (if necessary) the CMOM plan. (Part II, Paragraph E.)

Appendix 5 provides the Permit pages for the above referenced portions of the Permit. See below in Actions Implemented and On-Going Programs for a discussion of the OERP modifications made to comply with the “Pueblo of Isleta Reporting Requirement”. The full permit is available at <https://cloud.env.nm.gov/water/pages/view.php?ref=6881&k=fd428af5b1>

## CMOM Program Self-Assessment

EPA states (see <http://www.epa.gov/npdes/pubs/cmomselfreview.pdf>): “An important component of a successful CMOM program is to periodically collect information on current systems and activities and develop a “snapshot-in-time” analysis. From this analysis, the utility establishes its performance goals and plans its CMOM program activities.” The Water Authority developed Self-Assessments as a part of the FY2013 and FY2014 reports. Because the data provided in the Self-Assessment does not significantly change year-to-year, the Water Authority has set a goal of updating the Self-Assessment every five years.

Therefore, the CMOM Program Self-Assessment CY2018 has been prepared and posted to [http://www.abcwua.org/Sewer\\_System.aspx](http://www.abcwua.org/Sewer_System.aspx) along with the CMOM Reports. Rather than being an appendix to the CMOM Report, it is now a stand-alone document.

The next update will coincide with the CY2023 CMOM Report.

## FOG Policy

The Water Authority’s FOG Policy is a separate document. The FOG Policy was developed as a requirement of the NPDES Permit effective on October 1, 2012 and subsequently approved by the United States Environmental Protection Agency (EPA). The policy was developed to work in conjunction with the Water Authority Sewer Use and Wastewater Control Ordinance (SUO) and Enforcement Response Plan (ERP) to reduce the rate of SSOs in the collection system and decrease FOG loading at the SWRP. The policy describes expectations for FOG dischargers such

as Food Service Establishments (FSEs) and waste haulers, and the steps the Water Authority is taking to mitigate FOG.

The FOG Policy sets a Water Authority goal of inspecting every FSE at least once every three years. Details of what is expected of the FSE in terms of Grease Removal System (GRS) functionality, pumping schedule, maintenance, and recordkeeping are identified. The FOG policy explains the Water Authority use of the 25% solids and grease rule (25 Percent Rule) to determine if a GRS is filled to capacity. The policy also contains Best Management Practices (BMPs) such as scraping plates, using screens, and not using emulsifiers, etc.

Pumper requirements are also covered in the FOG Policy. Full evacuation of a GRS is required each time pumping occurs. The pumper must leave the FSE documentation in the form of manifests that contain pertinent information such as date, time, volume pumped, and the condition of the GRS. The FOG Policy lists the minimum service to be provided by the pumper.

Enforcement of FOG violations and hauled wastewater violations is described in the FOG Policy. The FOG Policy works in conjunction with the ERP to set administrative assessments for violations.

The FOG Policy also sets forth the process for identifying new sources of FOG. The Water Authority Pretreatment Program will update the FOG database on an annual basis. The FOG Policy sets a goal that the Water Authority will meet with the City of Albuquerque, Bernalillo County, the Village of Los Ranchos, the Village of Corrales, plumbers, and the New Mexico Restaurant Association on a periodic basis to discuss FOG issues.

In developing the FOG Policy, the Water Authority held a meeting with the hauled wastewater permit holders on July 22, 2013 and a public meeting on July 25, 2013 to discuss the proposed Policy. The final FOG Policy was submitted to the EPA on September 27, 2013 and updated in the Pretreatment Program modification documents sent to EPA on June 2, 2014. No comments from EPA were received regarding either submission, thus indicating approval.

### **FOG Enforcement**

In CY2019, the Water Authority Pretreatment Program had 1,915 compliant FSEs out of 2,039 FSE sites for a compliance rate of 94%. 650 FSE inspections were conducted with 342 passing and 308 failing. Of the 308 failed inspections, 238 Notices of Violation were issued. 70 FSEs corrected the deficiencies and called for a re-inspection within fifteen (15) days. 185 FSEs took corrective action before the issuance of a second Notice of Violation (NOVs). 53 second Notice of Violations were issued after thirty (30) days. Four (4) Violations were issued for no GRS, 202 were for non-functioning GRS, 102 were for GRS needs pumping, or missing manifests.

In response to SSOs, 67 FSE inspections were conducted with 41 failing. Within fifteen-days, forty-nine (49) FSEs corrected the deficiency. Eighteen (18) FSEs resolved their deficiencies after the issuance of NOV. In addition, Water Authority Pretreatment personnel distributed FOG brochures to FSEs, single-family residences and apartment complexes upstream of the SSOs.

Additionally, the Water Authority's Public Information Office advanced radio, print and television public outreach for the purpose of improving the Water Authority's FOG Policy.

## SSO Analyses

### Permit Requirements

The Permit requires a CMOM Plan. The Plan goal is to reduce SSOs. The FOG Policy states that the Pretreatment Program will investigate all SSOs related to large amounts of grease. The policy is to take enforcement actions for violations of FOG requirements with priority on FSEs causing repeat SSOs.

### SSO Study Team

To meet these requirements, the Water Authority created an SSO Study Team. The Team is comprised of:

1. Collection Section – Research Analyst (team lead), Gravity Superintendent, Assistant Superintendent and Closed Circuit Television (CCTV) Supervisor;
2. NPDES Pretreatment –Industrial Pretreatment Engineer and Pollution Prevention Specialist.

The Mission Statement for the Study Team is: *The SSO Study Team will work inter-divisionally to study, analyze and determine causes of previous SSOs to mitigate future SSOs in the Collection System.*

The Study Team procedure is:

1. Tabulate all 10-40s, 10-42s and 10-48s (see Table 1 for definitions).
2. Ensure all segments responsible for causing 10-42s and 10-48s are televised.
3. The Research Analyst will review and analyze all CCTV inspections to determine causes (if possible) and document findings.
4. To conduct meetings with the SSO Study Team to review and analyze CCTV that needs further investigation for resolution.
5. Recommend/implement and document mitigations (if possible) based on analysis.
6. Coordinate with NPDES Pretreatment concerning grease issues discovered during analysis.

**Table 1 Sewer Trouble Definitions**

<b>Sewer Trouble Definitions</b>		
10-40	Sewer Backup	A gravity line blockage that does not result in a spill, or in the vacuum system, a low vacuum (low vac) that causes a customer service disruption. Does not result in an SSO Reportable (10-42) or a Property Damage (10-48).
10-42	SSO Reportable	An overflow of sewage from the system that may impact surface waters. These are reported to the EPA and other locally impacted stakeholders.
10-48	Property Damage	An overflow of sewage from the system that results in damage to private property. These are not reportable under current definitions.

Appendix 1 identifies all 10-42s and 10-48s, and the overflows that resulted in both a 10-42 and a 10-48. When documenting the number of Sewer Troubles of different types, for example in Figure 1 and Figure 2, the 10-42 item includes all overflows that may impact surface waters, including those that also had property damage; the 10-48 item includes overflows that only resulted in property damage. This prevents double-counting the number of overflow occurrences.

All 10-40s, 42s and -48s were CCTV inspected, although only 10-42s are “reportable”, i.e., required to be reported to the EPA, et al. All 10-42s and -48s were then examined by the Study Team and a Cause and Mitigation were determined.

**Table 2 Types of Causes for SSOs**

<b>Cause(s) of SSO from DMR</b>		<b>Causes determined from CCTV</b>
<b>CO</b> - Construction	<b>DB</b> - Debris	<b>SC</b> - Surcharged
<b>CU</b> -Cause Unknown	<b>RK</b> -Rocks	<b>SL</b> - Sag in Line
<b>EQ</b> - Equipment Failure	<b>GR</b> - Grease	<b>IT</b> - Intruding Tap
<b>SGG</b> -Sand, grit or gravel	<b>RT</b> - Roots	<b>MH</b> - Manhole
<b>LF</b> - Line Failure	<b>RN</b> - Rainfall	<b>OJ</b> - Offset Joint
<b>V</b> - Vandalism	<b>RGS</b> -Rags	
<b>RGR</b> - Roots / Grease	<b>BP</b> -Burped	

## Causes & Mitigations

The Cause(s) were selected from Table 2 that identifies SSO causes from the DMR and CCTV. The monthly SSO DMR has a specific list of Causes that are based on system observations made by an Operator or Supervisor at the site of an SSO. The CCTV data provided to the Study Team often results in a different, more refined Cause or Causes. Table 3 provides the causes determined by the Study team for CY2018. (Note: Percentages may not add up to 100%, as they are rounded to the nearest percent.)

**Table 3 Summary of Causes from SSO Study**

<b>10-42, 10-48 Causes</b>	<b>Total</b>	<b>% of Total</b>
Construction	2	6%
Burped	3	9%
Cause Unknown	3	9%
Debris/Rags	1	3%
Debris/Sand, Grit or Gravel	1	3%
Equipment Failure	1	3%
Grease	8	24%
Grease/Roots/Rocks	1	3%
Line Failure	3	9%
Rags	3	9%
Rags/Grease	1	3%
Roots	5	15%
Roots/Rags	1	3%
<b>Grand Total</b>	<b>33</b>	<b>100%</b>

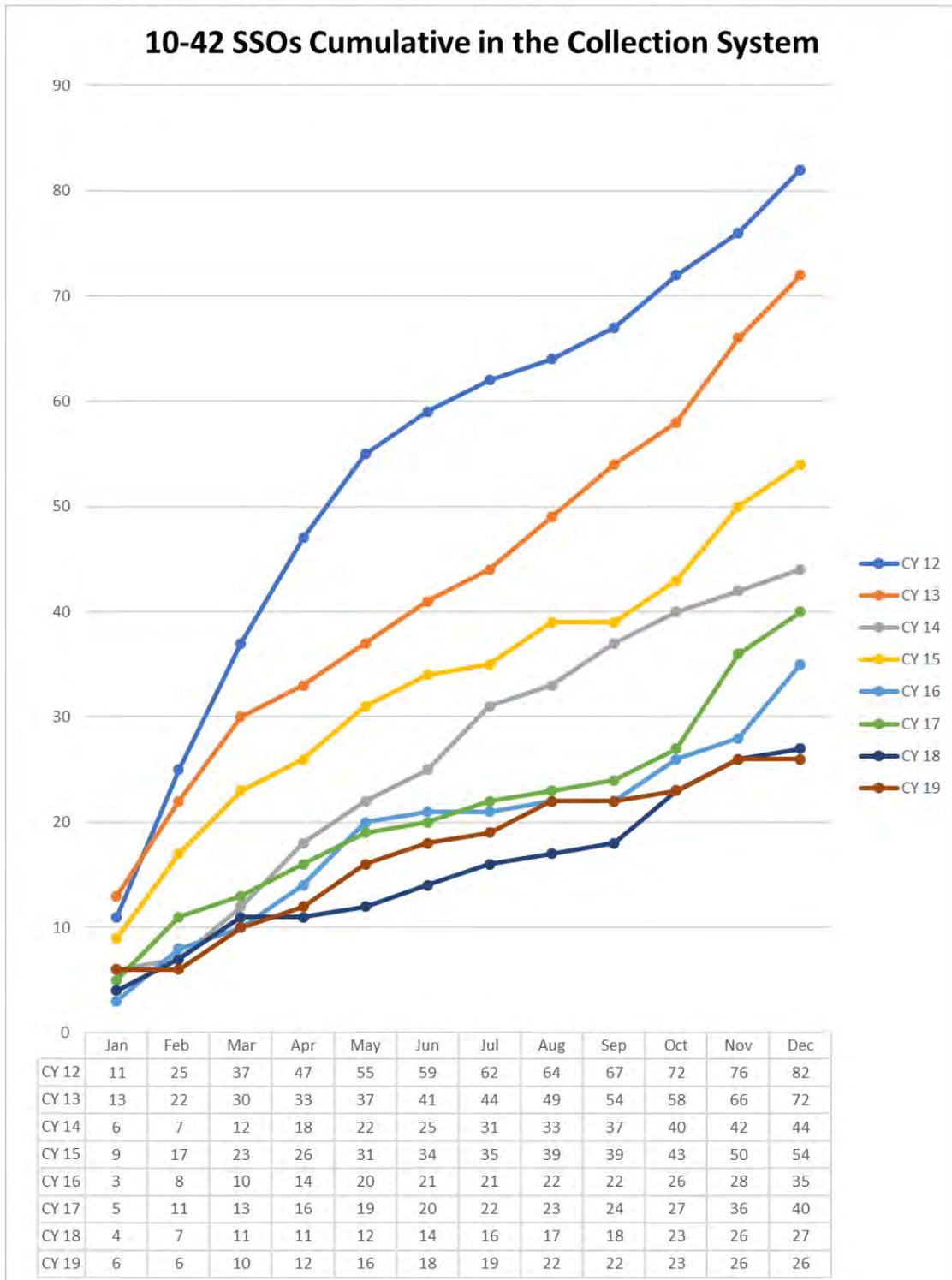
Mitigations are the steps that the Team identified to prevent a recurrence of an SSO, at least for the identified Cause. Specific Mitigations are very dependent on the conditions observed from the CCTV video and report. Table 4 provides a summary of the various Mitigations. The Mitigations are tracked through completion or implementation. (Note: Percentages may not add up to 100%, as they are rounded to the nearest percent.)

**Table 4 Summary Mitigations from SSO Study**

<b>10-42, 10-48 Mitigations</b>	<b>Total</b>	<b>% of Total</b>
No Follow Up Needed	4	12%
Pretreatment Notified	7	21%
Pretreatment Notified/Special Instructions	1	3%
Pretreatment Notified/Short Interval	2	6%
Rehab/Replace	4	12%
Special Instructions	1	3%
Short Interval	12	36%
Short Interval/Special Instructions	1	3%
Short Interval/Rehab/Replace	1	3%
<b>Grand Total</b>	<b>33</b>	<b>100%</b>

## SSO Tabulation & Analysis

Figure 1 shows the cumulative 10-42s by month for CY2012-18.



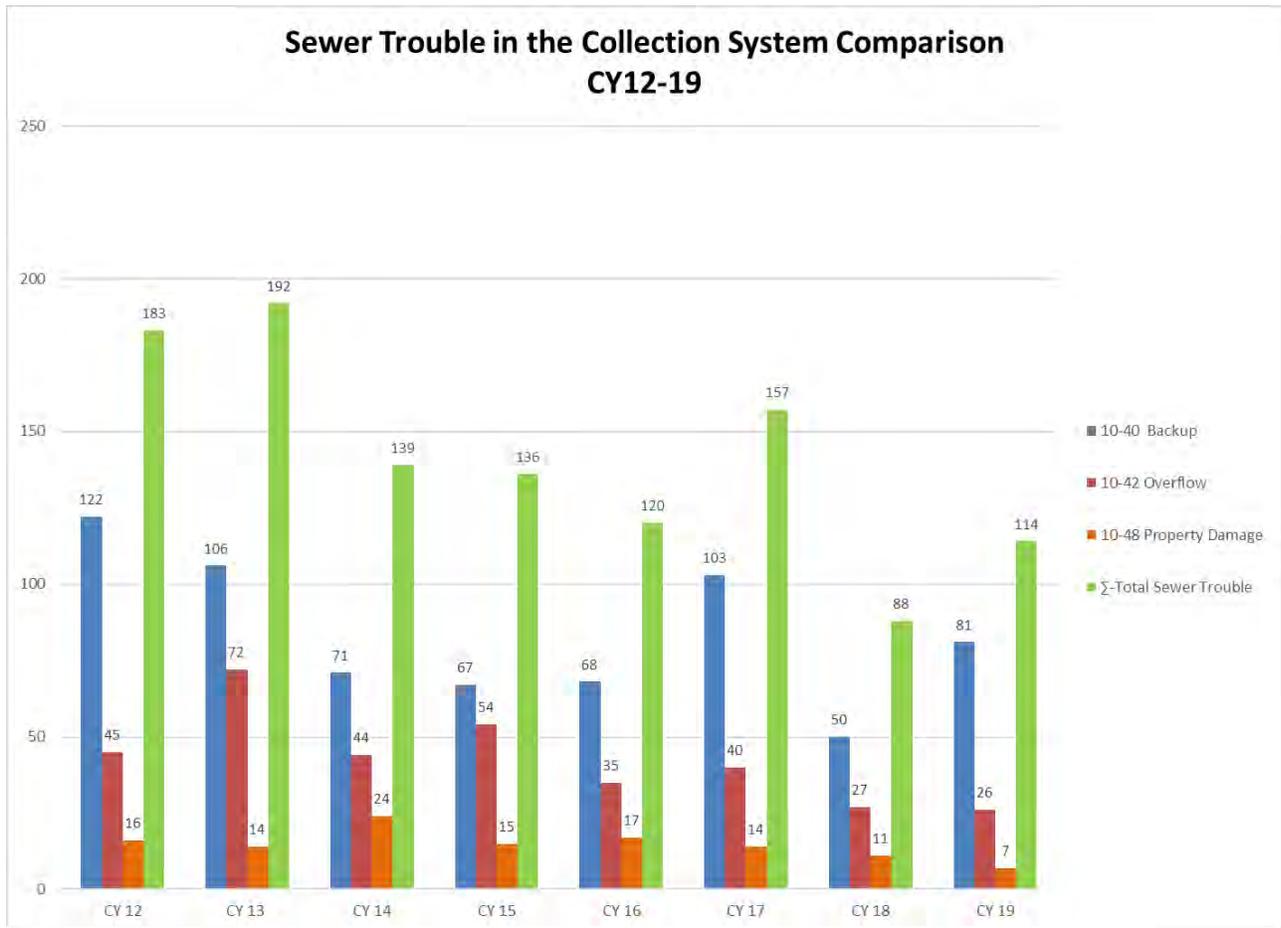
**Figure 1 Reportable SSOs**

Appendix 1 contains a list of every 10-42 and 10-48 event in CY2019. The table columns are grouped as follows:

1. The type, i.e., 10-42 or -48, is identified on the left. In one case a single event was both a 10-42 and a 10-48, as indicated.
2. Next to the right are the data included in the monthly SSO DMRs. It is noted that a “Reported Cause” is listed. This is typically based on the observations of the Operator that reported the SSO.
3. Next to the right is data determined by the Study Team:
  - a. Cause
  - b. Mitigation
  - c. If Pretreatment follow-up is necessary
4. To the far right are follow-ups by NPDES Pretreatment
  - a. FSEs visited
  - b. Notice of Violation issued

The SSO Rate is defined as 100 times the number of SSOs in a year divided by the miles of sewer in the system. The Water Authority system has a total of approximately 2,414 miles of line (p. 8 of the Self-Assessment). The SSO rate is therefore 3.4, 3.0, 1.8, 2.2, 1.4, 1.7, 1.1 and 1.1 for CY2012-19 respectively.

Figure 2 shows the total sewer troubles, i.e. 10-40s, -42s, and -48s by year for CY2012-19. This graph does not include 10-48s due to “burps” which are not due to a blockage or other failure resulting in the overflow of sewage. Instead, air displaced during the Vactor jetting cleaning can under certain circumstances force out the water in the home fixture P-traps, e.g. toilets and sinks. These sometimes result in claims and are therefore included in the Property Damage totals for completeness and consistency. There were three burps during CY 2019. These burps are identified in Appendix 1.



**Figure 2 Sewer Trouble Comparison**

### Volume Spilled and Recovered

Via the OERP, the Water Authority has implemented a policy of capturing spills and documenting actions. Appendix 2 provides estimated spill volumes and volumes recovered for the 26 reported SSOs for CY2019. Of the spill volume estimated not to be recovered, none was identified as directly reaching the Rio Grande. No spills reached a facility operated by the MRGCD. As discussed below, spill recovery for the August 28, 2019 spill mixed with nuisance flows in the North Diversion Channel (NDC) and therefore the volume removed for this spill exceeded the amount spilled.

## Actions Implemented and On-Going Programs

### General

Below are gaps that were identified in the CY2017 CMOM Report and were closed in CY2018, or are on-going programs, or both. In addition to the commitments made in the CMOM Report, CY2019, the following additional actions were taken to expand the Water Authority's ability to operate and maintain the system.

1. Purchase orders were issued for two new Vactors to be obtained and put into service in CY2020.
2. The Water Authority's Public Affairs section continued to support SSO prevention efforts by reprising an advertising campaign aimed at discouraging disposal of improper materials in household drains. The campaign, which ran during the winter months, included ads on television, radio, outdoor boards, and social media, and also featured water bill inserts reminding customers to keep trash, grease and wipes out of the sewer system.



Figure 3 Refrigerator Magnet

### FOG Policy Implementation:

The FOG Policy is an on-going program and FOG Enforcement efforts are a part of this program. Both the FOG Policy and the FOG Enforcement efforts are described above. On-going efforts are described in the FOG Enforcement section and not reiterated here.

In the CY2017 CMOM Report, the following goal was identified:

Develop a link between the Linko FOG database utilized by NPDES Pretreatment and the Maximo work order system used by the Collection Section.

This was investigated and was found to not be possible. This completes this effort.

In the CY2017 CMOM Report, the following goal was identified:

Continue working on creating an FSE flier in Spanish. The Pretreatment Section, in conjunction with the Public Information Office, will continue to develop FSE fliers in languages other than English.

An FSE flier has been developed in Spanish. This completes this goal. In FY2021, an FSE flier will be developed in Chinese.

## Overflow Emergency Response Plan (OERP)

This is an on-going program to update the OERP as required. In CY2019, the following modifications were made to the OERP:

1. Pages 4 and 5:
  - a. Updated contact personnel.
2. Page 7:
  - a. Modified notifications to the Pueblo of Isleta (POI) to meet the changed requirements in the renewed Permit.
  - b. See discussion below.
3. Page 11:
  - a. Updated the process to meet the changed requirements in the renewed Permit.
  - b. See discussion below.

The Water Authority worked to modify the OERP in accordance with the changed requirements of the renewed Permit. Specifically, the Permit changes reporting to the POI. Category One and Two overflow events are defined, and protocols specified for each. The Water Authority developed draft OERP processes to meet the Permit requirements.

The Water Authority then met with the POI on November 22, 2019 and presented the draft OERP processes for their review. After discussion, a modified version of the draft OERP was agreed up and this is the version implemented on December 1, 2019, the effective date of the renewed Permit. The modification, determined in the November 22 meeting with the POI, was to exceed the renewed Permit and to continue sending the 5-day written report to the POI. Through this meeting, consistent expectations and understandings were established and are now implemented in the OERP.

The Collection Section is the “owner” of the OERP. The Collection Section creates the components of the OERP, routes for internal review (specifically including the Compliance Division), and the completed portions are approved for posting to SharePoint by the Collection Section Manager. Appendix 3 provides the OERP which was in effect at the end of CY2019. The most current version of the OERP is posted to [http://www.abcwua.org/Sewer\\_System.aspx](http://www.abcwua.org/Sewer_System.aspx)

In accordance with the OERP, the Water Authority coordinated with AMAFCA on a spill that occurred on August 28, 2019 and reached the North Diversion Channel (NDC). The NDC was bermed and the spill removed. Nuisance flow also was removed and therefore the volume removed for this spill exceeded the amount spilled.

## Closed Circuit Television (CCTV)

This is an on-going program. The following recommendation is made in the FY2013 CMOM Report: “CCTV inspections of the collection system as follows: 1) Small diameter main lines less than 15”: In four of five years, televise approximately 5% per year of the small diameter system. Televise high risk lines based on current Asset Management Plan and subsequent in-house analysis. 2) Large diameter lines 15” and larger: Every fifth year, televise as much as possible acknowledging access limitations of the unlined concrete lines 15” and larger. Anticipated schedule: 3) FY2014-17: 5% of the small diameter each year. 2) FY18: Large diameter unlined concrete pipe.”

CMOM Report figures for cleaning and CCTV will continue showing fiscal year (FY) goals in accordance with funding and contracting cycles and actual metrics will reflect work through the end of the calendar year (CY). Figure 4 provides the CCTV goal for a ten-year basis and the actual CCTV inspection through CY2019. The CY2019 portion of this recommendation is complete.

The CCTV program will continue. Anticipated schedule:

1. FY21: 5% of the small diameter.
2. FY22: 5% of the small diameter.
3. FY23: Large diameter unlined concrete pipe.
4. FY24: 5% of the small diameter.
5. FY25: 5% of the small diameter.
6. FY26: 5% of the small diameter.

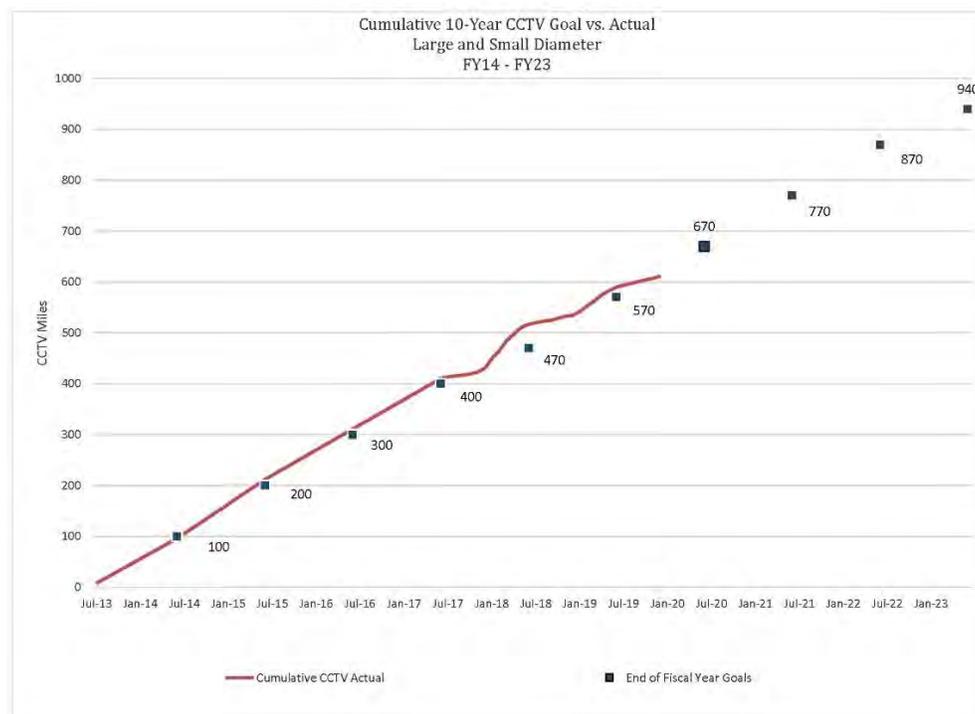


Figure 4 Small Diameter Sewer CCTVed vs. Ten-Year Goal

## Cleaning Program Goal

This is an on-going program. The following recommendation is made in the FY2013 CMOM Report: “The Water Authority will establish and monitor a goal of cleaning all gravity small diameter lines every ten years. (This will be accomplished through the existing Sub-Basin program.) The Water Authority will continue the program of high-frequency maintenance of known problem locations within the system. (This will be accomplished through the existing Short Interval program.) The frequency of Short Interval cleaning will vary in accordance with system performance and risk factors, maintenance history, and the latest maintenance findings.”

CMOM Report figures for cleaning and CCTV will continue showing fiscal year (FY) goals in accordance with funding and contracting cycles and actual metrics will reflect work through the end of the calendar year (CY). As shown Figure 5, the Water Authority is ahead of its goal to clean then entire system once in ten years through the Sub-Basin program.

The Sub-Basin program and associated ten-year cleaning goal remain in place. While meeting this CMOM commitment for Sub-Basin cleaning, the Collection Section has increased Short Interval cleaning.



Figure 5 Small Diameter Sewer Cleaned vs. Ten-Year Goal

## **Force Main Inspection Program**

This is an on-going program in which the alignment is annually inspected for all force mains and valves found in field are compared to those in the GIS mapping and this information is stored in Maximo.

Per the CY2018 CMOM Report, a test was performed on the LS24 force mains. In this test, performed on December 4 and 5, the 24” force main was closed, and all flow was handled by only the 18” force main. It was found that LS24 pumping only through the 18” was able to meet peak flows. This completes evaluation of the LS24 force mains.

LS20 pumps westside flow to the Southside Water Reclamation Plant (SWRP) via twin 30” ductile iron force mains. In CY2020, the Water Authority will perform an air pocket profile, utilizing a smart ball, of the north force main. A report will be received and evaluated.

## **Root Foaming**

The following recommendation is made in the FY2013 CMOM Report: “Starting in FY15, implement a 3-year pilot program. Root foam selected lines that meet the root infested and / or inaccessibility criteria. Compare effectiveness to mechanical cleaning currently practiced and provide recommendation.”

The Root Foaming Pilot Project is a three-year treatment program with follow-up study. The FY15 and FY16 groups were foamed in June 2015 and March 2016 respectively. Per vendor recommendations, the FY15 group was retreated in June 2017. This completed the foaming application portion of the Pilot Project. An interim inspection of the FY15 treated and control group was performed in FY2016 and was inconclusive. During FY2017, the FY15 and FY16 lines, both treated and control, were scheduled for CCTV inspection. In CY2018, this CCTV data was examined to compare treated and control pipes but was inconclusive. In CY2019, the review continued. In CY2019, the Final Report for the Root Foaming Pilot Project will be completed.

## **Segment Loading Number (SLN) Analysis**

The Water Authority has developed a new collection system analysis tool. The method and results were published in the issue May 2019 of Water Environment & Technology (WE&T) magazine. See Appendix 6. A critical finding is that sewer blockages and spill frequency increase with increasing SLN numbers. Based on this finding, the Water Authority is increasing its small diameter CCTV efforts on lines with SLN = 4 or greater.

## **Odor Complaints**

Odor complaints are tabulated and reported monthly. The Water Authority odor control program is described in the CMOM Self-Assessment Report in the Hydrogen Sulfide Monitoring and Control (HSMC) section in the current CMOM Program Self-Assessment.

## **Identified Gaps in the Water Authority Processes with Recommendation to Close**

In the process of continuous improvement, the Water Authority is committed to identifying and closing gaps. As discussed above, most of these recommendations are now considered On-Going programs.

### **Prohibited Discharges, i.e., SSOs**

The Water Authority acknowledges that prohibited discharges have occurred and that all discharges from the sanitary sewer system are prohibited.

Recommendation: The Water Authority will annually examine sewer system performance, set specific steps for decreasing SSOs and mitigating their impacts, and has a program of continuous improvement.

# Appendices

**Appendix 1      Sanitary Sewer Overflow Analysis Table**

Type				DMR													SSO Team Study		Enforcement		
10-42	10-48	10-42 & 10-48	Maximo WO #	Diameter	Repeat	Repeat within 1 year	Date of SSO	Time of SSO	Duration (HH:MM)	Location	Estimated Volume (gallons)	Reported Cause of Overflow	Observed Environment Impacts	Action Taken	Ultimate Discharge Location	Volume Recovered (gallons)	Cause	Mitigation	Pretreatment & Follow Up Requested	FSEs Visited	Notice of Violation
X			371092	8	N	N	1/9/2019	10:30 AM	:45	601 LA VETA DR NE (SRVPREM458727)	6,750	SGG	NEAH	CC/HTH/CWW/WD	PST	3,375	CO	SI			
X			373347	8	Y	N	1/10/2019	11:44 AM	:51	4521 EUBANK BLVD NE	2,550	RGS	NEAH	CC/HTH/PO/CWW/WD	PST	1,275	RGS/GR	SI			
X			373348	8	Y	N	1/10/2019	9:20 AM	:55	3309 COORS BLVD SW	1,375	GR/RGS	NEAH	CC/HTH/CWW/RP/WD	PST	1,000	CO	PT	X	1	0
X			376630	8	Y	N	1/14/2019	9:40 AM	:40	10320 LAS CASITAS NE	400	RT	NEAH	CC/HTH/PO/CWW/RS	PST	350	RT	SI			
X			383718	8	Y	N	1/23/2019	10:20 AM	:40	1331 JUAN TABO BLVD NE	200	GR	NEAH	CC/HTH/CWW/RP/WD	PST	150	GR	PT	X	10	6
X			390397	8	Y	N	1/28/2019	9:05 AM	1:05	4200 TRAMWAY BLVD NE	325	GR	NEAH	CC/HTH/PO/CWW/RP	DST	200	GR/RT/RK	SI			
X			428058	10	N	N	3/2/2019	6:55 PM	1:10	RENAISSANCE/ALEXANDER BLVD NE	1,750	GR	NEAH	CC/HTH/RS/WD	SD	800	GR	PT/SI	X	1	1
X			437393	10	N	N	3/12/2019	4:42 PM	:48	1928 BRYN MAWR DR NE	240	GR	NEAH	CC/HTH/RS/WD	PST	150	GR	PT	X	3	2
X			440240	8	Y	N	3/15/2019	1:57 PM	:18	2500 LOUISIANA BLVD NE	50	GR	NEAH	CC/HTH/WD	PST	20	LF	RH			
X			454593	LF#84	N	N	3/30/2019	9:00 AM	4:00	LYONS / BLUE FEATHER AVE NW	24,000	EQ	NEAH	HTH/PO/BR/RP/RS/WD	AD	22,000	EQ	NF			
X			475888	8	N	N	4/22/2019	4:20 PM	1:03	6001 WINTER HAVEN RD NW	275	GR	NEAH	CC/HTH/RP/RS/WD	PST	200	GR	PT	X	2	2
	X		475847	8	Y	N	4/22/2019	1:45 PM	:15	1911 LOMAS BLVD NW	NA	BP	NA	CC	NA	NA	BP	NF			
	X		477303	8	N	N	4/23/2019	4:24 PM	1:10	302 SYCAMORE ST NE	NA	GR/RGS/RT	NA	CC	PP	NA	RT	SI			
X			479932	8	Y	N	4/27/2019	10:30 AM	1:40	1104 SILVER AVE SW	30	RGS	NEAH	CC/HTH/RP/RS/WD	PST	30	RT/RGS	SI			
X			487516	8	N	N	5/6/2019	6:45 AM	:50	7400 SAN PEDRO DR NE	20	GR/RGS	NEAH	CC/HTH/RP/WD	PST	-	GR	PT	X	5	2
	X		491082	8	N	N	5/7/2019	11:55 AM	1:25	700 FITZGERALD RD NW	NA	BP	NA	IN	NA	NA	BP	NF			
X			491532	8	N	N	5/11/2019	10:44 AM	2:46	901 20th ST NW	830	SGG	NEAH	CC/HTH/CWW/WD	SD	800	DB/SGG	SI			
X			491533	8	N	N	5/11/2019	11:01 AM	1:39	2636 ISLETA BLVD SW	495	RGS	NEAH	CC/HTH/ CWW/ WD	SD	400	RGS	SI			
X			493334	8	N	N	5/13/2019	6:10 AM	:50	1617 CANDELARIA RD NE	1,000	DB/RGS	NEAH	CC/HTH/CWW/RP/WD	PST	750	RGS	PT	X	1	0
X			517690	8	N	N	6/12/2019	7:45 AM	:25	7012 ARROYO DEL OSO AVE NE	300	CU	NEAH	CC/HTH/CWW/RP/RS/WD	PST	150	CU	SI			
X			532501	8	N	N	6/23/2019	9:30 AM	1:10	909 FOUR HILLS RD SE	50	RT	NEAH	CC/HTH/WD	PST	-	RT	SI			
X			561482	16		N	7/26/2019	5:15 PM	1:45	3306 MARS RD NE	10,500	DB/RGS	NEAH	CC/HTH	O	-	DB/RGS	RH			
X			569571	8	N	N	8/5/2019	9:40 AM	2:00	FOUR HILLS SE & WENONAH AV SE	600	RT	NEAH	CC/HTH/RS/WD	AC	-	RT	SP			
X			579745	8	N	N	8/15/2019	8:45 AM	:45	MONTGOMERY & MORRIS BLVD NE	60	GR	NEAH	CC/HTH/RS/WD	PST	-	GR	PT/SI	X	2	2
X			594223	10	Y	Y	8/28/2019	1:29 PM	:56	1923 BRYN MAWR DR NE *REFER BACK TO WO#437393 & SR#3948	4,200	GR/RGS	NEAH	CC/HTH/CWW/BR/WD	AC	16,847	GR	PT/SP	X	3	2
	X		633380	8	N	N	10/2/2019	10:48 AM	1:40	3000 SAN JOAQUIN AVE SW	NA	CU	NA	CC/IN	NA	NA	CU	SI			
	X		643824	8	Y	Y	10/10/2019	2:00 PM	:15	4508 3RD ST NW	NA	BP	NA	CC	NA	NA	BP	NF			
X			644997	8	N	N	10/12/2019	10:43 AM	2:02	4729 SOUTHERN AVE SE	122	GR	NEAH	CC/HTH/RP/WD	PST	50	RT	SI/SP			
		X	668686	8	N	N	11/6/2019	7:26 AM	:59	6320 SAN FRANCISCO DR NE	5,900	CU	NEAH	CC/HTH/IN/PO/CWW/BR/RP/RS/W D/ET	AD	5,500	CU	SI/RH			
X			679115	8	N	N	11/13/2019	10:37 AM	:48	9201 APACHE PINE WY NE	60	GR	NEAH	CC/HTH/PO/RP/WD	PST	40	GR	PT	X	1	1
X			686596	8	N	N	11/21/2019	6:01 PM	:53	2401 JENSEN DR NE	5,300	RGS	NEAH	CC/HTH/CWW/WD	PST	500	RGS	SI			
	X		690108	8	Y	N	11/25/2019	10:20 AM	3:25	4125 LEAD AVE SE	NA	LF/SGG	NA	CC	NA	NA	LF	RH			
	X		722865	8	N	N	12/27/2019	12:45 PM	:45	6001 GONZALES RD SW	NA	GR/RGS	NA	CC/IN/PO	NA	NA	LF	RH			

**Appendix 2      Sanitary Sewer Overflow Volume Captured Analysis Table**

**CY2019 10-42 SPILL VOLUME AND VOLUME RECOVERED**

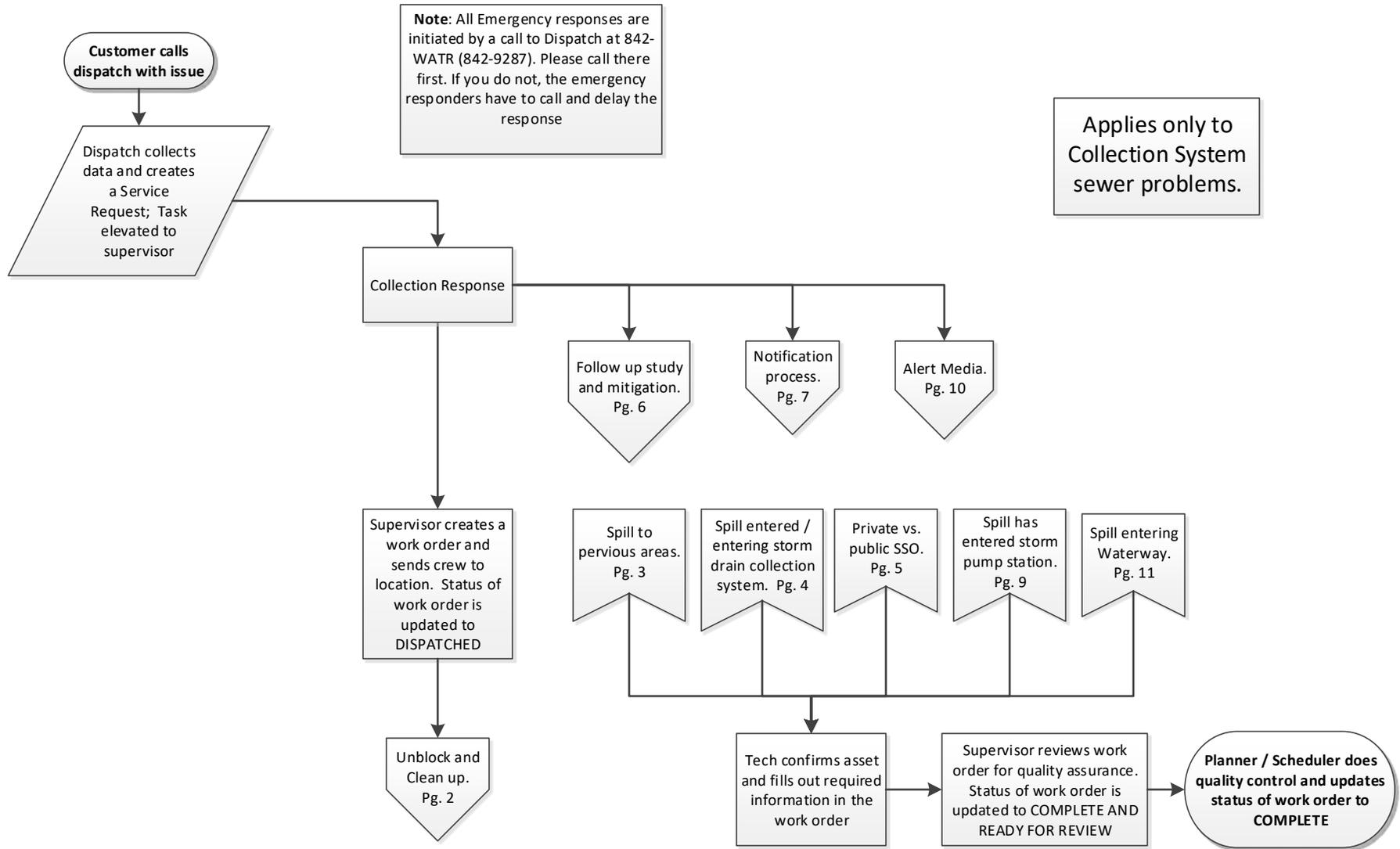
<b>Maximo WO #</b>	<b>Date of SSO</b>	<b>Location</b>	<b>Estimated Volume (gallons)</b>	<b>Volume Recovered (gallons)</b>	<b>Volume Not Recovered</b>	<b>% Recovered</b>
371092	1/9/2019	601 LA VETA DR NE (SRVPREM458727)	6,750	3,375	3,375	50%
373347	1/10/2019	4521 EUBANK BLVD NE	2,550	1,275	1,275	50%
373348	1/10/2019	3309 COORS BLVD SW	1,375	1,000	375	73%
376630	1/14/2019	10320 LAS CASITAS NE	400	350	50	88%
383718	1/23/2019	1331 JUAN TABO BLVD NE	200	150	50	75%
390397	1/28/2019	4200 TRAMWAY BLVD NE	325	200	125	62%
428058	3/2/2019	RENAISSANCE/ALEXANDER BLVD NE	1,750	800	950	46%
437393	3/12/2019	1928 BRYN MAWR DR NE	240	150	90	63%
440240	3/15/2019	2500 LOUISIANA BLVD NE	50	20	30	40%
454593	3/30/2019	LYONS / BLUE FEATHER AVE NW	24,000	22,000	2,000	92%
475888	4/22/2019	6001 WINTER HAVEN RD NW	275	200	75	73%
479932	4/27/2019	1104 SILVER AVE SW	30	30	-	100%
487516	5/6/2019	7400 SAN PEDRO DR NE	20	-	20	0%
491532	5/11/2019	901 20th ST NW	830	800	30	96%
491533	5/11/2019	2636 ISLETA BLVD SW	495	400	95	81%
493334	5/13/2019	1617 CANDELARIA RD NE	1,000	750	250	75%
517690	6/12/2019	7012 ARROYO DEL OSO AVE NE	300	150	150	50%
532501	6/23/2019	909 FOUR HILLS RD SE	50	-	50	0%
561482	7/26/2019	3306 MARS RD NE	10,500	-	10,500	0%
569571	8/5/2019	FOUR HILLS SE & WENONAH AV SE	600	-	600	0%
579745	8/15/2019	MONTGOMERY & MORRIS BLVD NE	60	-	60	0%
594223	8/28/2019	1923 BRYN MAWR DR NE *REFER BACK TO WO#4	4,200	16,847	(12,647)	401%
644997	10/12/2019	4729 SOUTHERN AVE SE	122	50	72	41%
668686	11/6/2019	6320 SAN FRANCISCO DR NE	5,900	5,500	400	93%
679115	11/13/2019	9201 APACHE PINE WY NE	60	40	20	67%
686596	11/21/2019	2401 JENSEN DR NE	5,300	500	4,800	9%
<b>Grand Total</b>			<b>67,382</b>	<b>54,587</b>	<b>12,795</b>	<b>81%</b>

**Appendix 3      Overflow Emergency Response Plan (OERP)**

# Overflow Emergency Response Plan

12-1-2019

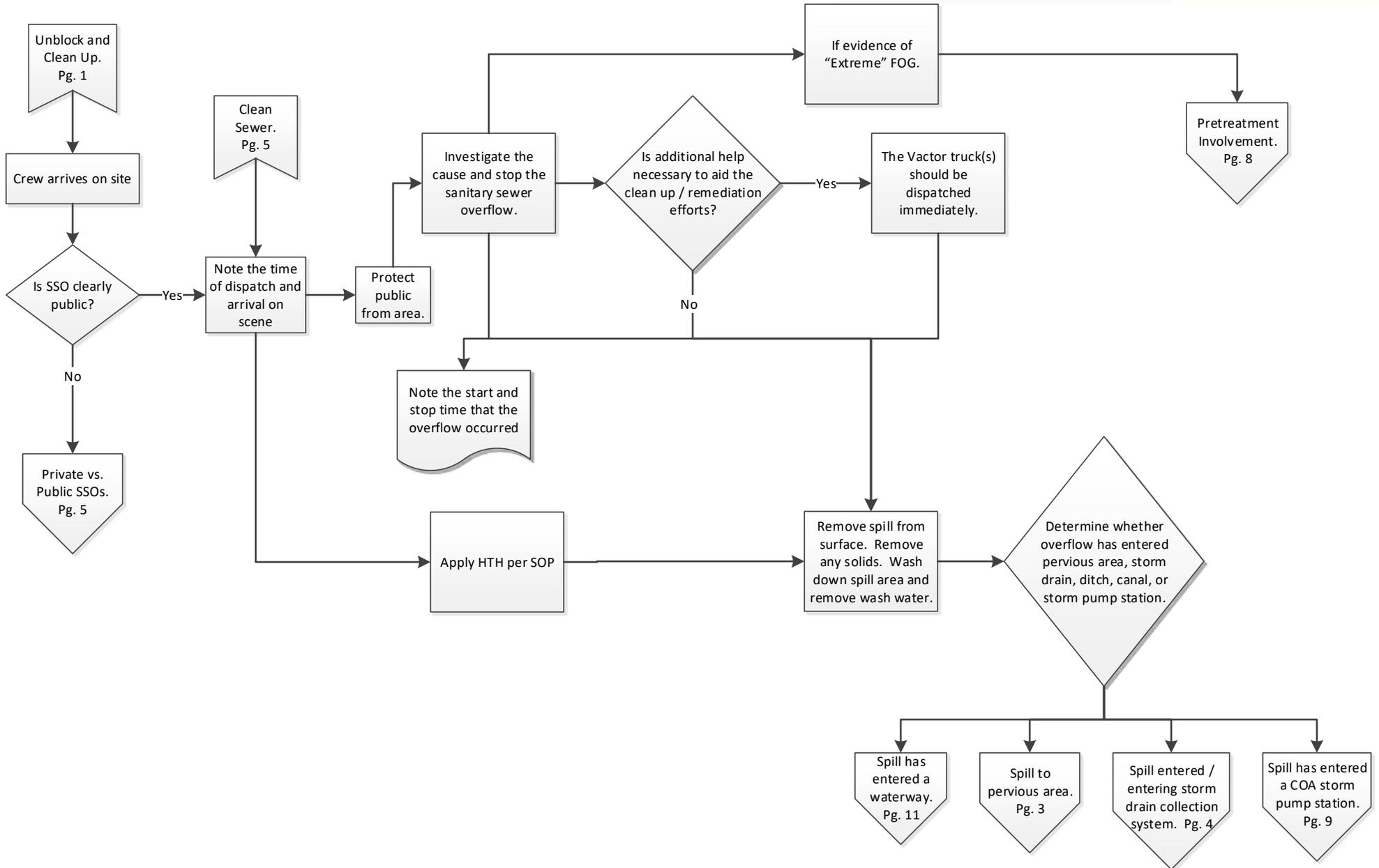
Albuquerque Bernalillo County Water Utility Authority

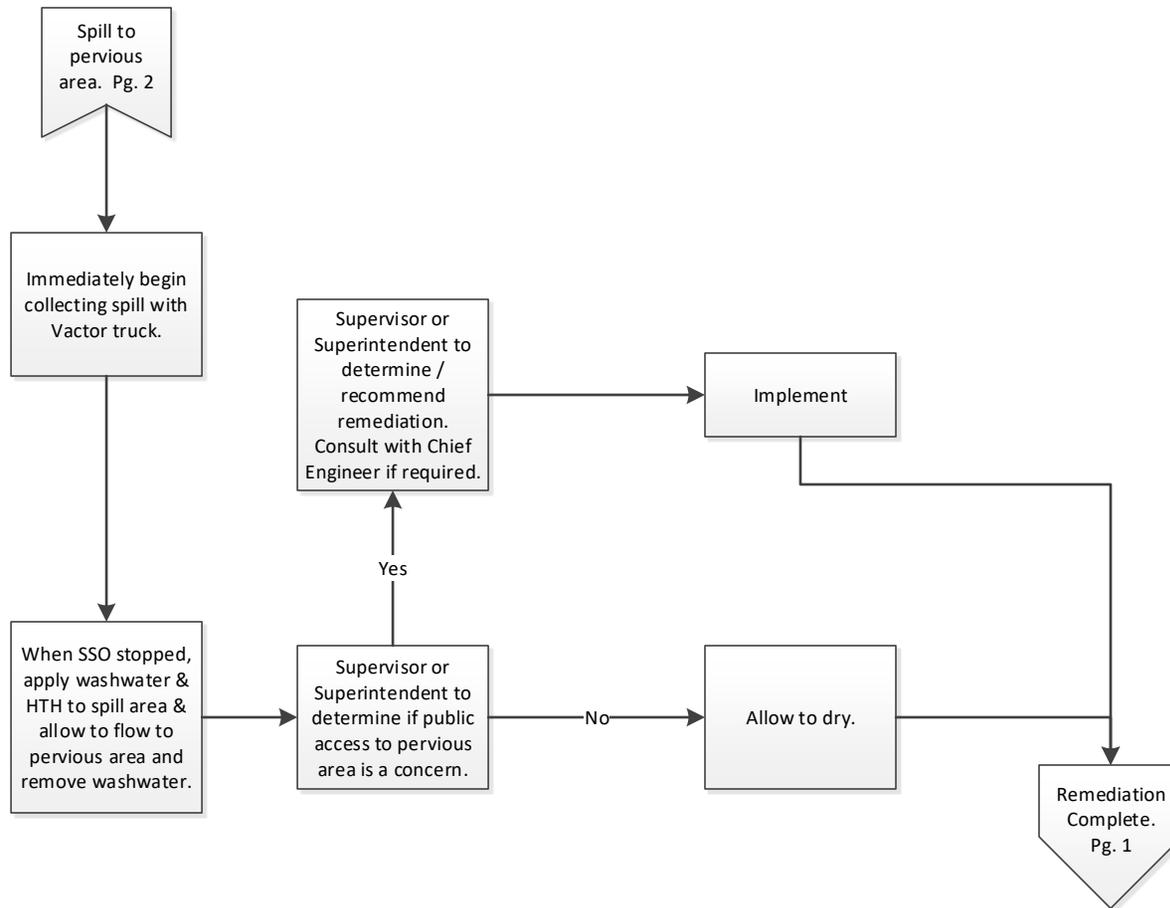


# Overflow Emergency Response Plan

12-1-2019

Albuquerque Bernalillo County Water Utility Authority



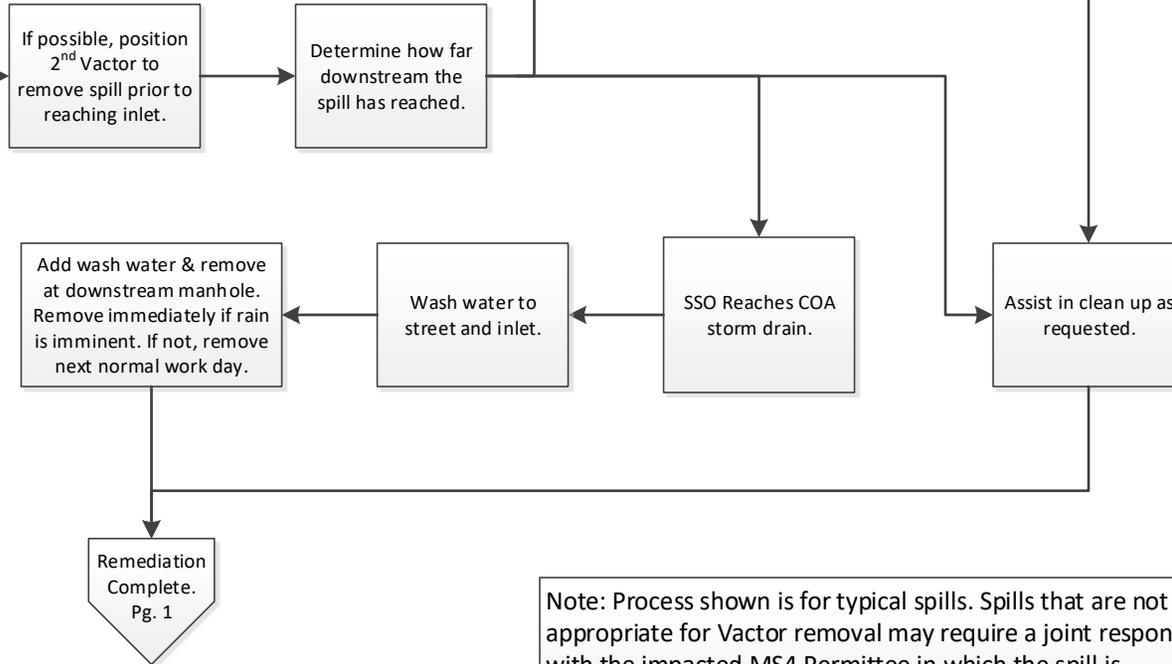


# Overflow Emergency Response Plan

12-1-2019

Albuquerque Bernalillo County Water Utility Authority

Spill entered / entering storm drain collection system. Pg. 2



SSO Reaches	Contact			
	Name	Position	Office	Cell
AMAFA Facility	Jerry Lovato*	Executive Engineer	884-2215	362-0020
Bernalillo County Facility	Patrick E. Chavez#	Storm Drainage Maintenance Manager	848-1505	934-2704
NMDOT Facility	Thomas Kratochvil	District 3: Assistant District Engineer-Maintenance	N/A	228-8169
COA Facility	Kathy Verhage **	Senior Engineer	768-2778	803-8058

Note: Process shown is for typical spills. Spills that are not appropriate for Vactor removal may require a joint response with the impacted MS4 Permittee in which the spill is captured, treated, and determined appropriate for release.

\*If Jerry Lovato is not immediately available, call:  
 Nolan Bennett: Field Engineer (505) 301-6941  
 Sal Hernandez: Superintendent (505) 366-8209

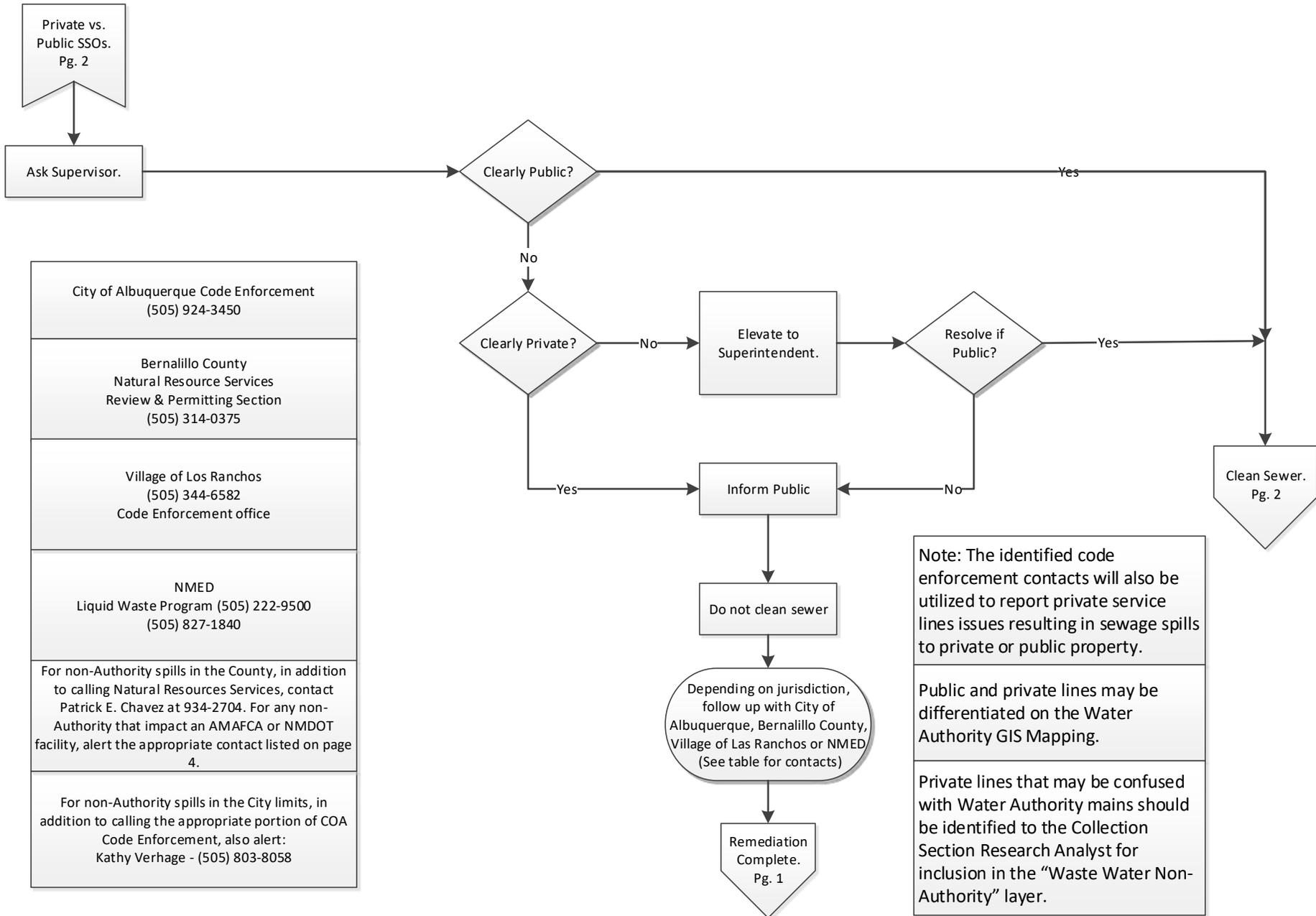
\*\*If Kathy Verhage is not immediately available, call:  
 David Harrison: Engr. Div. Manager (505) 238-4158  
 Carl Rinkenberger: O&M Manager (505) 250-4334  
 Daniel Tapia: O&M Supt (505) 228-6874

#If Patrick E. Chavez is not immediately available, call:  
 Kali Bronson: Stormwater Program Compliance Manager (505) 401-1779

# Overflow Emergency Response Plan

12-1-2019

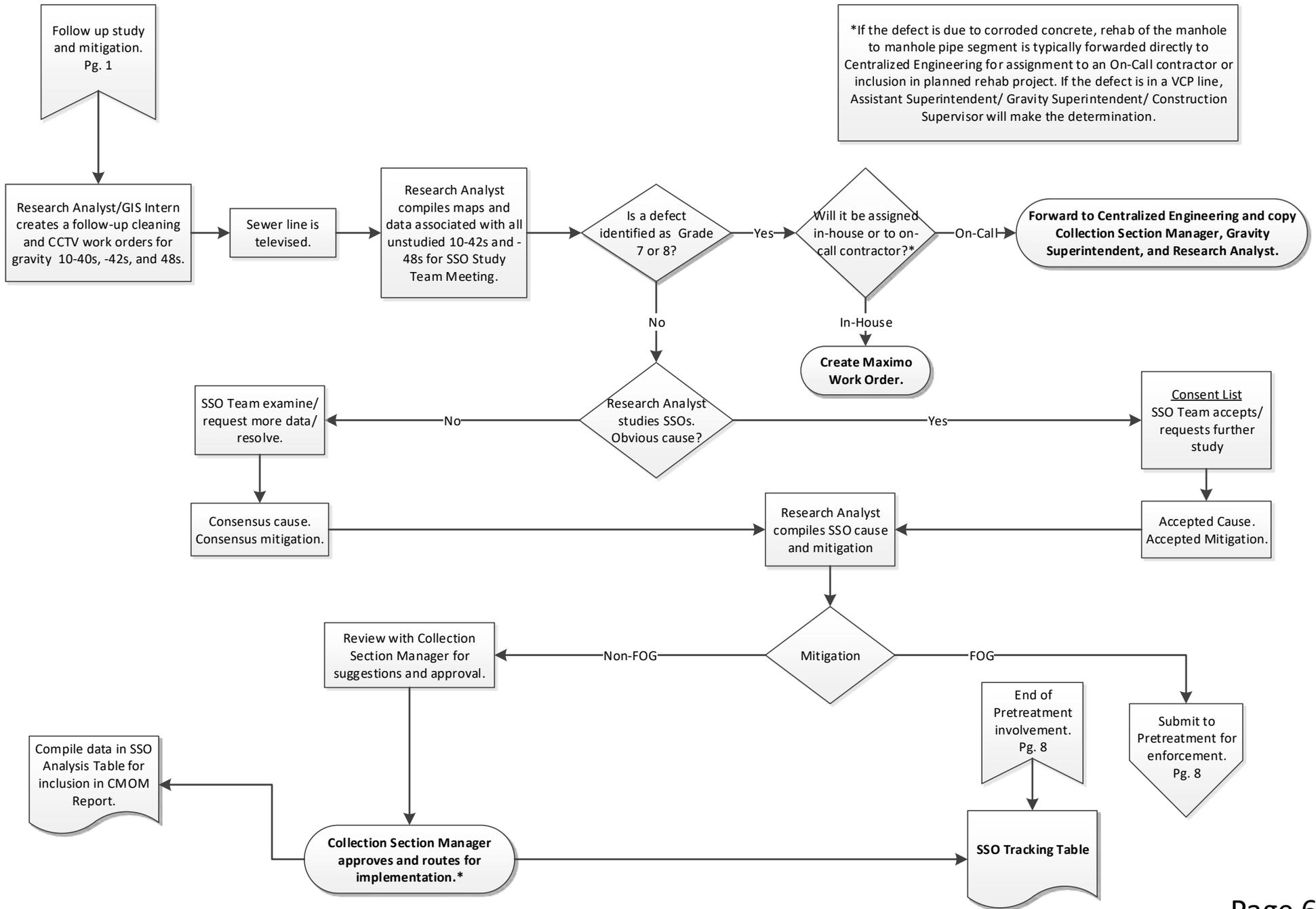
Albuquerque Bernalillo County Water Utility Authority



# Overflow Emergency Response Plan

12-1-2019

Albuquerque Bernalillo County Water Utility Authority

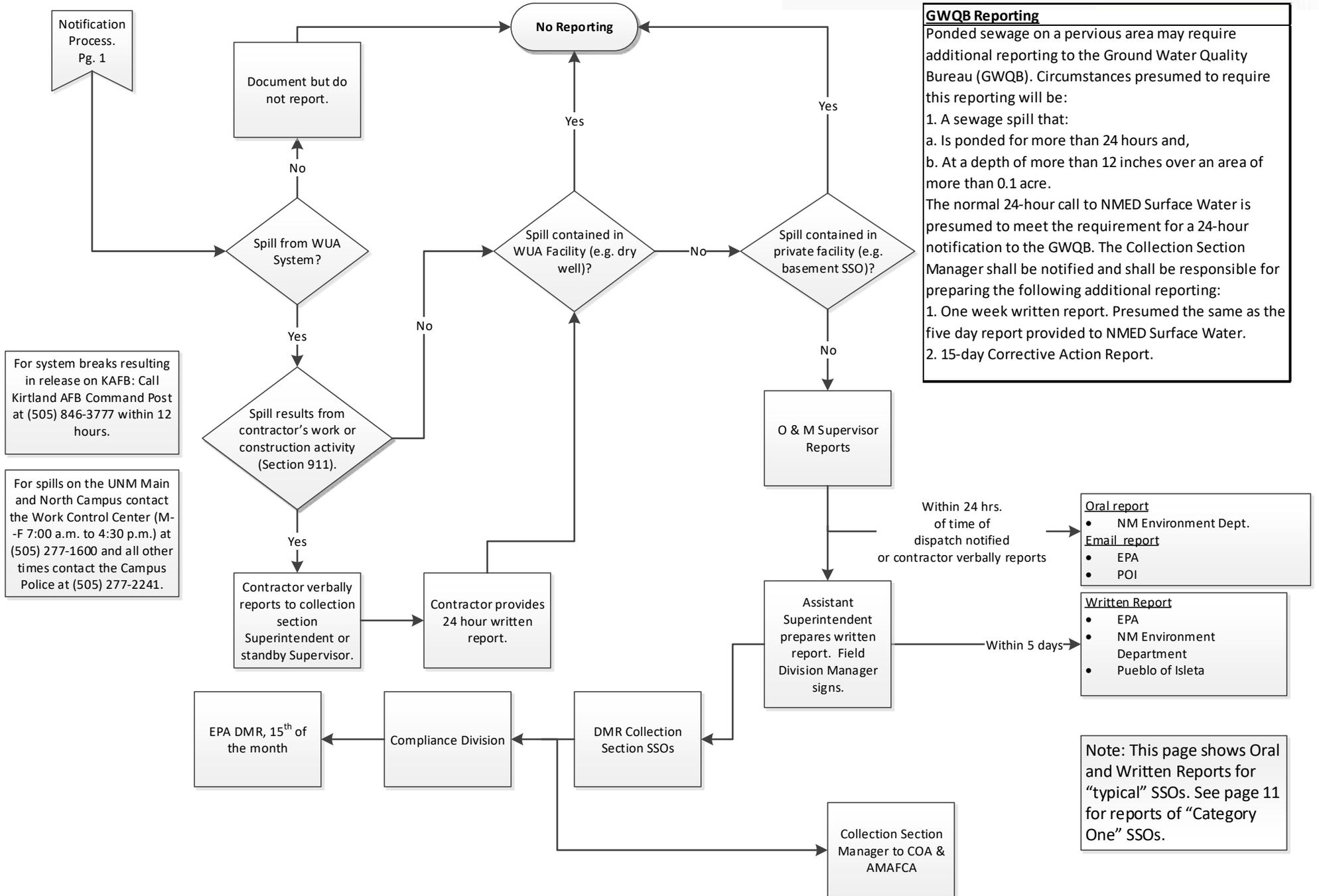


# Overflow Emergency Response Plan

12-1-2019

Albuquerque Bernalillo County Water Utility Authority

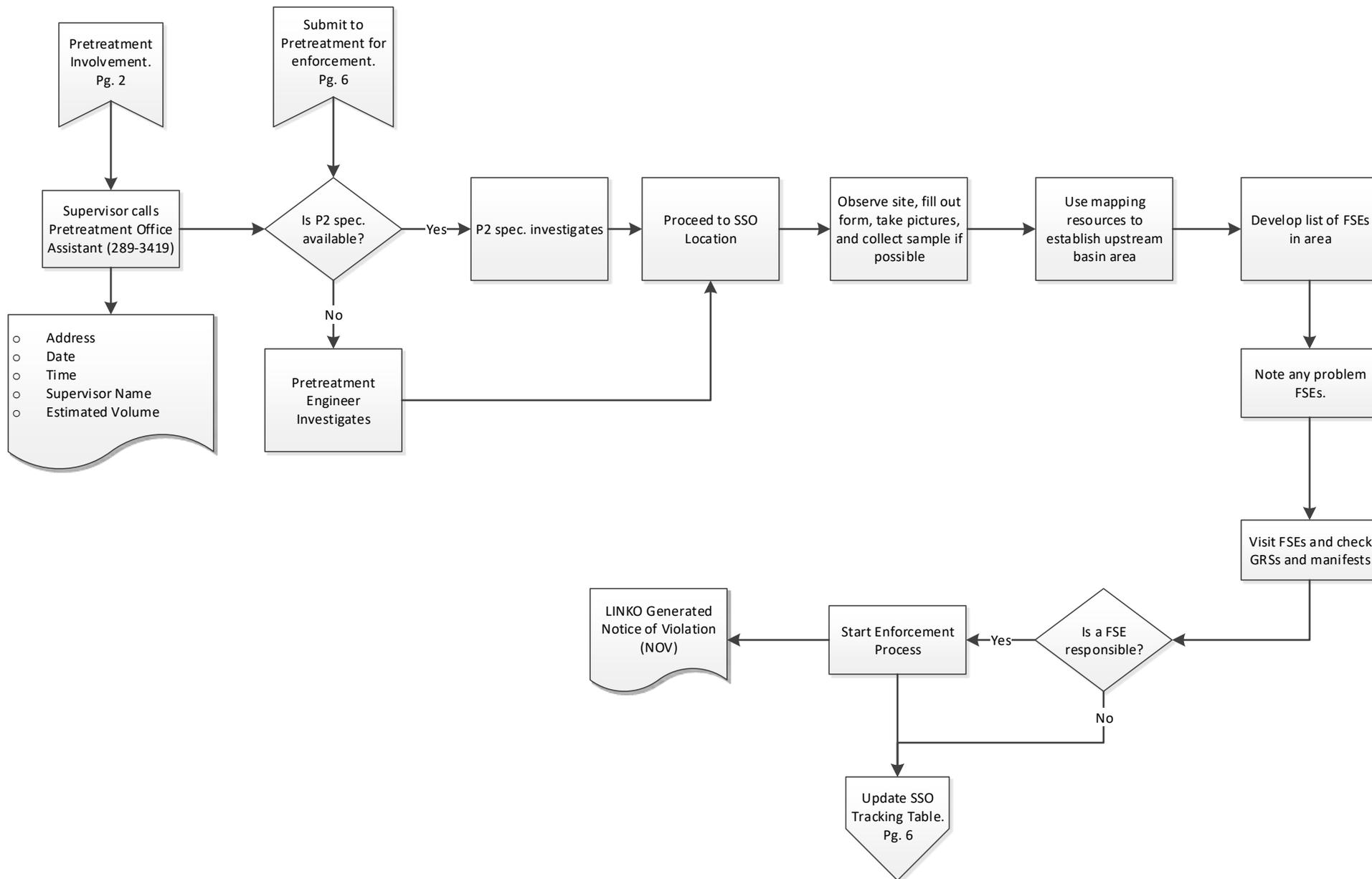
**GWQB Reporting**  
 Pondered sewage on a pervious area may require additional reporting to the Ground Water Quality Bureau (GWQB). Circumstances presumed to require this reporting will be:  
 1. A sewage spill that:  
 a. Is ponded for more than 24 hours and,  
 b. At a depth of more than 12 inches over an area of more than 0.1 acre.  
 The normal 24-hour call to NMED Surface Water is presumed to meet the requirement for a 24-hour notification to the GWQB. The Collection Section Manager shall be notified and shall be responsible for preparing the following additional reporting:  
 1. One week written report. Presumed the same as the five day report provided to NMED Surface Water.  
 2. 15-day Corrective Action Report.

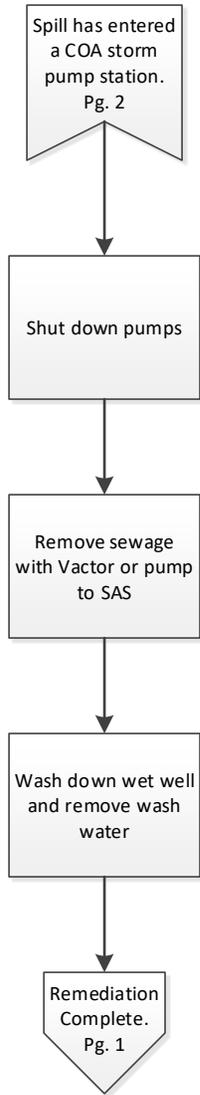


# Overflow Emergency Response Plan

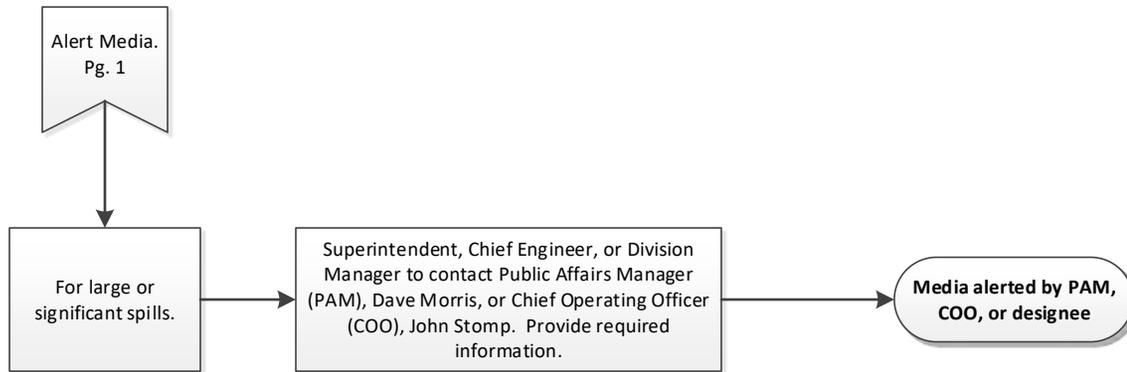
12-1-2019

Albuquerque Bernalillo County Water Utility Authority

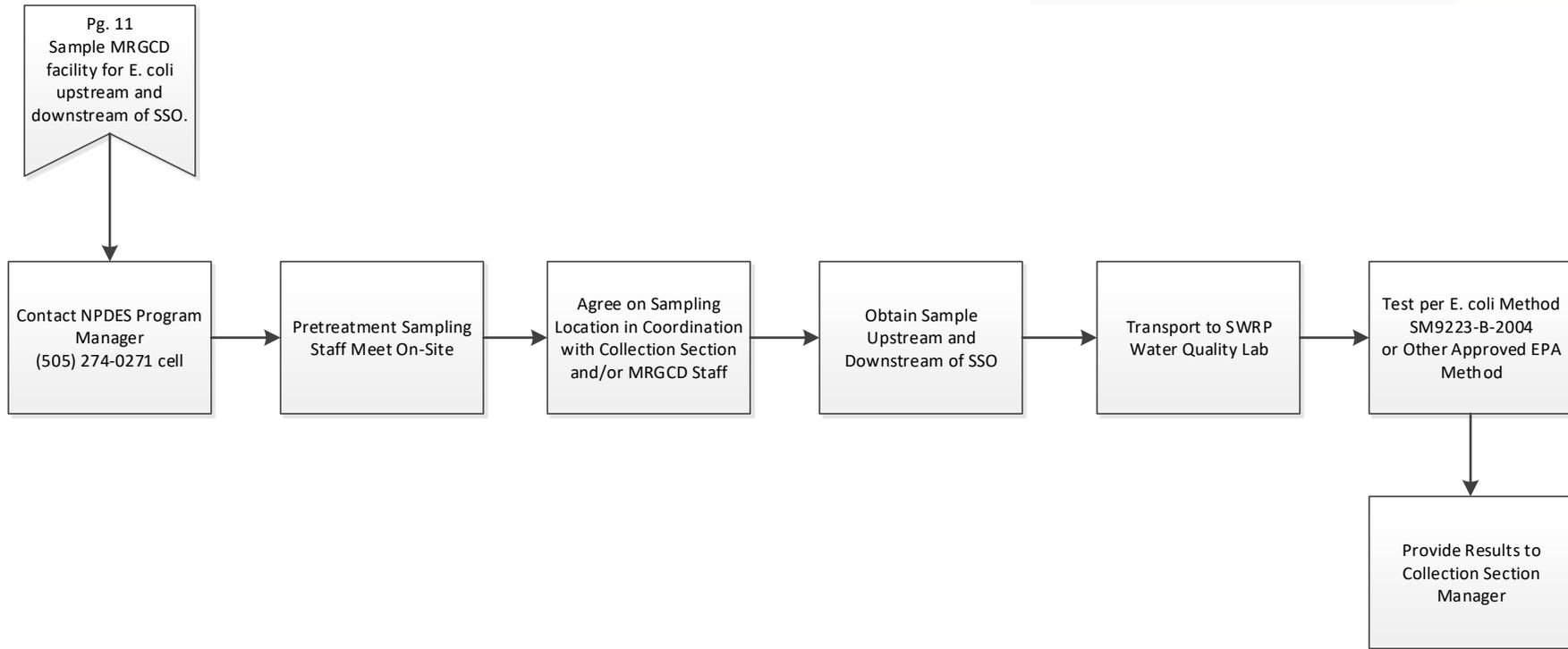




Note: Process shown is for typical spills. Some spills may require a joint response with the City of Albuquerque in which the spill is captured, treated, and determined appropriate for release.







**Appendix 4      Goal Summary - CY2019 Report**

<b>Goal Summary - CY2019 CMOM Report</b>		
<b>Goal</b>	<b>Timing</b>	<b>Page # for Discussion</b>
CCTV all gravity pipes suffering a blockage. For all SSOs, determine a cause and mitigation and report in the next CMOM report	Annually	6
Public advertising	On-Going	11
FSE flier in Chinese	FY2021	11
Update OERP	As required	12
CCTV a portion of system	Ten Year goal. Report annually.	13
Force main inspection program	Annually	15
Perform an air pocket profile, utilizing a smart ball, of Lift Station 20's north force main.	CY2020	15
Clean a portion of the system	Ten Year goal. Report annually.	14
Compare root foaming effectiveness versus mechanical cleaning. Finalize Internal Report.	CY2020	15
SSOs: Decrease number and mitigate impact.	On-Going	16

## Appendix 5

## Portion of Permit Effective 12/1/2019

Selected pages providing Collection System and CMOM requirements



REGION 6  
1201 ELM STREET, SUITE 500  
DALLAS, TEXAS 75270

NPDES Permit No NM0022250

## AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. 1251 et. seq; the "Act"),

Albuquerque Bernalillo County Water Utility Authority (ABCWUA) WWTP  
PO Box 568  
Albuquerque, NM 87103

is authorized to discharge from a facility located at 4201 2nd Street SW, Bernalillo County, New Mexico. The discharge will be to receiving water named Rio Grande River (Segment 20.6.4.105 of the Middle Rio Grande River Basin), from a point located approximately:

Outfall 001: Latitude 35° 01' 04" North and Longitude 106° 40' 13" West

in accordance with this cover page and the effluent limitations, monitoring requirements and other conditions set forth in Part I, Part II, III and Part IV.

This permit, prepared by Tung Nguyen, Environmental Engineer, Permitting Section (WDPE), supersedes and replaces NPDES Permit No. NM0022250 with an effective date of October 1, 2012.

This permit shall become effective on *December 1, 2019*

This permit and the authorization to discharge shall expire at midnight, *November 30, 2024*

Issued on OCT 10 2019

*Charles W. Maguire*  
Charles W. Maguire  
Director  
Water Division (WD)  
*for*

**2. FLOATING SOLIDS, VISIBLE FOAM AND/OR OILS**

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge of visible films of oil, globules of oil, grease or solids in or on the water, or coatings on stream banks.

**3. SAMPLE LOCATION**

Samples taken in compliance with the monitoring requirements specified above shall be taken at the discharge from the final treatment unit prior to the receiving stream. The sample point shall be clearly marked by the facility if it is not at the final outfall location. There shall be no flow from any source into the piping system after the sample point and prior to the final outfall.

**B. SCHEDULES OF COMPLIANCE**

None

**C. MONITORING AND REPORTING (MAJOR DISCHARGERS)**

Discharge Monitoring Report (DMR) results shall be electronically reported to EPA per 40 CFR 127.16. To submit electronically, access the NetDMR website at <https://netdmr.epa.gov>. Until approved for Net DMR, the permittee shall request temporary or emergency waivers from electronic reporting. To obtain the waiver, please contact: U.S. EPA - Region 6, Water Enforcement Branch, New Mexico State Coordinator (6EN-WC), (214) 665-7179. If paper reporting is granted temporarily, the permittee shall submit the original DMR signed and certified as required by Part III.D.11 and all other reports required by Part III.D. to the EPA and copies to POI (refer to attached "PUEBLO OF ISLETA REPORTING REQUIREMENT"), NMED (under Part III.D.4 of the permit). Reports shall be submitted monthly.

1. Reporting periods shall end on the last day of the month.
2. The permittee is required to submit regular reports as described above postmarked no later than the 15<sup>th</sup> day of the month following each reporting period.
3. The annual sludge report required in part IV of the permit is due on February 19 of each year and covers the previous calendar year from January 1 through December 31.
4. **NO DISCHARGE REPORTING:** If there is no discharge at Outfall 001 during the sampling month, place an "X" in the NO DISCHARGE box located in the upper right corner of the Discharge Monitoring Report.
5. If any 7-day average or 30-day average value exceeds the effluent limitations specified in Part I.A, the permittee shall report the excursion in accordance with the requirements of Part III.D.
6. Any 7-day average or 30-day average value reported in the required Discharge Monitoring Report which is in excess of the effluent limitation specified in Part I.A shall constitute evidence of violation of such effluent limitation and of this permit.

7. Other measurements of oxygen demand (e.g., TOC and COD) may be substituted for the five days Biochemical Oxygen Demand (BOD<sub>5</sub>), or for the five-day Carbonaceous Biochemical Oxygen Demand (CBOD<sub>5</sub>), as applicable, where the permittee can demonstrate long term correlation of the method with BOD<sub>5</sub> or CBOD<sub>5</sub> values, as applicable. Details of the correlation procedures used must be submitted and prior approval granted by the permitting authority for this procedure to be acceptable. Data reported must also include evidence to show that the proper correlation continues to exist after approval.

#### **D. OVERFLOW REPORTING**

The permittee shall report all overflows with the Discharge Monitoring Report submittal. These reports shall be summarized and reported in tabular format. The summaries shall include: the date, time, duration, location, estimated volume, and cause of the overflow; observed environmental impacts from the overflow; actions taken to address the overflow; and ultimate discharge location if not contained (e.g., storm sewer system, ditch, tributary).

Overflows that endanger health or the environment shall be reported via email to EPA (Part III.D.7) within 24 hours, to POI (refer to attached "PUEBLO OF ISLETA REPORTING REQUIREMENT") immediately, and to NMED Surface Water Quality Bureau at (505) 827-0187 within 24 hours from the time the permittee becomes aware of the circumstance. A written report of overflows that endanger health or the environment shall be provided to EPA, POI and the NMED Surface Water Quality Bureau within 5 days of the time the permittee becomes aware of the circumstance.

#### **E. POLLUTION PREVENTION REQUIREMENTS**

The permittee shall institute a program within 12 months of the effective date of the permit (or continue an existing one) directed towards optimizing the efficiency and extending the useful life of the facility. The permittee shall consider the following items in the program:

- a. The influent loadings, flow and design capacity;
- b. The effluent quality and plant performance;
- c. The age and expected life of the wastewater treatment facility's equipment;
- d. Bypasses and overflows of the tributary sewerage system and treatment works;
- e. New developments at the facility;
- f. Operator certification and training plans and status;
- g. The financial status of the facility;
- h. Preventative maintenance programs and equipment conditions and;
- i. An overall evaluation of conditions at the facility.

**B. 24-HOUR ORAL REPORTING: DAILY MAXIMUM LIMITATION VIOLATIONS**

Under the provisions of Part III.D.7.b.(3) of this permit, violations of daily maximum limitations for the following pollutants shall be reported orally to EPA Region 6 (email accepted), Compliance and Assurance Division, Water Enforcement Branch (6EN-W), Dallas, Texas and concurrently to POI (immediate report under attached PUEBLO OF ISLETA REPORTING REQUIREMENT) and to NMED within 24 hours from the time the permittee becomes aware of the violation followed by a written report in five days.

E. coli, TRC, and Mercury

**C. PERMIT MODIFICATION AND REOPENER**

In accordance with [40 CFR Part 122.44(d)], the permit may be reopened and modified during the life of the permit if relevant portions of Pueblo of Isleta WQS, New Mexico's Water Quality Standards for Interstate and Intrastate Streams are revised, or new State water quality standards are established and/or remanded by New Mexico Water Quality Control Commission, respectively.

In accordance with [40 CFR Part 122.62(s)(2)], the permit may be reopened and modified if new information is received that was not available at the time of permit issuance that would have justified the application of different permit conditions at the time of permit issuance. Permit modifications shall reflect the results of any of these actions and shall follow regulations listed at [40 CFR Part 124.5].

**D. CONTRIBUTING INDUSTRIES AND PRETREATMENT REQUIREMENTS**

See attached Appendix B of Part II; reports shall be due annually.

**E. CAPACITY, MANAGEMENT OPERATIONS AND MAINTENANCE (CMOM)**

The permittee shall continue to implement and update (if necessary) the Capacity, Management, Operation and Maintenance (CMOM) plan.

**PUEBLO OF ISLETA REPORTING REQUIREMENT**

**NPDES PERMIT PART I.C: MONITORING AND REPORTING**

- Email all "Discharge Monitoring Reports" to [notifications@isletapueblo.com](mailto:notifications@isletapueblo.com). No hard copy reports are required.

**NPDES PERMIT PART I.D: OVERFLOW REPORTING**

**Category One Protocol:** Overflow events from a broken line or spill that could or will discharge to the Rio Grande and/or reach the Pueblo through a drain, culvert, canal, or other feature:

Step 1: Immediately following the overflow event, contact the following numbers until a live person is reached. In the event there is no answer, leave a message on each number.

Position	Name	Office Number	Cell Number
Emergency Dispatch	N/A	505.869.3030	N/A
Environment Division Manager	Ruben Lucero	505.869.9819	505.917.8346
Transportation Division Manager	James Weldon	505.869.9818	505.933.1225 or 505.417.0124
Water Quality Specialist	Cody Walker	505.869.9623	505.220.4595

Pueblo of Isleta (POI) may update the contact information above. After updating, POI should send it to EPA and the permittee a copy via email or mail.

Step 2: Email all "Overflow Monitoring Report(s)" to [notifications@isletapueblo.com](mailto:notifications@isletapueblo.com). No hard copy reports are required.

**Category Two Protocol:** Overflow events from a broken line or spill that will not discharge to the Rio Grande and/or reach the Pueblo through a drain, culvert, canal, or other feature:

Step 1: Email all "Overflow Monitoring Report(s)" to [notifications@isletapueblo.com](mailto:notifications@isletapueblo.com). No hard copy reports are required.

Step 2: No additional steps are necessary.

**NDPES PERMIT PART II.B: 24-HOUR ORAL REPORTING: DAILY MAXIMUM LIMITATION VIOLATIONS**

Step 1: Immediately contact the following numbers until a live person is reached. In the event there is no answer, leave a message on each number.

Position	Name	Office Number	Cell Number
Emergency Dispatch	N/A	505.869.3030	N/A

NPDES PERMIT NO. NM 0022250

Environment Division Manager	Ruben Lucero	505.869.9819	505.917.8346
Transportation Division Manager	James Weldon	505.869.9818	505.933.1225 or 505.417.0124
Water Quality Specialist	Cody Walker	505.869.9623	505.220.4595

Pueblo of Isleta (POI) may revise the contact information above. After revising, POI should send it to EPA and the permittee a copy via email or mail.

Step 2: Email all "Daily Maximum Limitation Violation Report(s)" to [notifications@isletapueblo.com](mailto:notifications@isletapueblo.com). No hard copy reports are required.



# SSO Risks Increase with Flow

Top to bottom cleaning  
doesn't cut it in small  
diameter sub-basins

*Mark S. Holstad*



Collection systems have long focused operations and maintenance (O&M) efforts where sanitary sewer overflows (SSOs) were most likely. Hot-spot cleaning programs exist because SSOs are more likely to recur in segments that previously experienced a spill. Likewise, closed-circuit television (CCTV) has long identified pipe defects to enable allocation of rehabilitation funds where most needed. Now, utilities are developing and using increasingly sophisticated means to understand where system problems are likely to occur. The concepts of *just-in-time* and *not-too-late* O&M and rehab are coming closer and will be based on timely and direct observations.

Asset management is a powerful tool to minimize risk by assigning values for the likelihood and consequence of failure for all assets in a system. Likelihood scores for sewer pipe segments typically are assigned based on such direct observations as CCTV, pipe age, pipe material, and history.

But what if it were possible to determine the likelihood of a spill based simply on a pipe segment's location in the system? This is the question the Albuquerque Bernalillo County Water Utility Authority in New Mexico sought to answer in response to a perceived high frequency of sewer troubles in the top segments of its system.

### **Smarter To Clean Only the Bottom Half?**

The water authority possesses a comprehensive database that can be used to identify patterns. For example, a 2017 in-house study found a line segment with a previous reportable SSO is 34 times more likely to experience a future reportable SSO than the system as a whole. Therefore, in 2018, the water authority increased its hot-spot cleaning program by 27% (the length of pipes cleaned) in each cycle.

Now, a different study has indicated that the bottom half (roughly) of the small diameter system has a spill rate to the environment and to private properties that is approximately 4.7 times greater than the spill rate in the top half.

This finding seems to indicate an opportunity to improve the collection system preventive maintenance program further using the easily identifiable location of the pipes in the system.

### **Sewer Troubles Versus Location**

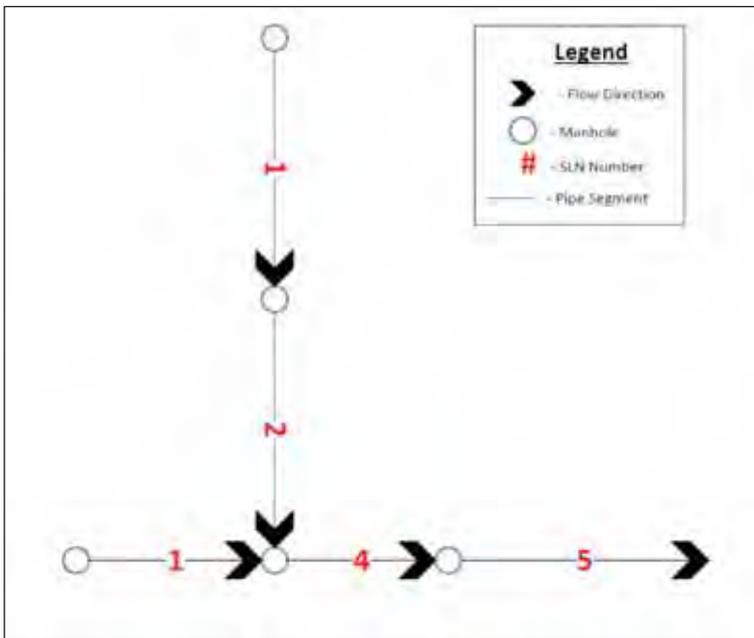
The authority developed a simple, counting scheme based on its geographic information system. The scheme assigns a Segment Loading Number (SLN) to each manhole-to-manhole pipe segment. Figure 1 (p. 44) shows how SLNs were assigned.

### System Data by Segment Loading Number (SLN)

SLN	Segment Count		Length		Sewer Troubles (in 6.25 years)			Upper / Lower	Portion of Length	Rate (Number per 100 miles per year)					
	Number	Percent	Miles	Percent	Sewer Backup	Reportable SSO	Property Damage			Sewer Backup	Reportable SSO	Property Damage	Spill	Trouble	
1	974	29.1%	45.8	28.6%	18	0	4	Upper	54.1%	5.9	0.4	1.1	1.5	7.4	
2	491	14.7%	25.4	15.9%	10	2	2								
3	336	10.0%	15.5	9.7%	4	0	0								
4	216	6.5%	10.1	6.3%	6	2	1								
5-6	291	8.7%	13.3	8.3%	6	1	5	Lower	45.9%	12.8	3.9	3.0	7.0	19.8	
7-9	231	6.9%	11.5	7.2%	13	4	2								
10-15	236	7.1%	11.2	7.0%	6	2	1								
16-25	181	5.4%	8.7	5.4%	12	0	1								
26-50	211	6.3%	9.8	6.1%	10	4	2	Total	100%	9.1	2.0	2.0	4.0	13.1	
51-346	180	5.4%	9.0	5.6%	6	5	2								
Totals	3347	100.0%	160.4	100.0%	91	20	20								

As described in Figure 1 (below), each manhole-to-manhole segment is assigned an SLN. The number of segments was determined for each SLN and the length of the segments also was determined. Note the similarity of the composition by SLN for both count and length. The sewer troubles that had occurred over the past 6.25 years for each segment were assigned to the corresponding SLN. Sewer trouble rates were thereby determined for the upper and lower portions of the sub-basins studied.

Figure 1. Segment Loading Number (SLN) Example



The SLN identifies the number of segments loading to a pipe segment connecting two manholes. In this example, the SLN is 1 for the two dead-end pipe segments. Downstream SLNs are the sum of the SNLs loading to a manhole plus 1. SLNs were assigned using a simple GIS-based process.

### Try It Yourself

To expand the scope of this work, the Albuquerque Bernalillo County Water Utility Authority in New Mexico is offering its assessment tool to other utilities. This easy and written GIS process can be used to evaluate systems in terms of the median SLN and to match sewer troubles to segments. Readers are encouraged to study their systems and share their findings.

To receive the tool, contact Mark S. Holstad at [mholstad@abcwua.org](mailto:mholstad@abcwua.org).

### Weigh In

Likewise, a survey has been created to help further this discussion. Visit [bit.ly/SSO-insights](http://bit.ly/SSO-insights) to provide your input and thoughts on how collection system operations and maintenance can be improved.

SLNs were thereby determined for 3347 segments of 200- to 300-mm (8- to 12-in.) pipe. This 257 km (160 mi) of pipes represent approximately 8% of the small diameter pipe in the system. Figure 2 (p. 46) shows how the assignments look in one of the three sub-basins that received assignments. These sections also represent the three sub-basins with the highest sewer trouble and spill frequency.

Each of the water authority’s three types of sewer problems then was matched to each manhole-to-manhole pipe segment and thereby to each SLN. The table left and figures 3 and 4 (pp. 46 and 47, respectively) show for a summary of these findings.

The water authority performed this study because many sewer troubles were observed in dead-end (SLN = 1) lines and those nearby. The initial hypothesis was poor hydraulics or other factors caused disproportionate troubles in these upper lines. However, this initial hypothesis — that the upper portions of the system suffer more troubles — was turned on its head.

It was not anticipated that so much (28.6%) of the system is a dead-end segment. Nor that the median segment (SLN = 3) is no more than two segments from a dead-end. SLN assignments 1, 2, and 3 make up more than half (54.1%) of the system. This upper portion of the system suffered a lower trouble rate (defined as number per year per 100 miles of line) than the lower portion, 7.4 versus 19.8, respectively. Spills were even more disproportionate with rates of 1.5 and 7.0, respectively.

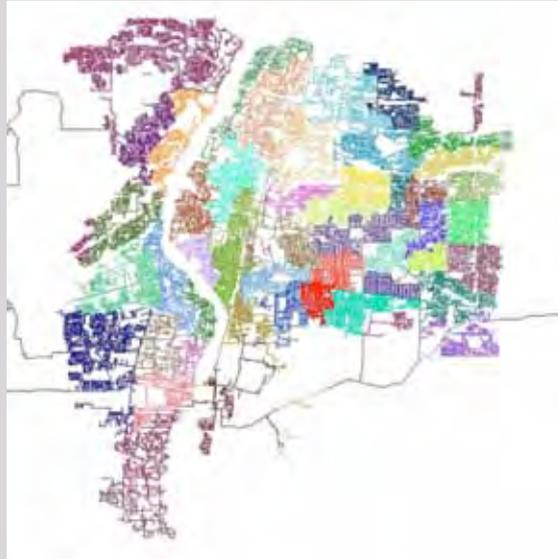
### What’s Up in the Upper Portion?

Why did fewer sewer troubles occur in the upper portions of the system? Obviously flow rates increase from top to bottom and the upper portion has lower flows. The February 2003 article, “Movement Mechanisms of Gross Solids in Intermittent Flow,” by Littlewood and Butler in *Water Science & Technology*, states that upper reaches of a collection system are subject to intermittent flows in which solids “hop” with each pulse and then come to rest awaiting the next pulse. Only in the downstream

## About the Albuquerque Bernalillo County Water Utility Authority

The water authority utilizes an area-wide cleaning program consisting of 49 sub-basins that are cleaned, top to bottom, no less than every 10 years. Area-wide and hot-spot cleaning programs are gravity pipe cleaning programs utilized by the water authority, along with most utility programs, to clean the entire system and known problem locations, respectively.

Only small diameter pipes — defined as 300-mm (12-in.) and smaller — are included in the area-wide and hot-spot cleaning programs. The small diameter lines make up approximately 90% of the total length of the gravity pipes. The water authority has a separate large diameter pipe cleaning program.



segments, does flow build up to a quasi-steady flow for which standard engineering techniques such as Manning’s Formula are applicable. While flow conditions are different in the upper reaches and are not easily analyzed, quite possibly the system works better under intermittent flow, at least in terms of blockages and SSOs. Pipe systems do not necessarily need to be differently designed due to intermittent flow conditions.

It also is important to differentiate the effect of sewer troubles. Simply put, spills are much more significant than sewer back-ups. Costs to the water authority from a back-up include pulling a crew from its typical duties as well as administrative and documentation costs. However, each reportable SSO requires several costly reports and a loss

of credibility with regulatory agencies, affected municipal separate storm sewer systems (MS4s), downstream communities, and the public. Property damage spills are even worse and can be extremely damaging to customers as well as result in severe financial and credibility damage to the water authority.

Therefore, the water authority has a vested interest in identifying the portion of the system more prone to spills and increasing O&M efforts to reduce them. And the data collected show that spills occur much less often in the upper portions of the system than in the lower portion. In fact, the difference is even greater than for the sewer back-ups. Just as Littlewood and Butler described how hydraulic conditions in the upper and lower reaches

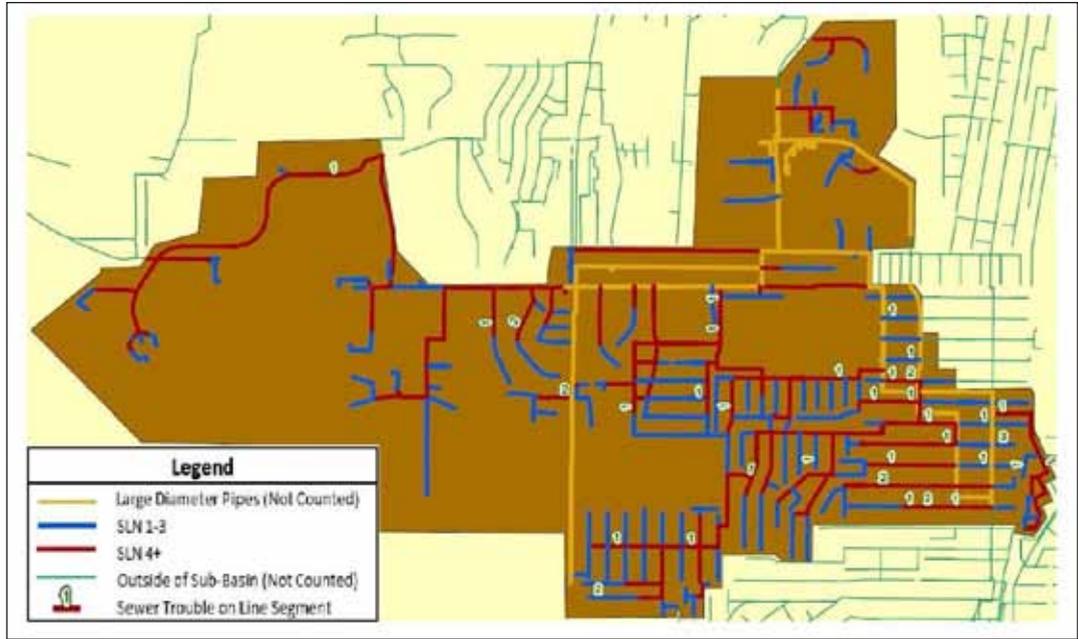
## Albuquerque’s Sewer Terminology

- *Sewer back-up* — A gravity line blockage that does not result in a spill, or in the vacuum system, a low vacuum (low vac) that causes a customer service disruption. Does not result in a reportable SSO or property damage.
- *Reportable SSO* — An overflow of wastewater from the system that is reported to regulatory agencies and a downstream community.
- *Property damage spills* — An overflow of wastewater sewage from the system that, while not a reportable SSO, results in damage to private property.
- *Sewer troubles* — The total of sewer back-ups + reportable SSOs + property damage spills
- *Spills* — The total of reportable SSOs + property damage spills

While included in all required reporting, for this article, sewer troubles were omitted if they were non-O&M related — that is caused by contractor hits, construction debris, burps, line breaks, etc.

**Figure 2. An Area-Wide Basin**

Sub-basins form the water authority's area-wide cleaning program for 200- to 300-mm (8- to 12-in.) pipes, which are cleaned top-to-bottom every 10 years. This is one of the three studied sub-basins. Shown are the upper and lower portions as determined by SLN as well as the sewer troubles on each segment. Pipes 375 mm (15 in.) and larger are not included in the area-wide cleaning program and were not assigned SLNs.



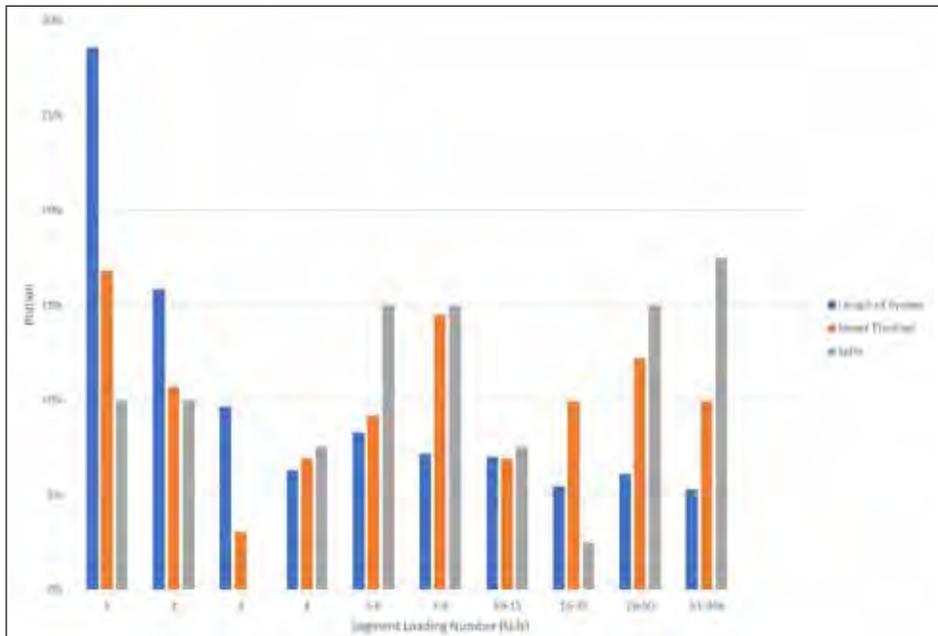
of the system differ, the blockage mechanisms resulting in a spill also may differ.

The water authority has developed a mechanistic blockage model addressing a catastrophic failure resulting in a spill. This model indicates that intermittent flows in the upper reaches of the system may develop blockages more slowly than in

locations with continuous flow.

Possibly more significant is that relatively low flow in the upper portion of the system takes time to accumulate. A spill does not occur until the blockage causes upstream manholes and pipes to fill to the level of a manhole cover or plumbing fixture; even with a 100% blockage, the flow is so low that more than a day could be needed to cause a spill. That's time for the blockage to be noted and corrected before it becomes a spill, and even a small leak in blockage could allow enough flow through to prevent a spill from occurring.

**Figure 3. Portion of Pipe Segments by SLN Versus Portion of Sewer Troubles**



Sewer troubles and spills are not evenly distributed throughout the system. At one extreme are the SLN = 1 segments which make up 28.6% of the system but only experience 10.0% of costly spills and 16.8% of total sewer troubles. At the other extreme, segments with an SLN = 51 and greater make up only 5.6% of the system, but experience 9.9% of the trouble and 17.5% of the spills. The spill rate, defined as number per year per 100 mile of pipe is 1.4 for SLN = 1 and 12.4 for SLN = 51 and greater.

**Merely Interesting or Useful?**

Utilities are increasing expenditures to assess and monitor collection systems for the explicit purpose of reducing SSOs. These include CCTV, acoustic inspection devices, and manhole level monitoring products. These programs are intended to identify problems before they cause a spill. The water authority utilizes a risk-based approach to select which lines to CCTV each year. Adding SLN to the CCTV selection criteria is simple and will be utilized in future projects.

More difficult is to change an area-wide preventive maintenance (PM) cleaning program. The

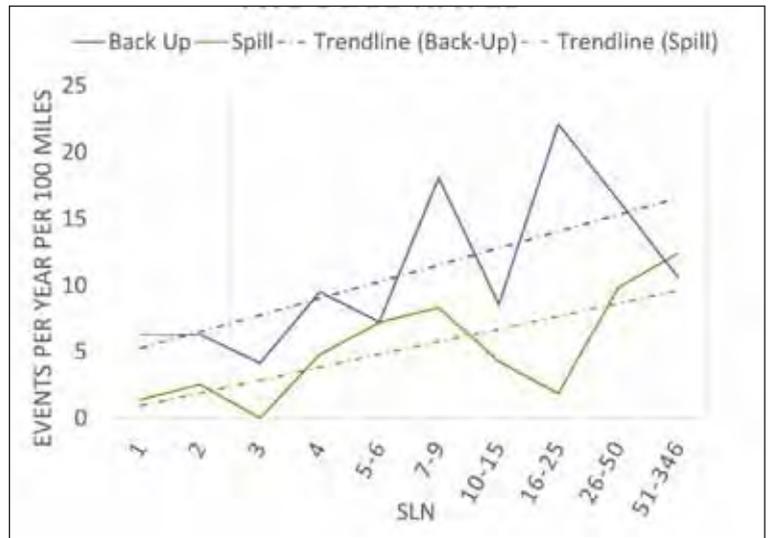


typical utility has an enormous investment in its collection system preventive maintenance program that includes both hot-spot and area-wide cleaning programs. These programs must not be trifled with lightly.

The water authority built its program at great cost in the mid-90s and has since updated as spills occurred and they system expanded. A new program may have advantages but the process to change will be costly and difficult. And other O&M improvements must be delayed. Therefore, the benefit must be significant. The water authority is carefully considering the costs and benefits before

**The typical utility has an enormous investment in its collection system preventive maintenance program that includes both hot-spot and area-wide cleaning programs. These programs must not be trifled with lightly.**

**Figure 4. Back-Up and Spill Rates by SLN**



**Both back-up and spill rates correspond and increase with SLN. Back-ups are sewer blockages that do not result in a spill. Spills may be to the environment or private property. The rate is the number of occurrences per year per 160.9 km (100 mi) of system.**

modifying its PM program.

When such a change is made, however, SLN assignment could play a role. One approach would be to modify the area-wide cleaning program to clean the bottom portion more often than the rest of the system. For instance, the water authority could maintain the same length of piping cleaned each year but focus on the just segments  $SLN \geq 4$ . This would result in fully cleaning the bottom portion twice in 14.6 years and the top portion once. This change is estimated to reduce spills by 12.3%.

**Future Work**

O&M programs are based on available data as well as the perceptions of both O&M departments and regulatory agencies. Continual refinement of theories and practices leads to a better understanding of collection systems and may result in more effective design criteria, regulations, and O&M programs. To continue this work, the water authority plans to study the rest of its systems sub-basins in terms of the median SLN and back-ups and spills. 🌊

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