Appendices

Identified Gaps in the Water Authority Processes with Recommendation to Close

Contents

Capacity, Management, Operations and Maintenance (CMOM) Plan Overview ........................................... 2
  Report Purpose ........................................................................................................................................... 2
  Permit Requirements ................................................................................................................................. 3
  CMOM Program Self-Assessment ............................................................................................................. 3
FOG Policy .................................................................................................................................................. 3
  FOG Enforcement ..................................................................................................................................... 4
SSO Analyses ............................................................................................................................................... 5
  Permit Requirements ............................................................................................................................... 5
  SSO Study Team ...................................................................................................................................... 5
  Causes & Mitigations ................................................................................................................................. 7
  SSO Tabulation & Analysis ....................................................................................................................... 8
Volume Spilled and Recovered ................................................................................................................... 10
Actions Implemented and On-Going Programs ......................................................................................... 11
  General ..................................................................................................................................................... 11
  FOG Policy Implementation: ....................................................................................................................... 11
Overflow Emergency Response Plan (OERP) ............................................................................................... 12
  Closed Circuit Television (CCTV) ............................................................................................................... 13
  Cleaning Program Goal ............................................................................................................................. 14
  Force Main Inspection Program .............................................................................................................. 15
  Root Foaming .......................................................................................................................................... 15
Segment Loading Number (SLN) Analysis ..................................................................................................... 15
  Odor Complaints ....................................................................................................................................... 15
Identified Gaps in the Water Authority Processes with Recommendation to Close ..................................... 16
  Prohibited Discharges, i.e., SSOs ............................................................................................................... 16
Appendices .................................................................................................................................................... 17
  Appendix 1  Sanitary Sewer Overflow Analysis Table .............................................................................. 18
  Appendix 2  Sanitary Sewer Overflow Volume Captured Analysis Table .................................................. 19
  Appendix 3  Overflow Emergency Response Plan (OERP) ....................................................................... 20
  Appendix 4  Goal Summary - CY2019 Report ......................................................................................... 21
  Appendix 5  Portion of Permit Effective 12/1/2019 .................................................................................. 22
  Appendix 6  SSO Risks Increase with Flow – WE&T Article ................................................................. 23
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.

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.

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&amp;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 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

<table>
<thead>
<tr>
<th>10-40</th>
<th>Sewer Backup</th>
<th>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).</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-42</td>
<td>SSO Reportable</td>
<td>An overflow of sewage from the system that may impact surface waters. These are reported to the EPA and other locally impacted stakeholders.</td>
</tr>
<tr>
<td>10-48</td>
<td>Property Damage</td>
<td>An overflow of sewage from the system that results in damage to private property. These are not reportable under current definitions.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Cause(s) of SSO from DMR</th>
<th>Causes determined from CCTV</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO - Construction</td>
<td>DB - Debris</td>
</tr>
<tr>
<td>CU-Cause Unknown</td>
<td>RK - Rocks</td>
</tr>
<tr>
<td>EQ - Equipment Failure</td>
<td>GR - Grease</td>
</tr>
<tr>
<td>SGG - Sand, grit or gravel</td>
<td>RT - Roots</td>
</tr>
<tr>
<td>LF - Line Failure</td>
<td>RN - Rainfall</td>
</tr>
<tr>
<td>V - Vandalism</td>
<td>RGS - Rags</td>
</tr>
<tr>
<td>RGR - Roots / Grease</td>
<td>BP - Burped</td>
</tr>
<tr>
<td></td>
<td>SC - Surcharged</td>
</tr>
<tr>
<td></td>
<td>SL - Sag in Line</td>
</tr>
<tr>
<td></td>
<td>IT - Intruding Tap</td>
</tr>
<tr>
<td></td>
<td>MH - Manhole</td>
</tr>
<tr>
<td></td>
<td>OJ - Offset Joint</td>
</tr>
</tbody>
</table>
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>
<thead>
<tr>
<th>10-42, 10-48 Causes</th>
<th>Total</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>Burped</td>
<td>3</td>
<td>9%</td>
</tr>
<tr>
<td>Cause Unknown</td>
<td>3</td>
<td>9%</td>
</tr>
<tr>
<td>Debris/Rags</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Debris/Sand, Grit or Grave</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Equipment Failure</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Grease</td>
<td>8</td>
<td>24%</td>
</tr>
<tr>
<td>Grease/Roots/Rocks</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Line Failure</td>
<td>3</td>
<td>9%</td>
</tr>
<tr>
<td>Rags</td>
<td>3</td>
<td>9%</td>
</tr>
<tr>
<td>Rags/Grease</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Roots</td>
<td>5</td>
<td>15%</td>
</tr>
<tr>
<td>Roots/Rags</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>33</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>10-42, 10-48 Mitigations</th>
<th>Total</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Follow Up Needed</td>
<td>4</td>
<td>12%</td>
</tr>
<tr>
<td>Pretreatment Notified</td>
<td>7</td>
<td>21%</td>
</tr>
<tr>
<td>Pretreatment Notified/Special Instr</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Pretreatment Notified/Short Interval</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>Rehab/Replace</td>
<td>4</td>
<td>12%</td>
</tr>
<tr>
<td>Special Instructions</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Short Interval</td>
<td>12</td>
<td>36%</td>
</tr>
<tr>
<td>Short Interval/Special Instructions</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Short Interval/Rehab/Replace</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>33</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
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](image)

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

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](image)
**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
<table>
<thead>
<tr>
<th>RA/LE</th>
<th>RA/LE</th>
<th>Location</th>
<th>Action Taken</th>
<th>Estimated Volume (gallons)</th>
<th>Reported Cause of Spill</th>
<th>Ultimate Discharge Location</th>
<th>Volume Recovered (gallons)</th>
<th>Cause</th>
<th>Mitigation</th>
<th>Pretreatment Follow Up Requested</th>
<th>Note of Violation</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>371092</td>
<td>8 N N N</td>
<td>1/9/2019 10:30 AM</td>
<td>601 LA VETA DR NE (KRPREM458727)</td>
<td>6,750</td>
<td>GG</td>
<td>NEAH</td>
<td>CC/HTH/CWW/WD</td>
<td>PST</td>
<td>3,375</td>
<td>CO SI</td>
</tr>
<tr>
<td>X</td>
<td>373347</td>
<td>8 Y N N</td>
<td>1/10/2019 11:44 AM</td>
<td>4521 EUBANK BLVD NE</td>
<td>2,550</td>
<td>RG</td>
<td>NEAH</td>
<td>CC/HTH/PO/CWW/WD</td>
<td>PST</td>
<td>1,275</td>
<td>RG/GR SI</td>
</tr>
<tr>
<td>X</td>
<td>373348</td>
<td>8 Y N N</td>
<td>1/10/2019 9:20 AM</td>
<td>3309 CDORS BLVD SW</td>
<td>1,375</td>
<td>GR/RG</td>
<td>NEAH</td>
<td>CC/HTH/PO/CWW/FP/WD</td>
<td>PST</td>
<td>1,000</td>
<td>CO PT X 1 0</td>
</tr>
<tr>
<td>X</td>
<td>376630</td>
<td>8 Y N N</td>
<td>1/14/2019 9:40 AM</td>
<td>10320 LAS CASITAS NE</td>
<td>400</td>
<td>RT</td>
<td>NEAH</td>
<td>CC/HTH/PO/CWW/R5</td>
<td>PST</td>
<td>350</td>
<td>RT SI</td>
</tr>
<tr>
<td>X</td>
<td>383718</td>
<td>8 Y N N</td>
<td>1/23/2019 10:20 AM</td>
<td>1331 JUAN TABO BLVD NE</td>
<td>200</td>
<td>GR</td>
<td>NEAH</td>
<td>CC/HTH/CWW/RP/WD</td>
<td>PST</td>
<td>150</td>
<td>GR PT X 10 6</td>
</tr>
<tr>
<td>X</td>
<td>390937</td>
<td>8 Y N N</td>
<td>1/28/2019 9:05 AM</td>
<td>4200 TRAMWAY BLVD NE</td>
<td>325</td>
<td>GR</td>
<td>NEAH</td>
<td>CC/HTH/PO/CWW/FP/WD</td>
<td>DST</td>
<td>200</td>
<td>GR/RT/RK SI</td>
</tr>
<tr>
<td>X</td>
<td>428058</td>
<td>10 N N N</td>
<td>3/2/2019 6:55 PM</td>
<td>RENAISSANCE/LEXINGTON BLVD NE</td>
<td>1,750</td>
<td>GR</td>
<td>NEAH</td>
<td>CC/HTH/RS/WD</td>
<td>SD</td>
<td>800</td>
<td>GR PT/N X 1 2</td>
</tr>
<tr>
<td>X</td>
<td>437393</td>
<td>10 N N N</td>
<td>3/12/2019 4:42 PM</td>
<td>1928 BRYN MAWR DR NE</td>
<td>240</td>
<td>GR</td>
<td>NEAH</td>
<td>CC/HTH/RS/WD</td>
<td>PST</td>
<td>150</td>
<td>GR PT X 3 2</td>
</tr>
<tr>
<td>X</td>
<td>440240</td>
<td>8 Y N N</td>
<td>3/15/2019 1:57 PM</td>
<td>2500 LOUISIANA BLVD NE</td>
<td>50</td>
<td>GR</td>
<td>NEAH</td>
<td>CC/HTH/WD</td>
<td>PST</td>
<td>0</td>
<td>LF RH</td>
</tr>
<tr>
<td>X</td>
<td>454593</td>
<td>LFBB4</td>
<td>N N N</td>
<td>3/30/2019 9:00 AM</td>
<td>LYONS / BLUE FEATHER AVE NW</td>
<td>24,000</td>
<td>EQ</td>
<td>NEAH</td>
<td>HTH/PO/BR/FP/RP/RS/WD</td>
<td>AD</td>
<td>22,000</td>
</tr>
<tr>
<td>X</td>
<td>475888</td>
<td>8 N N N</td>
<td>4/2/2019 4:20 PM</td>
<td>6001 WINTER HAVEN RD NW</td>
<td>275</td>
<td>GR</td>
<td>NEAH</td>
<td>CC/HTH/FP/RS/WD</td>
<td>PST</td>
<td>200</td>
<td>GR PT X 2 2</td>
</tr>
<tr>
<td>X</td>
<td>475847</td>
<td>8 Y N N</td>
<td>4/22/2019 1:45 PM</td>
<td>1911 LOMAS BLVD NW</td>
<td>NA</td>
<td>BP</td>
<td>NA</td>
<td>CC</td>
<td>NA NA</td>
<td>BP NF</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>477303</td>
<td>8 N N N</td>
<td>4/21/2019 4:24 PM</td>
<td>302 SYCAMORE ST NE</td>
<td>NA</td>
<td>GR/RG/RT</td>
<td>NA</td>
<td>CC</td>
<td>PP NA</td>
<td>RT SI</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>477932</td>
<td>8 Y N N</td>
<td>4/17/2019 10:30 AM</td>
<td>2169 SILVER AVE SW</td>
<td>30</td>
<td>RG</td>
<td>NEAH</td>
<td>CC/HTH/FP/R5/WD</td>
<td>PST</td>
<td>30</td>
<td>RT/RG SI</td>
</tr>
<tr>
<td>X</td>
<td>487516</td>
<td>8 N N N</td>
<td>5/6/2019 6:45 AM</td>
<td>7400 SAN PEDRO DR NE</td>
<td>20</td>
<td>GR/RG</td>
<td>NEAH</td>
<td>CC/HTH/RP/WD</td>
<td>PST</td>
<td>-</td>
<td>GR PT X 5 2</td>
</tr>
<tr>
<td>X</td>
<td>491082</td>
<td>8 N N N</td>
<td>5/7/2019 11:55 AM</td>
<td>700 FITZGERALD RD NW</td>
<td>NA</td>
<td>BP</td>
<td>NA</td>
<td>IN</td>
<td>NA NA</td>
<td>BP NF</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>491532</td>
<td>8 N N N</td>
<td>5/11/2019 10:44 AM</td>
<td>901 20th ST NW</td>
<td>830</td>
<td>SGG</td>
<td>NEAH</td>
<td>CC/HTH/CWW/WD</td>
<td>SD</td>
<td>800</td>
<td>DB/GG SI</td>
</tr>
<tr>
<td>X</td>
<td>491533</td>
<td>8 N N N</td>
<td>5/11/2019 11:05 AM</td>
<td>2836 ISELETA BLVD SW</td>
<td>495</td>
<td>RG</td>
<td>NEAH</td>
<td>CC/HTH/CWW/FP/WD</td>
<td>SD</td>
<td>400</td>
<td>RG SI</td>
</tr>
<tr>
<td>X</td>
<td>493334</td>
<td>8 N N N</td>
<td>5/11/2019 6:30 AM</td>
<td>1617 CANDILARIA RD NE</td>
<td>1,000</td>
<td>DB/RG</td>
<td>NEAH</td>
<td>CC/HTH/FP/R5/WD</td>
<td>PST</td>
<td>750</td>
<td>RG PT X 1 0</td>
</tr>
<tr>
<td>X</td>
<td>517690</td>
<td>8 N N N</td>
<td>6/12/2019 7:45 AM</td>
<td>7012 ARROYO DEL OSO AVE NE</td>
<td>300</td>
<td>CU</td>
<td>NEAH</td>
<td>CC/HTH/FP/R5/WD</td>
<td>PST</td>
<td>150</td>
<td>CU SI</td>
</tr>
<tr>
<td>X</td>
<td>532501</td>
<td>8 N N N</td>
<td>6/21/2019 9:10 AM</td>
<td>904 FOUR HILLS RD SE</td>
<td>50</td>
<td>RT</td>
<td>NEAH</td>
<td>CC/HTH/WD</td>
<td>PST</td>
<td>-</td>
<td>RT SI</td>
</tr>
<tr>
<td>X</td>
<td>536482</td>
<td>16 N N</td>
<td>7/26/2019 5:15 PM</td>
<td>3306 MARSH RD NE</td>
<td>10,500</td>
<td>DB/RG</td>
<td>NEAH</td>
<td>CC/HTH</td>
<td>O</td>
<td>DB/RG</td>
<td>RH</td>
</tr>
<tr>
<td>X</td>
<td>536971</td>
<td>8 N N N</td>
<td>8/5/2019 9:40 AM</td>
<td>400 FOUR HILLS AVE W &amp; WYNNONA AV SE</td>
<td>600</td>
<td>RT</td>
<td>NEAH</td>
<td>CC/HTH/RS/WD</td>
<td>AC</td>
<td>-</td>
<td>RT SP</td>
</tr>
<tr>
<td>X</td>
<td>537945</td>
<td>8 N N N</td>
<td>8/15/2019 8:45 AM</td>
<td>MONTGOMERY &amp; MORRIS BLVD NE</td>
<td>60</td>
<td>GR</td>
<td>NEAH</td>
<td>CC/HTH/R5/WD</td>
<td>PST</td>
<td>-</td>
<td>GR PT/32 X 2 2</td>
</tr>
<tr>
<td>X</td>
<td>594223</td>
<td>10 Y Y</td>
<td>8/28/2019 1:29 PM</td>
<td>1923 BRYN MAWR DR NE *REFER BACK TO W04437393 &amp; SRRH3948</td>
<td>4,200</td>
<td>GR/RG</td>
<td>NEAH</td>
<td>CC/HTH/BR/WD</td>
<td>AC</td>
<td>16,847</td>
<td>GR PT/SP X 3 2</td>
</tr>
<tr>
<td>X</td>
<td>633380</td>
<td>8 N N N</td>
<td>10/2/2019 10:48 AM</td>
<td>3000 SAN JUANILM AVE SW</td>
<td>NA</td>
<td>CU</td>
<td>NA</td>
<td>CC/PN</td>
<td>NA NA</td>
<td>CU SI</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>643824</td>
<td>8 N N N</td>
<td>10/10/2019 2:00 PM</td>
<td>4508 3RD ST NW</td>
<td>NA</td>
<td>BP</td>
<td>NA</td>
<td>CC</td>
<td>NA NA</td>
<td>BP NF</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>644997</td>
<td>8 N N N</td>
<td>10/12/2019 10:43 AM</td>
<td>4729 SOUTHERN AVE SE</td>
<td>122</td>
<td>GR</td>
<td>NEAH</td>
<td>CC/HTH/RP/WD</td>
<td>PST</td>
<td>50</td>
<td>RT SP</td>
</tr>
<tr>
<td>X</td>
<td>668686</td>
<td>8 N N N</td>
<td>11/6/2019 7:26 AM</td>
<td>6320 SAN FRANCISCO DR NE</td>
<td>5,900</td>
<td>CU</td>
<td>NEAH</td>
<td>CC/HTH/IN/PO/CWW/BR/FP/R5/WD</td>
<td>AD</td>
<td>5,500</td>
<td>CU SI/RH</td>
</tr>
<tr>
<td>X</td>
<td>679115</td>
<td>8 N N N</td>
<td>11/13/2019 10:37 AM</td>
<td>9201 APACHE PINE WY NE</td>
<td>60</td>
<td>GR</td>
<td>NEAH</td>
<td>CC/HTH/FP/R5/WD</td>
<td>PST</td>
<td>40</td>
<td>GR PT X 1 1</td>
</tr>
<tr>
<td>X</td>
<td>686596</td>
<td>8 N N N</td>
<td>11/21/2019 6:03 PM</td>
<td>2401 JENSEN DR NE</td>
<td>5,300</td>
<td>RG</td>
<td>NEAH</td>
<td>CC/HTH/CWW/WD</td>
<td>PST</td>
<td>500</td>
<td>RG SI</td>
</tr>
<tr>
<td>X</td>
<td>690108</td>
<td>8 Y N N</td>
<td>11/25/2019 10:20 AM</td>
<td>4125 LEAD AVE SE</td>
<td>NA</td>
<td>LF/GG</td>
<td>NA</td>
<td>CC</td>
<td>NA NA</td>
<td>LF RH</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>721265</td>
<td>8 N N N</td>
<td>12/17/2019 12:45 AM</td>
<td>6001 GONZALES RD SW</td>
<td>NA</td>
<td>GR/RG</td>
<td>NA</td>
<td>CC/IN/PO</td>
<td>NA NA</td>
<td>LF RH</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 2  Sanitary Sewer Overflow Volume Captured Analysis Table
<table>
<thead>
<tr>
<th>Maximo WO #</th>
<th>Date of SSO</th>
<th>Location</th>
<th>Estimated Volume (gallons)</th>
<th>Volume Recovered (gallons)</th>
<th>Volume Not Recovered (gallons)</th>
<th>% Recovered</th>
</tr>
</thead>
<tbody>
<tr>
<td>371092</td>
<td>1/9/2019</td>
<td>601 LA VETA DR NE (SRVPREM458727)</td>
<td>6,750</td>
<td>3,375</td>
<td>3,375</td>
<td>50%</td>
</tr>
<tr>
<td>373347</td>
<td>1/10/2019</td>
<td>4521 EUBANK BLVD NE</td>
<td>2,550</td>
<td>1,275</td>
<td>1,275</td>
<td>50%</td>
</tr>
<tr>
<td>373348</td>
<td>1/10/2019</td>
<td>3309 COORS BLVD SW</td>
<td>1,375</td>
<td>1,000</td>
<td>375</td>
<td>73%</td>
</tr>
<tr>
<td>376630</td>
<td>1/14/2019</td>
<td>10320 LAS CASITAS NE</td>
<td>400</td>
<td>350</td>
<td>50</td>
<td>88%</td>
</tr>
<tr>
<td>383718</td>
<td>1/23/2019</td>
<td>1331 JUAN TABO BLVD NE</td>
<td>200</td>
<td>150</td>
<td>50</td>
<td>75%</td>
</tr>
<tr>
<td>390397</td>
<td>1/28/2019</td>
<td>4200 TRAMWAY BLVD NE</td>
<td>325</td>
<td>200</td>
<td>125</td>
<td>62%</td>
</tr>
<tr>
<td>428058</td>
<td>3/2/2019</td>
<td>RENAISSANCE/ALEXANDER BLVD NE</td>
<td>1,750</td>
<td>800</td>
<td>950</td>
<td>46%</td>
</tr>
<tr>
<td>437393</td>
<td>3/12/2019</td>
<td>1928 BRYN MAWR DR NE</td>
<td>240</td>
<td>150</td>
<td>90</td>
<td>63%</td>
</tr>
<tr>
<td>440240</td>
<td>3/15/2019</td>
<td>2500 LOUISIANA BLVD NE</td>
<td>50</td>
<td>20</td>
<td>30</td>
<td>40%</td>
</tr>
<tr>
<td>454593</td>
<td>3/30/2019</td>
<td>LYONS / BLUE FEATHER AVE NW</td>
<td>24,000</td>
<td>22,000</td>
<td>2,000</td>
<td>92%</td>
</tr>
<tr>
<td>475888</td>
<td>4/22/2019</td>
<td>6001 WINTER HAVEN RD NW</td>
<td>275</td>
<td>200</td>
<td>75</td>
<td>73%</td>
</tr>
<tr>
<td>479932</td>
<td>4/27/2019</td>
<td>1104 SILVER AVE SW</td>
<td>30</td>
<td>30</td>
<td>-</td>
<td>100%</td>
</tr>
<tr>
<td>487516</td>
<td>5/6/2019</td>
<td>7400 SAN PEDRO DR NE</td>
<td>20</td>
<td>-</td>
<td>20</td>
<td>0%</td>
</tr>
<tr>
<td>491532</td>
<td>5/11/2019</td>
<td>901 20th ST NW</td>
<td>830</td>
<td>800</td>
<td>30</td>
<td>96%</td>
</tr>
<tr>
<td>491533</td>
<td>5/11/2019</td>
<td>2636 ISLETA BLVD SW</td>
<td>495</td>
<td>400</td>
<td>95</td>
<td>81%</td>
</tr>
<tr>
<td>493334</td>
<td>5/13/2019</td>
<td>1617 CANDELARIA RD NE</td>
<td>1,000</td>
<td>750</td>
<td>250</td>
<td>75%</td>
</tr>
<tr>
<td>517690</td>
<td>6/12/2019</td>
<td>7012 ARROYO DEL OSO AVE NE</td>
<td>300</td>
<td>150</td>
<td>150</td>
<td>50%</td>
</tr>
<tr>
<td>532501</td>
<td>6/23/2019</td>
<td>909 FOUR HILLS RD SE</td>
<td>50</td>
<td>-</td>
<td>50</td>
<td>0%</td>
</tr>
<tr>
<td>561482</td>
<td>7/26/2019</td>
<td>3306 MARS RD NE</td>
<td>10,500</td>
<td>-</td>
<td>10,500</td>
<td>0%</td>
</tr>
<tr>
<td>569571</td>
<td>8/5/2019</td>
<td>FOUR HILLS SE &amp; WENONAH AV SE</td>
<td>600</td>
<td>-</td>
<td>600</td>
<td>0%</td>
</tr>
<tr>
<td>579745</td>
<td>8/15/2019</td>
<td>MONTGOMERY &amp; MORRIS BLVD NE</td>
<td>60</td>
<td>-</td>
<td>60</td>
<td>0%</td>
</tr>
<tr>
<td>594223</td>
<td>8/28/2019</td>
<td>1923 BRYN MAWR DR NE *REFER BACK TO WO#4</td>
<td>4,200</td>
<td>16,847</td>
<td>(12,647)</td>
<td>401%</td>
</tr>
<tr>
<td>644997</td>
<td>10/12/2019</td>
<td>4729 SOUTHERN AVE SE</td>
<td>122</td>
<td>50</td>
<td>72</td>
<td>41%</td>
</tr>
<tr>
<td>668686</td>
<td>11/6/2019</td>
<td>6320 SAN FRANCISCO DR NE</td>
<td>5,900</td>
<td>5,500</td>
<td>400</td>
<td>93%</td>
</tr>
<tr>
<td>679115</td>
<td>11/13/2019</td>
<td>9201 APACHE PINE WY NE</td>
<td>60</td>
<td>40</td>
<td>20</td>
<td>67%</td>
</tr>
<tr>
<td>686596</td>
<td>11/21/2019</td>
<td>2401 JENSEN DR NE</td>
<td>5,300</td>
<td>500</td>
<td>4,800</td>
<td>9%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td></td>
<td></td>
<td><strong>67,382</strong></td>
<td><strong>54,587</strong></td>
<td><strong>12,795</strong></td>
<td><strong>81%</strong></td>
</tr>
</tbody>
</table>
Overflow Emergency Response Plan
Albuquerque Bernalillo County Water Utility Authority

Note: All Emergency responses are initiated by a call to Dispatch at 842-WATR (842-9287). Please call there first. If you do not, the emergency responders have to call and delay the response.

Applies only to Collection System sewer problems.

Customer calls dispatch with issue

Dispatch collects data and creates a Service Request; Task elevated to supervisor

Collection Response

Supervisor creates a work order and sends crew to location. Status of work order is updated to DISPATCHED

Unblock and Clean up. Pg. 2

Spill to pervious areas. Pg. 3
Spill entered / entering storm drain collection system. Pg. 4
Private vs. public SSO. Pg. 5
Spill has entered storm pump station. Pg. 9
Spill entering Waterway. Pg. 11

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Tech confirms asset and fills out required information in the work order

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Applies only to Collection System sewer problems.

Notification process.

Collection Response

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE

Follow up study and mitigation. Pg. 6
Notification process. Pg. 7
Alert Media. Pg. 10

Supervisor reviews work order for quality assurance. Status of work order is updated to COMPLETE AND READY FOR REVIEW

Planner / Scheduler does quality control and updates status of work order to COMPLETE
Overflow Emergency Response Plan
Albuquerque Bernalillo County Water Utility Authority

1. Unblock and Clean Up. Pg. 1
2. Crew arrives on site
3. Is SSO clearly public?
   - Yes: Note the time of dispatch and arrival on scene
   - No: Private vs. Public SSOs. Pg. 5
4. Note the start and stop time that the overflow occurred
5. Protect public from area.
6. Investigate the cause and stop the sanitary sewer overflow.
7. Is additional help necessary to aid the clean up / remediation efforts?
   - Yes: The Vactor truck(s) should be dispatched immediately.
   - No: Apply HTH per SOP
8. Remove spill from surface. Remove any solids. Wash down spill area and remove wash water.
9. Determine whether overflow has entered pervious area, storm drain, ditch, canal, or storm pump station.
   - Spill has entered a waterway. Pg. 11
   - Spill to pervious area. Pg. 3
   - Spill entered / entering storm drain collection system. Pg. 4
   - Spill has entered a COA storm pump station. Pg. 9

Note the start and stop time that the overflow occurred.
Overflow Emergency Response Plan
Albuquerque Bernalillo County Water Utility Authority

Immediately begin collecting spill with Vactor truck.

When SSO stopped, apply washwater & HTH to spill area & allow to flow to pervious area and remove washwater.

Supervisor or Superintendent to determine / recommend remediation. Consult with Chief Engineer if required.

Implement

Supervisor or Superintendent to determine if public access to pervious area is a concern.

Yes

No

Allow to dry.

Remediation Complete. Pg. 1
Overflow Emergency Response Plan
Albuquerque Bernalillo County Water Utility Authority

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

If possible, position 2nd Vactor to remove spill prior to reaching inlet.

Determine how far downstream the spill has reached.

Add wash water & remove at downstream manhole. Remove immediately if rain is imminent. If not, remove next normal work day.

Wash water to street and inlet.

SSO Reaches COA storm drain.

SSO Reaches COA Facility

Bernalillo County Facility

NMDOT Facility

COA Facility

Assist in clean up as requested.

Remediation Complete. Pg. 1

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 Rinkerberger: 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
Albuquerque Bernalillo County Water Utility Authority

Private vs. Public SSOs. Pg. 2

Ask Supervisor.

Clearly Public?

Yes

Clearly Private?

No

Elevate to Superintendent.

Resolve if Public?

Yes

Inform Public

No

Do not clean sewer

Depending on jurisdiction, follow up with City of Albuquerque, Bernalillo County, Village of Las Ranchos or NMED (See table for contacts)

Remediation Complete. Pg. 1

Clean Sewer. Pg. 2

City of Albuquerque Code Enforcement
(505) 924-3450

Bernalillo County Natural Resource Services Review & Permitting Section
(505) 314-0375

Village of Los Ranchos
(505) 344-6582
Code Enforcement office

NMED
Liquid Waste Program (505) 222-9500
(505) 827-1840

Note: The identified code enforcement contacts will also be utilized to report private service lines issues resulting in sewage spills to private or public property.

Public and private lines may be differentiated on the Water Authority GIS Mapping.

Private lines that may be confused with Water Authority mains should be identified to the Collection Section Research Analyst for inclusion in the “Waste Water Non-Authority” layer.

For non-Authority spills in the County, in addition to calling Natural Resources Services, contact Patrick E. Chavez at 934-2704. For any non-Authority that impact an AMAFCA or NMDOT facility, alert the appropriate contact listed on page 4.

For non-Authority spills in the City limits, in addition to calling the appropriate portion of COA Code Enforcement, also alert: Kathy Verhage - (505) 803-8058
Follow up study and mitigation. Pg. 1

Research Analyst/GIS Intern creates a follow-up cleaning and CCTV work orders for gravity 10-40s, -42s, and 48s.

Sewer line is televised.

Research Analyst compiles maps and data associated with all unstudied 10-42s and -48s for SSO Study Team Meeting.

Is a defect identified as Grade 7 or 8? Yes → Will it be assigned in-house or to on-call contractor?* On-Call → Forward to Centralized Engineering and copy Collection Section Manager, Gravity Superintendent, and Research Analyst.

No → In-House → Create Maximo Work Order.

Research Analyst studies SSOs. Obvious cause?

Yes → Consent List SSO Team accepts/requests further study

No → SSO Team examine/request more data/resolve.

Consensus cause. Consensus mitigation.

Review with Collection Section Manager for suggestions and approval.

Non-FOG → Mitigation → FOG

End of Pretreatment involvement. Pg. 8

Submit to Pretreatment for enforcement. Pg. 8

Collection Section Manager approves and routes for implementation.*

Consent List SSO Team accepts/requests further study

Accepted Cause. Accepted Mitigation.

Research Analyst compiles SSO cause and mitigation

Acceptance Review with Collection Section Manager for inclusion in CMOM Report.

Collection Section Manager approves and routes for implementation.*

*If the defect is due to corroded concrete, rehab of the manhole to manhole pipe segment is typically forwarded directly to Centralized Engineering for assignment to an On-Call contractor or inclusion in planned rehab project. If the defect is in a VCP line, Assistant Superintendent/Gravity Superintendent/Construction Supervisor will make the determination.
Overflow Emergency Response Plan
Albuquerque Bernalillo County Water Utility Authority

Notification Process. Pg. 1

Spill from WUA System?

Spill contained in WUA Facility (e.g. dry well)?

Spill contained in private facility (e.g. basement SSO)?

O & M Supervisor Reports

For system breaks resulting in release on KAFB: Call Kirtland AFB Command Post at (505) 846-3777 within 12 hours.

For spills on the UNM Main and North Campus contact the Work Control Center (M-F 7:00 a.m. to 4:30 p.m.) at (505) 277-1600 and all other times contact the Campus Police at (505) 277-2241.

GWQB Reporting
Ponded 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.

For system breaks resulting in release on KAFB: Call Kirtland AFB Command Post at (505) 846-3777 within 12 hours.

For spills on the UNM Main and North Campus contact the Work Control Center (M-F 7:00 a.m. to 4:30 p.m.) at (505) 277-1600 and all other times contact the Campus Police at (505) 277-2241.

EPA DMR, 15th of the month

Compliance Division

DMR Collection Section SSOs

Collection Section Manager to COA & AMAFCA

Written Report
- EPA
- NM Environment Department
- Pueblo of Isleta

Note: This page shows Oral and Written Reports for “typical” SSOs. See page 11 for reports of “Category One” SSOs.
Spill has entered a COA storm pump station. Pg. 2

Shut down pumps

Remove sewage with Vactor or pump to SAS

Wash down wet well and remove wash water

Remediation Complete. Pg. 1

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.
Overflow Emergency Response Plan
Albuquerque Bernalillo County Water Utility Authority

For large or significant spills, contact the Superintendent, Chief Engineer, or Division Manager to contact Public Affairs Manager (PAM), Dave Morris, or Chief Operating Officer (COO), John Stomp. Provide required information.

Media alerted by PAM, COO, or designee.
Overflow Emergency Response Plan
Albuquerque Bernalillo County Water Utility Authority

If possible, stop the flow from entering the waterway and collect wastewater.

Reaches MRGCD Facility?

Reaches Rio Grande?

Remove debris.

Yes

Contact (In sequence until contacted)
- Jason Casuga  Engineering (505) 259-1005
- Joe Brem  ABQ Division Manager (505) 249-5780
- Mike Hamman  CEO / Chief Engineer (505) 206-6378

No

Category One SSO
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.

POI Category One Protocol

<table>
<thead>
<tr>
<th>Contacts</th>
<th>Position</th>
<th>Name</th>
<th>Cell Number</th>
<th>Office Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Dispatch</td>
<td>N/A</td>
<td>N/A</td>
<td>(505) 869-3030</td>
<td></td>
</tr>
<tr>
<td>Environment Division Manager</td>
<td>Ruben Lucero</td>
<td>(505) 917-8346</td>
<td>(505) 869-9819</td>
<td></td>
</tr>
<tr>
<td>Transportation Division Manager</td>
<td>James Weldon</td>
<td>(505) 933-1225</td>
<td>(505) 869-9818</td>
<td></td>
</tr>
<tr>
<td>Water Quality Specialist</td>
<td>Cody Walker</td>
<td>(505) 220-4595</td>
<td>(505) 869-9623</td>
<td></td>
</tr>
</tbody>
</table>

Is spill fully contained?

Yes

Sample MRGCD facility for E. coli upstream and downstream of SSO.

No

Pg. 12

12-1-2019
Overflow Emergency Response Plan
Albuquerque Bernalillo County Water Utility Authority

Sample MRGCD facility for E. coli upstream and downstream of SSO.

Contact NPDES Program Manager (505) 274-0271 cell
Pretreatment Sampling Staff Meet On-Site
Agree on Sampling Location in Coordination with Collection Section and/or MRGCD Staff
Obtain Sample Upstream and Downstream of SSO
Transport to SWRP Water Quality Lab
Test per E. coli Method SM9223-B-2004 or Other Approved EPA Method
Provide Results to Collection Section Manager
<table>
<thead>
<tr>
<th>Goal</th>
<th>Timing</th>
<th>Page # for Discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCTV all gravity pipes suffering a blockage. For all SSOs, determine a cause and mitigation and report in the next CMOM report</td>
<td>Annually</td>
<td>6</td>
</tr>
<tr>
<td>Public advertising</td>
<td>On-Going</td>
<td>11</td>
</tr>
<tr>
<td>FSE flier in Chinese</td>
<td>FY2021</td>
<td>11</td>
</tr>
<tr>
<td>Update OERP</td>
<td>As required</td>
<td>12</td>
</tr>
<tr>
<td>CCTV a portion of system</td>
<td>Ten Year goal. Report annually.</td>
<td>13</td>
</tr>
<tr>
<td>Force main inspection program</td>
<td>Annually</td>
<td>15</td>
</tr>
<tr>
<td>Perform an air pocket profile, utilizing a smart ball, of Lift Station 20's north force main.</td>
<td>CY2020</td>
<td>15</td>
</tr>
<tr>
<td>Clean a portion of the system</td>
<td>Ten Year goal. Report annually.</td>
<td>14</td>
</tr>
<tr>
<td>Compare root foaming effectiveness versus mechanical cleaning. Finalize Internal Report.</td>
<td>CY2020</td>
<td>15</td>
</tr>
<tr>
<td>SSOs: Decrease number and mitigate impact.</td>
<td>On-Going</td>
<td>16</td>
</tr>
</tbody>
</table>
Appendix 5  Portion of Permit Effective 12/1/2019
Selected pages providing Collection System and CMOM requirements
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
Director
Water Division (WD)
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 15th 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 (BODs), or for the five-day Carbonaceous Biochemical
Oxygen Demand (CBODs), as applicable, where the permittee can demonstrate long term
correlation of the method with BODs or CBODs 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.
NPDES PERMIT NO. NM 0022250

PUEBLO OF ISLETA REPORTING REQUIREMENT

NPDES PERMIT PART I.C: MONITORING AND REPORTING

- Email all “Discharge Monitoring Reports” to 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.

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

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. 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. 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.

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Office Number</th>
<th>Cell Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Dispatch</td>
<td>N/A</td>
<td>505.869.3030</td>
<td>N/A</td>
</tr>
</tbody>
</table>
NPDES PERMIT NO. NM 0022250

<table>
<thead>
<tr>
<th>Environment Division Manager</th>
<th>Ruben Lucero</th>
<th>505.869.9819</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation Division Manager</td>
<td>James Weldon</td>
<td>505.869.9818</td>
<td>505.917.8346</td>
</tr>
<tr>
<td>Water Quality Specialist</td>
<td>Cody Walker</td>
<td>505.869.9623</td>
<td>505.933.1225 or 505.417.0124</td>
</tr>
<tr>
<td></td>
<td></td>
<td>505.220.4595</td>
<td></td>
</tr>
</tbody>
</table>

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. 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.
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

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.

Weigh In

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

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.

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 of the system are different, so too are the types of incidents that occur.

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.
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.

**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

---

**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.

**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.
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 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 ≥ 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.

---

*Mark S. Holstad, PE, is Collection System Manager – Field Division for the Albuquerque Bernalillo County Water Utility Authority (Albuquerque, N.M.). He can be reached at mbolstad@abcwua.org.*