Sanitation District No. 1
December 29, 2017

Capacity, Management, Operations, & Maintenance (CMOM) FY 2017 Annual Report



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SD1
Managing Northern Kentucky's
Wastewater and Storm Water

December 29, 2017

Director of the Division of Enforcement
Department for Environmental Protection
300 Fair Oaks Lane
Frankfort, KY 40601

Chief, Environmental Enforcement Section
Environmental and Natural Resources Division
U.S. Department of Justice
601 D street NW
Washington, DC 20005
DOJ Case No. 90-5-1-1-08591

Ms. Denisse Diaz, Chief
NPDES Permitting and Enforcement Branch
U.S. Environmental Protection Agency, Region 4
Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, Georgia 30303

Re: Consent Decree Case No. 2:05-cv-00199-WOB

To Whom It May Concern:

Pursuant to the above-referenced Consent Decree, Sanitation District No. 1 (SD1) is required to submit annual reports on the implementation of its Capacity, Management, Operations, and Maintenance (CMOM) programs. These reports are due no later than December 31, each year.

The Consent Decree was entered on April 18, 2007 and required SD1 to submit four separate CMOM documents within the first year – the Grease Control Program, the Sewer Overflow Response Plan (SORP), the CMOM Self-assessment, and the Pump Station Operation Plan for Backup Power. Each of these submittals has received regulatory approval. Updates to these programs are now included in the CMOM Annual Report, as it is not required for the program updates to be submitted as separate documents.

A certification, as required by the Consent Decree (Paragraph 38), is also enclosed.

To the best of my knowledge and belief, the enclosed report is true, accurate, and complete, and further demonstrates SD1's commitment to the mission of protecting and enhancing the water resources and quality of life in Northern Kentucky.

If you have any questions or concerns, do not hesitate to contact me at 859-578-7465 or by e-mail at achaney@sd1.org.

Best regards,

Adam Chaney
Executive Director

AC/wck
Enclosures

CERTIFICATION

Capacity, Management, Operations, & Maintenance (CMOM)
FY 2017 Annual Report
Consent Decree Case No. 2:05-cv-00199-WOB

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Adam Chaney
Executive Director

12-28-17
Date

COMMONWEALTH OF KENTUCKY

)ss.

COUNTY OF Kenton

The foregoing instrument was acknowledged before me this 28 day of Dec, 2017 by Adam Chaney, Executive Director of Sanitation District No. 1.

Angela M. Cook
NOTARY PUBLIC

Kenton County, Kentucky

My commission expires: 9-1-20

Angela M. Cook
Notary Public
Kentucky, State at Large
Comm. Exp. 09-01-2020
Notary ID 562735

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CAPACITY, MANAGEMENT, OPERATIONS, AND MAINTENANCE FY 2017 ANNUAL REPORT

December 29, 2017

Sanitation District No. 1
1045 Eaton Drive
Ft. Wright, KY 41017

TABLE OF CONTENTS

SECTION 1. INTRODUCTION 5
1.1 Overview and Report Period 5
1.2 CMOM Program Structure 5
1.3 Collection System's Major Components 7

SECTION 2. CMOM PROGRAM HIGHLIGHTS 8
2.1 Budgeting 8
2.1.1 Capital and Operations & Maintenance Expenditures 8
2.1.2 Funding Sources 9
2.2 Capacity Assessment & Assurance 9
2.2.1 Overflow Inspections and Hydraulic Modeling 10
2.2.2 Flow Monitoring and Hydraulic Modeling 11
2.2.3 Reservation of Capacity 13
2.3 Call Before You Dig 13
2.4 New Connection Tap-In 15
2.4.1 Certified Tapper Program 15
2.4.2 Violations and Fines 16
2.5 Lateral Repair Program 16
2.6 Continuous Sewer Assessment 17
2.6.1 Collection System Condition Assessment 18
2.6.2 Collection System Maintenance 21
2.6.3 CSAP Logic Improvements and Results 25
2.7 Pump Station Operations 29
2.7.1 Pump Station Maintenance 29
2.8 Compliance 30
2.8.1 Permitting 30
2.8.2 Monitoring & Enforcement 30
2.9 Water Quality Monitoring 31
2.10 Organizational Structure 32
2.11 Legal Authority 32
2.11.1 Backup Assistance Program 33
2.12 Safety 33
2.12.1 Safety Training 34
2.12.2 Performance Indicators 34
2.12.3 Manhole Lid Retrofits 34
2.13 Training 35

SECTION 3. SORP 36
3.1 Emergency Preparedness & Response 36
3.1.1 SORP Training 36
3.1.2 SORP Annual Review 37
3.1.3 SSO Reporting 37

SECTION 4. GREASE CONTROL PROGRAM 37
4.1 Permitting 38
4.1.1 Record Keeping 38
4.1.2 Grease Control Equipment (GCE) 38
4.2 Grease Trap Waste Disposal 40
4.3 Inspections 41
4.3.1 Compliance Inspections 41
4.3.2 Sewer Inspections 41
4.4 FOG Education 42
4.4.1 FSE Compliance Workshop 42
4.4.2 General Education 42
4.5 Performance Indicators 44

SECTION 5. PUMP STATION BACKUP POWER 44

SECTION 6. SELF-ASSESSMENT 44
6.1 Strategic Business Plan 45
6.1.1 FY 2017 SBP Initiatives 46

APPENDIX A: Maps of Sanitary and Storm Service Areas
APPENDIX B: Lateral Repair Program Brochure
APPENDIX C: Updated CSAP and SCREAM Program Manuals
APPENDIX D: FY 2017 Industrial Pretreatment Violations Summary Report
APPENDIX E: FY 2017 Water Quality Reports
APPENDIX F: Current Organization Charts
APPENDIX G: Backup Assistance Program Information and Brochures
APPENDIX H: FY 2017 Safety Training Calendar
APPENDIX I: FY 2017 SORP Training Presentation Slides
APPENDIX J: Pump Station Backup Power Plan Completed Schedule
APPENDIX K: SD1 Strategic Business Plan Summary Document
APPENDIX L: SD1 Lean Improvement Program

TABLES

Table 1.1 CMOM Program Activities
Table 2.1 Two-Year CIP Budget *(FY 2018 and FY 2019)*
Table 2.2 Line Locations
Table 2.3 Capacity Connection Violations & Fines
Table 2.4 SD1 Repairs of Failed Private Laterals in the Public Right-of-Way
Table 2.5 Sewer Inspection Footage
Table 2.6 Catch Basin & Manhole Inspections
Table 2.7 Sewer Cleaning Footage
Table 2.8 SL-RAT inspections and Next Action Adjustments
Table 2.9 Cubic Yards of Debris Removed from Catch Basin & Grit Pit Cleanings
Table 2.10 Rehabilitation and Replacement Activities
Table 2.11 Safety Program Performance
Table 4.1 GCE Plans Reviewed and Permits Issued
Table 4.2 Grease Disposed at Dry Creek Wastewater Treatment Plant
Table 4.3 Grease Control Program Performance Indicators

FIGURES

Figure 2.1 SD1 Estimated Expenses: Annual Debt Service, O&M, and CIP *(FY 2018 and FY 2019)*
Figure 2.2 SD1 Flow Monitoring Locations in FY 2017
Figure 2.3 SD1 Model Calibrations in FY 2017
Figure 2.4 Capacity Connection Permits Issued (FY 2005 – FY 2017)
Figure 2.5 Lines Located and Marked in FY 2017
Figure 2.6 Sewer Inspection Progress
Figure 2.7 Maintenance Related Pipe Failures by Fiscal Year
Figure 2.8 Cause of Maintenance Related Pipe Failures since FY 2008
Figure 2.9 Cause of Maintenance Related Pipe Failures in FY 2017
Figure 2.10 Cause of Maintenance Related Pipe Failures in First Half of FY 2018
Figure 2.11 Self-Swiveling Manhole Lid
Figure 4.1 Observed Grease Restrictions
Figure 4.2 Properties that Received FOG Education Material in FY 2017
Figure 6.1 Aerial Sewer Inspection
Figure 6.2 Fire Suppression System Upgrade to Data Center

LIST OF ACRONYMS AND ABBREVIATIONS

CCTV	Closed Circuit Television
CIP	Capital Improvement Program
CMOM	Capacity, Management, Operations, and Maintenance
CSAP	Continuous Sewer Assessment Program
CSO	Combined Sewer Overflow
CSS	Combined Sewer System
ERP	Emergency Response Plan
FOG	Fats, Oils, and Grease
FSE	Food Service Establishments
FY	Fiscal Year
GCE	Grease Control Equipment
I/I	Inflow and Infiltration
IT	Information Technology
KPI	Key Performance Indicator
LOS	Level(s) of Service
NOV	Notice of Violation
O&M	Operations & Maintenance
OSHA	Occupational Safety and Health Administration
PM	Preventive Maintenance
SBP	Strategic Business Plan
SCREAM	System Condition and Risk Enhanced Assessment Model
SD1	Sanitation District No. 1
SL-RAT	Sewer Line Rapid Assessment Tool
SOP	Standard Operating Procedure
SORP	Sewer Overflow Response Plan
SSES	Sanitary Sewer Evaluation Survey
SSO	Sanitary Sewer Overflow
VPLS	Virtual Private Local-Area-Network System
YTD	Year to Date

SECTION 1. INTRODUCTION

1.1 Overview and Report Period

On April 18, 2007, Sanitation District No. 1 (SD1) entered into a Consent Decree with the U.S. Environmental Protection Agency and the Kentucky Energy and Environment Cabinet (Cabinet) to address sanitary sewer overflows (SSOs) and combined sewer overflows (CSOs), in an effort to improve water quality throughout SD1's service area. The Consent Decree requires that SD1 continue the implementation of formal Capacity, Management, Operations, and Maintenance (CMOM) programs. SD1's CMOM programs are designed to manage the collection system assets and provide operational guidelines that maximize efficiency and reduce the potential for overflow occurrences. Proper planning and management of CMOM programs can result in a reduction of the number, frequency, and volume of SSOs and CSOs.

SD1 received regulatory approval of its CMOM programs on May 14, 2008. Pursuant to the Consent Decree, SD1 is required to submit annual reports on its implementation of these CMOM programs. This report describes SD1's ongoing commitment to its CMOM programs, during Fiscal Year (FY) 2017, which began on July 1, 2016 and ended on June 30, 2017.

Section 2 provides updates on the implementation and progress of some of SD1's CMOM programs. Described in Sections 3 through 5 are programs required by the Consent Decree to establish a Sewer Overflow Response Plan (SORP), a Grease Control Program, and a Pump Station Operation Plan for Backup Power, which are all specific CMOM programs that required separate approvals, but no separate reporting schedules. Section 6 deals with ongoing self-assessments and initiatives that support and advance SD1's CMOM programs.

1.2 CMOM Program Structure

SD1 has been performing CMOM activities for many years. In 2007, these activities were structured into formal programs with the CMOM Self-Assessment. During the self-

assessment process, a written purpose, goals, and recommended improvements were established for each program. Most of the recommendations of the initial CMOM self-assessment have already been fully implemented, however, SD1 continues to advance toward the goals of maximized efficiency and overflow reduction by sustaining the CMOM principles of self-assessment and self-improvement.

SD1 has 34 formal CMOM programs, which are identified in Table 1.1. Section 2 and Section 6 of this Annual Report provide updates on the progress of some of these programs and new initiatives. The programs that have not been covered in this Annual Report are italicized in Table 1.1. The programs that are not currently covered, here, may be in previous or future reports.

Table 1.1 CMOM Program Activities

Management Programs	Operations Programs
• Organizational Structure	• Emergency Preparedness & Response
• *Communication & Customer Service*	• Safety
• Legal Authority	• Budgeting
• *Acquisition Considerations*	• Engineering
• Information Management System (IMS)	• Call Before You Dig
• Training	• Water Quality Monitoring
• System Mapping	• Compliance
• SSO Reporting & Notification	• Mobile Waste Haulers
Maintenance Programs	• Pump Station Operations
• Manhole Repairs	• *Pump Station Emergencies*
• Rehabilitation & Replacement	• *Pump Station Force Mains PM*
• Mainline Sewer Repairs	• *Odor & Corrosion Control*
• Sewer Cleaning	• Continuous Sewer Assessment
• *Equipment & Tools Maintenance*	• *Smoke & Dye Testing*
• Pump Station Maintenance	• Flow Monitoring
• Maintenance of Rights-of-Way	• CCTV Inspection
Capacity Programs	• Manhole Inspections
• Capacity Assessment & Assurance	
• New Connection Tap-In	

Italicized programs in the above table have not been reviewed in this Annual Report

1.3 Collection System's Major Components

SD1's sanitary service area currently covers approximately 187 square miles, and its storm service area covers approximately 217 square miles. SD1 serves approximately 105,500 sanitary accounts and approximately 95,750 storm water accounts. SD1 manages a collection system that serves more than 286,000 residents and is approximately comprised of:

- 42,550 SD1 owned manholes
- 3,960 SD1 owned catch basins and inlets in the combined sewer system
- 1,600 miles of SD1 owned and operated gravity sewer lines and force mains
- 160 miles of additional Florence owned sewer lines and force mains
- 83 miles of additional privately owned sewer lines
- 431 miles of SD1 owned and operated separate storm water lines
- 125 pump stations (3 of which are owned by the Airport and operated by SD1 through a contract; 2 of which are associated with treatment plants)
- 78 gate structures
- 15 flood pump stations
- 6 small wastewater treatment plants (2 of which are owned by separate entities and operated by SD1)
- 3 regional water reclamation facilities

SD1 no longer operates 11 pump stations that are owned by the City of Walton. The contract with the city was terminated on June 30, 2016.

During FY 2017, SD1 acquired more than 51,700 feet of privately developed sewer and approximately 287 new manholes. All newly acquired sewers passed inspection and met the technical specifications and construction standards of SD1.

SD1's sewer system conveys wastewater from private laterals connected to homes, businesses, and industries through a series of gravity lines, pumped systems, and interceptors to a wastewater treatment plant. The service area consists of both combined and separate systems. The combined sewers are located primarily in the river cities. Maps of the sanitary and storm service areas and the major components can be found in Appendix A.

SECTION 2. CMOM PROGRAM HIGHLIGHTS

This section provides updates on the implementation and progress of many of the CMOM programs provided in Table 1.1.

2.1 Budgeting

The purpose of SD1's Budgeting Program is to enable all operating departments to execute SD1's mission and vision in a fiscally responsible manner and provide cost-effective services to ratepayers. The Budgeting Program provides SD1 with a clear understanding of the organization's financial needs and obligations, which results in the ability to adequately manage debt service and plan for future needs. This program also helps SD1 personnel categorize expenses and properly manage assets and infrastructure.

2.1.1 Capital and Operations & Maintenance Expenditures

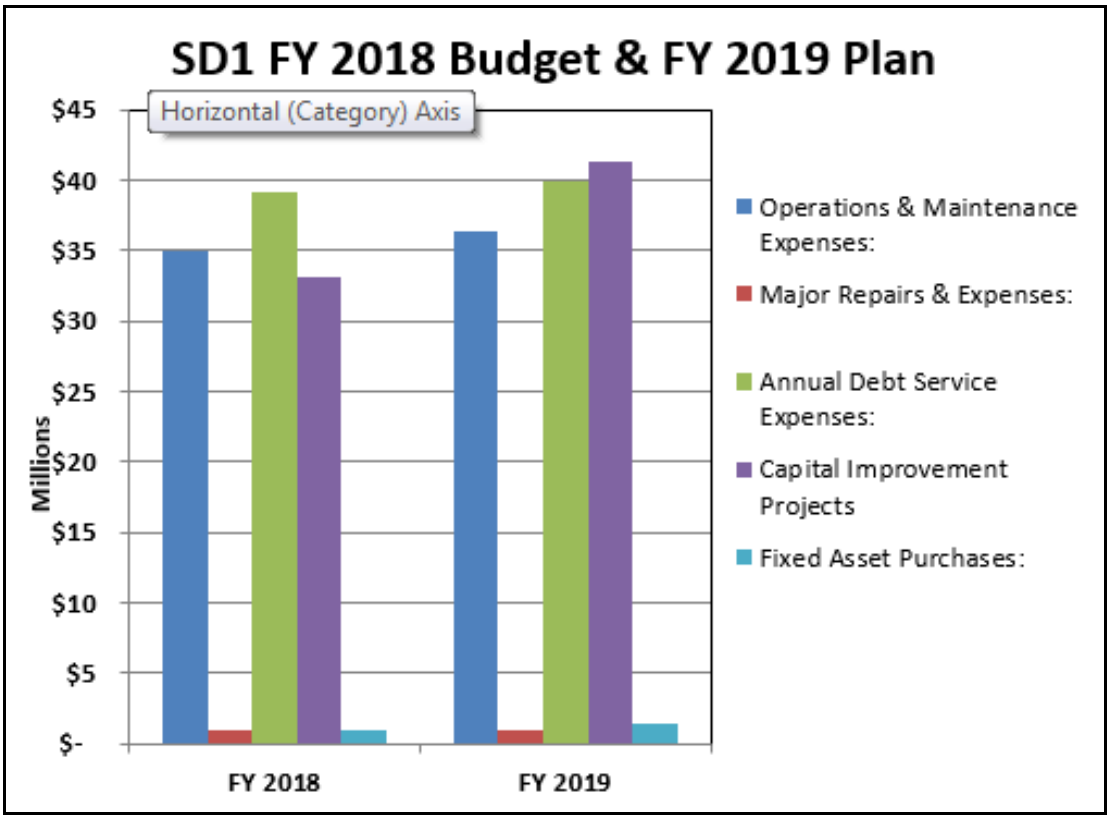
The audited capital expenditures for FY 2017 totaled approximately $10.9 million, and the audited O&M expenditures for FY 2017 totaled approximately $34.2 million. As required by the Consent Decree, SD1 has developed Watershed Plans for improvement projects to be implemented over the next several years, which will impact capital spending. The total capital spending associated with all sanitary projects over the next two years is approximately $74.4 million, as demonstrated in Table 2.1. Figure 2.1 represents SD1's anticipated debt service, O&M, and capital improvement program (CIP) expenses over the next two years.

Table 2.1 Two-Year CIP Budget
(FY 2018 and FY 2019)

Fiscal Year	Projected Capital Spending
2018	$34,107,744
2019	$41,258,500
Total	**$74,366,244**

Figure 2.1 SD1 Estimated Expenses: Annual Debt Service, O&M, and CIP

(FY 2018 and FY 2019)



2.1.2 Funding Sources

Although SD1 receives adequate funding from its operating revenue sources to fund its O&M and debt service commitments, these sources do not provide sufficient funding to also support the CIP. SD1 is therefore required to borrow money from other sources. During FY 2017, user rates, fees, and other revenues made up the majority of the total funding sources, and over $1.1 million in remaining bond proceeds and over $543 thousand in State Revolving Loan proceeds was drawn in the fiscal year.

2.2 Capacity Assessment & Assurance

The purpose of SD1's Capacity Assessment and Assurance Program is to determine the overall capacity of the collection, transmission, and treatment components of the system, and to identify areas that lack adequate capacity, so solutions can be

developed to provide sufficient service. This program provides staff with a holistic understanding of SD1's current capacity, which allows for better management, design, and control of the system.

2.2.1 Overflow Inspections and Hydraulic Modeling

SD1's wet-weather CSO investigation crew continued to perform routine inspections after rain events and during dry weather periods. SSO investigation and clean-up crews also continued to perform routine inspections after rain events at prioritized recurring and suspected wet-weather SSO locations. The purpose of these routine inspections is to verify overflow activity, assess the cause of overflow, and initiate the proper procedures for overflow containment and cleanup. This is part of SD1's ongoing effort to characterize, verify, and respond to overflows throughout the collection system, and to ensure that they are appropriately categorized and prioritized for elimination. Proper overflow characterization from field inspections reinforces the accuracy of the hydraulic models used by SD1 to understand system capacity, and also helps to identify the most appropriate and effective solutions for eliminating overflows.

SD1 developed a highly calibrated system-wide hydraulic model in 2008 to be used as an accurate planning tool for capital improvements, and to provide information about the current performance of SD1's collection system. To ensure that the hydraulic model continues to provide the most accurate information about the system's performance, SD1's Collections Systems – Operations Asset Maintenance crews perform routine inspections after rain events to verify the model-predicted overflows.

SD1 conducted approximately 5,155 CSO diversion inspections in FY 2017. Approximately 3,772 of the CSO inspections were conducted within 48 hours of a wet-weather event that produced at least one half of an inch of rain, or after a high-river event that activated the flood control system. The remaining 1,383 were routine CSO inspections conducted in dry-weather conditions. Additionally, following at least one inch of rain, SD1 conducted approximately 1,342 inspections at its known recurring and inactive SSO locations. These overflow inspections are used to verify activity for collection system modeling and to initiate clean-up procedures when necessary.

2.2.2 Flow Monitoring and Hydraulic Modeling

Flow Monitoring Activity

SD1's flow monitoring crew continuously utilizes remote-sensing devices, such as, flow meters, levels sensors, cameras, and rain gauges to collect various data in targeted areas of the collection system. These data are used to confirm model predictions, improve model certainty, identify and confirm areas that are suspected of having high inflow and infiltration (I/I) rates, inform reservation of capacity decisions, and quantify the benefits of capital projects with pre and post construction monitoring.

The map provided in Figure 2.2 identifies approximately 86 separate locations that were monitored with flow meters during the current reporting period. The purpose of monitoring these sites include:

- 71 capacity analysis and model calibration sites
- 5 CSO monitoring sites
- 4 micro-monitoring sites to analyze average flows and I/I of new developments
- 2 pre-construction monitoring sites
- 1 post-construction monitoring site
- 1 creek for a comprehensive watershed study
- 1 injection well pilot project monitoring site
- 1 pump station bypass (Highland Heights PS)

These meters are also used to calibrate and expand SD1's hydraulic model. Section 2.2.1 describes how field inspections are used to continuously provide assurances of model predictions. Flow meters are used to gather more detailed information on system response to varying antecedent moisture conditions and weather patterns. The data collected answer specific conveyance questions related to the reservation of capacity and the construction of capital improvements that alter the system enough to warrant calibration of the model.

Figure 2.3 illustrates where SD1's hydraulic model was calibrated or expanded with the continuous input of the SD1 flow monitoring program.

Figure 2.2 Flow Monitoring Locations in FY 2017

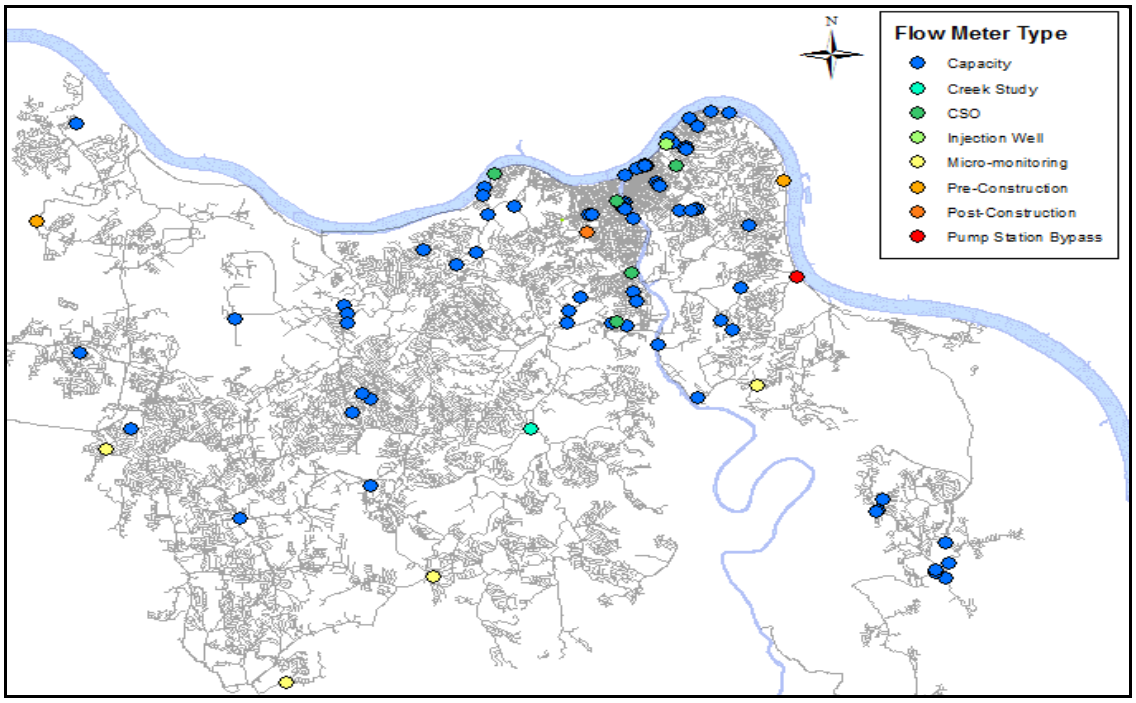
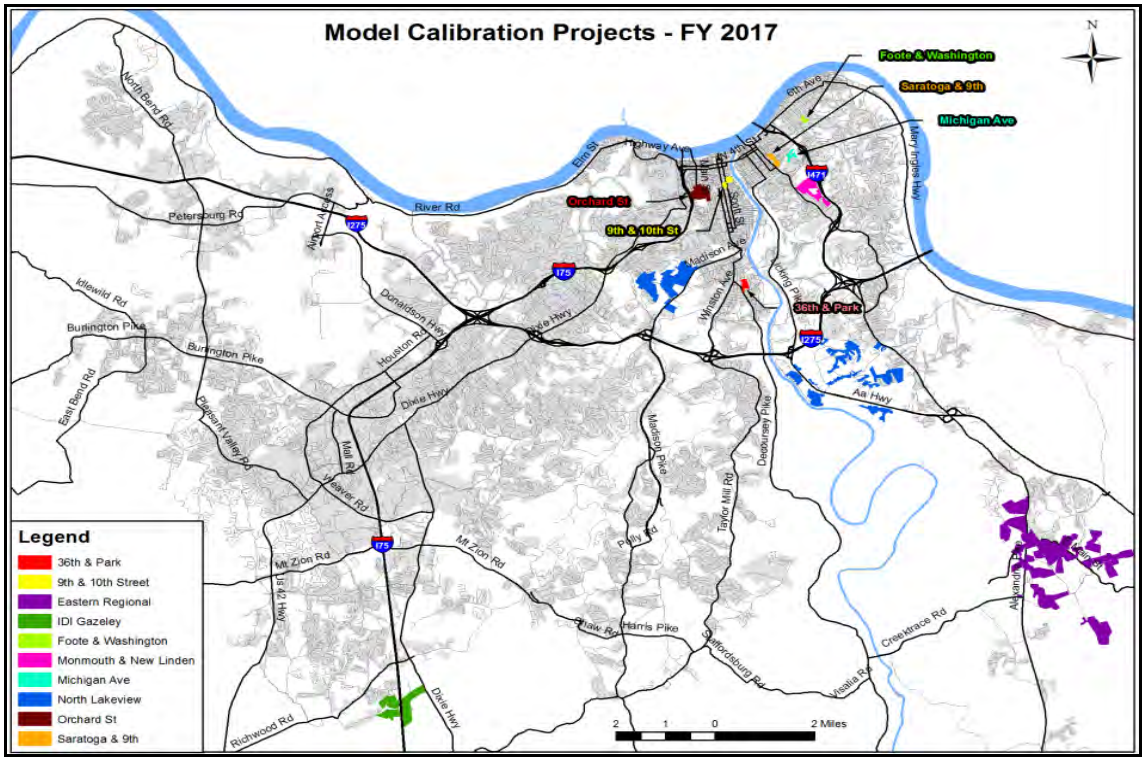


Figure 2.3 SD1 Model Calibrations in FY 2017

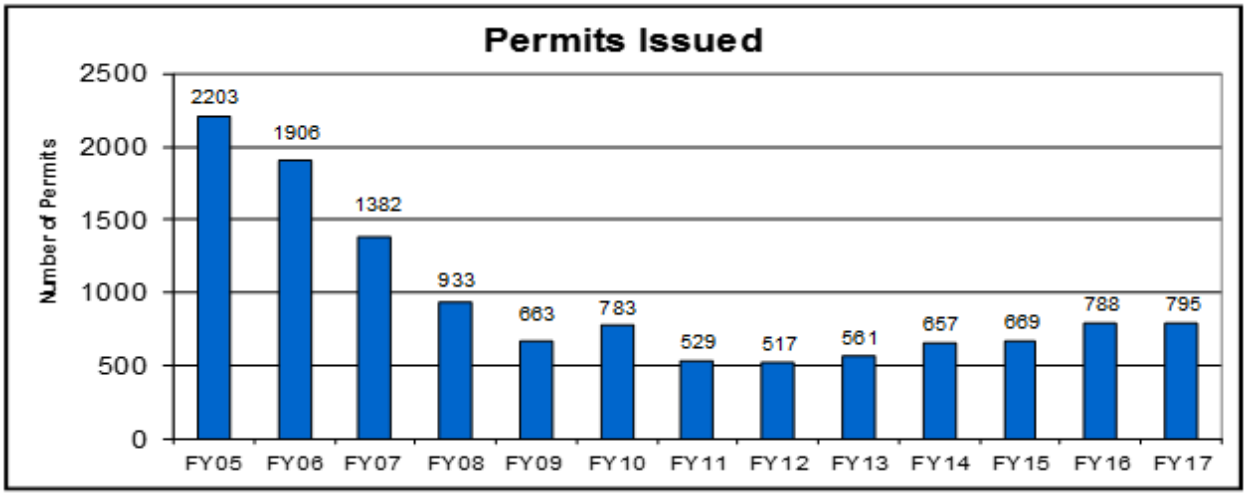


2.2.3 Reservation of Capacity

SD1's Rules and Regulations require developers to submit a written request for the reservation of sanitary sewer capacity, which is reviewed and considered for approval by SD1's Board of Directors.

A sewer capacity connection permit must be obtained from SD1, prior to connecting to the system. Figure 2.4 shows that permits issued by SD1 have declined sharply from ten years ago, but are steadily on the rise. SD1 has issued on average 749 capacity connection permits per year, since entering the Consent Decree in 2007. In FY 2017, SD1 issued 795 capacity connection permits, which is approximately six percent more than the ten-year average.

Figure 2.4 Capacity Connection Permits Issued (FY2005 - FY2017)



2.3 Call Before You Dig

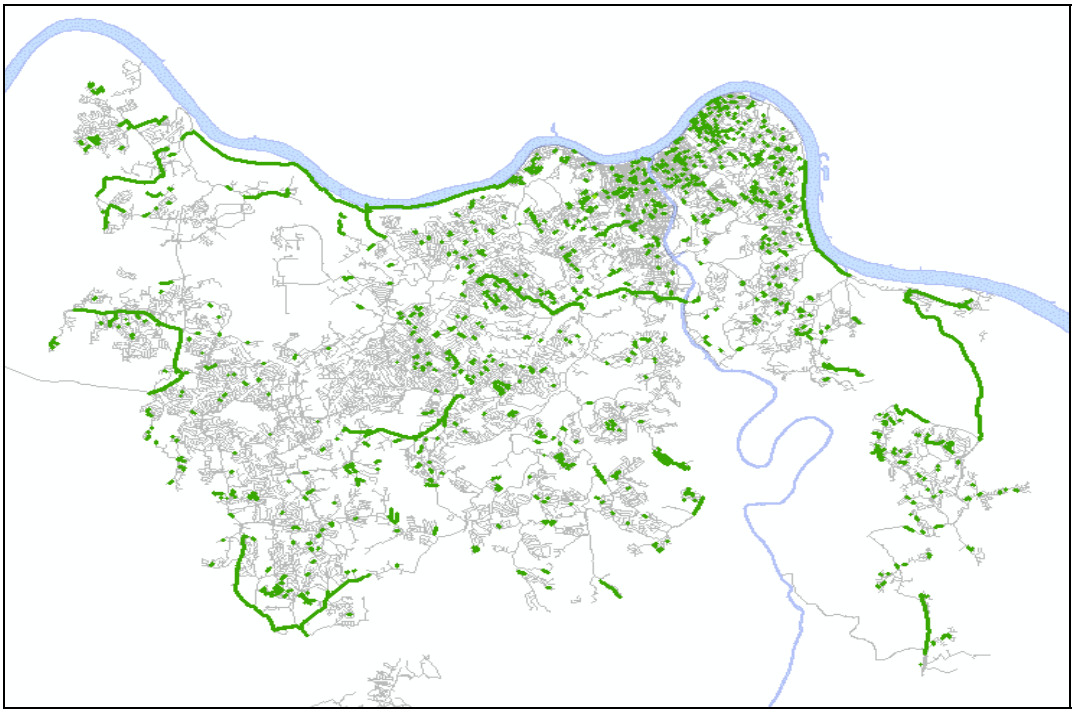
The purpose of SD1's Call Before You Dig Program is to protect underground assets by marking the ground where SD1 lines and easements exist, prior to construction activities by contractors, homeowners, and other utilities. By marking these assets prior to construction or any other disturbance, SD1 prevents unintended damage that could lead to line failures and SSOs. In compliance with the American Public Works Association Uniform Color Code, SD1 uses green paint to mark all sewers.

During FY 2017, SD1 responded to approximately 1,907 asset location requests. Approximately 1,794 work orders were generated from the requests and approximately 2,045 assets were marked. Table 2.2 provides the approximate total of line location work orders and assets marked by SD1 in the past six years. Figure 2.5 displays the assets that were located and marked in FY 2017.

Table 2.2 Line Locations

Fiscal Year	Work Orders Complete	Assets Marked
FY 2011	688	1,220
FY 2012	1,194	2,722
FY 2013	955	2,520
FY 2014	966	2,226
FY 2015	1,465	2,701
FY 2016	1,698	2,065
FY 2017	1,794	2,045

Figure 2.5 Lines Located and Marked in FY 2017



2.4 New Connection Tap-In

The purpose of SD1's New Connection Tap-in Program is to ensure standard policies and procedures are in place to approve and perform connections to the sanitary and storm sewer systems. The objectives of this program are to:

- Accommodate economic development throughout the Northern Kentucky region
- Eliminate the number of illegal and improper taps made throughout the collection system
- Ensure all connection fees are paid and all new connections are put on billing
- Maintain the integrity of the sanitary sewer system by reducing the amount of I/I that can enter the system through bad taps or improper abandonment of service laterals
- Protect the integrity of the sanitary and storm sewer systems by enforcing the use of proper materials
- Provide an avenue for SD1 to keep certified tappers informed about changes to the Rules and Regulations or specifications for tapping the system
- Provide supplemental training on other critical SD1 programs, such as FOG, illicit discharge and confined space entry safety

2.4.1 Certified Tapper Program

SD1's formal Certified Tapper Program ensures that connections to the sanitary and storm sewer system are approved by SD1 personnel and are performed accurately based upon written specifications and procedures. Plumbers interested in becoming certified are required to attend training and pass a written exam. In addition, Certified Tappers must attend a recertification class offered by SD1 every three years. SD1 currently has 204 Certified Tappers representing 118 plumbing companies, one city, one county, one university, and one utility. Of these 204 Certified Tappers, 36 became newly certified during FY 2017.

2.4.2 Violations and Fines

During FY 2017, SD1 issued 14 violations and $8,250 in fines to 10 companies for connecting to SD1's sewer system without obtaining the proper Capacity Permit or Sanitary Sewer Connection Application Permit. Table 2.3 provides the total amount of documented violations and fines issued since FY 2009.

Table 2.3 Capacity Connection Violations and Fines

Fiscal Year	Total Violations	Total Companies	Total in Fines
2009	6	6	$3,000
2010	8	7	$5,250
2011	9	6	$5,500
2012	7	3	$2,000
2013	19	8	$10,500
2014	23	14	$15,250
2015	3	3	$1,500
2016	7	7	$3,500
2017	14	10	$8,250
Total	**96**	**64**	**$54,750**

2.5 Lateral Repair Program

At the beginning of FY 2016, a formal policy was adopted by the SD1 Board of Directors to assist homeowners with the rehabilitation of failed service laterals that are in the public right-of-way. A full summary of the legal authority, the community's need for this program, and the program eligibility requirements was documented in the CMOM FY 2016 Annual Report.

Table 2.4 provides the total number of reviewed and repaired lateral failures in the public right-of-way, since the formal reestablishment of this program.

Table 2.4 SD1 Repairs of Failed Private Laterals in the Public Right-of-Way

Fiscal Year	Lateral Failures Reviewed	Lateral Repairs Approved
2016	114	94
2017	92	45
2018 YTD	14	24
Total	**220**	**163**

Appendix B provides a brochure that was developed in FY 2017 on SD1's Lateral Repair Program.

2.6 Continuous Sewer Assessment

The purpose of the Continuous Sewer Assessment program (CSAP) is to provide a proactive and coordinated asset management-based approach to assessing the condition and life cycle of SD1's infrastructure and managing a cost-effective rehabilitation/replacement of the system. Implementation of this program has enabled SD1 to more effectively and proactively prioritize and implement system inspection, cleaning, and rehabilitation/replacement of its assets.

The CSAP is comprised of the following six specific O&M activities that work in conjunction to assess and maintain the collection system:

- Interceptor Program – targets the maintenance and condition assessment of critical main trunk and interceptor sewers
- Large Diameter Sewer Assessment Program – focuses on the maintenance and condition assessment of sewers in the combined sewer system with pipes typically 15-inches and larger in diameter that have a high consequence of failure
- Manhole Inspection Program – assesses manholes throughout the collection system to determine the extent of structural defects, signs of surcharge and I/I
- Preventive O&M Program – prioritizes the condition assessment, maintenance and repair/rehabilitation of the collection system to proactively prevent system failure that can cause overflows
- SSES Program – identifies and assesses the sources of I/I throughout the collection system

- Trouble Call Program – provides response to calls from customers who suspect problems related to the sanitary sewer service

CSAP classifies pipes by using the Sewer Condition Risk Evaluation Analysis Model™ (SCREAM) to generate structural and maintenance scores for each pipe inspected. The structural and maintenance scores are used to identify appropriate schedules for recommended next actions, such as: reinspection, cleaning, repair, rehabilitation, or replacement.

Together, the activities of each O&M program ensure that SD1 is meeting the overall objectives of the CSAP. The remaining portions of this section highlight the collective progress of the six O&M programs in meeting the performance goals and projected targets of the overall CSAP, as well as an update to program logic improvements.

2.6.1 Collection System Condition Assessment

Sewer Inspections

On the following page, Table 2.5 outlines the amount of the system that has been assessed since the onset of the CSAP, through the end of the current reporting period. The table provides the initial and follow-up inspection footages over the first nine years of the CSAP. Initial inspections reflect the amount of the system that has been inspected for the first time based on a prioritization of the assets and criticality. Follow-up inspections are for pipes that have already been initially inspected and found to need maintenance, requiring reinspection for post-maintenance assessment and a new condition score.

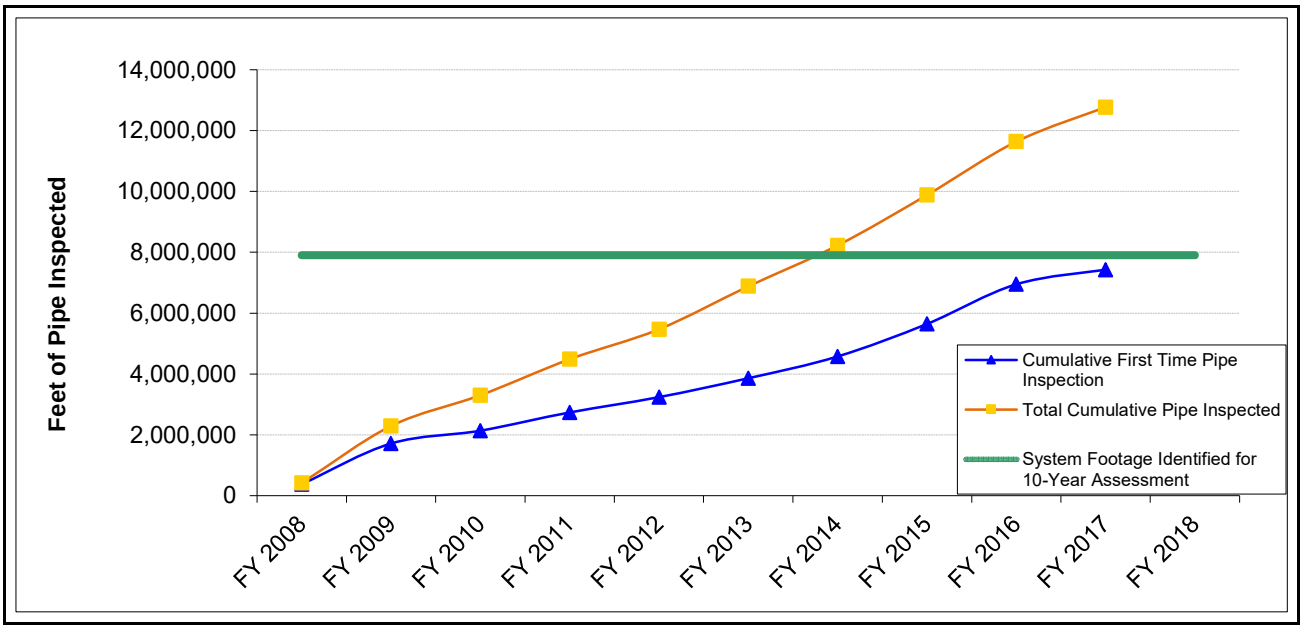
Table 2.5 Sewer Inspection Footage

	Initial Inspection Footage	Follow-Up Inspection Footage	Total Cumulative Footage
FY 2008	374,068	46,898	420,966
FY 2009	1,340,874	498,113	1,838,987
FY 2010	421,130	589,519	1,010,649
FY 2011	600,306	583,389	1,183,695
FY 2012	501,160	483,494	984,654
FY 2013	622,585	788,311	1,410,896
FY 2014	716,278	629,179	1,345,457
FY 2015	1,070,089	623,860	1,693,949
FY 2016	1,304,103	450,934	1,755,037
FY 2017	475,850	654,491	1,130,342
Total	**7,426,443** (94% of system)	**5,348,188**	**12,774,632**

SD1's CMOM Self-Assessment, submitted on October 17, 2007, projected a 10-year target for condition assessment of SD1's existing assets at that time, approximately 7,900,000 feet of pipe. The projection was largely based on historical inspections and maintenance routines performed prior to the formal development of SD1's CSAP. As stated in the Self-Assessment, this goal requires continuous evaluation that may require an adjustment of the projected schedule. However, with approximately 94 percent of the initially identified system assessed at the end of FY 2017, SD1 anticipates that it will meet the 10-year goal in FY 2018.

Figure 2.6 displays SD1's progress toward meeting the 10-year schedule for condition assessment of the system, as of FY 2017. The green horizontal line on the graph indicates the footage of pipe that was initially set in the CMOM Self-Assessment for condition assessment.

Figure 2.6 Sewer Inspection Progress



RedZone Robotics

To meet the ten-year target for assessment of the system identified in the CMOM Self-Assessment, SD1 made strategic investments in new camera technology to help accomplish this aggressive goal on time. RedZone Robotics' Solo camera is the world's only unmanned condition assessment tool made for sewer inspections. Refer to CMOM FY 2014 Annual Report for a thorough description of the technology that's being utilized to meet this goal. Currently, SD1 is regularly operating four of the robotic cameras to increase annual inspection footage.

SD1 used the RedZone Solo cameras to capture approximately 353,599 feet of initial inspections, or 54 percent of the total FY 2017 initial inspection footage.

Catch Basin and Manhole Inspections

SD1 temporarily suspended its manhole inspection program for FY 2016 and FY 2017, due to budgetary constraints.

SD1 continually reviews its collected inspection data to adjust maintenance strategies. In the past, SD1 has aimed to inspect all public combined sewer system catch basins at least once per year, as recommended in the Nine Minimum Controls Guidance. With the data collected over the past ten years, SD1 is now able to confidently target catch

basins for inspections and cleanings where there are known recurring maintenance issues. Catch basins that are known to not experience recurring maintenance issues are now being inspected on a less frequent schedule. Catch basins are cleaned on an as-needed basis, as determined by the annual inspections. In addition to the as-needed cleanings, crews clean a set of approximately 400 catch basins annually that are assigned to specific preventive maintenance schedules that have proven to be effective. SD1 continues to evaluate how to incorporate its Lucity inspection and assessment records for catch basins into the CSAP for automatic forecasting of maintenance and repair schedules.

Table 2.6 summarizes the number of catch basins and manholes inspected since the onset of CSAP.

Table 2.6 Catch Basin & Manhole Inspections

Fiscal Year	Number of Catch Basin Inspections*	Number of Manhole Inspections
FY 2008 (January – June)	986	2,050
FY 2009	1,774	7,238
FY 2010	4,168	1,933
FY 2011	3,401	1,783
FY 2012	4,019	901
FY 2013	4,247	889
FY 2014	3,745	824
FY 2015	3,569	208
FY 2016	986	0
FY 2017	1,937	0
Total Inspections	**28,832**	**15,826**

**Total includes basins owned by SD1, the Commonwealth of Kentucky, municipalities and private entities*

2.6.2 Collection System Maintenance

Sewer Cleaning

Cleaning is critical in maintaining the capacity of the sewer system and preventing overflows. SD1's prioritization process ensures that cleaning activities are done in a

cost-effective manner and only on pipes in need of cleaning. The cleaning program classifies pipes by using SCREAM™ maintenance scores and identifies appropriate schedules for re-inspections, cleaning, and when the pipe should be reviewed for a permanent solution, in lieu of continued cleaning.

Table 2.7 provides an overview of the total length of pipe cleaned, in accordance with the CSAP cleaning program logic.

Table 2.7 Sewer Cleaning Footage

Period	Footage of Pipe Cleaned
FY 2008 (January – June)	113,695
FY 2009	439,191
FY 2010	737,613*
FY 2011	382,352
FY 2012	370,296
FY 2013	632,825
FY 2014	568,551
FY 2015	600,302
FY 2016	325,798
FY 2017	347,030
Total Feet Cleaned	**4,517,653**

**Higher totals in FY 2010 are due to sewer cleaning support provided by an outside contractor*

Pipes with high recurring maintenance scores undergo further evaluation for potential permanent solutions. Taking into consideration the pipe's structural and maintenance condition, a life-cycle cost analysis is performed to determine if it is more cost-effective to continue to inspect and clean the pipe on a regular preventive maintenance (PM) schedule or to permanently repair or replace the pipe.

Typically, the cleaning and re-inspection frequencies of pipes vary, depending on the condition of the pipe or known recurring maintenance issues, such as grease, roots, and debris. SD1's permanent PM cleaning list will continue to evolve as new inspection data

are collected and corrective actions are assigned. Currently, more than 6,000 pipes are assigned to a cleaning program.

Sewer Line Rapid Assessment Tool (SL-RAT)

SD1 made further investments in sewer assessment technology in FY 2015. The Sewer Line Rapid Assessment Tool (SL-RAT) is a portable and very easy to deploy tool, composed of one transmitter and one receiver, which sends, receives, and interprets acoustic signals in a pipe. The SL-RAT is designed to listen for and assess the presence of blockages in pipes that are 12 inches or less in diameter. Typical assessments take less than three minutes to perform. During FY 2016, SD1 began using the SL-RAT to adjust the automated scheduling of maintenance next actions as determined by the CSAP. The SL-RAT provides a much more efficient method of refining the CSAP scheduling logic than the conventional deployment of resource-intensive and time-intensive CCTV crews. During FY 2017, the SL-RAT inspections were incorporated into the CSAP logic to improve the automation of next action scheduling and reduce the need for manual overrides, based on the acoustic scores.

Table 2.8 provides approximations of the annual acoustic inspection footages and adjustments made to delay unnecessary next actions, as determined by the automated CSAP, since FY 2016.

Table 2.8 SL-RAT Inspections and Next Action Adjustments

Fiscal Year	Footage of SL-RAT Acoustic Inspections	Footage of Pipe Next Action Adjustments Based on SL-RAT Score
FY 2016	290,000	240,000
FY 2017	267,087	139,968
FY 2018 YTD	131,945	63,333
Total	**689,032**	**443,301**

Catch Basin and Grit Pit Cleaning

In January 2009 SD1 began tracking the amount of debris removed during catch basin and grit pit cleaning. During FY 2017, SD1 removed an estimated 315 cubic yards of

debris from catch basins. Additionally, an estimated 20 cubic yards of debris were removed from grit pits.

Table 2.9 provides the estimated total cubic yards of debris removed from the collection system since mid-FY 2009.

Table 2.9 Cubic Yards of Debris Removed from Catch Basin & Grit Pit Cleanings

Activity	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	Total
Total Cubic Yards Removed with Catch Basin Cleanings	149	433	629	527	367	455	486	985	315	**4,346**
Total Cubic Yards Removed with Grit Pit Cleanings	237	362	330	400	468	355	210	33	20	**2,415**
Total Cubic Yards Removed	**386**	**795**	**959**	**927**	**835**	**810**	**696**	**1,018**	**428**	**6,854**

Rehabilitation and Replacement

The Asset Renewal group within the SD1 Collection Systems Department manages the internal construction crews and external maintenance contractors that perform repair, replacement, and rehabilitation work. The work schedule is determined by various criticality factors and the proximity of pipes to priority watershed areas. Pipes requiring emergency work are scheduled for immediate repairs upon discovery. Additional considerations that may determine if the rehabilitation schedule should be accelerated are:

- proximity to known building backups
- proximity to recurring overflows
- lack of hydraulic capacity
- proximity to other assets in need of repair
- high consequence of failure

Table 2.10 provides the rehabilitation and replacement activities performed by SD1's internal construction crews and contractors since the onset of the CSAP through the

end of the FY 2017. These activities do not include capital improvements managed by SD1's Engineering Division or O/M activities related to MS4 assets.

Table 2.10 Rehabilitation & Replacement Activities

Activity	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	Grand Total
Feet of Sewer Lines Repaired or Replaced	11,608	17,944	29,239	19,500	18,508	21,051	6,122	6,371	6,893	7,168	**144,404**
Feet of Sewer Lines Rehabbed (CIPP)	1,081	3,204	12,872	64,715	65,757	38,129	43,026	28,237	41,185	58,232	**356,438**
Number of Manhole Repairs	548	370	317	321	774	299	258	154	277	263	**3,581**
Number of Manhole Replacements	35	63	80	60	89	33	19	10	22	10	**421**
Number of New Manhole Installations	16	53	40	36	57	34	14	9	30	21	**310**
Number of CSS Catch Basin Repairs	68	115	71	209	292	21	56	63	65	84	**1,044**
Number of CSS Catch Basin Replacements	81	209	203	116	100	54	28	23	13	15	**842**
Number of New CSS Catch Basin Installs	0	4	2	3	3	3	6	0	0	2	**23**

2.6.3 CSAP Logic Improvements and Results

In FY 2017, SD1 worked extensively with its consultant who developed the SCREAM

assessment model to make significant programming improvements to the CSAP. These programming improvements include:

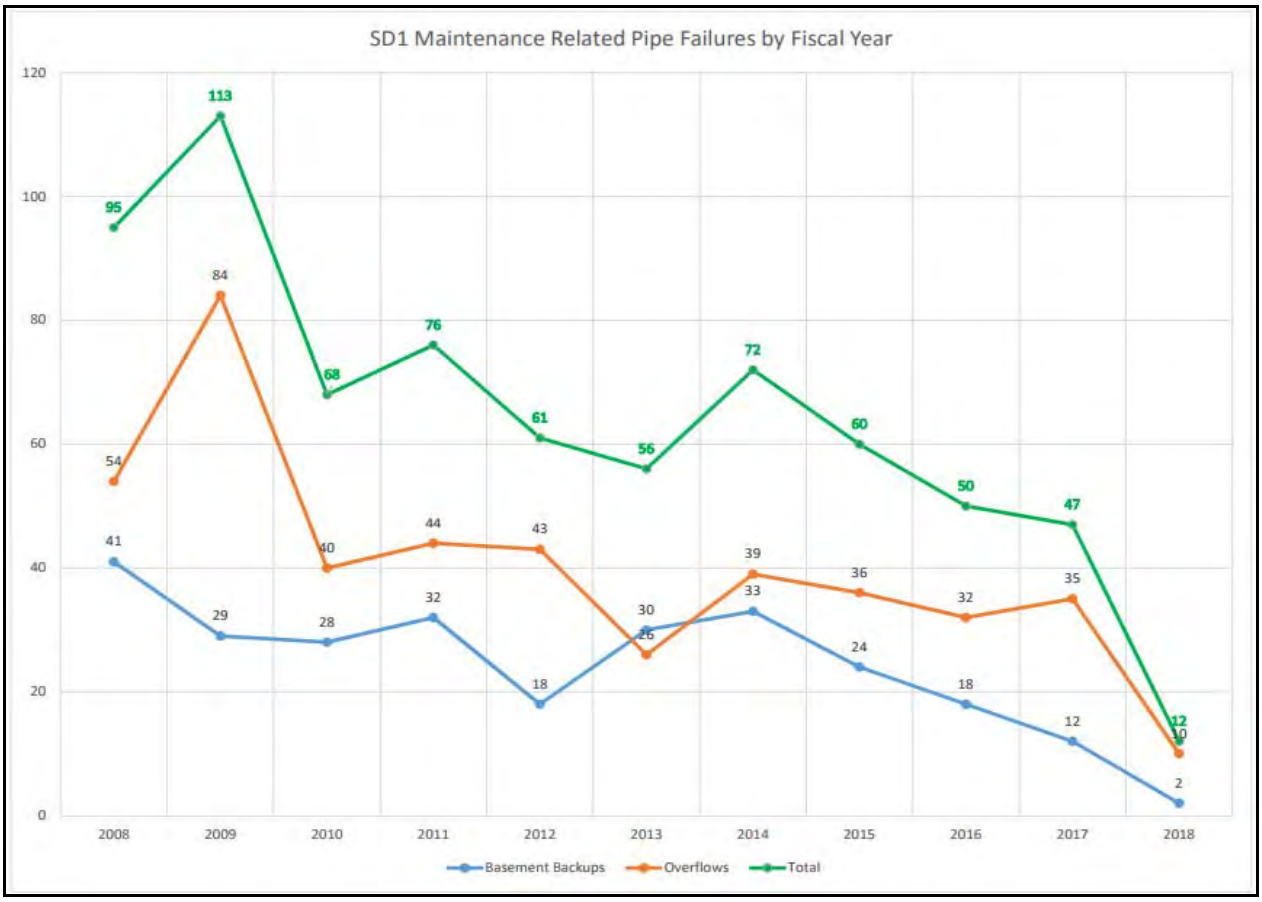
- Refinements of defect scoring to better predict failures
- Updated automation logic to better reflect historical behavior of the system
- Incorporated the recently developed consequence of failure and risk models in the CSAP logic
- Incorporated SL-RAT acoustic inspections into the logic for next action automation and scheduling
- Improved database management to reduce the need for manual overrides of automated next actions, making work order scheduling and quality control less cumbersome
- Better geographic distribution and clustering of work order creation
- Updates to costing tools and web reports

Additionally, fully updated SCREAM program manuals have been developed to guide new users and manage troubleshooting of the CSAP. All of the newly updated SCREAM manuals, which include the upgrades listed above, are provided in Appendix C.

These FY 2017 program investments in the CSAP have already begun to provide the intended results by effectively reallocating resource, improving proactive maintenance schedules, and reducing asset failures that lead to SSOs and building backups.

On the following page, results of the CSAP improvements are clearly demonstrated by the graph provided in Figure 2.7, which shows a dramatic decrease in overflows due to maintenance-related pipe failures in FY 2018.

Figure 2.7 Maintenance Related Pipe Failures by Fiscal Year



In particular, SD1 has utilized the recent CSAP upgrades and the incorporated SL-RAT inspections to respond quicker to blockages of debris, which have been determined to be the largest cause of maintenance-related pipe failures in SD1's collection systems.

Figure 2.8 illustrates how blockages of debris have been the leading cause of all pipe failures since FY 2008.

Figures 2.9 and 2.10 illustrate the reduction in debris-related pipe failures between FY 2017 and the first half of FY 2018.

Figure 2.8 Cause of Maintenance Related Pipe Failures since FY 2008

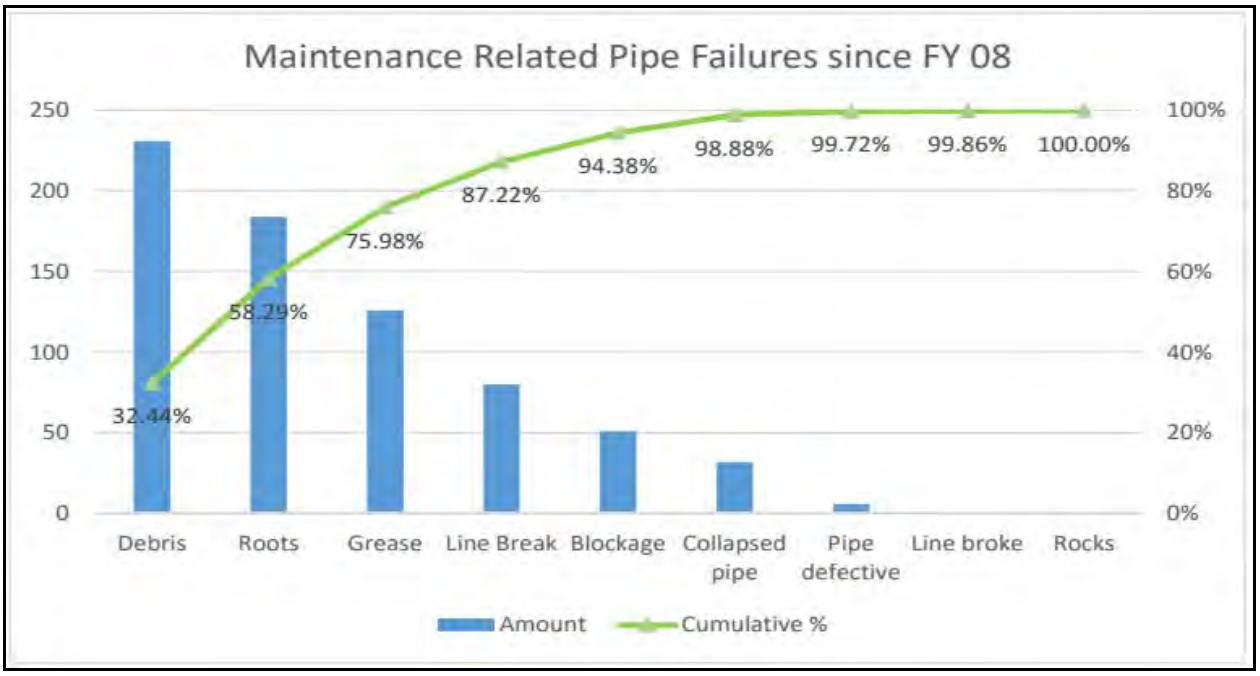


Figure 2.9 Cause of Maintenance Related Pipe Failures in FY 2017

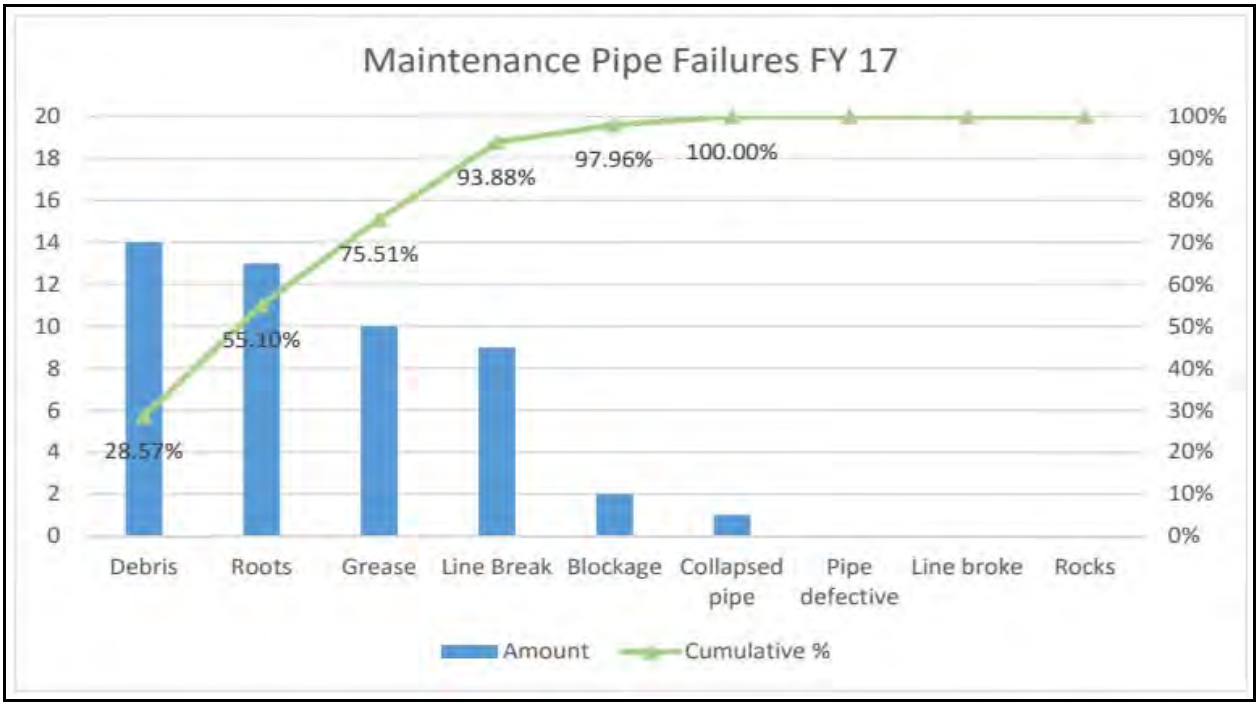
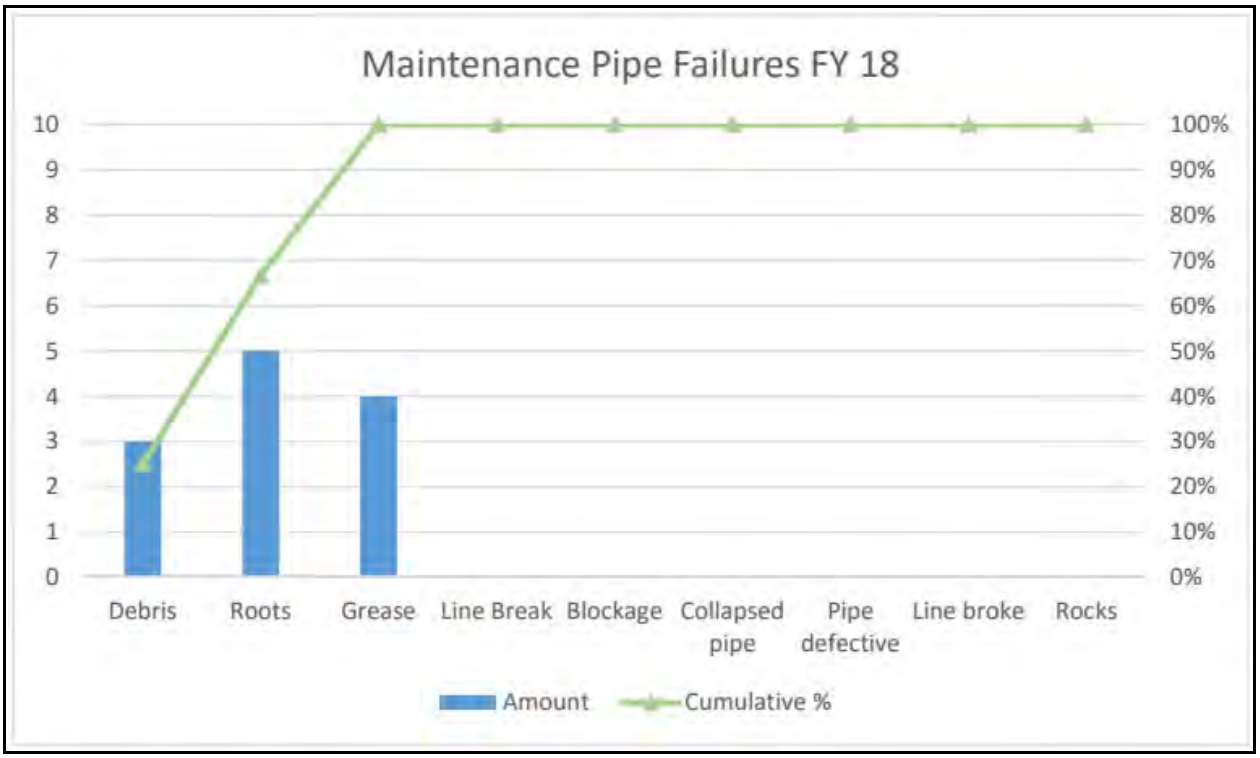


Figure 2.10 Cause of Maintenance Related Pipe Failures in First Half of FY 2018



2.7 Pump Station Operations

The purpose of SD1's Pump Station Operations program is to ensure reliable operations of the pump stations throughout the service area. Routine inspections and preventative maintenance are preformed to ensure that all stations are operating at maximum efficiency.

2.7.1 Pump Station Maintenance

In FY 2017, SD1 completed approximately 7,951 pump station check-list inspections and approximately 173 pump inspections. Additionally, SD1 performed 22,842 pump readings. More than 1,900 inspections and readings of generators were also performed. The routine pump station inspections include, but are not limited to:

- Generator assessments
- Stand-by pumps
- Heating ventilation and air conditioning
- Electrical components

- Air release valves, gate valves, plug valves
- Motors and motor controls
- Wet well evaluations
- Pneumatics and bubblers
- Hydraulics
- Telemetry and SCADA

SD1's FY 2018 target is to perform approximately 9,400 pump station check-list inspections, 5,200 generator inspections, and 780 flood station check-list inspections.

2.8 Compliance

The purpose of SD1's Compliance Program is to identify and control residential, commercial, and industrial sources of flow that could adversely affect the collection system. This program encompasses both the Industrial Pretreatment Program and Grease Control Program (see Section 4: Grease Control Program). This program meets the Clean Water Act pretreatment regulations and complies with the National Pollution Discharge Elimination System permit.

2.8.1 Permitting

The Compliance Program provides the authoritative measures necessary to permit and monitor discharges from commercial and industrial users that may cause corrosion or blockages in the collection system. SD1 ended FY 2017 with a total of 55 permitted Significant Industrial Users in its collection system.

2.8.2 Monitoring & Enforcement

The purpose of the Industrial Pretreatment Monitoring Program is to monitor discharges from industrial users throughout the service area to ensure compliance with Article 5 of SD1's Sanitary Rules and Regulations and protect SD1's sanitary sewer system, treatment plants, employees, and the receiving waters. All permitted industries are inspected annually and monitored semi-annually, with additional inspection and sampling performed as needed. During FY 2017, a total of 56 inspections were conducted. Of the 56 inspections performed, 54 were routine annual inspections, one was a wet-weather inspection, and one was due to a foaming event.

SD1 has an Enforcement Response Plan in place to address each violation. Typically, the first Notice of Violation (NOV) issued is verbal. The second NOV is written. Each subsequent NOV includes a fine. Fines can range anywhere from $500 to $1000 depending upon the violation. Most issues are resolved before escalating to fines. If problems persist, an industry is put on a compliance schedule. During FY 2017, SD1 issued 52 NOVs and five written notices with fines totaling $2,500. Refer to Appendix D for a summary report describing these violations in more detail.

2.9 Water Quality Monitoring

The purpose of the Watershed Monitoring Program is to establish a baseline assessment of watershed and stream conditions, via the collection of instream water quality, biological, physical habitat and hydromodification data throughout Northern Kentucky. This program includes dry-weather base flow water quality and biological monitoring in all watersheds (approximately 75 locations), as well as, event-based wet-weather water quality in major watersheds (approximately 60 locations). Additionally, both wet and dry weather water quality samples are collected on the Ohio River between river miles 444 and 518 (22 locations).

Performance Monitoring

Instream water quality and overflow data collected to help characterize watersheds in Northern Kentucky plays an integral role in prioritizing, designing, and implementing cost-effective solutions that will reduce overflow occurrences and improve water quality in rivers and creeks within SD1's service area. These data were used to create the hydraulic and water quality models that served as essential planning tools in developing SD1's Watershed Plans first submitted on June 30, 2009, as well as the March 14, 2014 final submission. In 2012, SD1 initiated Phase II of its monitoring efforts, which entailed revisiting sites originally sampled at the onset of the program in 2007.

During FY 2017, 27 sites within the Central Basin were sampled. These site revisits included biological and habitat assessments, base flow water quality samples, and where appropriate, hydromodification surveys. Additionally, one base flow and one wet-weather event were sampled for the entire Northern Kentucky portion of the Ohio River (river miles 444-518). SD1 continues to develop and refine performance metrics, in order to measure its progress in improving water quality in relation to the base-line water quality models.

Provided in Appendix E are two reports that were completed during FY 2017, which document the results of this ongoing water quality monitoring program.

Hydromodification

Hydromodification, or the alteration of stream channels due to land use changes that impact hydrology, is widespread in Northern Kentucky. It is one of the most serious threats to public infrastructure, private property, and water quality. Appropriate storm water management controls and strategies can serve to reduce the degree and rate of hydromodification, thereby reducing damages to infrastructure and property, while simultaneously improving water quality. SD1 has collected several years of data to identify relevant discharge rates to address these issues and continues to monitor and validate this approach. Additionally, SD1 has been forging partnerships with other regional agencies and private land owners who are dedicating resources to retrofit existing storm water infrastructure with better controls and implementing new technologies, in an effort to reduce the worst impacts of hydromodification.

2.10 Organizational Structure

The purpose of SD1's Organizational Structure Program is to delineate job responsibilities, outline opportunities for advancement, ensure effective employee supervisor ratios, and guarantee adequate staff is in place to accomplish the mission and vision of SD1. This program also works in conjunction with the annual budget process to determine staffing needs and allocate operational expenses appropriately.

SD1 currently employs 247 full time equivalents. Appendix F provides the current SD1 organization charts.

2.11 Legal Authority

The purpose of SD1's Legal Authority Program is to:

- Implement and enforce SD1's Rules and Regulations
- Assist in the development of policies and guidance documents
- Implement SD1's existing policies and guidance
- Ensure compliance with applicable state and federal laws
- Assist with securing necessary permits from state and federal agencies

- Keep informed of relevant legal issues and state and federal policies and guidance
- Reduce legal liability and manage risk
- Provide staff with legal support and advice
- Effectively manage litigation
- Provide legal assistance for timely, effective, and cost-efficient implementation of the Consent Decree, including coordination with regulators and legal review of all plans submitted pursuant to the Consent Decree

2.11.1 Backup Assistance Program

In April of 2017, SD1's Board of Directors approved a new Backup Assistance Program to help qualified customers who have experienced building backups during large magnitude storm events that occurred outside of SD1's level of service, as described in Article 3, Sections 301.5, of SD1's Sanitary Rules and Regulations. This financial assistance program requires customers to demonstrate that backups are not a result of failed internal pumping or private service laterals. If eligible, SD1 will reimburse expenses up to $5000 for the installation of a backflow preventer or other control device. The customer shall retain ownership and maintenance responsibilities of all devices installed to prevent backups. Detailed background information and program brochures are available in Appendix G.

2.12 Safety

The purpose of SD1's Safety Program is to ensure that appropriate measures are taken to eliminate or control the exposure of SD1 employees and the general public to hazards that may cause physical harm, and to comply with local, state, and federal safety codes and legislation. Performing daily operations in a safe manner not only protects our workforce and the community, but also demonstrates fiscal prudence, high employee morale, and results in financial savings for our ratepayers.

SD1's Safety Committee assists in providing a safe working environment for all employees. The Committee provides recommendations to improve safety and working conditions at SD1 and communicates with all departments, staff, and employees on matters relating to occupational safety and health. In addition, SD1 has an established

an Emergency Response Team that has been trained to plan for and respond to workplace emergencies.

2.12.1 Safety Training

SD1 has continued to produce and distribute a Safety Training Calendar that identifies class offerings, instructors, times, and dates of training throughout the year. A copy of the FY 2017 Safety Training Calendar is included in Appendix H. The calendar is posted to SD1's intranet, and monthly email notifications are sent to SD1 employees to notify them of upcoming trainings and mandatory attendance requirements. Attendance at safety training classes is tracked with Halogen performance management software to ensure that each employee meets his or her annual safety training requirements.

2.12.2 Performance Indicators

Table 2.11 outlines the indicators used to measure the success of the Safety Program and SD1's performance in each area during FY 2008 through FY 2017.

Table 2.11 Safety Program Performance

Performance Metric	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
OSHA Recordables	10	15	19	6	8	8	27	23	16	22
Worker Comp Claims	10	9	10	9	7	5	34	37	16	11
Friendly Reminders	18	1	8	6	5	2	10	0	14	7
Safety Violations Issued	3	0	4	1	4	1	1	1	6	2
First Aids	17	17	21	23	22	5	7	6	16	19
Site Safety Audits	104	348	222	235	192	253	874	764	282	297

2.12.3 Manhole Lid Retrofits

In FY 2017 and FY 2018, SD1 made investments in new manhole lids to reduce the risk of injuries during routine wet-weather inspections and flow monitoring operations. Multiple employees were injured in previous years while removing the standard 180-pound cast iron lids from elevated manholes in difficult terrain. SD1 purchased

approximately 40 50-pound composite plastic lids and approximately 25 bolted-down, self-swiveling cast iron lids to install on elevated manholes where routine annual inspections are performed. Installation of these lids will be ongoing throughout FY 2018 and FY 2019. Reductions in the risk of lost-time injuries, during wet-weather inspections and flow monitoring operations, ensures that consistent capacity analysis studies and overflow record keeping can be performed in challenging locations.

Figure 2.11 is an illustration of the self-swiveling lids that have been installed at Recurring SSOs and permanent flow monitoring sites.

Figure 2.11 Self-Swiveling Manhole Lid



2.13 Training

The purpose of SD1's Training Program is to build an elite, professional, and proactive workforce capable of executing the mission and vision of SD1 in a safe, timely, and cost-effective manner.

SD1 employees are provided with a wide array of training opportunities throughout the year, including safety training, technical skills training, and soft skills training in areas

such as communication and leadership. Employees may receive professional development through external conferences and courses, or through SD1's formal in-house training program that is managed by Human Resources. SD1 personnel received more than 6,676 hours of training (an average of 25.5 hours per person), during FY 2017.

(Refer to Section 3.1.1 for a description of SORP training and Section 2.12.1 for a description of safety training that took place during the current reporting period.)

SECTION 3. SORP

3.1 Emergency Preparedness & Response

SD1's Sewer Overflow Response Plan (SORP) is an operational document that emphasizes emergency response activities to contain, mitigate, and clean residuals from overflows. The long-range objective of the SORP is to provide a framework whereby proper documentation of each event will help establish permanent overflow abatement programs to be incorporated into SD1's Watershed Plans. SD1's SORP as amended July 10, 2009 received regulatory approval on November 10, 2009.

3.1.1 SORP Training

SD1 held annual SORP trainings between March and November of 2017. Approximately 100 operations-level employees attended these trainings, and were issued a standard operating procedures handbook, if needed. Personnel in Collection Systems and Plant and Pump Station Operations are required to attend a one-hour training course annually, as well as periodic refreshers throughout the year. The SORP initially required SD1 operations-level employees to attend a seven-hour course, annually. However, after seven years of intensive SORP trainings, it has been determined that an annual one-hour course is sufficient. The presentation slides from the FY 2017 SORP training for Collection Systems employees are provided in Appendix I. Operations-level employees also receive continuous hands-on training from supervisors in the field, during actual overflow response events.

3.1.2 SORP Annual Review

The Consent Decree requires SD1 to perform annual reviews of the SORP and make adjustments as necessary. Specifically, Section 36 (c) states that:

> **36. (c) Specific CMOM Program Development – Sewer Overflow Response Plan ("SORP").** …By no later than each anniversary date of the approval of the SORP, the District shall annually review the SORP and propose changes as appropriate subject to Cabinet/EPA review and approval.

SD1 conducted two SORP annual review meetings on September 05, 2017 and September 26, 2017. The first meeting was an overview of the entire SORP program with an emphasis on response procedures for SSOs and building backups. Procedures for public notification of overflow events and internal SORP communications were also covered in detail. The second annual meeting reviewed inspection and response procedures for wet and dry weather CSOs. It has been determined that there have been no material modifications to the SORP for FY 2017. Minor updates include personnel and scheduling changes.

3.1.3 SSO Reporting

The SORP describes SSO Reporting and Notification. On a quarterly basis, SD1 reports overflows that occurred throughout SD1's service area, which includes a cumulative accounting of all overflow activity from January 2008 through the current reporting period, and an annual comparison of the overflow activity. For the most up-to-date information regarding total SSO occurrences and volumes, refer to SD1 Consent Decree Quarterly Report No. 40, submitted on October 30, 2017.

SECTION 4. GREASE CONTROL PROGRAM

The purpose of SD1's Grease Control Program is to prevent the introduction of fats, oils, and grease (FOG) into the sanitary sewer system thereby reducing sewer overflows, maximizing sewer capacity and decreasing sewer maintenance costs. In addition, this program is intended to increase awareness of operators of local food

service establishments (FSE) and home owners about measures they can take to limit or prevent the introduction of FOG into the drains and sanitary sewer system.

SD1 received regulatory approval of its Grease Control Program: Proposed Phased Implementation Plan on January 8, 2008. The revised Grease Control Program includes components such as ordinances, design standards, and permitting requirements, inspection, and enforcement protocols. The enhancements made in the new Grease Control Program reduce sewer overflows within the collection systems and optimizes system capacity.

SD1 met the deadline for completion of all required tasks by January 8, 2012, and is currently tracking the remaining on-going tasks as part of its regulatory compliance measures.

4.1 Permitting

SD1 determines the need to issue a Food Service Discharge Permit along with any applicable fees. Effective January 1, 2012, all new food service establishments are required to obtain a Food Service Discharge Permit, in accordance with SD1 Rules and Regulations.

4.1.1 Record Keeping

SD1 Food Service Discharge Permit requires that FSE maintain a “FOG Folder” at the FSE facility address that must be available for periodic inspections. Records shall be retained for a minimum of three years. Failure to demonstrate the record keeping requirements during an annual or surprise inspection is a violation of the Food Service Discharge Permit and SD1 Rules and Regulations and subject to enforcement actions.

4.1.2 Grease Control Equipment (GCE)

SD1’s permit requires that all discharges containing grease & oil pass through Grease Control Equipment (GCE) before entering the sanitary sewer. GCE refers to any equipment that removes fats, oils, and grease from wastewater such as a grease trap which is installed inside the building usually under a counter/sink or built into the floor of the kitchen area; or a grease interceptor which is usually installed outside in the ground

and is much larger in size. GCE must be well-maintained and in proper operating condition at all times.

The design criteria for approved devices are defined in the FOG Management Policy and are enforced with deadlines for installation with SD1's Sanitary Rules and Regulations.

Effective January 1, 2012, all new FSEs, as well as those undergoing significant renovations, are required to submit plumbing plans to SD1 to ensure that the grease control device specified for installation meets SD1's design criteria. Once installed, the grease control device must be inspected by SD1 to verify that an appropriate grease control device was installed and is operating properly. SD1 will use any and all legal remedies to enforce the use of such devices, including the Administrative and Judicial remedies set forth in SD1's Sanitary Rules and Regulation. Commonly used remedies include: notices of violation, cease and desist orders, and administrative fines.

During FY 2017, approximately 26 plans for GCE installations were reviewed and 4 permits were issued by SD1.

Table 4.1 provides an annual summary of plans reviewed and permits issued, since the effective date of the FOG Management Policy.

Table 4.1 GCE Plans Reviewed & Permits Issued

Period	Plans Reviewed	Permits Issued
FY 2012	10	23
FY 2013	53	52
FY 2014	45	58
FY 2015	36	50
FY 2016	29	30
FY 2017	26	4
Total	**199**	**217**

4.2 Grease Trap Waste Disposal

All individuals or companies that haul waste to the Dry Creek Wastewater Treatment Plant must apply for and obtain a Domestic Holding Tank Waste Hauler Discharge Permit. Permits are issued on an annual basis and provisions of the permit must be adhered to at all times. Mobile waste haulers disposing grease trap waste at the plant are required to submit a Domestic Holding Tank Waste Hauler Manifest, which provides a detailed description of each load on their truck. All FSEs in SD1 jurisdiction shall have an SD1 certified grease waste hauler complete a grease interceptor certification annually. SD1 monitors the method and location of disposal of grease removed from accepted grease control devices through the grease hauler manifest. The information is stored in SD1's Lucity asset management software.

The amount of grease hauled to and disposed of at the Dry Creek Wastewater Treatment plant since FY 2008 is provided in Table 4.2.

Table 4.2 Grease Disposed at Dry Creek Wastewater Treatment Plant

Fiscal Year	Gallons of Grease
2008	555,833*
2009	43,649
2010	108,300
2011	161,150
2012	234,210
2013	185,575
2014	194,325
2015	163,645
2016	203,400
2017	171,250
Total	**2,021,337**

*There was a significant reduction in the amount of grease disposed at Dry Creek following FY 2008 because SD1 no longer received grease from Schwan's Global Supply Chain.

4.3 Inspections

SD1's Industrial Monitoring Department performs inspections of local FSEs that may be contributing to the buildup of FOG in the collection system. Random inspections are conducted to ensure compliance with the permit and with SD1's Rules and Regulations. Additionally, SD1 requires permitted FSEs to report proof of service or cleaning of its GCE. All documentation must be submitted to SD1 by the FSEs within 30 days of the actual cleaning and hauling of grease.

4.3.1 Compliance Inspections

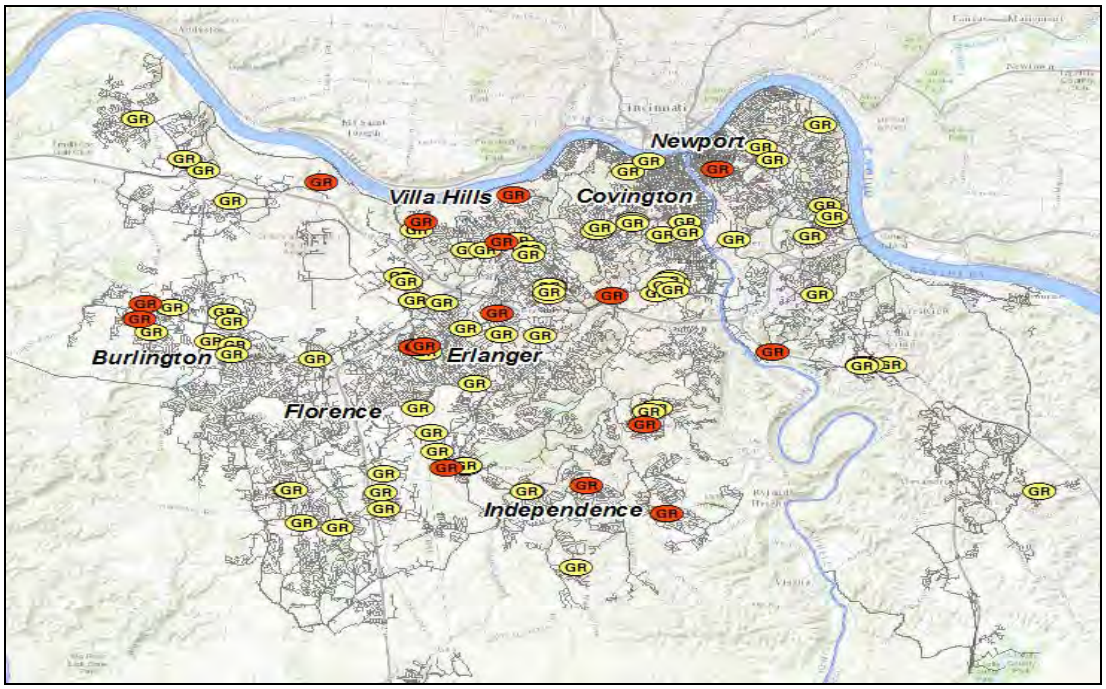
SD1 permitted 4 new FSEs throughout the service area, and 12 existing FSEs closed during FY 2017, bringing the total of permitted FSEs to 183. Within one year of a permit's issue date, at least one follow-up inspection is conducted at each permitted FSE. No Notice of Violations (NOVs) for non-compliance with the Food Service Discharge Permit were issued in FY 2017.

4.3.2 Sewer Inspections

SD1 may conduct FSE inspections based on sewer inspection data, which provides specific locations of grease blockages. CCTV inspection data in Lucity indicating a blockage of 30% or greater due to grease is visualized with GIS mapping to represent the FOG problem areas across SD1's service area. Maps are created from the data to display the sewer lines, sewer structures, and buildings connected to the collection system in relation to the grease blockages. The maps are updated daily with new inspection data and are reviewed periodically to determine if new problem areas exist. If new problem areas are discovered, the upstream FSEs in those areas may be inspected as a result of sewer inspections.

Figure 4.1 illustrates the current CCTV observations across the SD1 service where grease restrictions exist. There are approximately 83 locations that have been observed to have a 30-to-50 percent restriction in the pipe (yellow) and approximately 17 locations that have been observed to have greater than a 50 percent restriction in the pipe (red).

Figure 4.1 Observed Grease Restrictions



4.4 FOG Education

4.4.1 FSE Compliance Workshop

SD1's FSE compliance is coordinated with Northern Kentucky Health Department's (NKHD) monthly Food Service Managers Workshop, a required certification program for all FSEs in Northern Kentucky. The NKHD's certification test does have at least five questions covering proper grease disposal methods. This coordination provides a cost-effective and efficient way for SD1 to ensure that all FSEs, even those not currently permitted, are being trained. Additionally, FOG prevention posters printed in English and Spanish are provided at each workshop. FSEs must have at least one certified employee on duty, per shift. During FY 2017, approximately 1,300 food service managers attended the workshop and received information on SD1's FOG program.

4.4.2 General Education

SD1 uses various communication pieces throughout the year to inform and educate private residences on the harmful effects of FOG in sewer lines and the proper grease

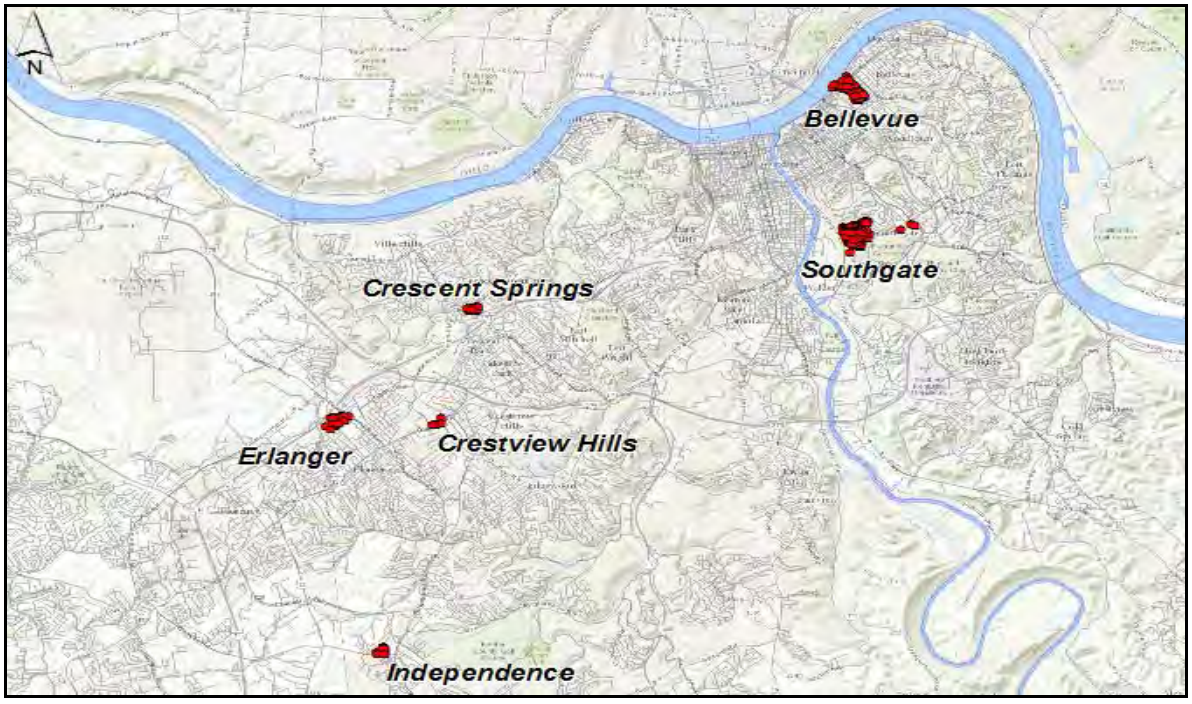
handling techniques that can be used to minimize the release of FOG into the collection system. This information is distributed through various channels such as: direct mailings, bill inserts, SD1's website, promotional product giveaways, and community newsletters and newspapers. With the grease observations obtained from CCTV inspections and overflow responses, SD1 focuses its public education efforts primarily in areas that are showing signs of grease problems and applies the appropriate communication strategy to best fit the situation.

Residential Communication

During FY 2017, SD1 mailed approximately 500 letters to residents and business in areas that have experienced overflows that were caused by excessive build-up of grease. The standard letter alerted customers that an overflow occurred, educated the residents about the effects of fats, oils, and grease on the collection system, and clarified proper disposal methods.

On the following page, Figure 4.2 illustrates, in red, the properties that SD1 mailed FOG education material to, following downstream SSOs that were related to grease blockages.

Figure 4.2 Properties that Received FOG Education Material in FY 2017



4.5 Performance Indicators

Table 4.3 provides a summary of the performance indicators that SD1 is tracking in relation to its implementation of a formal Grease Control Program. Specifically, SD1 is determining if there is a correlation between the approximate amount of pipe on a PM cleaning list for grease and the frequency of SSOs and building backups due to grease.

Table 4.3 Grease Control Program Performance Indicators

Performance Indicator	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13	FY 14	FY 15	FY 16	FY 17
Pipe Footage on PM Cleaning List, due to Grease	82,000*	4,326	4,326	4,892	4,945	5,465	7,656	13,721	7,958	3,981
Number of SSOs due to Grease	4	17	10	7	5	4	6	12	7	8
Number of Backups due to Grease (Trouble Calls)	2	5	7	7	7	6	4	8	6	1

**Between FYs 2008 and 2009, the lines listed on the permanent PM list were inspected and assessed according to the CSAP, using SCREAM scores to help identify the lines requiring PM.*

SECTION 5. PUMP STATION BACKUP POWER

SD1 received regulatory approval of the Pump Station Operation Plan for Backup Power on May 14, 2009, and completed the 110 required backup power projects before the December 31, 2015 Consent Decree deadline. For a detailed summary of the completed schedule, refer to Appendix J.

SECTION 6. SELF-ASSESSMENT

SD1 performed an extensive self-assessment of each CMOM program in mid-2007, involving approximately 75 employees in a series of interviews and team planning workshops. During the process, SD1 employees identified nearly 100 improvements to

SD1 operations that would help achieve regulatory compliance and reduce SSO and CSO occurrences throughout the service area. SD1 has completed or found better alternatives to all of the original recommendations of the 2007 CMOM Self-Assessment.

Since the original CMOM Self-Assessment, SD1 has continued to perform self-assessments to improve its performance in meeting the needs of its customers and the obligations of its Consent Decree. In 2013, SD1 developed a five-year Strategic Business Plan (SBP) for the organization. The SBP relied heavily upon employee input, similar to the original CMOM Self-Assessment. The process has produced a framework for identifying and prioritizing the goals, strategies, and metrics of SD1's essential services to the community. The following is an overview of the SBP and a few of the active project initiatives in FY 2017.

6.1 Strategic Business Plan

The SBP is a result of a collaborative planning process that was inclusive of customers, community stakeholders, and the employees of SD1. To develop a comprehensive community-focused and customer-centered plan, SD1 sought and assessed input and opinions from hundreds of individuals and organizations through surveys, interviews, and focus group sessions.

With the knowledge gathered from the assessment process, SD1 has:

- Updated its mission statement to reflect its purpose within the community
- Developed a new vision statement to communicate its plan to better serve the community moving forward
- Outlined company values to express the principles by which SD1 does business
- Identified seven goals to focus on the essential areas of improvement that are integral to the success of the organization and the Northern Kentucky community
- Devised key strategies to help SD1 achieve its seven goals

For further information on the development of the SBP, and a summary of the employee and stakeholder assessments, refer to Section 5.1 of the CMOM FY 2014 Annual Report. SD1's Strategic Business Plan summary document can be found in Appendix K.

6.1.1 FY 2017 SBP Initiatives

During FY 2017, SD1 made progress on several initiatives that align with the goals of the SBP. The following are brief summaries of just a few of the initiatives currently underway.

Aerial Sewer Inspection Program

Aerial sewers are elevated, exposed sanitary sewers that are supported by piers, which typically span valleys or creeks where there aren't slopes to support the pipes. Aerial sewers that fail can cause above ground overflows that are difficult to contain. SD1's new inspection program of these sewers includes inventorying and mapping all aerial sewers in SD1's GIS, performing structural assessments, assigning risk factors, and prioritizing re-inspection frequencies based on the pipe's condition. Additionally, the program helps identify where there are opportunities to reroute high risk aerial sewers. This project helps implement SD1's strategic priority to maximize the use of information technology systems to collect and share the asset-specific knowledge required to optimize the maintenance, rehabilitation, and replacement of assets at the right time. To date, 143 aerial sewers have been mapped and assessed. Figure 6.1 illustrates a typical aerial sewer inspection by SD1 staff.

Figure 6.1 Aerial Sewer Inspection



Data Center Fire Suppression System Upgrade

In order to protect the large volume of critical electronic information that SD1 has collected on its collections systems and customers, the Facilities Department has upgraded the data center's water-fed sprinkler system to the Sapphire fire suppression system. This new technology is effective at putting out fires, but, unlike water, will not destroy or damage electronic equipment. In the event of a fire, the new suppression system will be able to safely extinguish the fire while keeping SD1's data center intact, ensuring minimal business interruption and loss of records. This upgrade helps implement SD1's strategic priority to ensure business continuity and operational reliability during both routine and emergency conditions. Figure 6.2 illustrates SD1-owned electronics safety submerged in the liquid that's used in the Sapphire fire suppression system.

Figure 6.2 Fire Suppression System Upgrade to Data Center



Data Recovery and Business Continuity

Additional improvements to information management systems in FY 2017 include upgrades to voice and data services and the establishment of a redundant data center.

SD1 switched voice and data services to Cincinnati Bell, whose network architecture enables SD1 to leverage virtual private local area network (VPLS) mesh services for much more robust and resilient voice and data than previously possible. SD1's legacy phone system and hardware were replaced by the Cincinnati Bell hosted Avaya system that provides more reliable voice services to rate-payers, the customer service team, and dispatch operations.

SD1 also built a data center at it Dry Creek Treatment Plant to provide redundant data services for the main data center at the home office. The data centers have been connected to one another via Cincinnati Bell's VPLS network to provide high availability and network resiliency.

Lean Improvement Process

SD1 has made it an organization-wide priority in FY 2017 to adopt the principles and practices of Lean Six Sigma to eliminate wasteful and inefficient processes. Five SD1 employees completed formal Six Sigma training and received certifications. These employees have been designated Lean champions at SD1 and will be guiding the organization through process improvements for each department. The goal of this program is to create a Lean culture at SD1 by identifying and implementing continuous improvement strategies that are in line with the same self-assessment and continuous improvement principles outlined in CMOM. This meets SD1's strategic priority for achieving operational efficiency and resiliency through continuous improvement and innovation. Currently, SD1 is conducting process mapping for all critical business operations and establishing key performance indicators (KPIs) based on SD1's historical Levels of Service (LOS) and industry standards.

Provided in Appendix L are the draft core business processes for each department, and KPIs and LOS that have been established, to date. All provided KPIs and LOS are subject to change as more data is collected and analyzed.

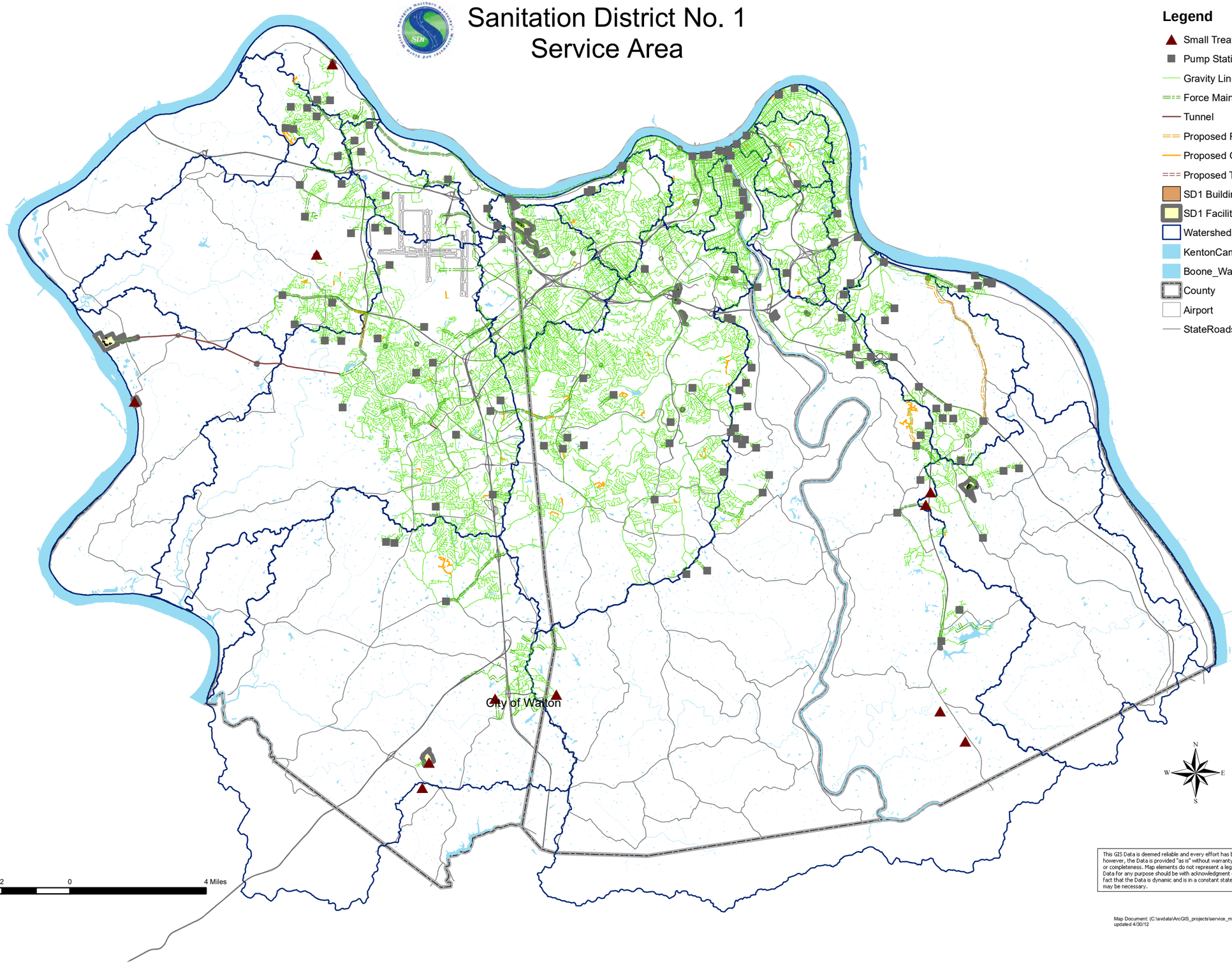
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APPENDIX A:

Maps of Sanitary and Storm Service Areas

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Sanitation District No. 1
Service Area



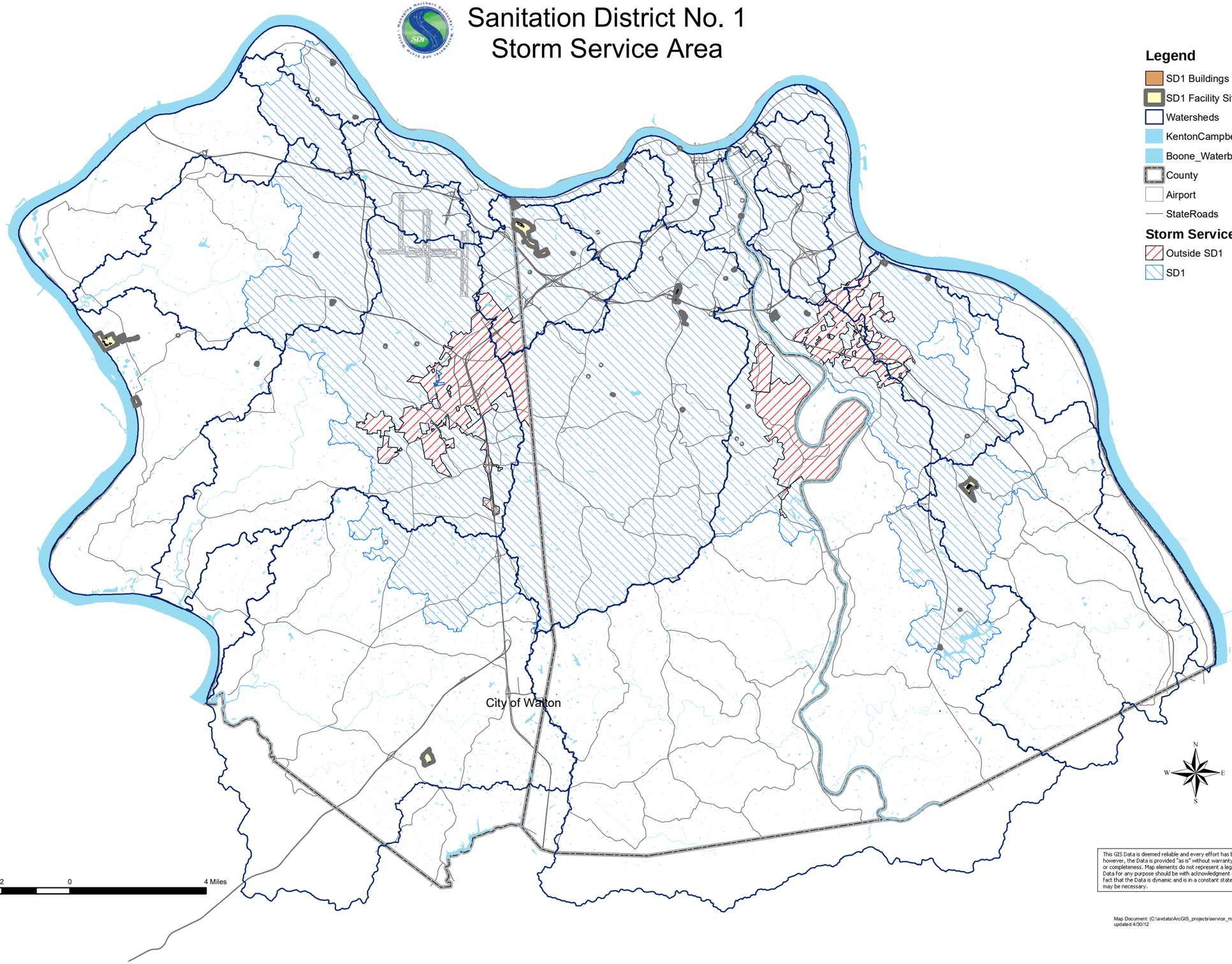
Legend

- Small Treatment Plant
- Pump Station
- Gravity Line
- Force Main
- Tunnel
- Proposed Force Main
- Proposed Gravity Line
- Proposed Tunnel
- SD1 Buildings
- SD1 Facility Sites
- Watersheds
- KentonCampbell_Waterbodies
- Boone_Waterbodies
- County
- Airport
- StateRoads

This GIS Data is deemed reliable and every effort has been made to ensure accuracy; however, the Data is provided "as is" without warranty of accuracy, timeliness, reliability or completeness. Map elements do not represent a legal survey of the land. Use of this Data for any purpose should be with acknowledgment of its limitations, including the fact that the Data is dynamic and is in a constant state of maintenance. Field investigation may be necessary.

Map Document: (C:\avdata\ArcGIS_projects\service_map_updates10_07.mxd)
updated 4/30/12

Sanitation District No. 1
Storm Service Area



Legend

- SD1 Buildings
- SD1 Facility Sites
- Watersheds
- KentonCampbell_Waterbodies
- Boone_Waterbodies
- County
- Airport
- StateRoads

Storm Service Boundary

- Outside SD1
- SD1

This GIS Data is deemed reliable and every effort has been made to ensure accuracy; however, the Data is provided "as is" without warranty of accuracy, timeliness, reliability or completeness. Map elements do not represent a legal survey of the land. Use of this Data for any purpose should be with acknowledgment of its limitations, including the fact that the Data is dynamic and is in a constant state of maintenance. Field investigation may be necessary.

Map Document: (C:\arvdata\ArcGIS_projects\service_map_updates10_07.mxd)
updated 4/30/12

APPENDIX B:

Lateral Repair Program Brochure

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SD1

Managing Northern Kentucky's Wastewater and Storm Water



Call for Help

Private property owners are responsible for maintaining their private sewer laterals. SD1, however, can help determine if the main public sewer line is contributing to a problem. If you see a pavement failure, building backup or sewer overflo , call SD1 at 859-578-7450 to request a check of the public sewer pipe.

If SD1 determines the issue is not related to the public sewer line, you will need to call a licensed plumber to investigate your lateral. If the defect is in the lateral below the public roadway, the following requirements must be met to qualify for SD1's lateral repair program:

- ☐ The owner of the roadway (city, county or state) must have agreed to participate in the program.
- ☐ You must provide SD1 with conclusive evidence, including a plumber's video recording, showing that the problem is below the public roadway and cannot be fixed through routine maintenance.
- ☐ Your plumber must locate the problem using a "locating device" and clearly mark the location on the surface of the roadway with spray paint or another appropriate material.
- ☐ Before SD1 can respond, the private property owner must sign an agreement holding SD1 harmless from any litigation resulting from the lateral repair project.

If you believe you qualify for SD1's private lateral repair program, you should call SD1's Debbie Rizzo at 859-578-6746 to request service.

Choosing a Plumber

If you need a plumber, consider these tips for choosing a service provider:

- Be sure the plumber you hire is licensed and carries full insurance that protects you and your neighbor's property in the event of a catastrophe.
- Ask for and check references. Remember a business's longevity does not always guarantee quality service.
- Ask for a flat, fixed quote so you know exactl what you will pay.
- Get more than one bid or quote for the job, but make sure you are comparing apples to apples for the same service level.
- Ask about the company's guarantee. Is it money back? Is it limited in any way? Is it written on your bid or quote?

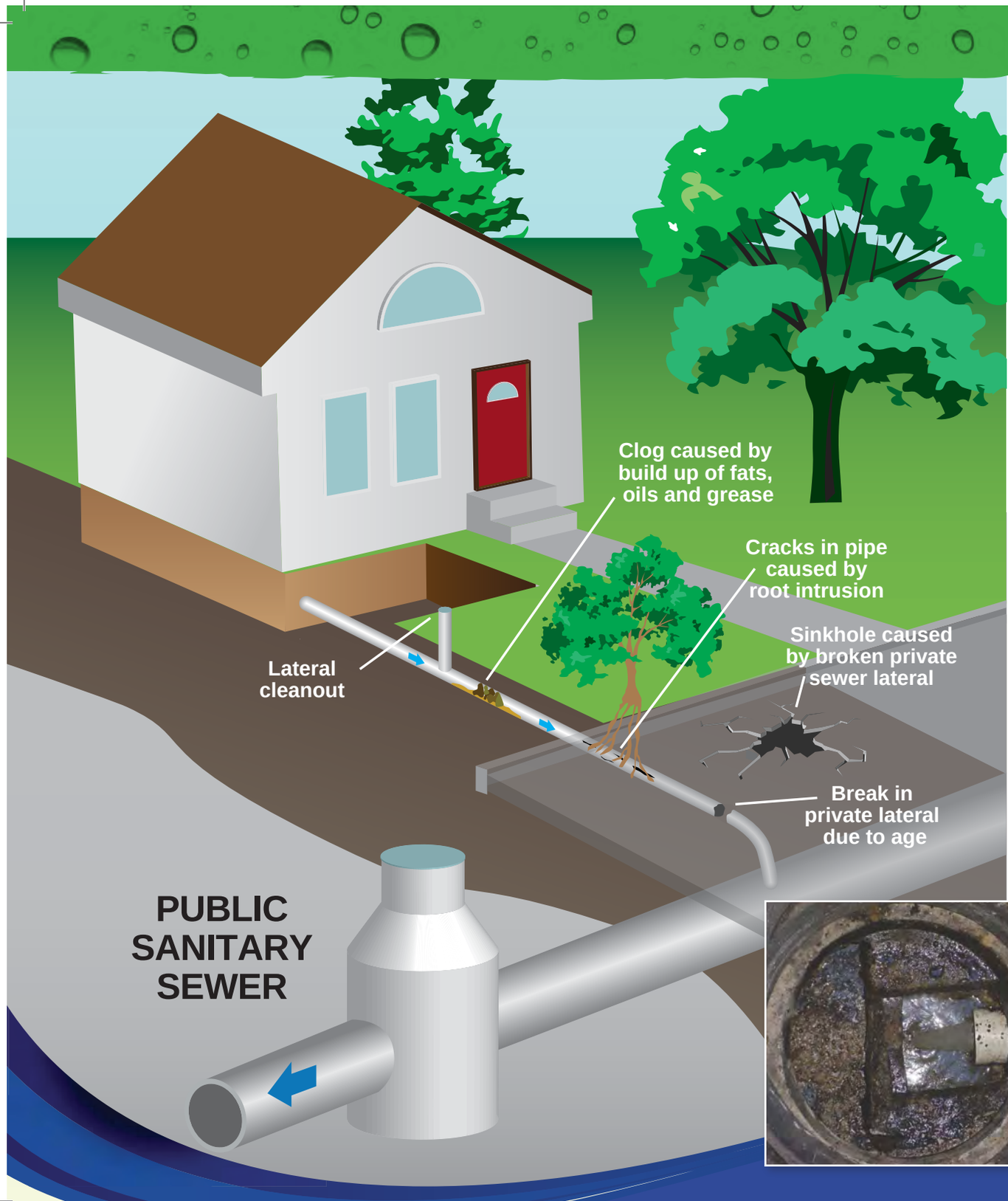
For more information about what to do in the event of a backup of sewage into your basement or another part of your home or business, visit www.sd1.org/RainEvents.



For more information about SD1's private lateral repair program, visit www.sd1.org/PrivateLateralRepairProgram.

Sanitation District No. 1
859-578-7450
1045 Eaton Drive
Ft. Wright, KY 41017
www.sd1.org

Maintaining Your Private Sewer Lateral





Your Lateral Is Your Responsibility

Your private sewer lateral is the pipe connecting your home or business's plumbing to the public sewer system. The wastewater, the water flushed or washed down drains and toilets, is conveyed through your private lateral to the public sewer system, often located beneath the roadway, which carries it to a treatment plant for cleaning.

A damaged or malfunctioning sewer lateral can cause a number of expensive, inconvenient and hazardous issues, including damage or sinkholes in the roadway above the pipe and backups of sewage into your basement or elsewhere in your home or business. These issues can be a risk to public health and safety, and, unfortunately, all cleanup and repair costs fall on the private property owner.

Protect Your Property and Wallet

You can prevent costly damages and repairs resulting from faulty sewer laterals by ensuring a vertical pipe with a removable cap called a cleanout connects your underground lateral to the surface for quick and easy maintenance access. Keep your sewer lateral functioning and clear of clogs and debris by following these tips:

- Never pour fats, oils or grease down the drains in your home or business. These substances can harden in the pipes and clog them.
- Don't flush diapers, wipes or personal hygiene products, which can also clog the pipes.
- Never pour chemicals down your drains, as some household cleaners can corrode pipes.
- Don't plant trees or shrubs with deep roots near your sewer lateral, as the roots can grow into the pipes.
- Have your lateral inspected by a certified plumber to ensure it is not damaged, cracked or clogged.

APPENDIX C:

Updated CSAP and SCREAM Program Manuals

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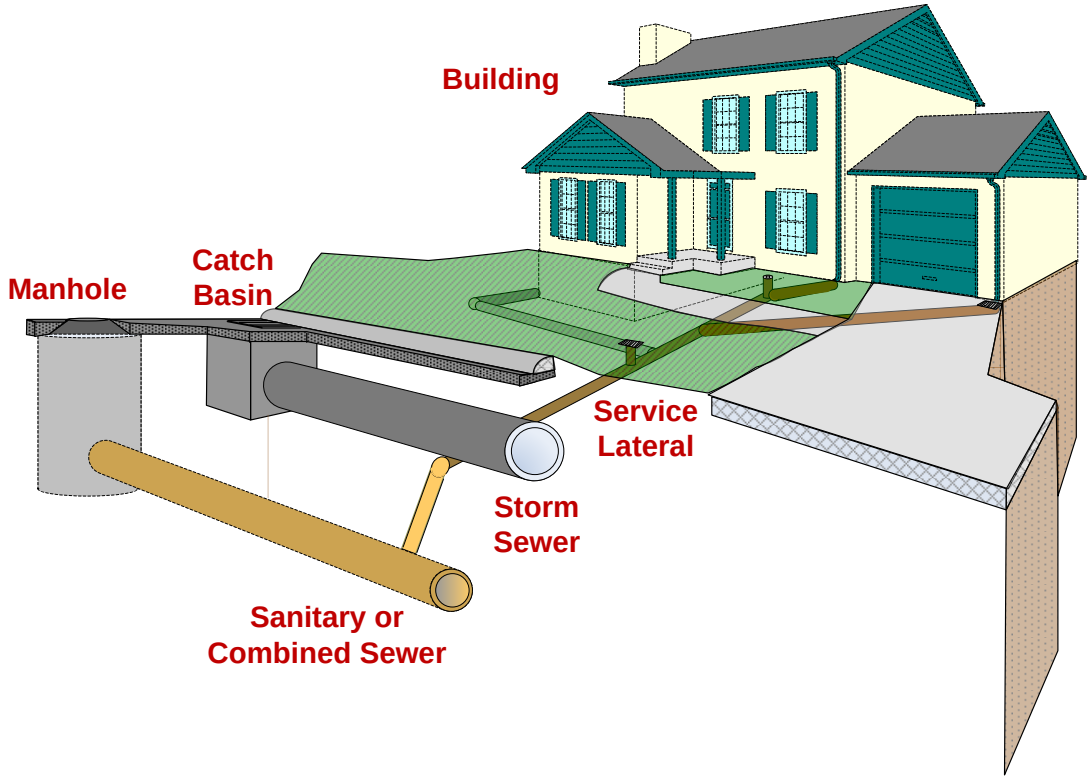
SCREAM Overview

For SD1, September 2017



Aging infrastructure require strong asset management toolkits

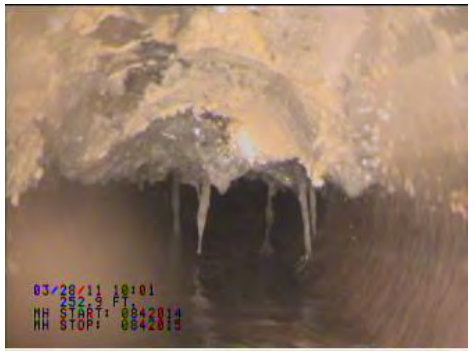
- Storm and Sanitary Sewer Assets
  - Manholes
  - Pipelines
  - Special Structures
    - Regulators
    - Outfalls
    - Catch basins
    - Other
- Inspection Techniques
  - CCTV
  - Manhole
  - Smoke and Dye
  - Pole camera
  - Acoustic
  - Custom – example special structures



None of our clients have funding to repair all their system's know problems

- They must prioritize
- But how?





- SCREAM

S – System C – Condition R – Risk E – Enhanced A – Assessment M - Model







SCREAM helps SD1 manage assets

Not just CCTV but manhole inspections and more



SCREAM

System **C**ondition **R**isk - **E**nhanced **A**ssessment **M**odel

Featured in EPA Technology Review:
***Innovative Internal Camera Inspection and Data Management for Effective Condition Assessment of Collection Systems,* 2010**



SCREAM is a proven, nationally recognized condition assessment and risk supporting tool

- Small Utilities or CH2M projects
  - Need analysis during a project
- Medium and Large Utilities
  - Overwhelmed with data, need to maintain their assets for the long term

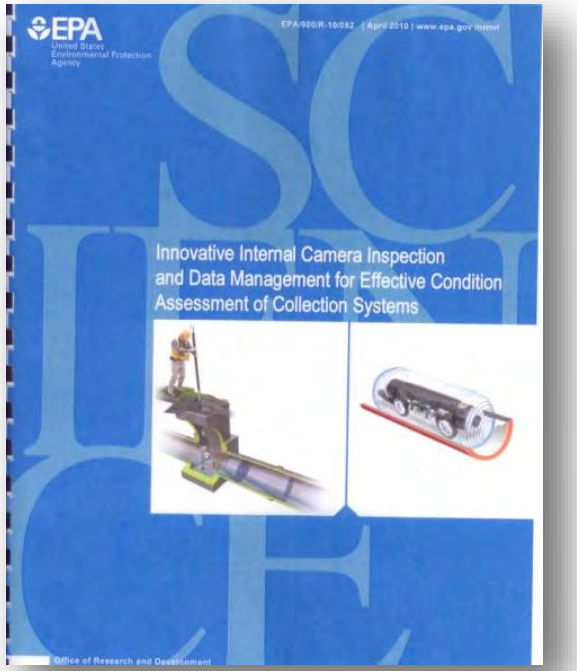
ON-GOING projects
Alexander City, AL*
Alexandria, VA
Ann Arbor, MI*+
Columbus, OH*
Dekalb County, GA*+
New Castle County, DE
Newport, RI
Northern Kentucky, OH*+
Tuscaloosa, AL*+
York, Ontario
DC Water
Cary, NC

Key HISTORIC projects	Service contract
Anchorage, AK	
Aurora, CO	
Boston, MA*	X
Fairfax County, VA	
Omaha, NE*	X
Puerto Rico*	
Suffolk, VA	

* SCREAM install at client site for continued use
+ Includes SCREAM Next Step and Costing

SCREAM provides tools utilities need

- Documented in EPA publication
  - *Innovative Internal Camera Inspection and Data Management for Effective Condition Assessment of Collection Systems,* 2010
- Better scoring accuracy than other standards
- Engineering judgement built into the algorithm
- Cost less because logic can be customized to the utility and focuses on their problems
- Capacity to handle multiple technologies
- Integration with other software



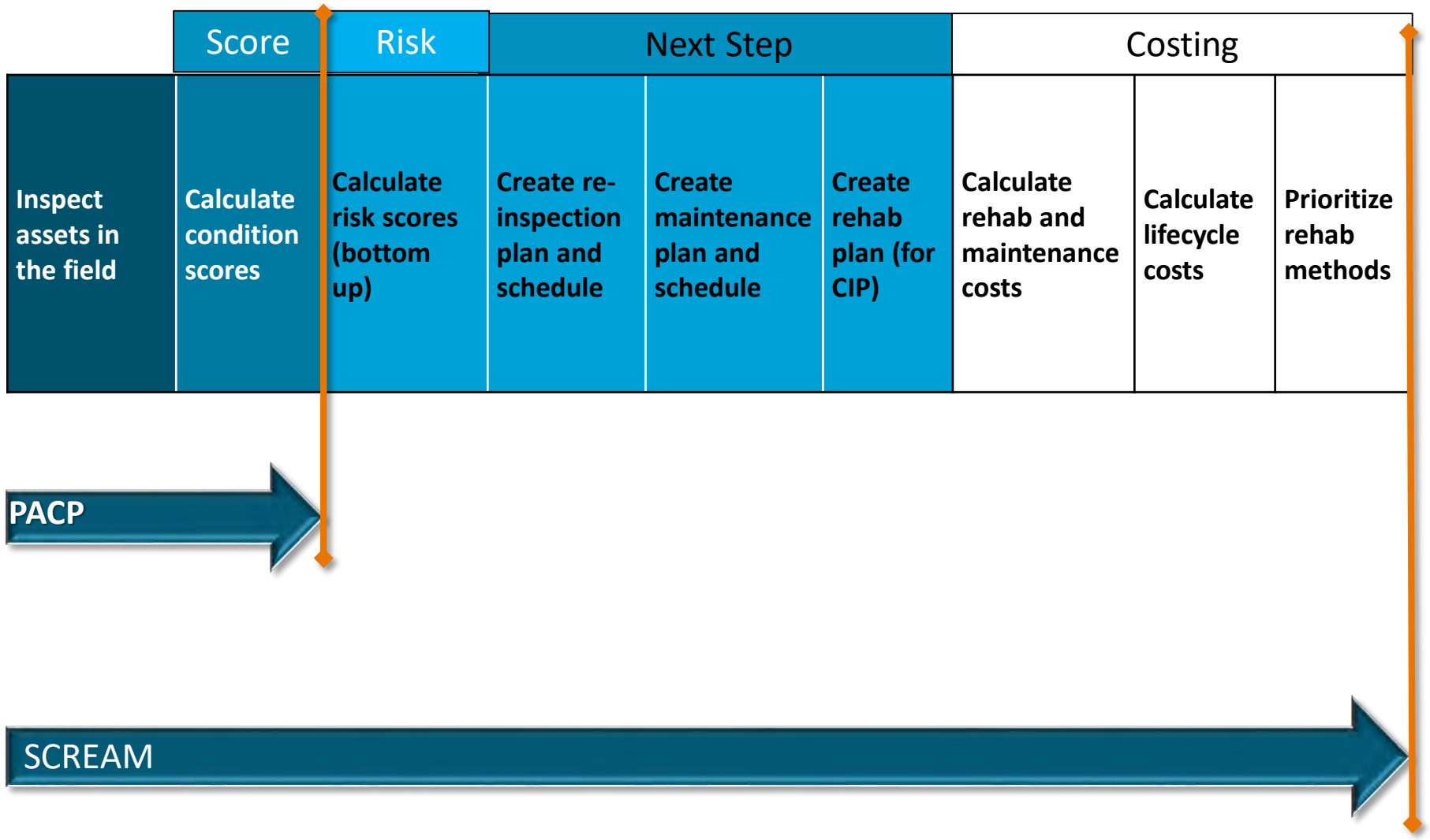
SCREAM can helps strategically manage and evaluate the large quantity of condition assessment data



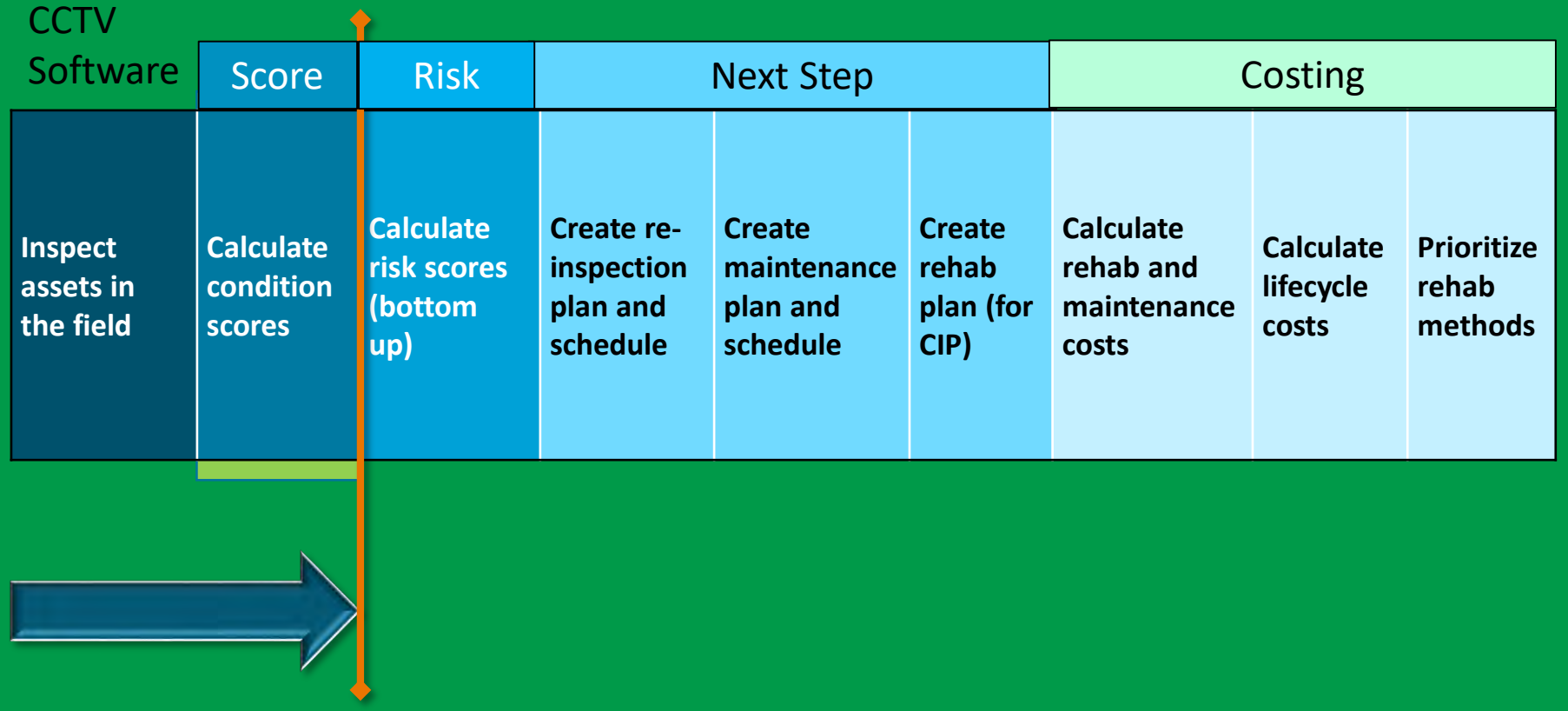
- Focus on assets needing immediate attention
  - Create Capital improvement and Maintenance Plans
- Track middle-grade assets (they may get worse over time)
  - Create Maintenance and re-inspection cycles

Staying on top of all your assets requires good inspection processes, data management, and integration

SCREAM can immediately manage your asset data



SCREAM Scoring - CCTV



SCREAM Scoring



Inputs

- **Asset Inventory**
- **Asset Attributes**
- **CCTV Inspection Logs**

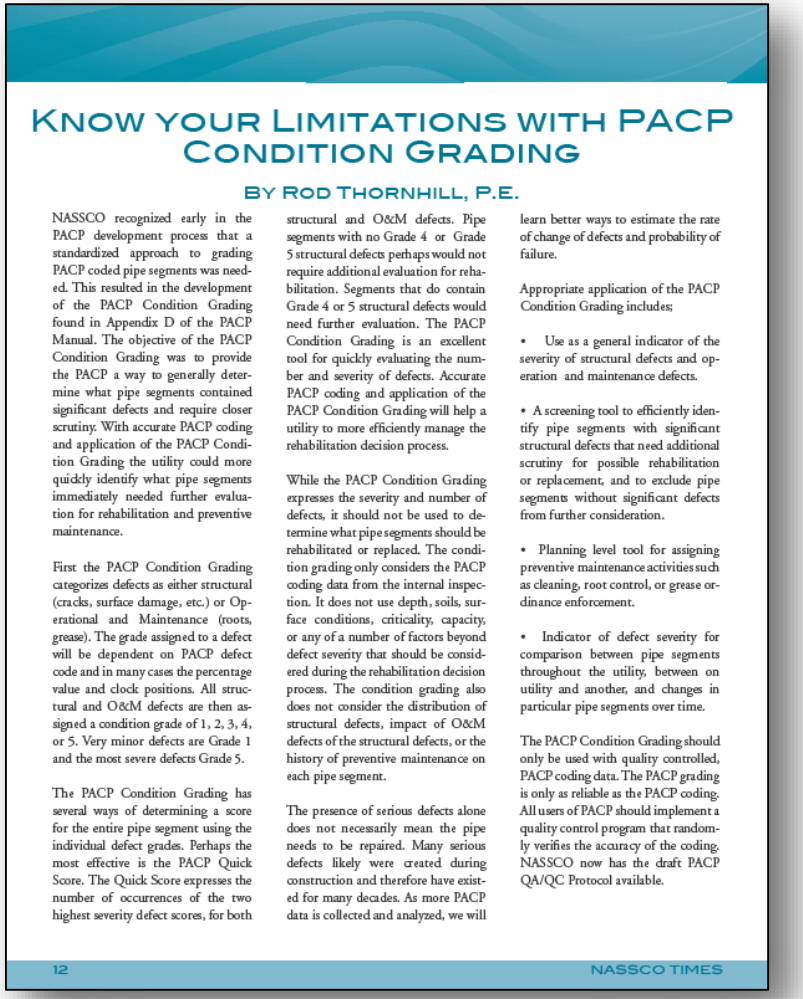
SCREAM Algorithms

Results

- **SCREAM Scores**

Structural	✓
Maintenance	✓
I/I	✓
Total	✓

Why we started SCREAM: NASSCO Alerts Users to PACP Grade Scoring Limitations



Know your Limitations with PACP Condition Grading

By Rod Thornhill, P.E.

NASSCO recognized early in the PACP development process that a standardized approach to grading PACP coded pipe segments was needed. This resulted in the development of the PACP Condition Grading found in Appendix D of the PACP Manual. The objective of the PACP Condition Grading was to provide the PACP a way to generally determine what pipe segments contained significant defects and require closer scrutiny. With accurate PACP coding and application of the PACP Condition Grading the utility could more quickly identify what pipe segments immediately needed further evaluation for rehabilitation and preventive maintenance.

First the PACP Condition Grading categorizes defects as either structural (cracks, surface damage, etc.) or Operational and Maintenance (roots, grease). The grade assigned to a defect will be dependent on PACP defect code and in many cases the percentage value and clock positions. All structural and O&M defects are then assigned a condition grade of 1, 2, 3, 4, or 5. Very minor defects are Grade 1 and the most severe defects Grade 5.

The PACP Condition Grading has several ways of determining a score for the entire pipe segment using the individual defect grades. Perhaps the most effective is the PACP Quick Score. The Quick Score expresses the number of occurrences of the two highest severity defect scores, for both structural and O&M defects. Pipe segments with no Grade 4 or Grade 5 structural defects perhaps would not require additional evaluation for rehabilitation. Segments that do contain Grade 4 or 5 structural defects would need further evaluation. The PACP Condition Grading is an excellent tool for quickly evaluating the number and severity of defects. Accurate PACP coding and application of the PACP Condition Grading will help a utility to more efficiently manage the rehabilitation decision process.

While the PACP Condition Grading expresses the severity and number of defects, it should not be used to determine what pipe segments should be rehabilitated or replaced. The condition grading only considers the PACP coding data from the internal inspection. It does not use depth, soils, surface conditions, criticality, capacity, or any of a number of factors beyond defect severity that should be considered during the rehabilitation decision process. The condition grading also does not consider the distribution of structural defects, impact of O&M defects of the structural defects, or the history of preventive maintenance on each pipe segment.

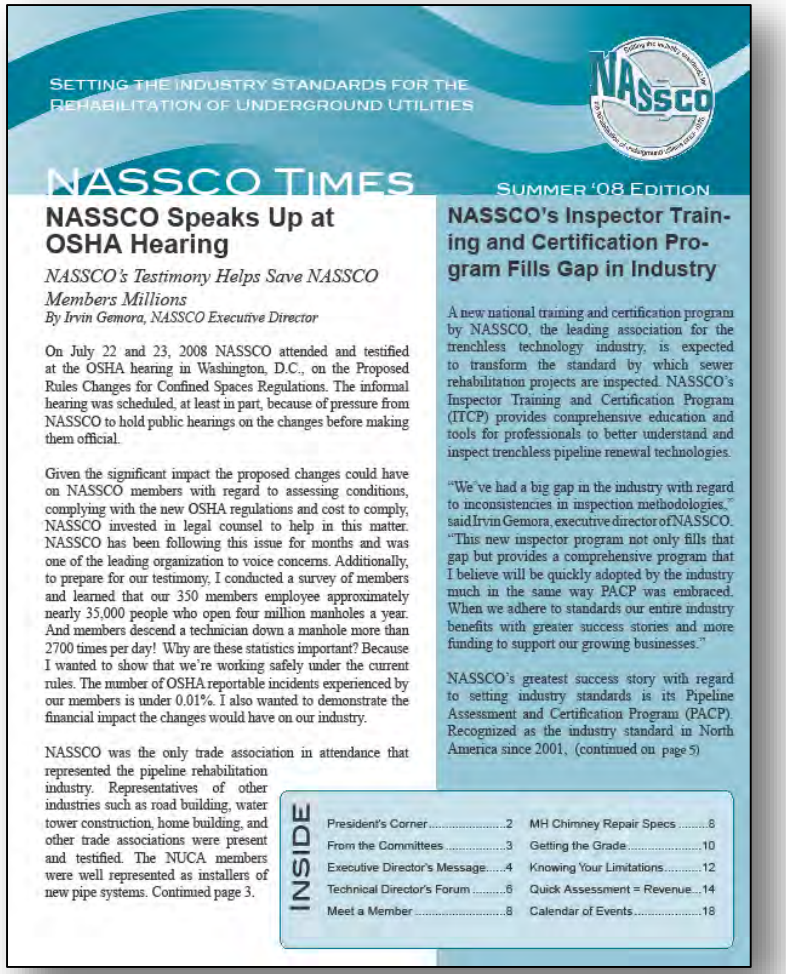
The presence of serious defects alone does not necessarily mean the pipe needs to be repaired. Many serious defects likely were created during construction and therefore have existed for many decades. As more PACP data is collected and analyzed, we will learn better ways to estimate the rate of change of defects and probability of failure.

Appropriate application of the PACP Condition Grading includes;

- Use as a general indicator of the severity of structural defects and operation and maintenance defects.
- A screening tool to efficiently identify pipe segments with significant structural defects that need additional scrutiny for possible rehabilitation or replacement, and to exclude pipe segments without significant defects from further consideration.
- Planning level tool for assigning preventive maintenance activities such as cleaning, root control, or grease ordinance enforcement.
- Indicator of defect severity for comparison between pipe segments throughout the utility, between on utility and another, and changes in particular pipe segments over time.

The PACP Condition Grading should only be used with quality controlled, PACP coding data. The PACP grading is only as reliable as the PACP coding. All users of PACP should implement a quality control program that randomly verifies the accuracy of the coding. NASSCO now has the draft PACP QA/QC Protocol available.

12 NASSCO TIMES



Setting the Industry Standards for the Rehabilitation of Underground Utilities

NASSCO TIMES

Summer '08 Edition

NASSCO Speaks Up at OSHA Hearing

NASSCO's Testimony Helps Save NASSCO Members Millions

By Irvin Gemora, NASSCO Executive Director

On July 22 and 23, 2008 NASSCO attended and testified at the OSHA hearing in Washington, D.C., on the Proposed Rules Changes for Confined Spaces Regulations. The informal hearing was scheduled, at least in part, because of pressure from NASSCO to hold public hearings on the changes before making them official.

Given the significant impact the proposed changes could have on NASSCO members with regard to assessing conditions, complying with the new OSHA regulations and cost to comply, NASSCO invested in legal counsel to help in this matter. NASSCO has been following this issue for months and was one of the leading organization to voice concerns. Additionally, to prepare for our testimony, I conducted a survey of members and learned that our 350 members employee approximately nearly 35,000 people who open four million manholes a year. And members descend a technician down a manhole more than 2700 times per day! Why are these statistics important? Because I wanted to show that we're working safely under the current rules. The number of OSHA reportable incidents experienced by our members is under 0.01%. I also wanted to demonstrate the financial impact the changes would have on our industry.

NASSCO was the only trade association in attendance that represented the pipeline rehabilitation industry. Representatives of other industries such as road building, water tower construction, home building, and other trade associations were present and testified. The NUCA members were well represented as installers of new pipe systems. Continued page 3.

NASSCO's Inspector Training and Certification Program Fills Gap in Industry

A new national training and certification program by NASSCO, the leading association for the trenchless technology industry, is expected to transform the standard by which sewer rehabilitation projects are inspected. NASSCO's Inspector Training and Certification Program (ITCP) provides comprehensive education and tools for professionals to better understand and inspect trenchless pipeline renewal technologies.

"We've had a big gap in the industry with regard to inconsistencies in inspection methodologies," said Irvin Gemora, executive director of NASSCO. "This new inspector program not only fills that gap but provides a comprehensive program that I believe will be quickly adopted by the industry much in the same way PACP was embraced. When we adhere to standards our entire industry benefits with greater success stories and more funding to support our growing businesses."

NASSCO's greatest success story with regard to setting industry standards is its Pipeline Assessment and Certification Program (PACP). Recognized as the industry standard in North America since 2001, (continued on page 5)

INSIDE

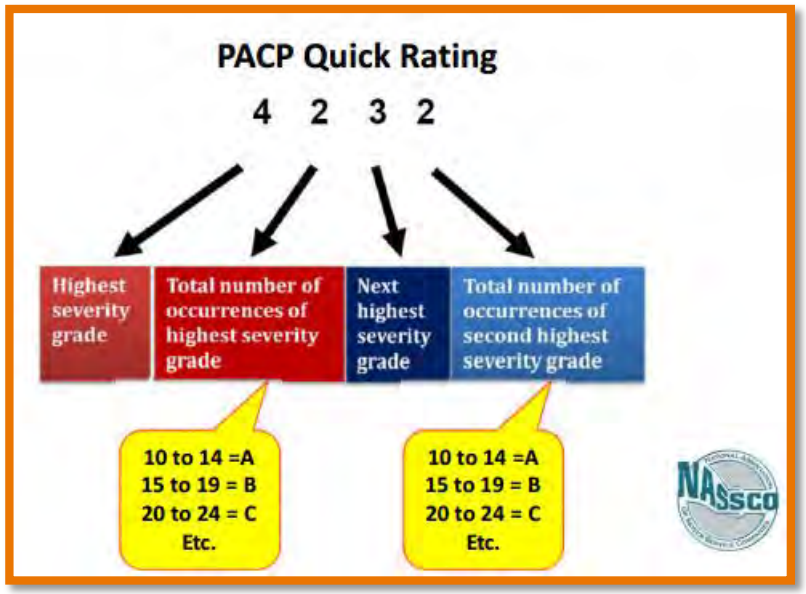
President's Corner 2
From the Committees 3
Executive Director's Message 4
Technical Director's Forum 6
Meet a Member 8
MH Chimney Repair Specs 8
Getting the Grade 10
Knowing Your Limitations 12
Quick Assessment = Revenue 14
Calendar of Events 18

CH2M Hill Condition Assessment and Rehabilitation Services

11

PACP Has Three Scores

- Pipe Rating → Sum of defect grades
- Pipe Rating Index
- Quick Rating



Equation: Arithmetic Mean

$$\text{Score } \overline{X} = \frac{1}{n} \sum_{i=1}^{n} X_i$$

Where: X = Pipe Rating or [Sum of Segment Grade Scores (Defect Grade x "n" for each defect)]

n = number of equivalent point defects

Score Scale: 1 – 5

Example PACP Condition Scoring Conundrums

Row #	Pipe Code	PACP Overall Rating	PACP Overall Quick Rating	PACP Rating Index
30	970155	73	5845	3.65
31	970160	29	5541	4.83
32	970180	14	3221	1.56
33	970185	13	4122	1.63
34	970190	3	3100	3
35	970195	19	3324	2.11
36	970200	4	4100	4
37	970210	15	3323	2.5
38	970220	5	5100	5
39	970230	17	5241	4.25
40	970235	5	5100	5
41	970245	14	5241	4.67
42	970255	113	5B44	4.71
43	970260	77	5A44	4.53
44	1110015	2	2100	2
45	1110035	19	3128	2.11
46	1240010	23	4333	3.29
47	1690160	13	1A00	1
48	1850435	5	5100	5

Row #30: Has 8 Severity 5 (worst on a scale of 1-5) and 5 Severity 4 defects; Rating Index = 3.65

Row #31: Has 5 Severity 5 and 1 Severity 4 defects; Rating Index = 4.83. Should not be worse than Row #30.

Row #38: Has 1 Severity 5 and no other defects. Rating Index = 5

Row #42: Has between 15 and 19 Severity 5 and 4 Severity 4 defects. Rating Index = 4.71. Should be worse than Row #38., #40, & #48

13

Scream's key scoring principle is embodied in its mathematical formula

Most urgent defect identified in formula

$$DS = \max(DS) + ((100 - \max(DS)) * (A * \text{Weight } A + B * \text{Weight}))$$

- An analogy; medical triage



Scale: 1 new -100 failed
DS = Defect Score
max DS = Most urgent DS

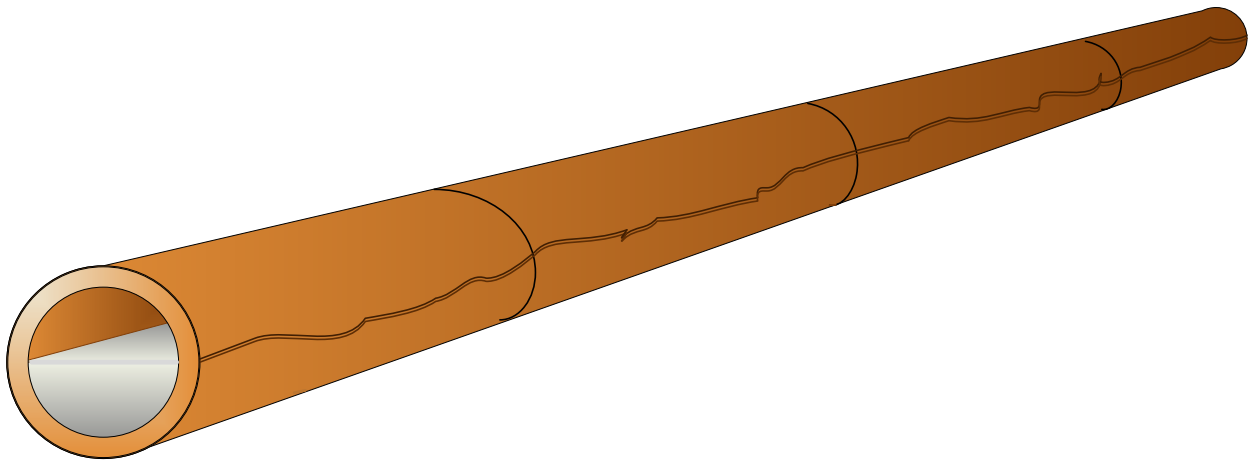


Triage is the process of determining the priority of patients' treatments based on the severity of their condition.

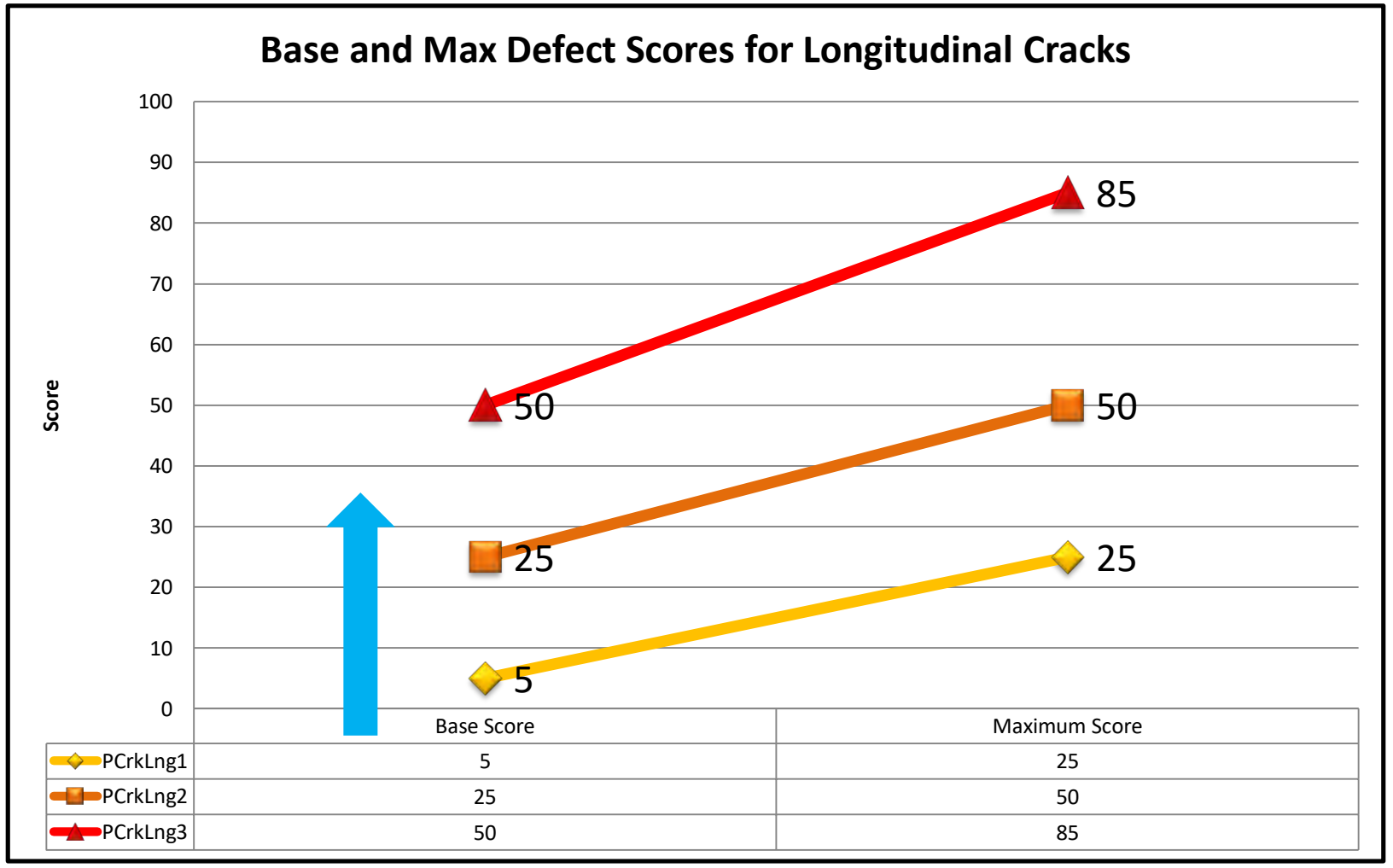
http://en.wikipedia.org/wiki/Triage

Each defect assigned a base and max score

- Concept that the extent of a continuous defect can extend the entire pipe length and still perform
- Each additional increment does not have a linear performance detriment
  - One of Dr. Kathula's thesis conclusions



Continuous Defects - Base and Max Defect Scores

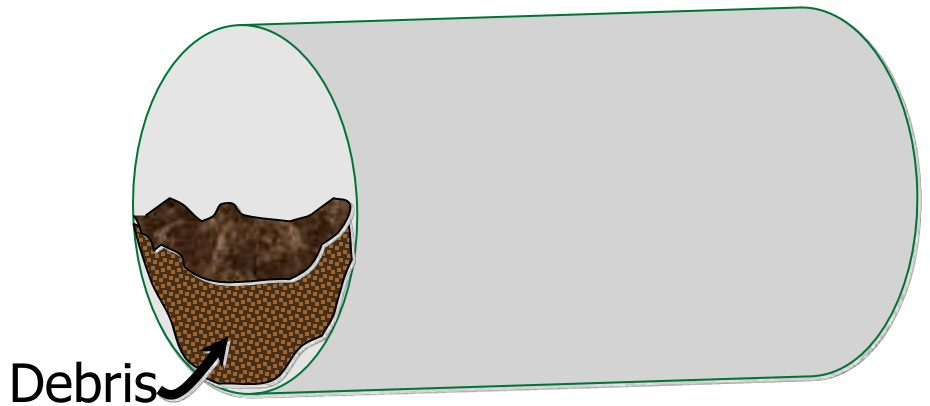


	Base Score	Maximum Score
PCrkLng1	5	25
PCrkLng2	25	50
PCrkLng3	50	85

The more severe the defect, the higher the base and max scores.

Parameters affecting SCREAM score for flow restricting defects, were used when designing scores

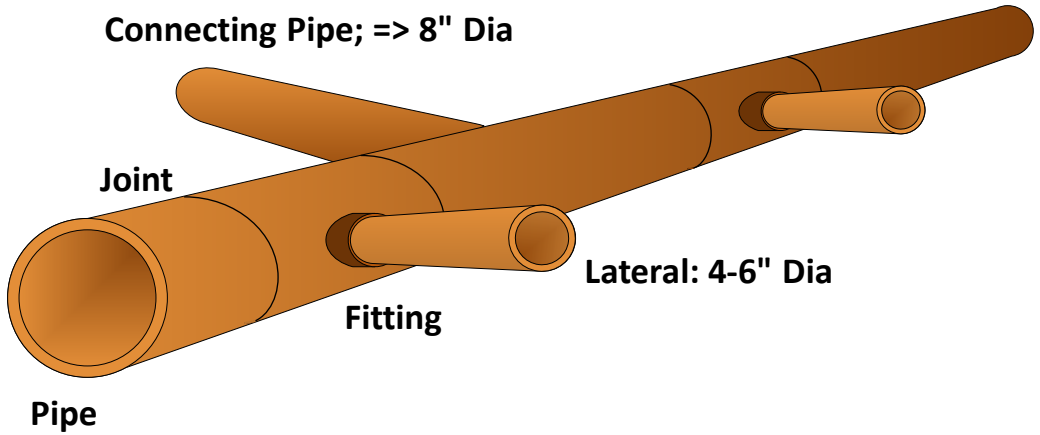
- Pipe material
- Pipe diameter
- Allowable surcharge depth
- Coarseness of the restricting defect
- Percent cross sectional area of restriction
- Extent of restriction



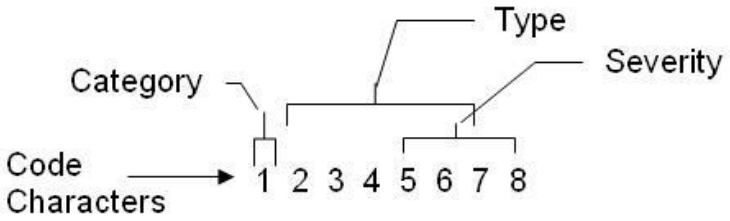
Scores vary by pipe material

- Primary material groups:
  - Concrete
  - Clay
  - Brick
  - Cast iron
  - Ductile iron
  - Steel
  - PVC
  - HDPE
  - Segmented Block
- Can add new materials if needed

Simple CCTV code design easy for operators to learn



SCREAM 8 Character Code Design



Category Acronym	Description
P	Pipe
C	Connecting Pipe
L	Lateral
F	Fitting (manufactured)
J	Joint
A	Access

Example SCREAM CCTV Codes



Defect Code	Small Descr.	Continuous	Component	Description	Brick		CI		CIPP		Clay		Concrete		DI		PVC	
					Base Score	Max Score	Base Score	Max Score	Base Score	Max Score	Base Score	Max Score	Base Score	Max Score	Base Score	Max Score	Base Score	Max Score
CL1	Crack-LongitudinalMin: hairline	Yes	Pipe	Crack line generally extends parallel to the pipe axis. Crack width is approximately 1mm separation.	10	30	5	25	10	30	10	30						
CL2	Crack-LongitudinalMod: tight	Yes	Pipe	Crack line generally extends parallel to the pipe axis. Crack width is approximately 1-3 mm separation. Might be a 1or linear performation in pipe wall.	30	60	10	60	30	60	30	60	30	60	30	60	30	60
CL3	Crack-LongitudinalMaj: fracture	Yes	Pipe	Crack visibly open in a pipe wall and extends primarily parallel to the axis of the pipe. Crack width is roughly 3- 8 mm. May be some small pipe pieces or fracturing of pipe that adjoin the longitudinal crack but the pieces or fractures are still in place in the pipe wall. In bricks pipes, the cracks are visibly open in the brick or mortar and the bricks show only slight signs of	61	85	61	90	61	90	61	85	61	80	61	80	61	95
CM1	Crack- MultipleMin: hairline	Yes	Pipe	Multiple cracks might include combinations of longitudinal, circumferential or spiral cracks. Represent clusters of cracks and resulting wall pieces that are more complex than just longitudinal, circumferential, or spiral. Crack width is approximately 1 mm for most cracks.	10	40	10	45	10	40	10	40	10	40	10	40	50	85
CM2	Crack- MultipleMod: tight	Yes	Pipe	Multiple cracks might include combinations of longitudinal, circumferential or spiral cracks. Represent clusters of cracks and include wall pieces that are more complex than just longitudinal, circumferential, or spiral cracks Crack width is approximately 1-3mm for most cracks.	25	75	15	75	15	75	15	75	10	70	10	70	65	95
CM3	Crack- MultipleMaj: fracture	Yes	Pipe	Multiple cracks might include combinations of longitudinal, circumferential or spiral cracks. Represent clusters of cracks and could include wall pieces that are more complex than just longitudinal, circumferential, or spiral cracks. Crack width is approximately 3-8 mm for most cracks. In bricks pipes, the cracks are visibly open in the brick or mortar and the bricks	61	100	61	100	61	100	61	100	61	100	61	100	61	100

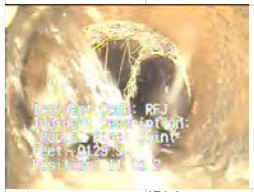
Web Reports – CCTV with video link and Photos

SCREAM ™ **CCTV Inspection with PACP Fields**

US District	US MH	DS District	DS MH	Street	Diam	Width	Material	Length	Year Installed	Last Review ID
0021	0021S0197		0021S0196	EASEMENT EAST OF WHITETHORNE	8		Vitrified Clay Pipe	291.89999		5235

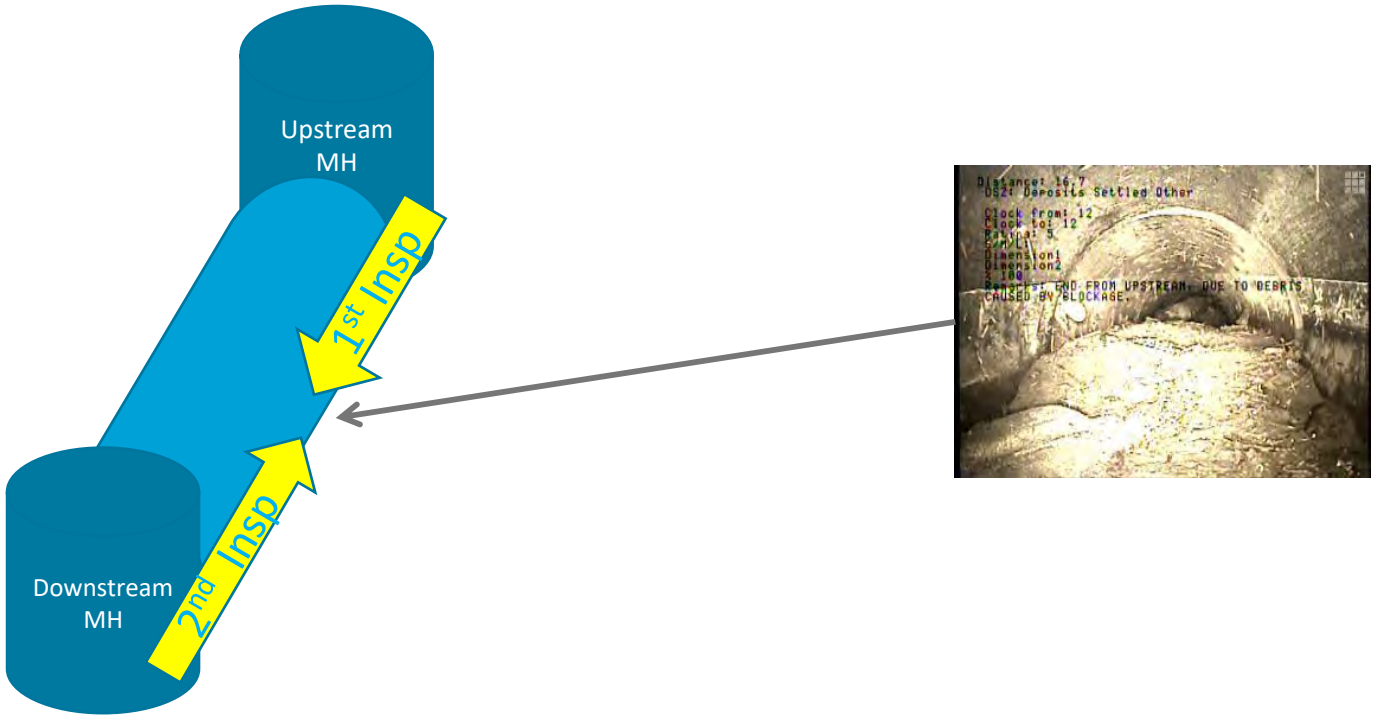
Reviewer	A A A PIPE CLEANING	**PACP Pipe Segment Reference**	0021S0197:0021S0196	**PACP Stuct Rating**	16
Source Created		**PACP Location Details**	early ditch	**PACP O&M Index**	1
SCREAM Struct Score	87	**PACP Up Rim to Invert**	12.89999962	**PACP Overall Rating**	134
SCREAM Maint Score	64	**PACP Up Grade to Invert**		**PACP Overall Index**	1
SCREAM II Score	19	**PACP Up Rim to Grade**	0	**Video:**	
SCREAM Total Score	88	**PACP Down Rim to Invert**	13.69999981	0021S0197_0021S0196.ptv	
CCTV Length	291.8999939	**PACP Down Grade to Invert**			

Defects Observed (Raw Data)

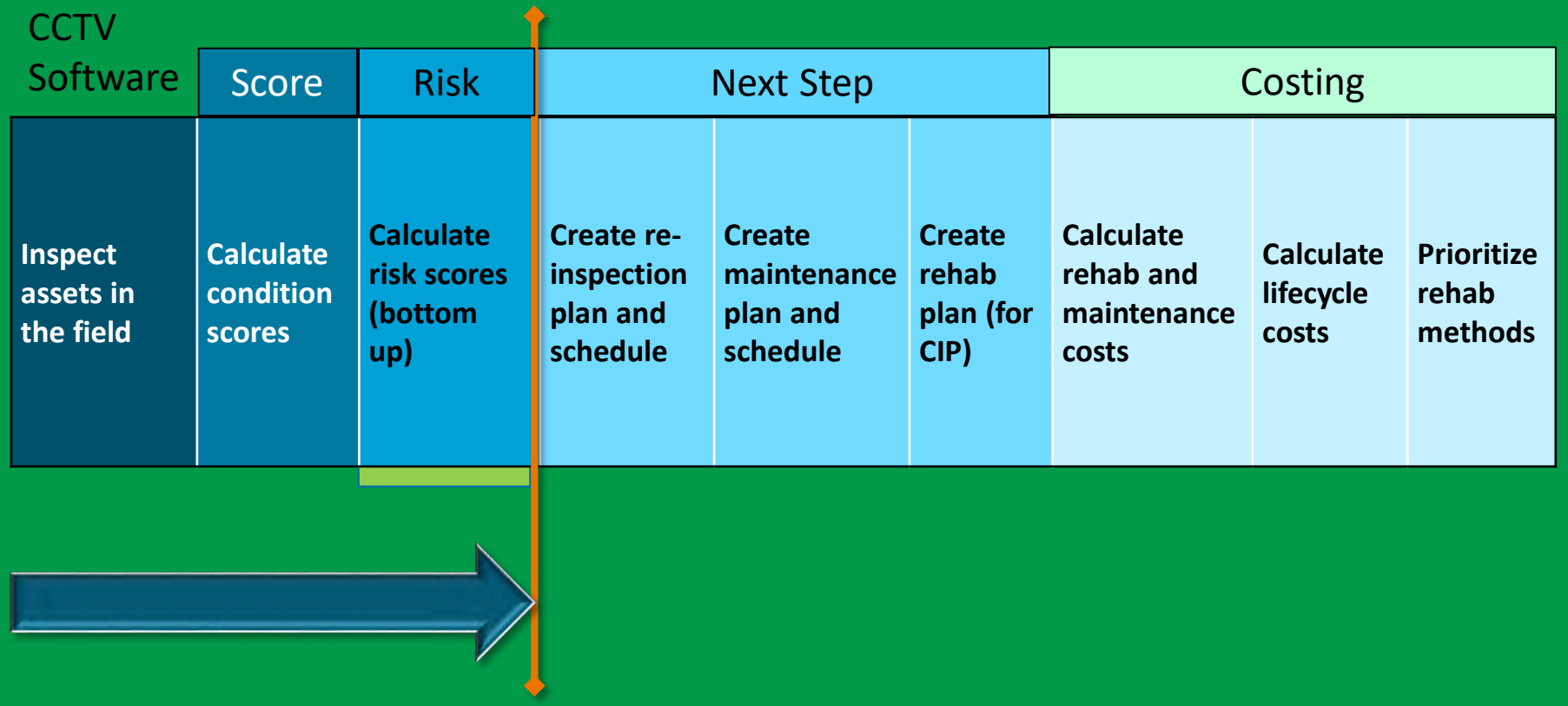
Direction	Start Ftg	End Ftg	SCREAM code	Defect Family	Category	Type	Severity	PACP Code	PACP Value Percent	PACP Remarks
upstream	0		AMH	None	Access	Manhole		AMH	0	DOWNSTREAM MANHOLE 196
upstream	129.9		JR1	Roots	Joint	Roots	Min:≤ 20% of Pipe	RFJ	0	
			RFJ@129.9.jpg		File:\\QAARA223PipeTk\pipetechdata\SSES\CIP650405_8\Atlas 21\0021S0197_0021S0196_1\RFJ@129.9.jpg					0021S0197:0021S0196
upstream	171.4		PCRKLNG3	Crack	Pipe	Crack: Longitudinal	Maj: Fracture	FL	0	
			FL@171.4.jpg		File:\\QAARA223PipeTk\pipetechdata\SSES\CIP650405_8\Atlas 21\0021S0197_0021S0196_1\FL@171.4.jpg					0021S0197:0021S0196
upstream	236.7		LRCRK1	Roots	Lateral Connection	Roots + Crack	Min: ≤ 20% of Pipe + Multiple Min	RMC	10	
			RFC@236.7.jpg		File:\\QAARA223PipeTk\pipetechdata\SSES\CIP650405_8\Atlas 21\0021S0197_0021S0196_1\RFC@236.7.jpg					0021S0197:0021S0196

Reverse Inspections are Merged

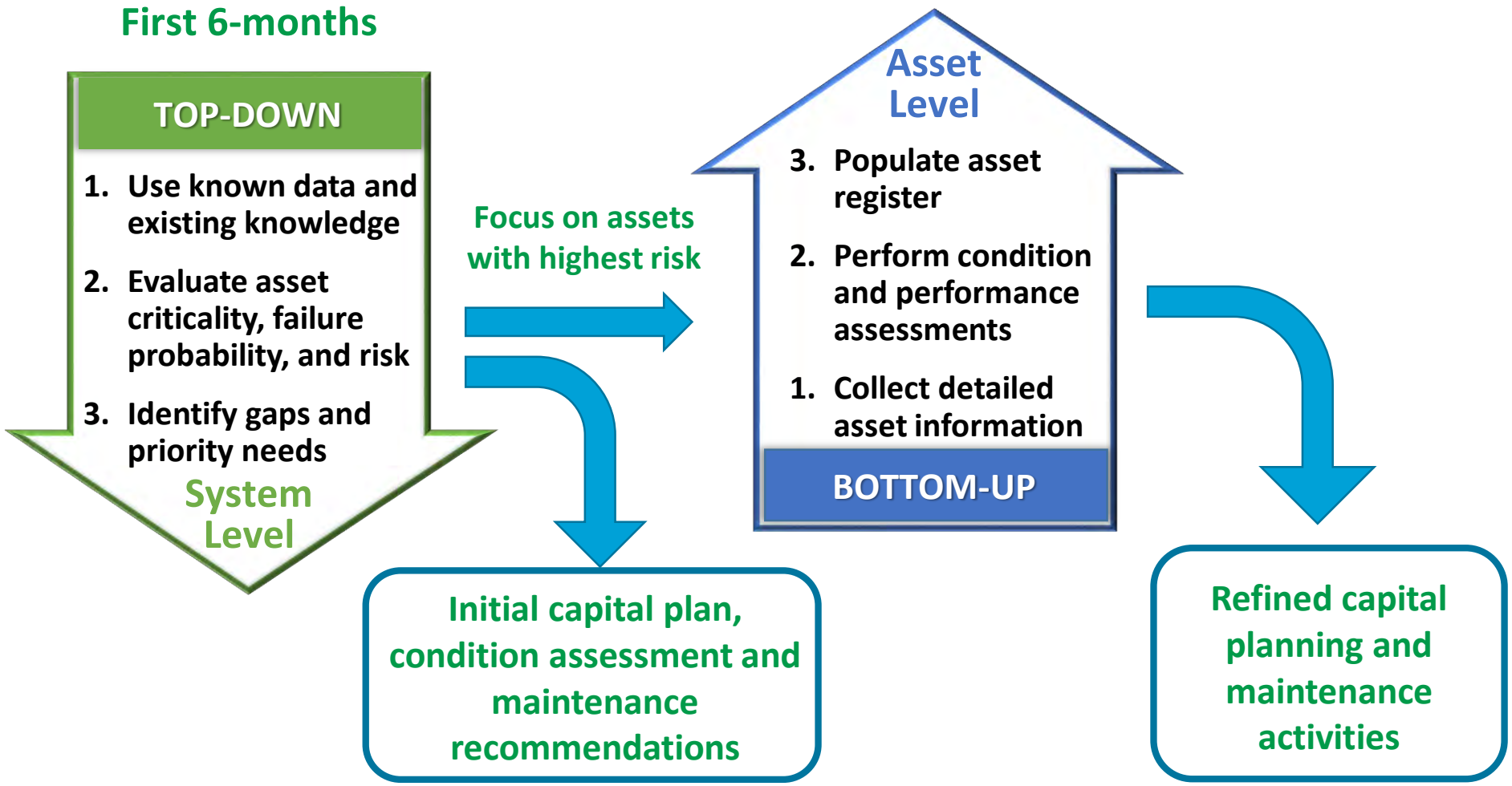
- Decide if they have to be in opposite directions
- Decide how many days can be in-between inspections and still be merged



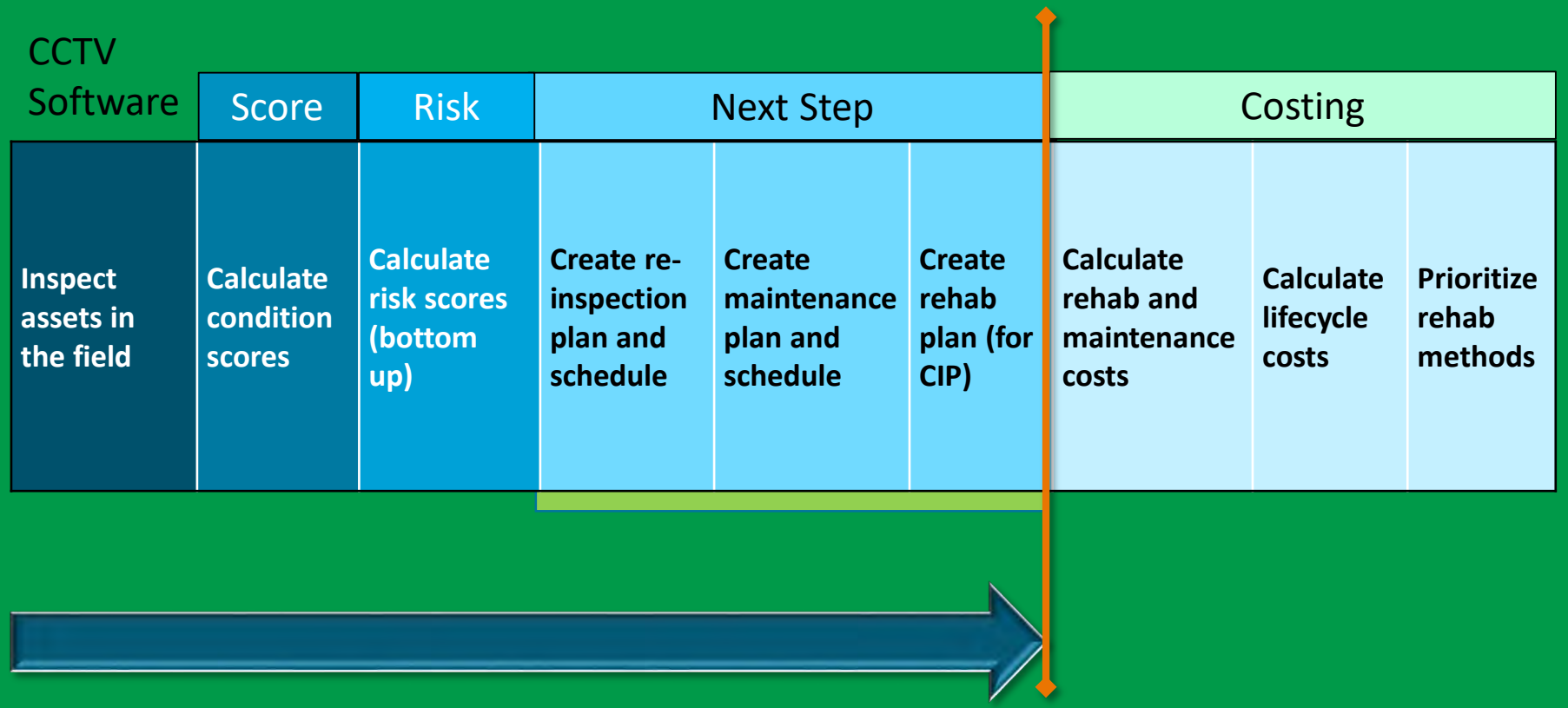
SCREAM Risk - CCTV



SCREAM Risk will provide Bottom-Up information



SCREAM Next Step - CCTV



SCREAM Next Step Inputs and Results



Inputs

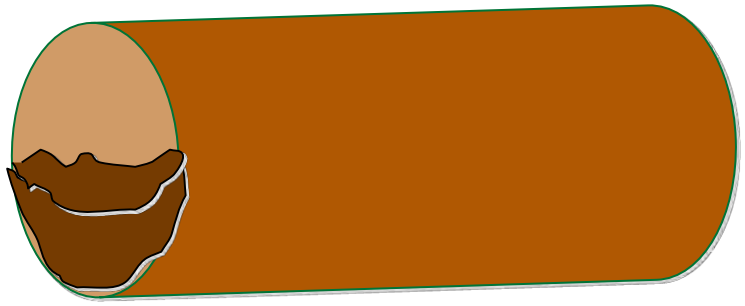
- Asset Inventory
- Asset Attributes
- CCTV data
- Call History
- Work Order History
- Risk COF scores
- Pipe Location
- Other

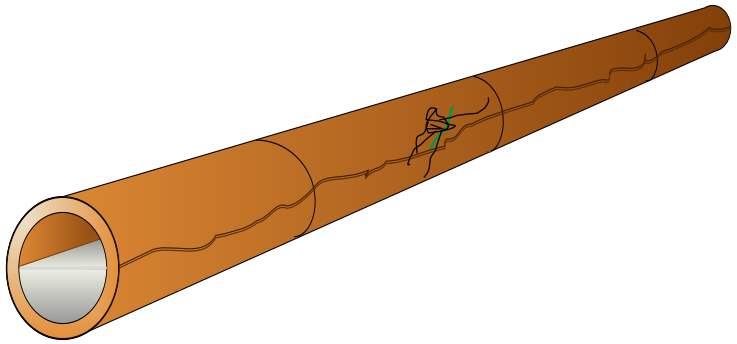
SCREAM Next Step Algorithms

Results

- Recommended Structural Action
- Recommended Maintenance Action
- Scheduled tasks

Why perform Condition Assessment?
Tells you what should you do next





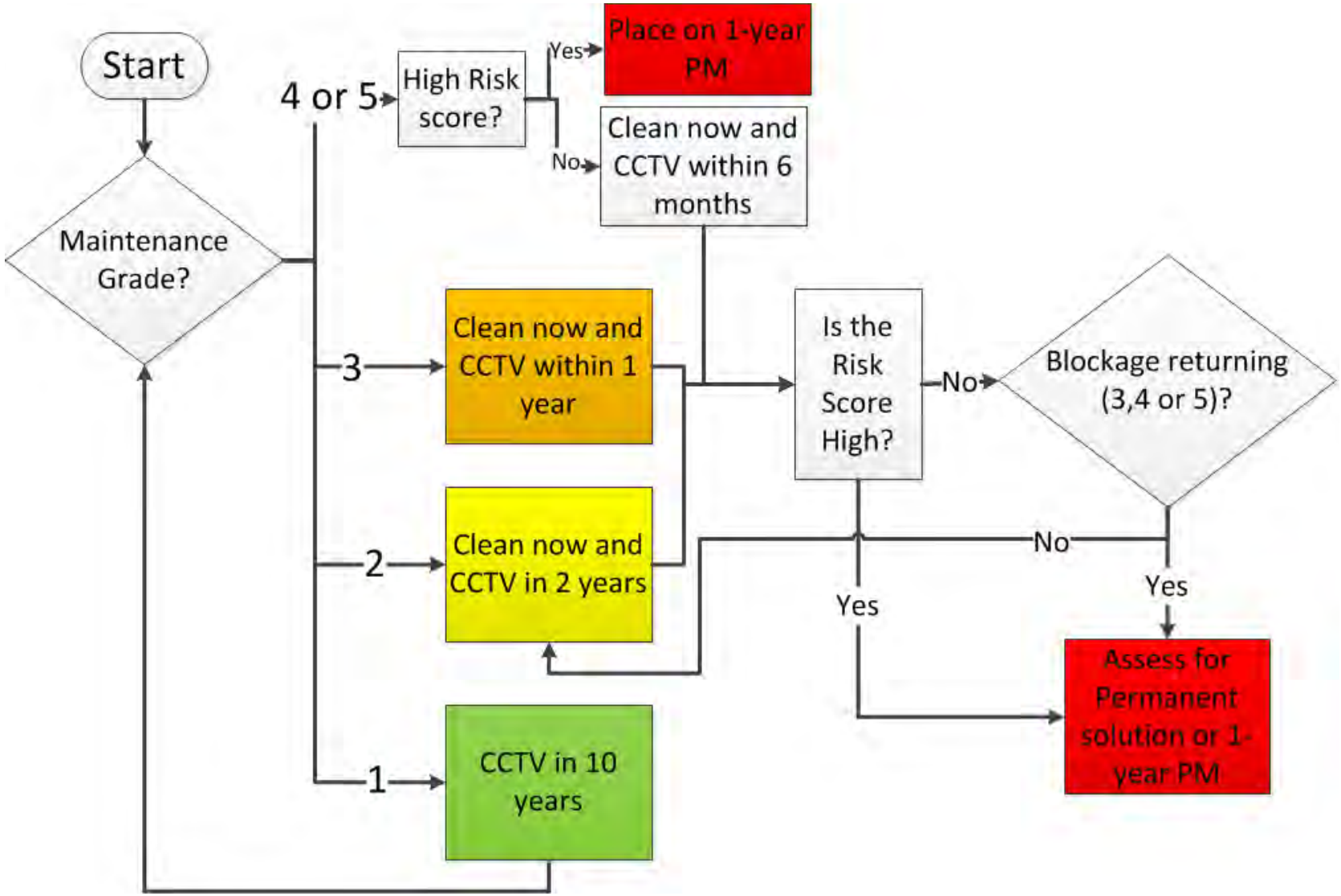
Maintenance Solutions:

- Clean
- CCTV again later
- Sonar again later
- Place on PM Cycle
- Other?

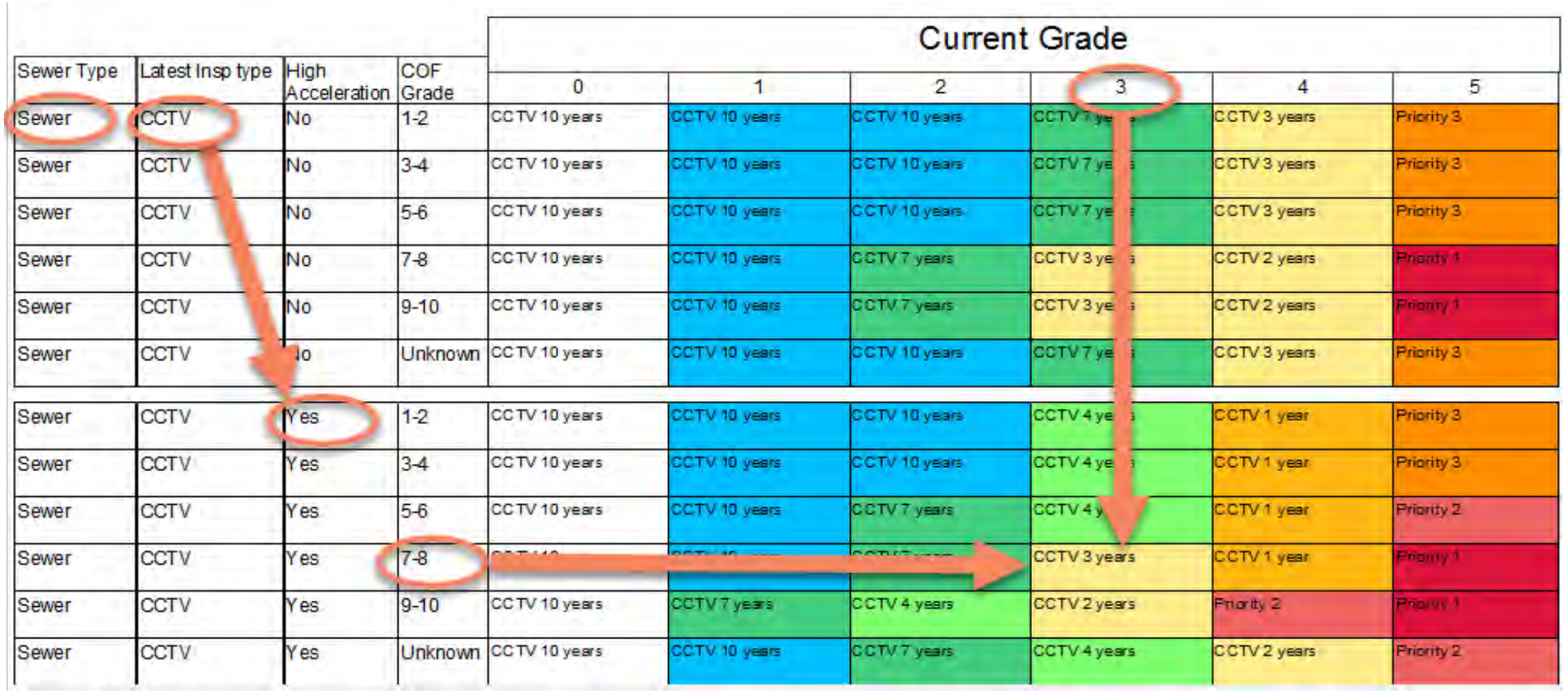
Structural Solutions:

- CCTV again later
- Spot Repair
- Line
- Replace
- Place on Priority List
- Other?

SCREAM Next Step (Corrective Action) Maintenance Logic Example



SCREAM Next Step logic integrates risk scores with condition scores and asset history



Sewer Type	Latest Insp type	High Acceleration	COF Grade	Current Grade 0	1	2	3	4	5
Sewer	CCTV	No	1-2	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 ye	CCTV 3 years	Priority 3
Sewer	CCTV	No	3-4	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 ye	CCTV 3 years	Priority 3
Sewer	CCTV	No	5-6	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 ye	CCTV 3 years	Priority 3
Sewer	CCTV	No	7-8	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 ye	CCTV 2 years	Priority 1
Sewer	CCTV	No	9-10	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 ye	CCTV 2 years	Priority 1
Sewer	CCTV	No	Unknown	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 ye	CCTV 3 years	Priority 3
Sewer	CCTV	Yes	1-2	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 4 ye	CCTV 1 year	Priority 3
Sewer	CCTV	Yes	3-4	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 4 ye	CCTV 1 year	Priority 3
Sewer	CCTV	Yes	5-6	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 4 y	CCTV 1 year	Priority 2
Sewer	CCTV	Yes	7-8				CCTV 3 years	CCTV 1 year	Priority 1
Sewer	CCTV	Yes	9-10	CCTV 10 years	CCTV 7 years	CCTV 4 years	CCTV 2 years	Priority 2	Priority 1
Sewer	CCTV	Yes	Unknown	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 4 years	CCTV 2 years	Priority 2

Note: Only valid inspections are included. Inspections before rehab/repair are not valid.

SCREAM uses condition scores, risk, and your maintenance history to optimize O&M activities

Sewer Type	Default Insp type	Latest Insp Type	Trouble Call	Frequent Blockage	Reoccuring type defects	High Avg Previous Grade	COF Grade	Current Grade 0	1	2	3	4	5
Storm	Acoustic	CCTV	No	Yes	na	na	1-2	Acoustic 7 years	Acoustic 7 years	Clean now, Acoustic 7 years	Clean now, CTV 4 years	Clean now, CCTV 2 years	Clean now, CCTV 1 year
Storm	Acoustic	CCTV	No	Yes	na	na	3-4	Acoustic 7 years	Acoustic 7 years	Acoustic 6 years	Clean now, CTV 3 years	Clean now, CCTV 2 years	Permanent Solution or PM List
Storm	Acoustic	CCTV	No	Yes	na	na	5-6	Acoustic 6 years	Acoustic 6 years	Acoustic 4 years	Clean now, CTV 2 years	Permanent Solution or PM List	Permanent Solution or PM List
Storm	Acoustic	CCTV	No	Yes	na	na	7-8	Acoustic 4 years	Acoustic 4 years	Clean now, Acoustic 3 years	Permanent lution or PM List	Permanent Solution or PM List	Permanent Solution or PM List
Storm	Acoustic	CCTV	No	Yes	na	na	9-10	Acoustic 4 years	Acoustic 3 years	Permanent Solution or PM List	Permanent lution or PM List	Permanent Solution or PM List	Permanent Solution or PM List
Storm	Acoustic	CCTV	No	Yes	na	na	Unknown	Acoustic 6 years	Acoustic 6 years	Acoustic 4 years	Clean now, CTV 2 years	Permanent Solution or PM List	Permanent Solution or PM List
Storm	Acoustic	CCTV	Yes	No	na	na	1-2	Acoustic 4 years	Acoustic 4 years	Acoustic 4 years	Clean now, CTV 2 years	Clean now, CCTV 2 years	Clean now, CCTV 1 year
Storm	Acoustic	CCTV	Yes	No	na	na	3-4	Acoustic 4 years	Acoustic 4 years	Acoustic 3 years	Clean now, CTV 2 years	Clean now, CCTV 2 years	Clean now, CCTV 1 year
Storm	Acoustic	CCTV	Yes	No	na	na	5-6	Acoustic 4 years	Acoustic 3 years	Acoustic 3 years	Clean now, V 2 years	Clean now, CCTV 2 years	Clean now, CCTV 1 year
Storm	Acoustic	CCTV	Yes	No	na	na	7-8				Clean now, CCTV 2 years	Clean now, CCTV 1 year	Permanent Solution or PM List
Storm	Acoustic	CCTV	Yes	No	na	na	9-10	Acoustic 3 years	Acoustic 3 years	Clean now, Acoustic 3 years	Clean now, CCTV 1 year	Clean now, CCTV 1 year	Permanent Solution or PM List
Storm	Acoustic	CCTV	Yes	No	na	na	Unknown	Acoustic 3 years	Acoustic 3 years	Acoustic 3 years	Clean now, CCTV 1 year	Clean now, CCTV 1 year	Clean now, CCTV 1 year

Note: Only valid inspections are included. For example, pre-cleaned inspections are not valid.

SCREAM Reports allow users to track the history and Recommendations together

Pipe Info		Next Step Info	Maintenance	Structure
Basin	Turkey Run	Latest Insp Type	CCTV	CCTV
USMAN	165-305	Trouble Call	Yes	
DSMAN	165-299	Frequent Blockage	No	
PipeID	121468	Reoccurring Type Defects	No	CCTV
SubWatershed	-	High Avg Previous Grade	No	

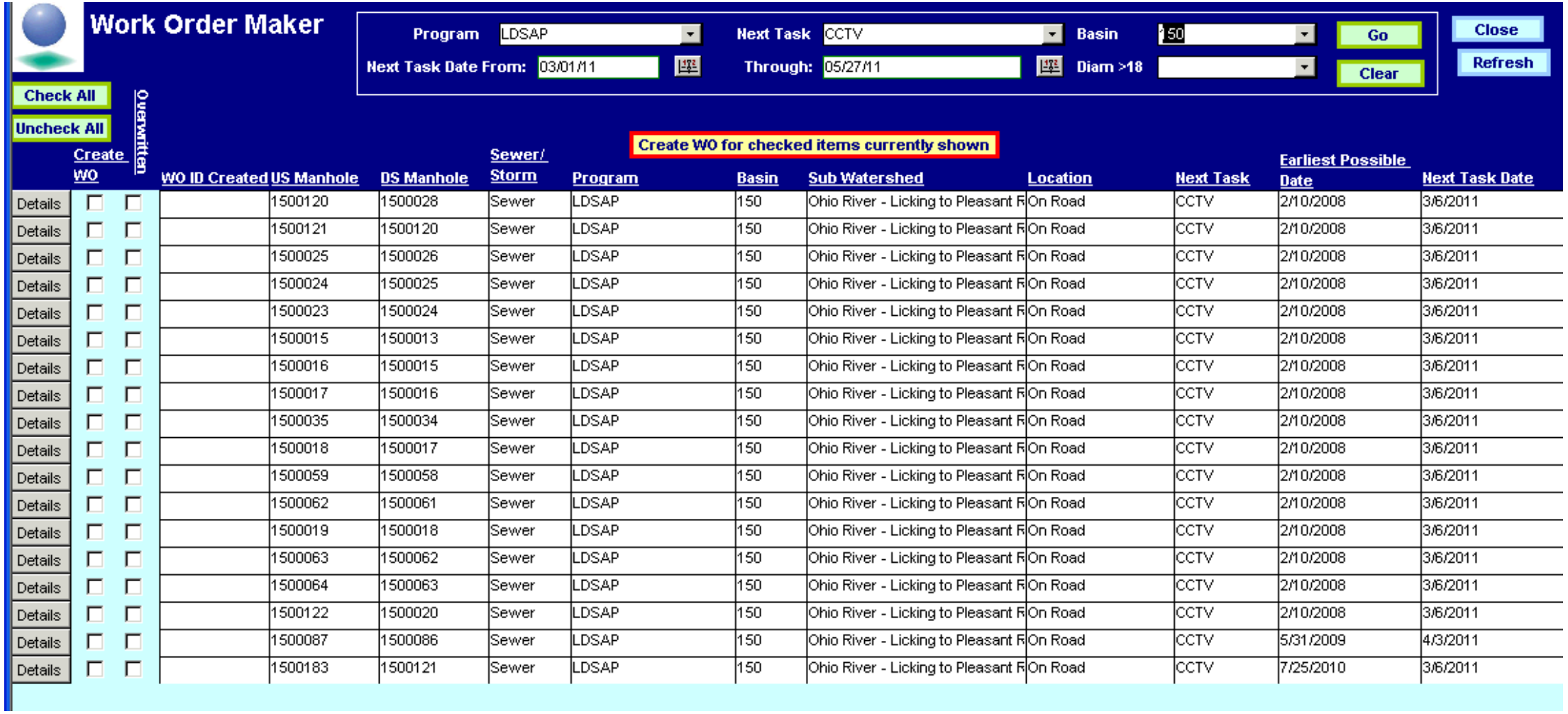
Date	Activity	Status	Struc Score	Maint Score	Rev Comments	Trouble Call	Pre Rehab	Clean Too Close	Pre Cleaned	Keep Maint - No Other Score	No Clean Inbetween Ignore First	Pre-Entered CP	WO NUMBER	CCTV ID
01-16-2007	clean	complete			PREV. MAINTENANCE - SEWER LINE								2.00702e+008	
01-30-2008	Inspect	complete			TV - INSPECT LINE								2.00802e+008	
06-02-2009	clean	complete			CHECK & CLEAN MAIN								2.00927e+008	
11-20-2009	clean	complete			PREV. MAINTENANCE - SEWER LINE								2.00961e+008	
07-29-2014	clean	complete			PREV. MAINTENANCE - SEWER LINE								2.0144e+008	
07-28-2015	CCTV		87	25	- Stand Alone Inspection				X	X			0	13115

Note: Pre-cleaned inspections are not valid but are used if not other inspection is available

Assigned Tasks

Struct Or Maint	Task	Target Date	Before Or After	Flexibility In Weeks	Assigned Date	Complete	On Hold	Interim	Rehab Perm Soln	Cleaning Perm Soln	Watershed Project Task
Maint	CCTV	01-28-2017	after	13	04-16-2017						
Struct	CCTV	07-28-2018	after	8							

Integrating Next Step with CMMS (Work Order Creation Tool)



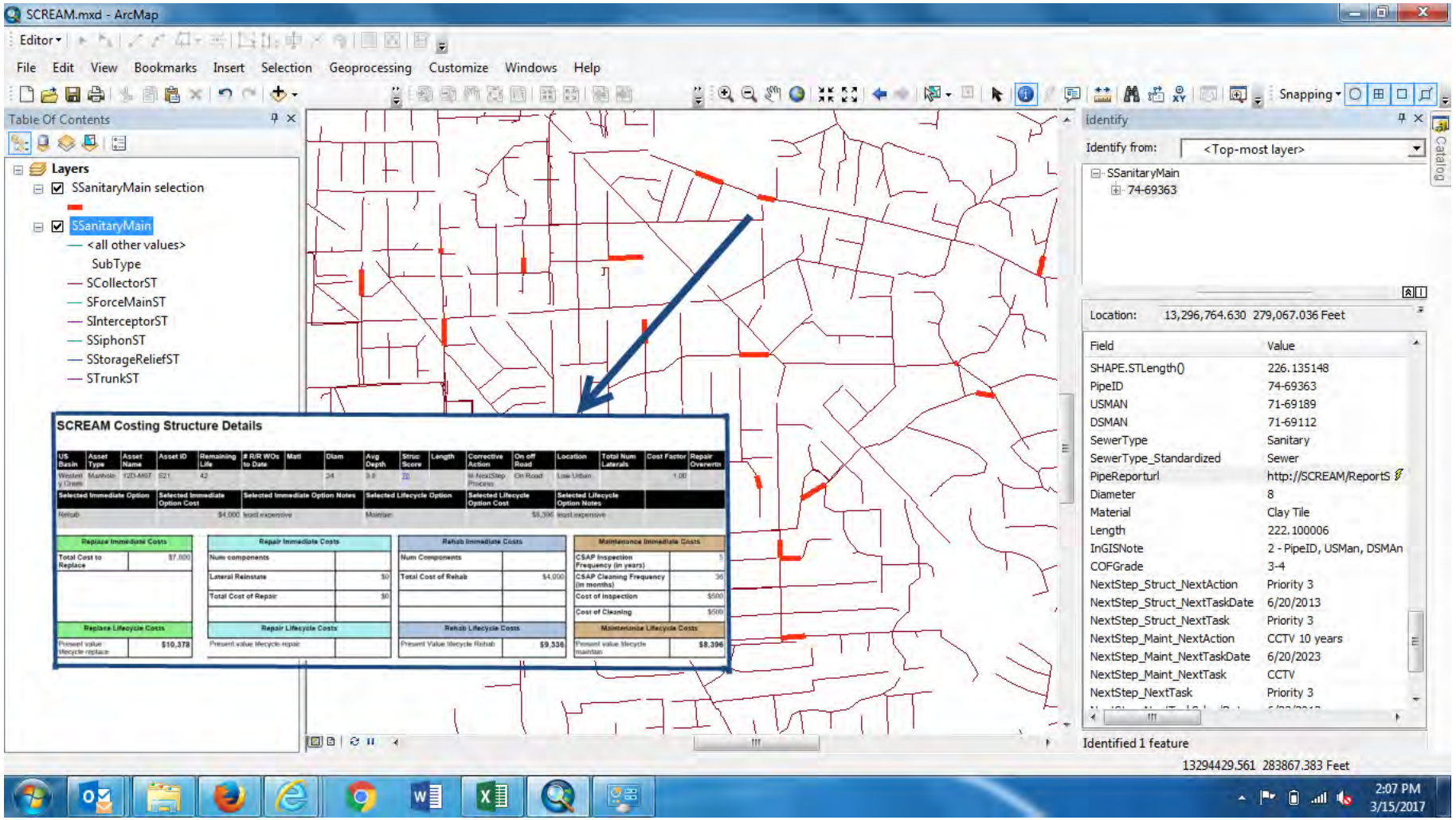
Work Order Maker

Program: LDSAP | Next Task: CCTV | Basin: 150 | Go | Close
Next Task Date From: 03/01/11 | Through: 05/27/11 | Diam >18 | Clear | Refresh

Check All | Uncheck All | Create WO | Overwritten | Create WO for checked items currently shown

	WO ID Created	US Manhole	DS Manhole	Sewer/ Storm	Program	Basin	Sub Watershed	Location	Next Task	Earliest Possible Date	Next Task Date
Details		1500120	1500028	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500121	1500120	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500025	1500026	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500024	1500025	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500023	1500024	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500015	1500013	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500016	1500015	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500017	1500016	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500035	1500034	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500018	1500017	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500059	1500058	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500062	1500061	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500019	1500018	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500063	1500062	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500064	1500063	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500122	1500020	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	2/10/2008	3/6/2011
Details		1500087	1500086	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	5/31/2009	4/3/2011
Details		1500183	1500121	Sewer	LDSAP	150	Ohio River - Licking to Pleasant R	On Road	CCTV	7/25/2010	3/6/2011

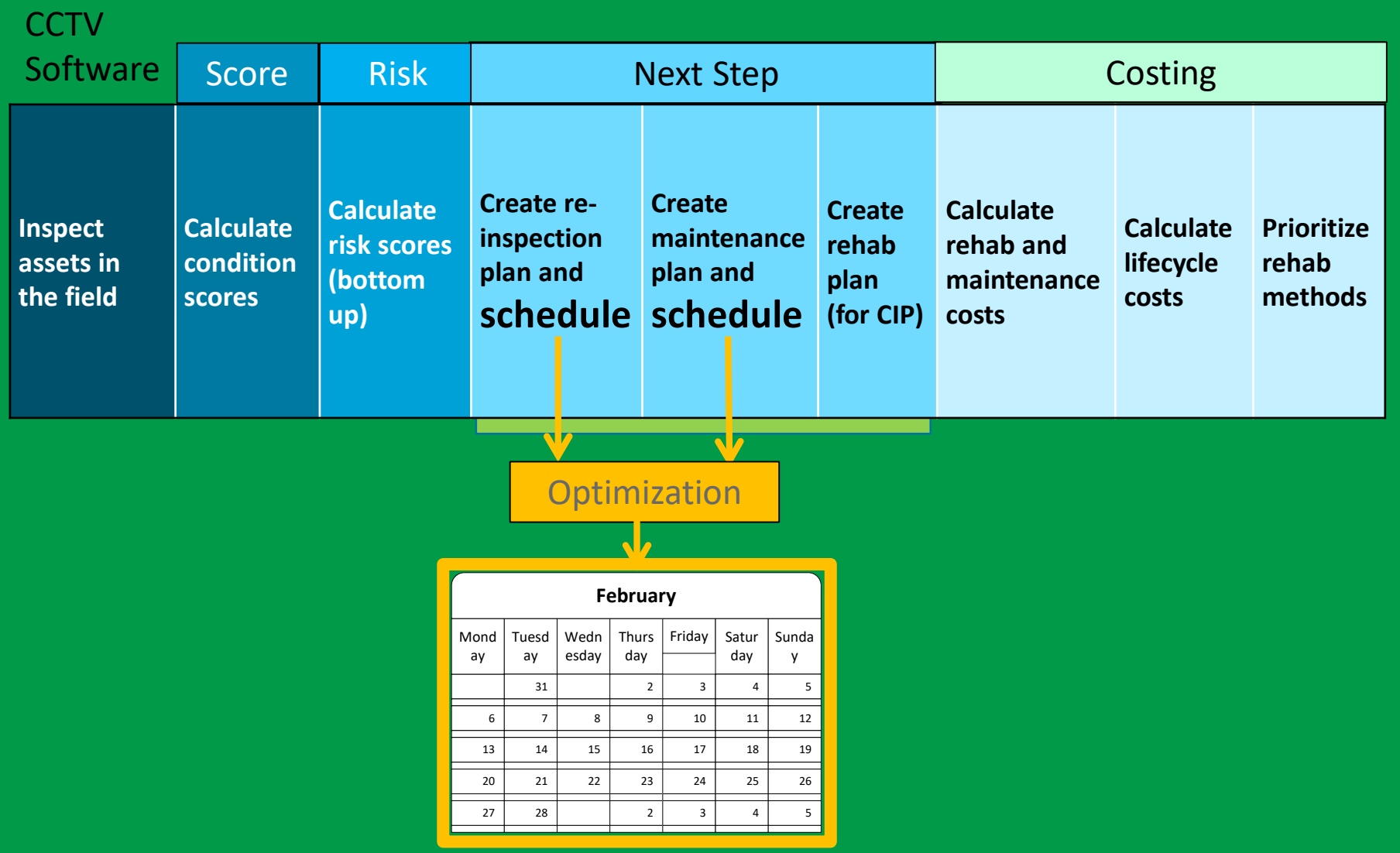
Link to our Combined table to find assets needing work in a given time period or to open reports from GIS



Inspections are only included if they are valid

- Pre Rehab: inspections that occurred before rehab/repair
  - Don’t use for maintenance or structural logic
- Clean Too Close: cleaning occurred to close to the time of the inspection
  - Don’t use for maintenance logic
- Pre Cleaned: inspection marked as pre-cleaned
  - Don’t use for maintenance logic
- Keep Maint - No Other Score or high score: inspection marked as pre-cleaned
  - If no other score available, use for maintenance purposes
- No Cleaning in-between, ignore first inspection: inspection marked as pre-cleaned
  - Ignore the first inspection for maintenance purposes

SCREAM Next Step Optimized Scheduling - CCTV



Next Actions are Broken Down into Tasks and Schedule

1. Either structural or maintenance tasks are scheduled

Assigned Tasks					
Struct Or Maint	Task	Target Date	Before Or After	Flexibility In Weeks	Assigned Date
Maint	Clean	09-02-2015	after	1	
Maint	CCTV	09-02-2019	after	13	
Struct	CCTV	09-02-2018	after	8	09-09-2018

2. Create Interim Tasks
   - Interim tasks are created while waiting for rehab to take place

Assigned Tasks								
Struct Or Maint	Task	Target Date	Before Or After	Flexibility In Weeks	Assigned Date	Complete	On Hold	Interim
Maint	CCTV	05-19-2024	after	26				
Struct	Priority 3	05-19-2014	after	1	05-25-2014			
Struct	CCTV	05-19-2015	after	12	06-21-2015			X

Assigned Tasks aren't always Scheduled

1. Mark Tasks Complete
   - A work order was already created for the task
     (the work may not be finished, but creating the wo is complete)

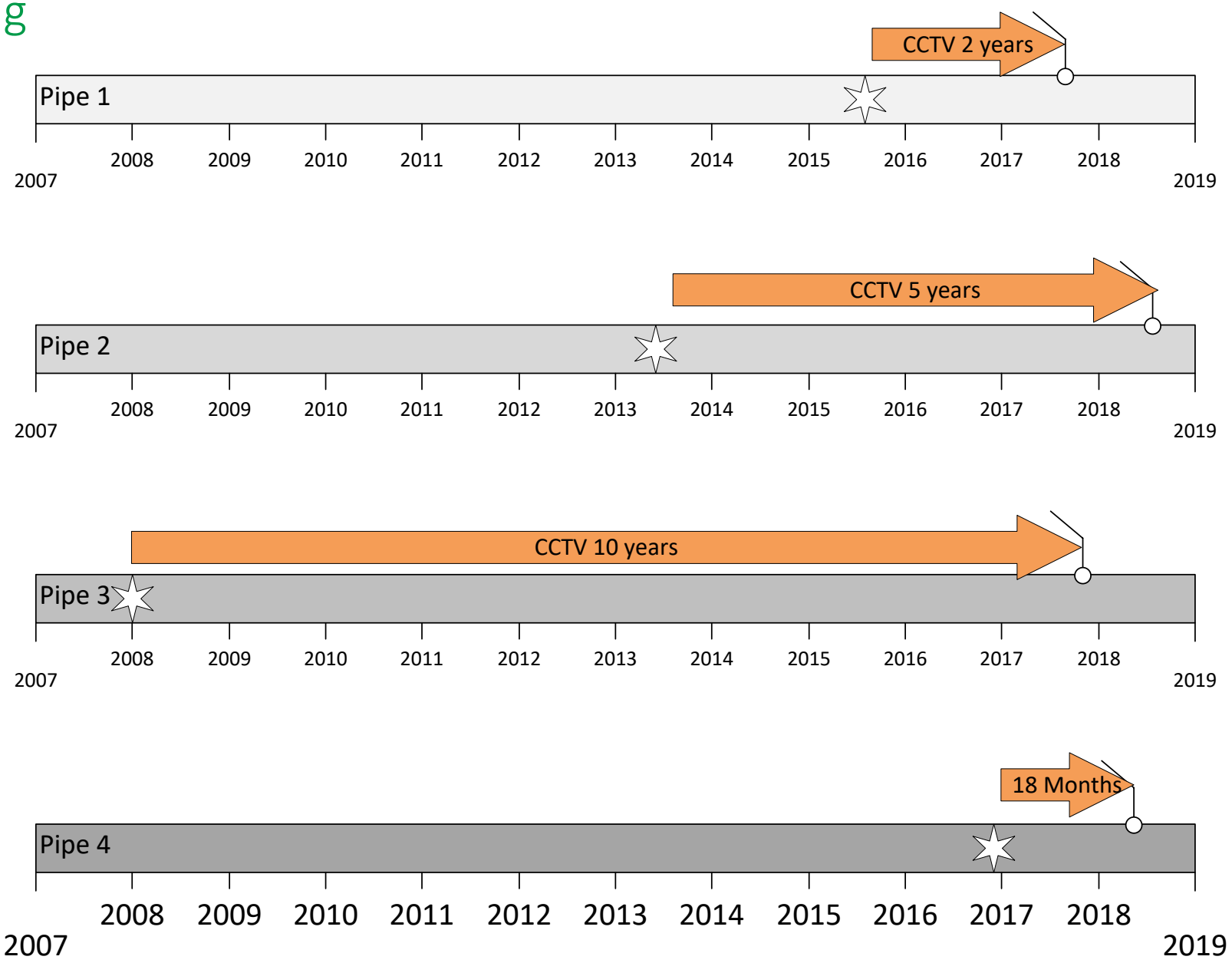
Assigned Tasks								
Struct Or Maint	Task	Target Date	Before Or After	Flexibility In Weeks	Assigned Date	Complete	On Hold	Interim
Maint	Clean	09-02-2015	after	1		X		
Maint	CCTV	09-02-2019	after	13				
Struct	CCTV	09-02-2018	after	8	09-09-2018			

2. Mark Tasks On Hold
   - An on-going rehab/repair/replace work order has been created for the pipe

Optimized Scheduling Assigns Work by Proximity Clusters

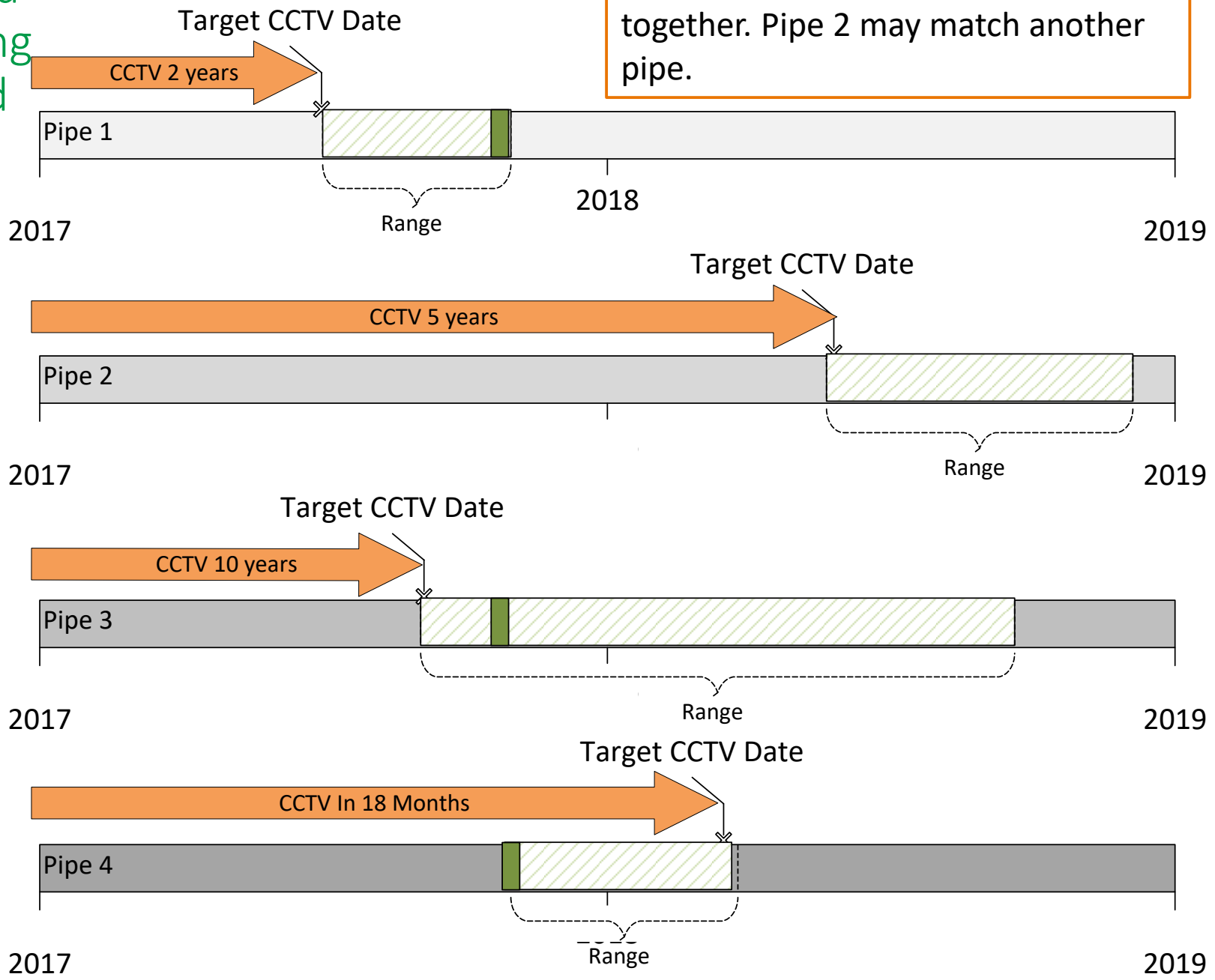
1. Pipes within same date range are clustered
   - Date ranges are given to tasks for flexible scheduling
   - The farther out the task, the more flexible the date range (CCTV in 10 years vs CCTV in 6 months)
2. Pipes with the same assigned tasks are clustered
   - Pipes needing CCTV during the same date range are scheduled together
   - Pipes needing cleaning during the same date range are scheduled together
3. Pipes in client-defined areas are clustered
   - Pipes within the same basin are scheduled together
   - Pipes within the same smaller area (like sub-basin or meter area) are scheduled together

Optimized Scheduling Explained



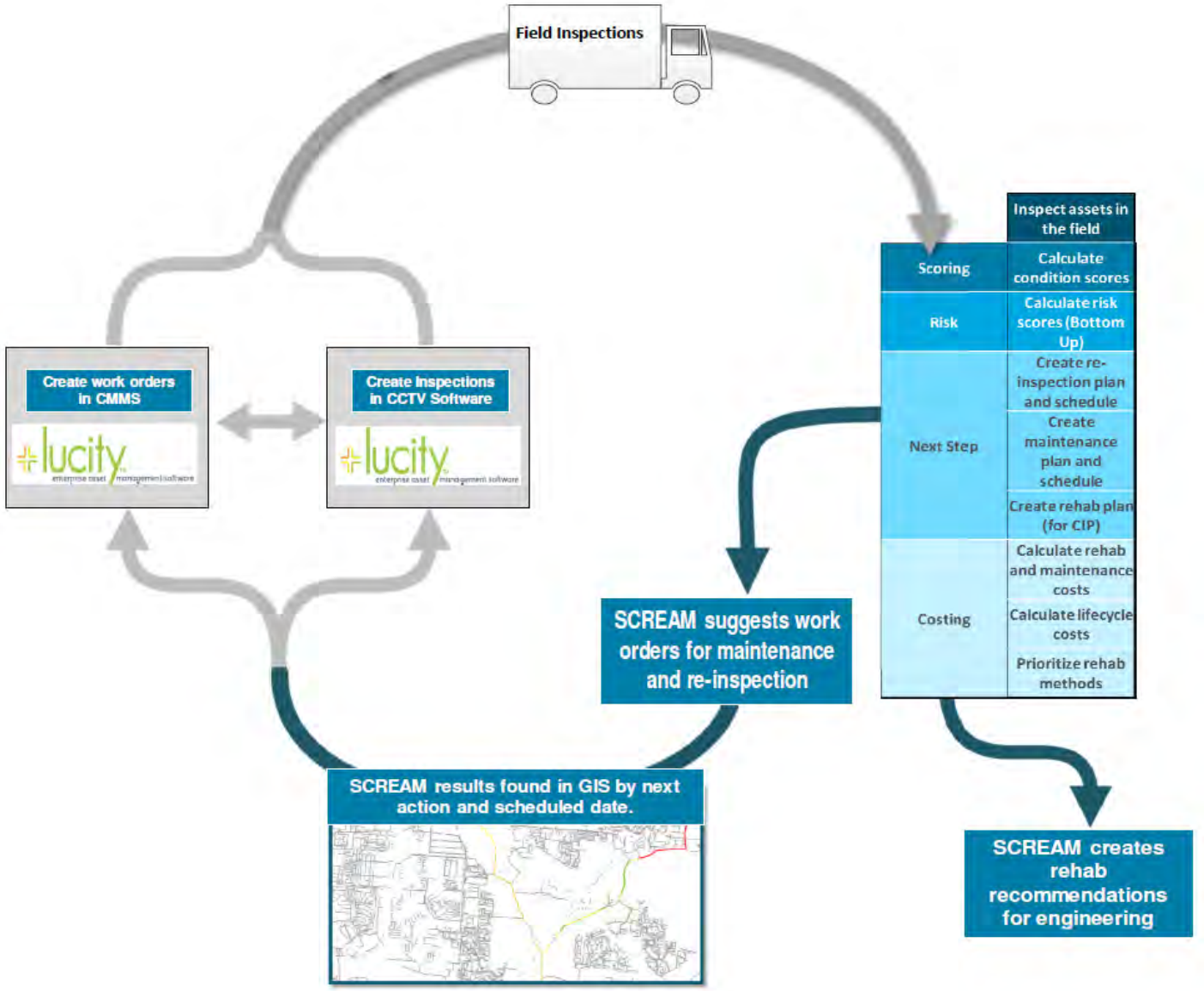
Optimized Scheduling Explained

Pipes 1, 3 and 4 are scheduled together. Pipe 2 may match another pipe.

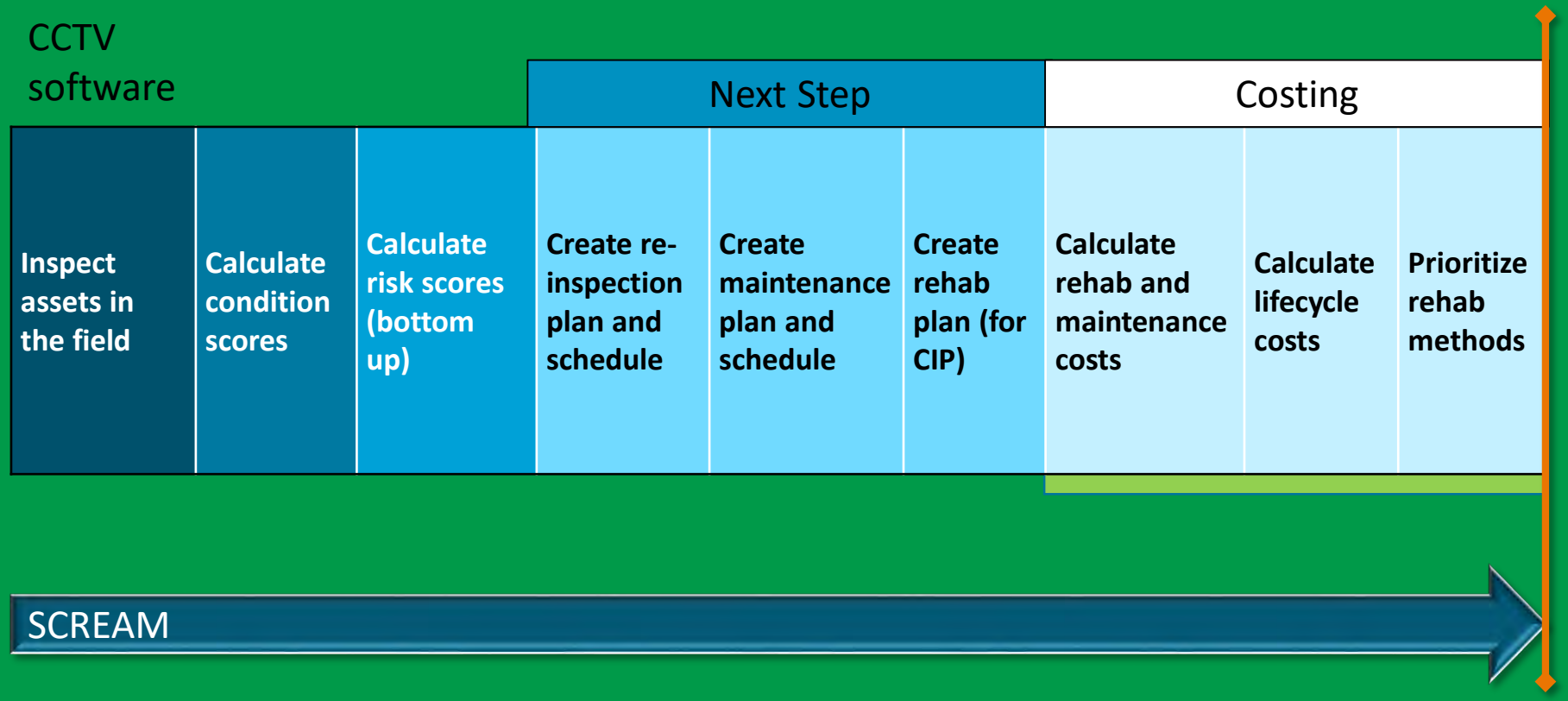


The goal was to have a complete work order/inspection cycle

- CCTV inspections are collected in Lucity
- Work orders are created in Lucity
- Pipes shouldn't "Fall Out"



SCREAM Costing - CCTV



SCREAM Costing Inputs and Results



Inputs

- **Asset Inventory**
- **Asset Attributes**
- **CCTV Inspection Logs**
- **Next Step results**
- **Costing tables**
- **Pipe location**
  - **Proximity to stream**
  - **On/off road**
- **# rehab/repair Wos to Date**
- **Average depth**

SCREAM Costing Algorithms

Results

- **Immediate costs**
  - Repair
  - Replace
  - Line
- **Lifecycle costs**
  - Repair and maintain
  - Replace and maintain
  - Line and maintain
  - Maintain as long as possible
- **Recommended best option**

SCREAM calculates life cycle and replacement costs

US Basin	Pipe Type	US MH	DS MH	Remaining Life	# R/R WOs to Date	Matl	Diam	Diam for Costing	Avg Depth	Struc Score	Length	Corrective Action	On off Road	Major Street	50 Ft of Stream	Utility congestion
25	Sewer	5831	5820	6		VCP	8	8	10.0	94	181	Select Immediate Action	On Road	False	False	False

Selected Immediate Option	Selected Immediate Option Cost	Selected Immediate Option Notes	Selected Lifecycle Option	Selected Lifecycle Option Cost	Selected Lifecycle Option Notes
Repair	$43,521	least expensive	Repair	$52,724	no maint - repair <=20% more

Replace Immediate Costs	Option 1	Option 2
	Trench	Tunnel
Costing Factor	1.33	1.33
Num laterals total	1	1
Lateral reinstate unit cost ($ per lat)	3,287.00	1,008.59
Replace unit cost ($/ft)	210.67	1,580.86
Total cost	**$54,002**	**$381,569**
Selected Option	Trench	
Selected Option Cost	$54,002	

Repair Immediate Costs	Option 1	Option 2
	Trench	
Costing Factor	1.33	-
Num laterals in trenches	1	-
Lateral reinstate unit cost ($ per lat)	3287.00	-
Repair unit cost ($/ft)	263.33	-
Feet of trench costed as sectional	143.6	-
Feet of trench costed as point	0	-
Num trenches	3	-
Total cost	**$43,521**	-
Selected Option	Trench	
Selected Option Cost	$43,521	

Rehab Immediate Costs	Option 1	Option 2	Option 3
	CIPP		
Costing Factor	1.33	-	-
Num laterals in trenches	1	-	-
Lateral reinstate unit cost ($ per lat)	100.00	-	-
Rehab unit cost ($/ft)	108.00	-	-
Feet of trench costed as point	0	-	-
Feet of trench costed as sectional	128.9	-	-
Num trenches	3	-	-
Total cost	**$62,214**	-	-
Selected Option	CIPP		
Selected Option Cost	$62,214		

Maintenance Immediate Costs	
Inspection frequency (yrs)	1
Cleaning frequency (mo)	120
Cost of Inspection	$272
Cost of Cleaning	$181

Replace Lifecycle Costs	
Present value lifecycle replace	**$55,304**

Repair Lifecycle Costs	
Present value lifecycle repair	**$52,724**

Rehab Lifecycle Costs	
Present Value lifecycle Rehab	**$68,839**

Maintenance Lifecycle Costs	
Present value lifecycle maintain	**$44,836**

The ideal method is selected

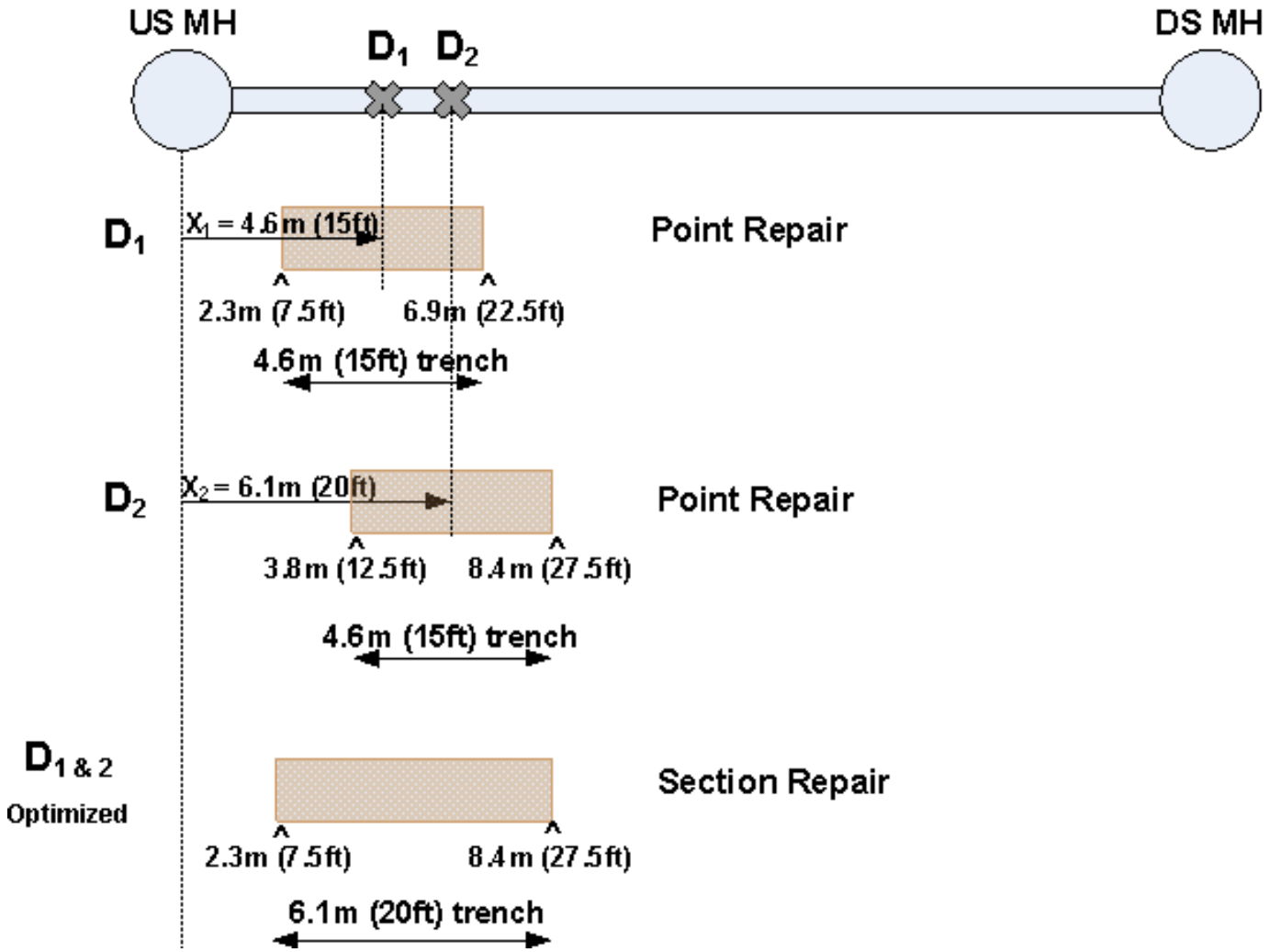
Corrective Action - Immediate Costs			Selected	Corrective Action - Lifecycle Costs			
Replace Cost	Repair Cost	Rehab Cost	Cost Running Sum	Replace Cost	Repair Cost	Rehab Cost	Maintain Cost
$4,050	**$3,038**	$6,660	3037.50	$4,212	$3,833	$7,262	**$2,975**
$33,600	**$2,625**	$24,225	5662.50	$35,039	**$9,383**	$29,376	$28,748
$41,310	**$3,600**	$40,550	9262.50	$42,961	**$11,716**	$46,689	$38,157
$27,384	**$3,494**	$20,964	12756.90	$28,557	**$9,002**	$25,162	$25,363
$41,294	$13,440	**$29,906**	42663.30	$43,063	**$21,746**	$36,237	$41,398
$39,295	**$7,493**	$28,621	50156.10	$40,978	**$15,397**	$34,645	$39,394
$40,471	**$714**	$32,401	50870.10	$42,204	**$8,854**	$38,606	$37,484
$41,849	$18,077	**$29,675**	80544.90	$43,641	**$26,494**	$36,090	$38,760
$262,855	**$17,875**	$231,392	98420.10	$274,534	**$71,441**	$272,381	$225,240
$6,840	**$3,762**	$9,718	102182.10	$7,113	**$5,106**	$10,735	$6,318
$13,076	**$3,780**	$18,864	105962.10	$13,855	**$6,771**	$21,228	$12,305

Trenching: CCTV Defects Needing to be Trenched

Defects compiled by SCREAM								
# Point Defects	Len Cont. Defects (ft)	Defect Score	SCREAM code	Group	Defect Family	Component	Type	Severity
2		0	AMh	Inventory	Information	Access	Manhole	
1		0						
		43						
1		56						
1		90						
1		0						
1		41						
3		6						
1		26						
1		0						
	100.0	29						
	32.0	38						

Start Ft	End Ft	SCREAM code	Type	Description	Codes To Be Trenched	Trenched for Lining
0	0	SIM	Inventory	Start inspection- Manhole		
7	0	TLD1	Structural	Manufactured tee- Lateral displacedMin: shear < thickness		
15	0	TLD2	Structural	Manufactured tee- Lateral displacedMod: shear > thickness	X	X
18	0	CJ1	Structural	Crack- JointMin: hairline		
19	0	TLD1	Structural	Manufactured tee- Lateral displacedMin: shear < thickness		
20	0	JO2	Structural	Joint- OpenMod: ~ thickness	X	
34	97	CL1	Structural	Crack- LongitudinalMin: hairline		
60	189	DA1	Maintenance	Deposits- AttachedMin:<20% of main		
75	0	MCP	Inventory	Material change- PVC		
100	0	EIM	Inventory	End inspection- Manhole		

Trenching: Example Length Calculation



Ideal Immediate Cost isn't always the cheapest

1. Ignore repair if repair =$0
   - Repair is based on trenched defects, if no trenched defects, ignore.
2. Ignore repair if trenches exceed a given % of pipe
3. Ignore repair if pipe exceeds a given # of repair work orders
4. Ignore repair if pipe exceeds a given number of trenches
5. Ignore rehab if pipe is already lined

Optimal Costing Method: Criteria to Override Repair	
Percent of Pipe Trenched >	40
Number of Work Orders >	3
Number of Trenches >	3

Lifecycle Costs run over the lifecycle (100 years)

Lifecycle Details

	Option 1 - Replace				Option 2 - Repair					Option 3 - Rehab					Option 4 - Maintain				
Year	Replace Cost	Maintain Cost*	# C	# I	Repair Cost	Replace Cost	Maintain Cost*	# C	# I	Salvage Value	Rehab Cost	Replace Cost	Maintain Cost*	# C	# I	Salvage Value	Replace Cost	Maintain Cost*	# C	# I	Salvage Value
0	32,777				6,794						15,236										
1		0	0	0			0	0	0				0	0	0			0	0	0	
2		0	0	0			0	0	0				0	0	0			0	0	0	
3		0	0	0			0	0	0				0	0	0			220	0	1	
4		0	0	0			0	0	0				0	0	0			0	0	0	
5		0	0	0			688	1	1				688	1	1			0	0	0	
6		0	0	0			0	0	0				0	0	0			220	0	1	
7		0	0	0			0	0	0				0	0	0			0	0	0	
8		0	0	0			0	0	0				0	0	0			0	0	0	
9		0	0	0			0	0	0				0	0	0			220	0	1	
10		688	1	1			688	1	1				688	1	1			468	1	0	
11		0	0	0			0	0	0				0	0	0			0	0	0	
12		0	0	0			0	0	0				0	0	0			220	0	1	
13		0	0	0			0	0	0				0	0	0			0	0	0	
14		0	0	0			0	0	0				0	0	0			0	0	0	
15		0	0	0			688	1	1				688	1	1		32,777				
16		0	0	0			0	0	0									0	0	0	
17		0	0	0			0	0	0									0	0	0	
18		0	0	0			0	0	0				0	0	0			0	0	0	
19		0	0	0			0	0	0				0	0	0			0	0	0	

Replace at end of remaining life

Remaining Life

- Calculation is based on a default Lifecycle curve
  - Based on Structural Score
  - Separate calculation for storm RCP pipe
  - Use the install date if no structural score
- Could be updated using SD1 data, possibly by material or other factor

Ideal Lifecycle Cost isn't always the cheapest

1. Ignore maintenance if other method is only a given % more expensive

Optimal Costing Method: Criteria to Override Maintenance	
Other method is only x% above Maint Cost	20

2. Ignore rehab if the cost is within 20% of the replacement costs, choose to replace instead
3. Ignore rehab if it requires more than 20% the pipe to be trenched first, choose to replace instead
4. Ignore rehab if the pipe material is already CIPP
5. Ignore rehab if the pipe is deformed (>10% deformed)

Example 1: Cost to Replace

Length: 200 ft
Diameter: 10”
Average depth: 5’
Laterals: 2

The cost to replace the pipe is $120.62 per foot, or $24,124 for a 200 foot pipe. The cost to reinstate the laterals is $3,287 per lateral, or $6,574 for two laterals
Total = $30,698 (without costing factors)

Type	Method	Avg Depth > (ft)	Avg Depth <= (ft)	Diameter (in)	Cost Per Ft	Cost to Reinstate Each Lateral	Elevated Cost to Reinstate Lateral
Replacement	Trench	0	4	10	$89.68	$3,287.00	$4,500
Replacement	Trench	4	8	10	$120.62	$3,287.00	$4,500
Replacement	Trench	8	12	10	$161.73	$3,287.00	$4,500
Replacement	Trench	12	16	10	$215.44	$3,287.00	$4,500
Replacement	Trench	16	30	10	$396.49	$3,287.00	$4,500

Example 2: Cost to Repair

Length: 200’
Diameter: 10”
Average depth: 10’
Trenches needed: 35 foot long sectional trench + 15 foot point trench laterals: 1 in the proposed trench

Sectional trench: $171.27/ft = $5,994 for a 35 foot long trench
Point trench: $206.30/ft = $3,094 for a 15 foot long trench
Reinstate the lateral: $3,287 per lateral
Total: $12,375 (without costing factors)

Type	Method	Avg Depth > (ft)	Avg Depth <= (ft)	Diameter (in)	Cost Per Ft	Cost to Reinstate Each Lateral	Elevated Cost to Reinstate Lateral
Repair	Sectional Trench	0	4	10	$93.51	$3,287.00	$4,500
Repair	Sectional Trench	4	8	10	$126.92	$3,287.00	$4,500
Repair	Sectional Trench	8	12	10	$171.27	$3,287.00	$4,500
Repair	Sectional Trench	12	16	10	$228.34	$3,287.00	$4,500
Repair	Sectional Trench	16	30	10	$416.68	$3,287.00	$4,500
Repair	Trench	0	4	10	$124.10	$3,287.00	$4,500
Repair	Trench	4	8	10	$159.35	$3,287.00	$4,500
Repair	Trench	8	12	10	$206.30	$3,287.00	$4,500
Repair	Trench	12	16	10	$273.51	$3,287.00	$4,500

Costing Factors

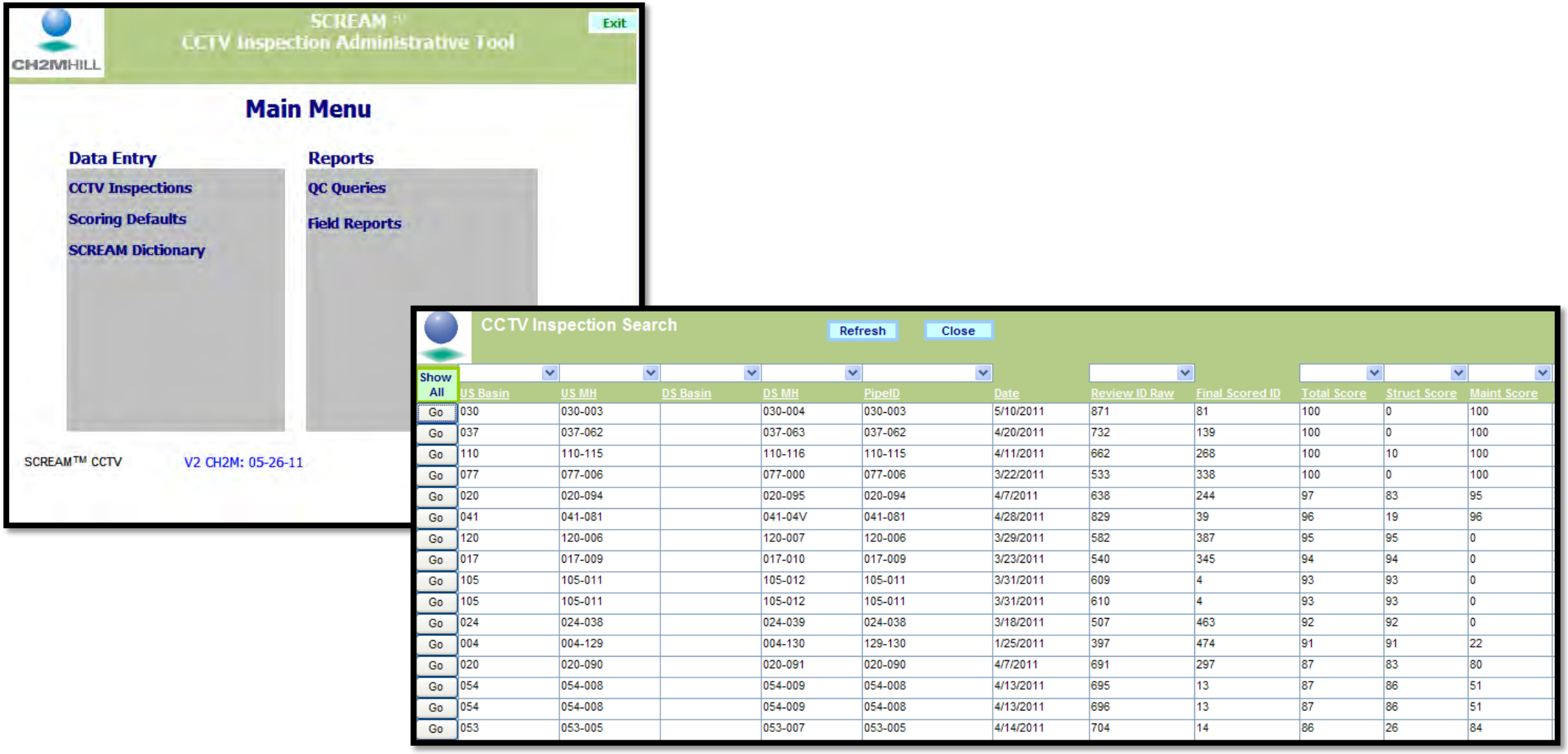
Costing Factors*						
Variable used	Apply factor when this value	Factor	Use For Rehab	Use For Repair	Use For Replace	Stored Procedure used to populate
50FtOfStream	1	0.25	False	True	True	spCosting_Get_50ftOfStream
MajorStreet	1	0.20	True	True	True	spCosting_Get_MajorStreet
UtilityCongestion	1	0.50	False	True	True	spCosting_Get_UtilityCongestion
OnOffRoad	on road	0.25	False	True	True	spCosting_Get_OnOffRoad

*Costing factors are used to mark up the calculated costs of rehabilitation, repair and replacement. Each costing factor that applies is added together and multiplied by the cost per foot listed in the costing tables.

SQL Reports

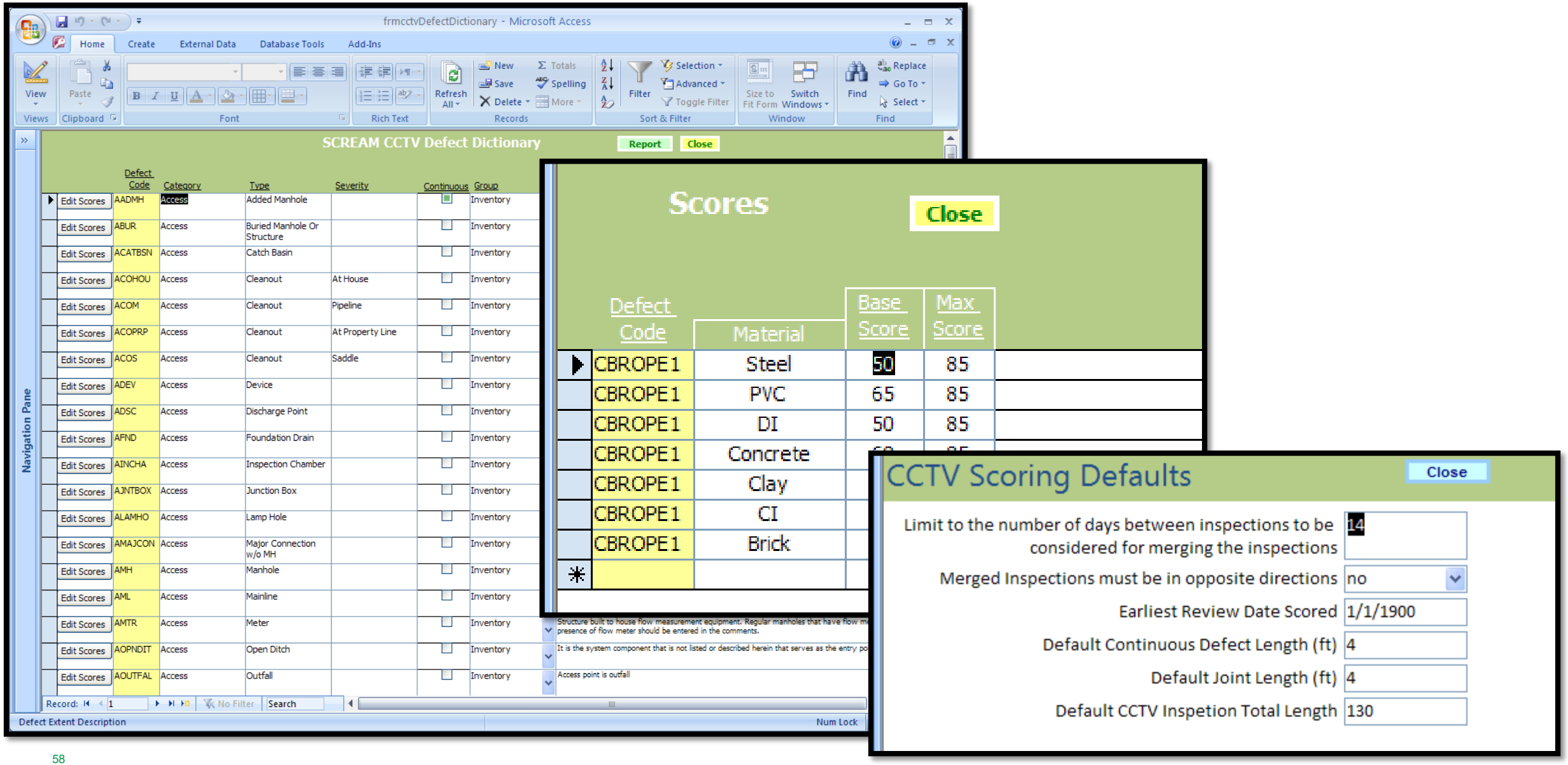
Admin Tools

Use MS Access Administrative Tool



Show All	US Basin	US MH	DS Basin	DS MH	PipeID	Date	Review ID Raw	Final Scored ID	Total Score	Struct Score	Maint Score
Go	030	030-003		030-004	030-003	5/10/2011	871	81	100	0	100
Go	037	037-062		037-063	037-062	4/20/2011	732	139	100	0	100
Go	110	110-115		110-116	110-115	4/11/2011	662	268	100	10	100
Go	077	077-006		077-000	077-006	3/22/2011	533	338	100	0	100
Go	020	020-094		020-095	020-094	4/7/2011	638	244	97	83	95
Go	041	041-081		041-04V	041-081	4/28/2011	829	39	96	19	96
Go	120	120-006		120-007	120-006	3/29/2011	582	387	95	95	0
Go	017	017-009		017-010	017-009	3/23/2011	540	345	94	94	0
Go	105	105-011		105-012	105-011	3/31/2011	609	4	93	93	0
Go	105	105-011		105-012	105-011	3/31/2011	610	4	93	93	0
Go	024	024-038		024-039	024-038	3/18/2011	507	463	92	92	0
Go	004	004-129		004-130	129-130	1/25/2011	397	474	91	91	22
Go	020	020-090		020-091	020-090	4/7/2011	691	297	87	83	80
Go	054	054-008		054-009	054-008	4/13/2011	695	13	87	86	51
Go	054	054-008		054-009	054-008	4/13/2011	696	13	87	86	51
Go	053	053-005		053-007	053-005	4/14/2011	704	14	86	26	84

Update Scoring in Admin Tool



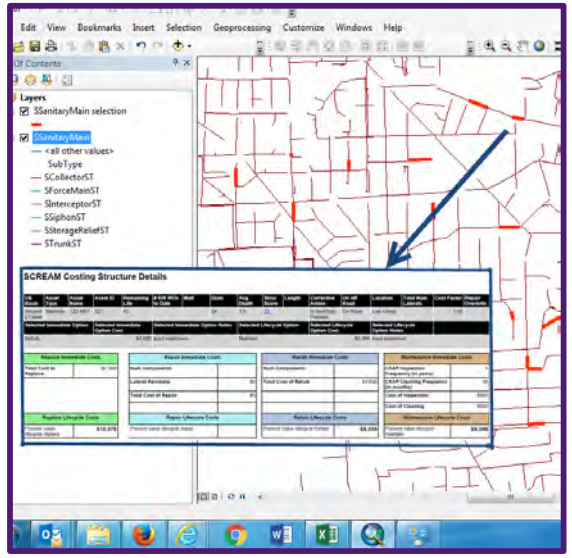
Thank You

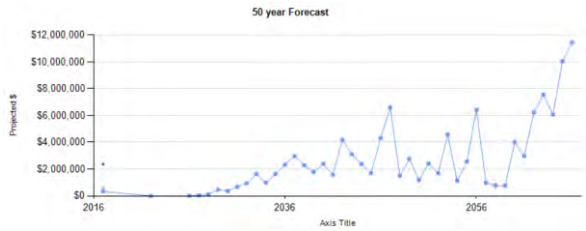
Questions?



Recent upgrades to SCREAM adds features for all clients.

- Web-based data collection tool with GIS links for manhole and special structure inspections
- Incorporation of hydraulic factors in Next Step logic (New Castle)
- Smoke test can now be preformed via ESRI's mobile collection app (Dekalb)
- Costing can now estimate up to 7 corrective action options
- The structural history of a pipe is now tracked
- Some forecasting reports were created
- New flexibility for applying costing factors





SCREAM Quick Guide: New Users

Prepared for

Northern Kentucky Sanitary District 1

May 2017

Contents

1. Quick Guide: General Tasks 1-1
1.1 Determine the User's Security Group 1-1
1.2 Configure an ODBC Connection (needed for the admin and field tools) 1-1

2. Quick Guide: CCTV 2-4

3. Quick Guide: Next Step and Costing 3-5
3.1 Allow Users to Create Work Orders 3-5

5. Troubleshooting work order creation 4-8
4.1 Common Error messages 4-8
4.2 Other suggestions 4-9

1. Quick Guide: General Tasks

1.1 Determine the User's Security Group

Setting up new users is straight forward. Simply determine which security group the user should be a part of and use the following table to determine which actions need to be taken.

User Group	Description	Tasks to Set up User
Reports User	View SCREAM reports	No action necessary
SCREAM_FieldUser	View SCREAM Reports View SCREAM QC Reports View SCREAM Admin Reports Public permissions to SCREAM SQL DB and a few select tables	1. Ask IT to add the user to the "SCREAM_FieldUser" group 2. Place Administrative Tools on User's computer
Scream_Admin	View SCREAM Reports View SCREAM QC Reports View SCREAM Admin Reports Administer the SCREAM SQL DB	1. Ask IT to add the user to the "SCREAM_Admin" group 2. Place Administrative Tool on User's computer

Everyone on the network has view permissions to the general SCREAM SQL reports. The SCREAM_FieldUsers group has permission to run all SQL reports, read permissions to the entire SCREAM SQL database, and write permissions to the following SCREAM data tables:

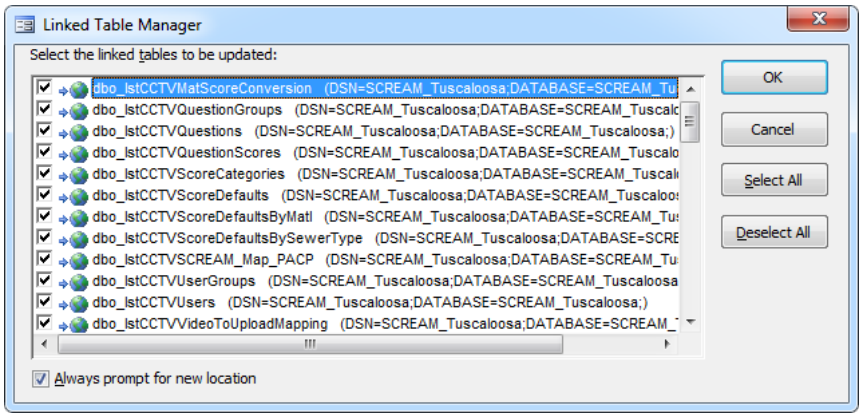
- tblCCTVPipes
- tblCCTVReviews_Raw
- tblCCTV_ReviewDetails_Raw
- tblCCTVReviews_Media
- tblCCTVReviewDetails_Media

The SCREAM_Admin group has administrative permissions to the entire SCREAM SQL database and execute permissions on the SQL jobs. The SCREAM_Admin group also has permission to view and modify all SCREAM SQL reports.

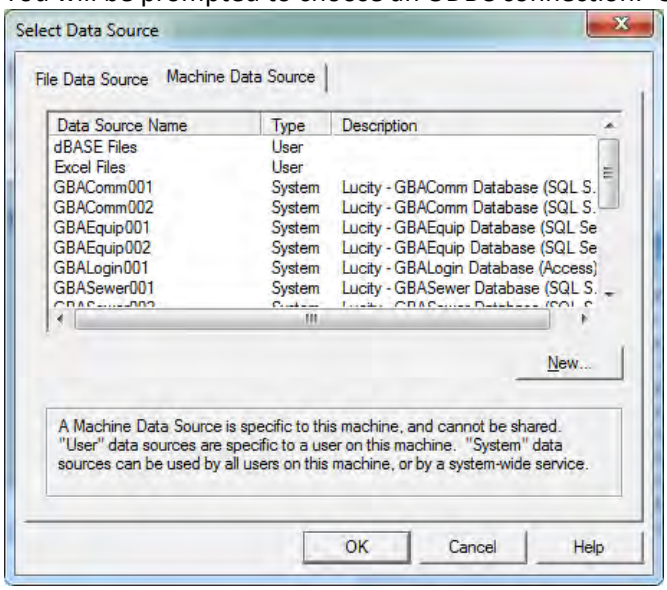
1.2 Configure an ODBC Connection (needed for the admin and field tools)

Create an ODBC connection on the user's computer to the SCREAM database on GIS03. See the following example screenshots for configuration (if a screen is not shown, use the default settings).

Inside of Access, open the linked table manager, select "Always prompt for new location", and "Select All" then "OK".

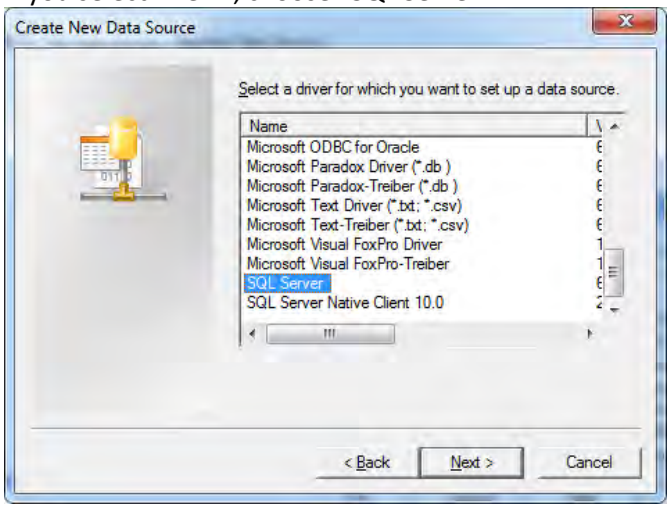


You will be prompted to choose an ODBC connection. Go to the “Machine Data Source” tab.

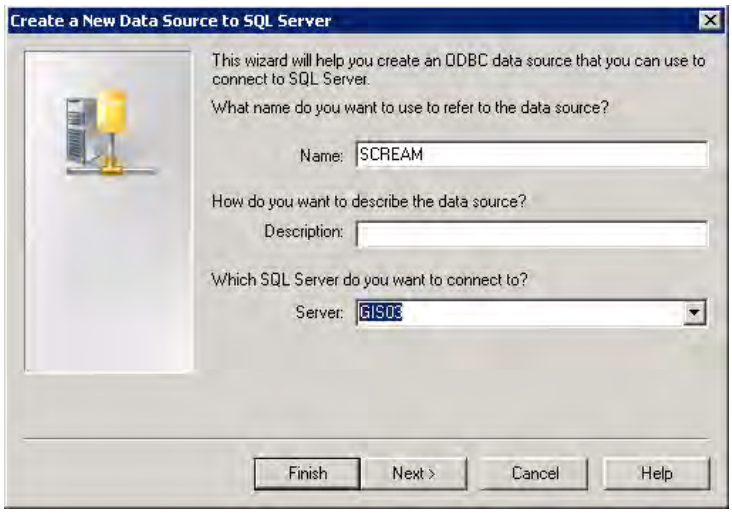


Either Select an ODBC connection that already exists, like “SCREAM” or click “New”

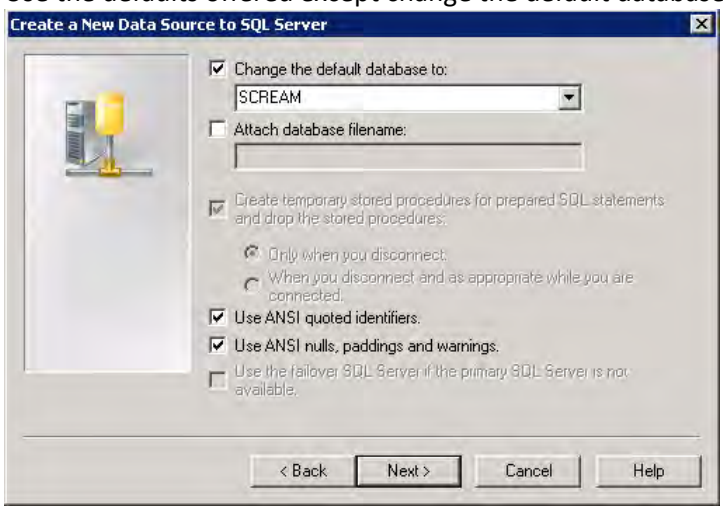
If you select “New”, choose “SQL Server”.



Set up the connection with a name of “SCREAM” and “GIS03” as the server.



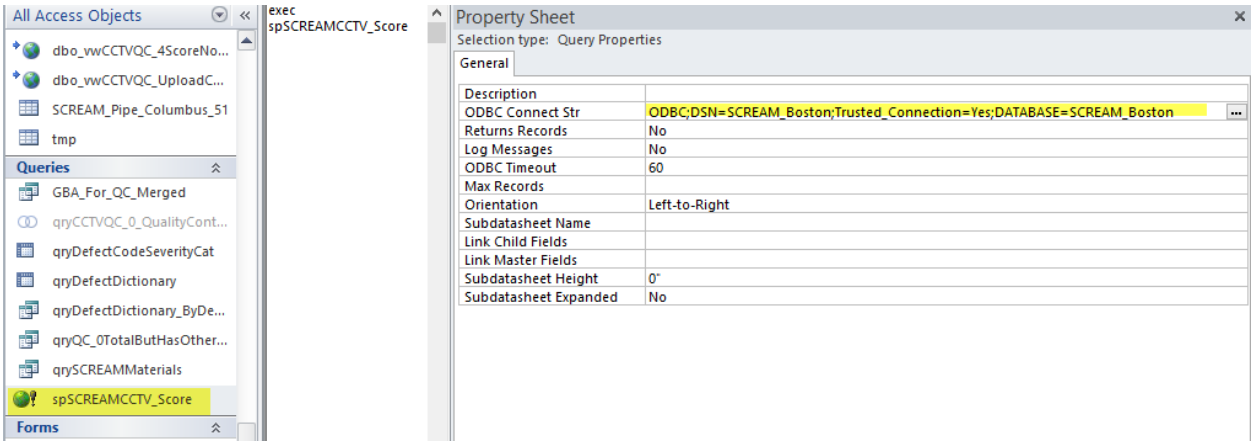
Use the defaults offered except change the default database to “SCREAM”.



When you are done, the linked tables should all refresh with the new ODBC connection. Just to be sure, go to “linked table manager” and refresh all the linked tables (typically under External Data/Linked Table Manager). Select all the tables linked to DSN=SCREAM. Then choose “Always prompt for new location” and then OK. You will have to link the tables to the “SCREAM” odbc connection.

2. Quick Guide: CCTV

1. Copy the latest version of the SCREAM CCTV administrative tool to the user's computer: SCREAM_CCTV_AdministraveDB_v8.mdb (at this writing), located at \\fnp05-ch00\itpipes_media\SCREAM.
2. Refresh the linked tables (once an ODBC connection has been created, see above).
    a. Go to "linked table manager" tables (typically under External Data/Linked Table Manager).
    b. Select all the tables linked to DSN=SCREAM.
    c. Choose "Always prompt for new location" and then OK.
3. If you want the user to re-score the CCTV inspections, update the scoring stored procedure's ODBC connection. This is not automatically done when you refresh tables.
    a. Open the Admin tool and press F11 to see a list of tables.
    b. Find "spSCREAMCCTV_Score" under the list of queries.
    c. Right click it and go to "design view".
    d. Open the properties and update the ODBC connection string to connect to SD1's SCREAM database.



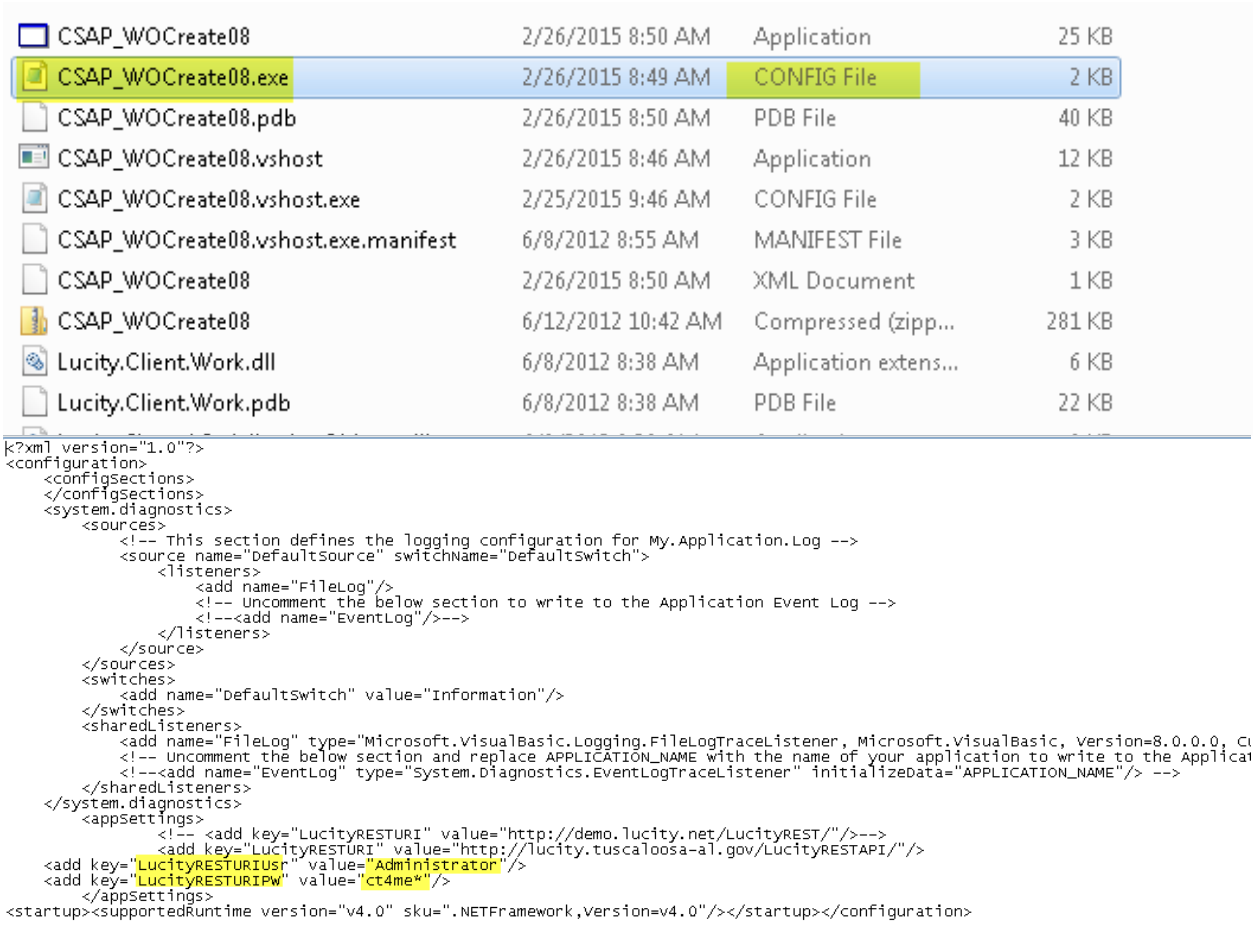
3. Quick Guide: Next Step and Costing

1. Copy the latest version of the SCREAM administrative tool, SCREAM_NextStepCostingWO_AdminTool.mdb (at this writing), from the SCREAM network folder \\fnp05-ch00\itpipes_media\SCREAM to the user's computer.
2. Refresh the linked tables (once an ODBC connection has been created, see above).
    a. Go to "linked table manager" and refresh all the linked tables (typically under External Data/Linked Table Manager).
    b. Select all the tables linked to DSN=SCREAM.
    c. Choose "Always prompt for new location" and then OK.

3.1 Allow Users to Create Work Orders

If you want the user to create work orders, perform the following steps:

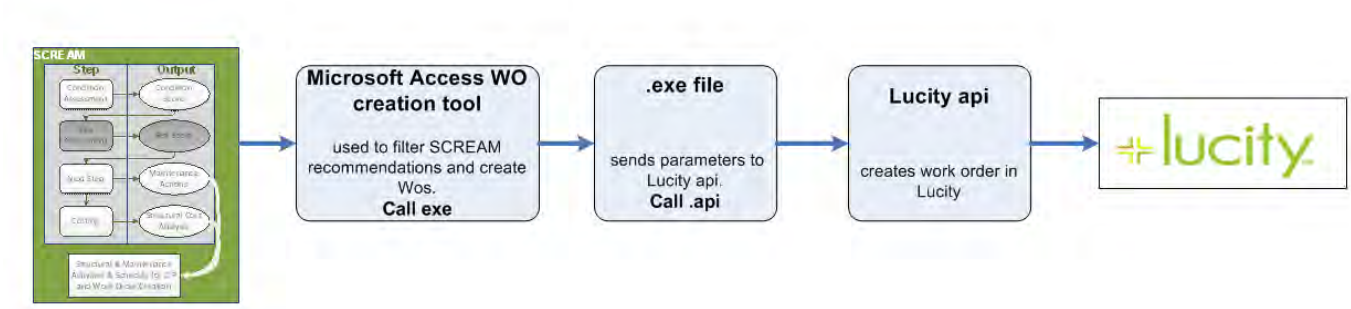
1. Copy the "Release" folder, which contains 21 files used to create workorders. The file CSAP_WOCreate08.exe.config is the only file you might edit. Note where you place the folder (placing it directly on the user's C drive is an easiest).
2. Open the Next Step and Costing Admin tool and press F11 to see the tables.
3. Open the lstEXEPath table. In the first row, enter (or overwrite) the path in the PathToEXE field (you can record the old path in the OLDPath field if you would like. The path should start with the drive, for example, "C:\WO_CreateEXE\CSAP_WOCreate08.exe".
4. Assure the user has permissions. Ask IT to add them to the SCREAM_Admin security group. Also assure they have read/write permissions to the following SQL tables: the SWNET Workorder tables.
5. If not already done, Adjust the user name and password in the configuration file to one that can run the api.
    a. In the CSAP_WOCreate08.exe.config file, adjust the key fields "LucityRESTURIUSr" and "LucityRESTURIPW" to the account with access to the Lucity API. At the time of this writing, the user name and password were: "SCREAM" and "scream".



For your information, the following table lists the fields used in the WO creation tool/EXE.

Field used	Value or source	Where	Field used in EXE
PathToEXE	http://lucity.tuscaloosa-al.gov/LucityRESTAPI/	Listed exe's .config file	
CategoryCode	CMMSCategoryCode in lstNextStep_LogicActionsAndTasks	In SQL table (accessible in the WO Tool)	boxCategoryCode.Text
MainTaskCode	CMMSTaskID in lstNextStep_LogicActionsAndTasks	In SQL table (accessible in the WO Tool)	BoxMainTaskCode.Text
StartDate	entered by user	in Access	BoxStartDate.Text
Reason	CMMSCause in lstNextStep_LogicActionsAndTasks	In SQL table (accessible in the WO Tool)	BoxReason.Text
AssetList	Selected by user. Behind the scenes, the pipeiD has to be converted from the NT_Number that SCREAM and IT Pipes uses to the NT_ID that Lucity needs). Use the vwsewerfilter query to convert.	in Access	BoxPipesIncluded.Text
account	The user name is ‘SCREAM’ while the password is ‘scream’ (was rknuckles, "rknuckles")	Listed exe's .config file	
WO Status	9 '"New WO from Next Step"	Listed exe's .config file	wrkOrder.StatusCode

The following diagram outlines how work orders are created.

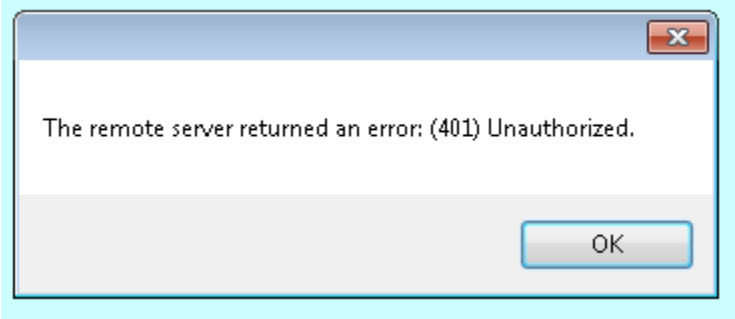


5. Troubleshooting work order creation

4.1 Common Error messages

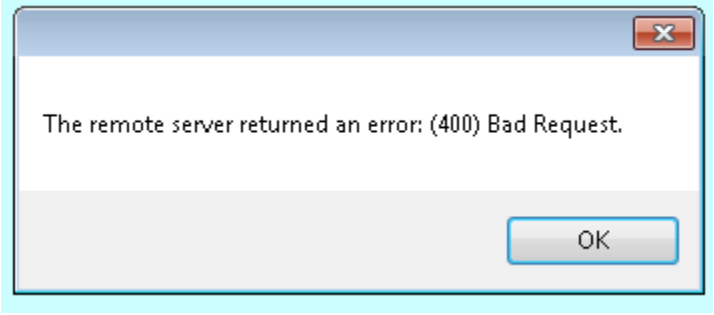
401 Unauthorized:

If you get this error when creating a WO, change the user name in the config file to one with Lucity admin privileges (step 4 above)



400 Bad Request:

If you get this error message when creating a WO, work with Lucity to assure that you are passing proper variables to the workorder. This message signals that perhaps the task code is off, the category code does not apply to the task code or the reason does not apply to the task. Update the Lucity mapped fields in the lsnNextStep_LogicActionsAndTasks table (or use the “Tasks and Factors” form accessible from the WO Tool main menu. You may also need to adjust the available tasks, category codes and reasons in Lucity.



404 Not Found:



This message indicates that the call being made to the API is unknown to the server. It cannot map the call into the API to figure out what to do. Did the naming convention change of when the new installed was created? Usually when I see this, the wrong URL is formed up to make the appropriate call into the API

So, for example, was the old URL to the API like:

http://youroriginalmachine.org/LucityRESTAPI/

and now maybe it points to something else like this:

http://yournewmachine.org/LucityRESTAPINewPath/

note: (keep in mind that the name of the server and the path to the Lucity API can be configured when it is installed so your new path may be slightly different)

4.2 Other suggestions

1. In the CSAP_WOCreate08.exe.config file, you may need to adjust the key field "LucityRESTTURI value to equal the proper url for SD1 (ask Lucity support for help if needed). At the time of this writing, the url was http://lucity.tuscaloosa-al.gov/LucityRESTAPI/
2. The Access database should have the following references (if a problem, check these)
    a. Lucityado.dll v 4.3
    b. LucityCInt.dll ver1.0
    c. GBAInteg.dll ver1.2
3. Check the application setting in the code. "*Dim uri As String : uri = System.Configuration.ConfigurationManager.AppSettings("LucityRESTURI").ToString()"* It may need to be adjusted to reflect the new install of the API.
4. Load Fiddler and look at the POST/GET to see what is being called and match that up to the where the API is installed. Contact LUCITY and give them the a .SAZ archive file from Fiddler so they can analyze it more.

SCREAM's CCTV Administrative Tool Guide

Prepared for

Northern Kentucky SD1

September 2017

Contents

Section **Page**

Quick Guide: SCREAM Administrative Tool 1-1
1.1 Check your ODBC Connection 1-1
1.2 The Main Menu 1-1
1.3 Review CCTV Inspections 1-2
1.4 CCTV Scoring Defaults 1-4
1.5 CCTV Dictionary and Scores 1-5
1.6 SCREAM Grades 1-6
1.7 Manage CCTV Uploads 1-7
1.8 QC Queries 1-7
1.8.1 An example: Mapping Materials to the SCREAM score list 1-9
1.9 Dictionary Reports 1-9
1.10 Rescore 1-10

Appendix
A Administrative Tool QC Queries

SECTION 5

SECTION 6

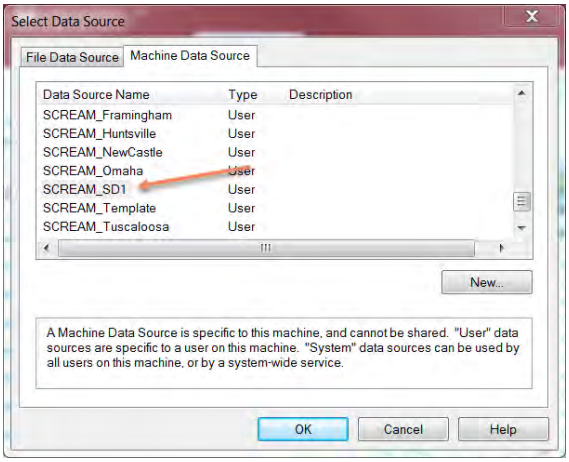
Quick Guide: SCREAM Administrative Tool

The SCREAM CCTV Administrative Tool (Admin Tool) was created to allow administrators to easily make modifications to the scoring dictionary and defaults without using SQL Server Management Studio. It also allows users to browse CCTV Inspections. The Admin Tool links directly to the SQL server tables via an ODBC connection so data can be viewed and modified. Note that we don't recommend updating inspection data here (except to mark defects as corrected). At SD1, changes to inspection records should be done in ITpipes or in the contractor's CCTV software (and resubmitted). Any changes to inspections in SCREAM will be overwritten the following night when the latest CCTV data is uploaded.

The Admin Tool is an Access Database with links to the data in the SCREAM SQL Server database. Browse to your Admin Tool using explorer. At the time of this document, the latest Admin Tool was SCREAM_Pipe_AdministrativeDB_v8.mdb. Simply double click on this tool to open it. Note that you will have to have Microsoft Access on your computer to use the Admin Tool.

1.1 Check your ODBC Connection

When using the tool for the first time or on a new machine, check the ODBC connection. Open the Admin tool and navigate to the linked table manager (External Data/Linked table manager) to make sure the data is pointing to the correct scream project. You should use or create an ODBC connection that links to the SCREAM database on GIS03. Update the connection if necessary by checking "Always prompt for new location" and selecting the correct ODBC connection or making a new one.



1.2 The Main Menu

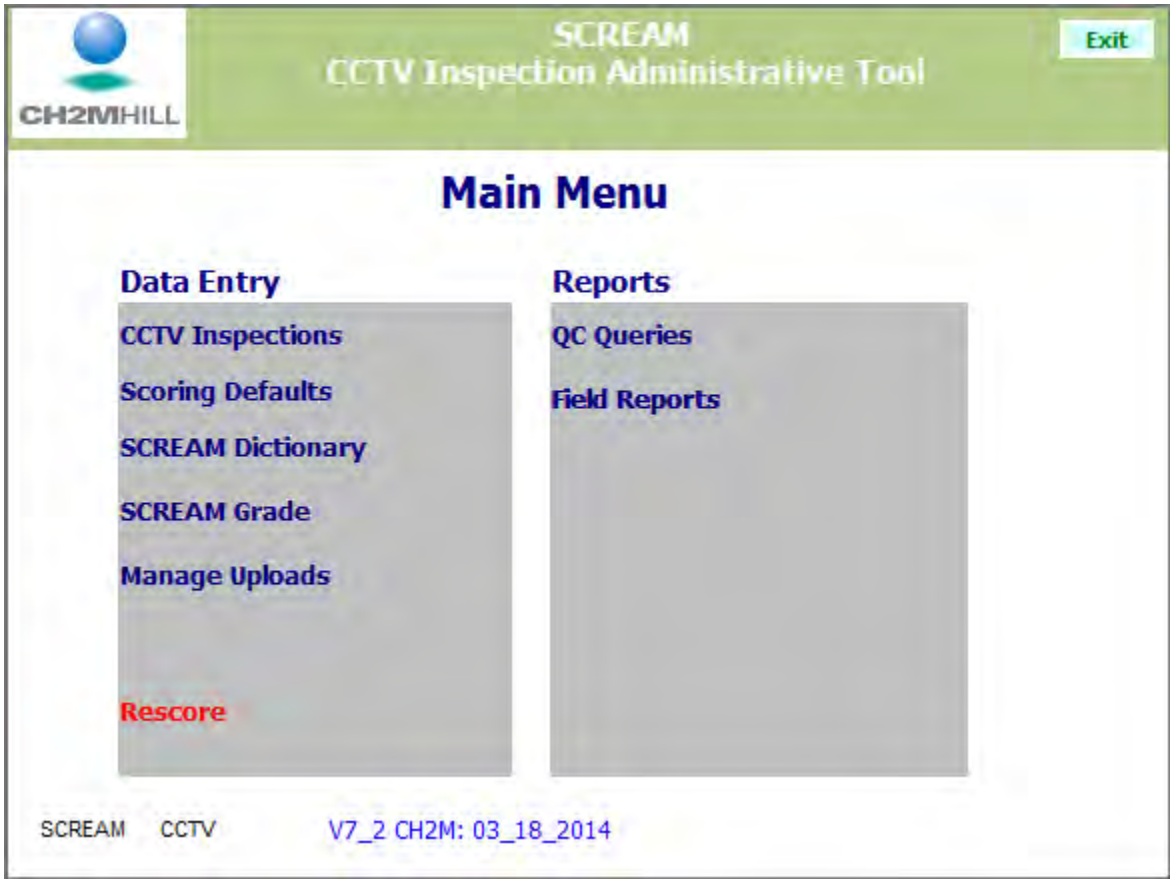
The CCTV Inspection Administrative Tool serves eight main purposes. The tool allows the user to:

1. Review CCTV inspections.
2. Update the CCTV look up tables
3. Review and Update the SCREAM Dictionary Scores
4. Update the SCREAM Grades (Score Categories)
5. Manage inspection uploads imported into SCREAM
6. Rescore the CCTV inspections
7. Perform quality control through QC Queries

Section **Page**

8. Run basic reports

You can see each of these purposes reflected in options listed in the Main Menu (below). The Main Menu is displayed when the Admin Tool is opened.



1.3 Review CCTV Inspections

This feature will not be used by SD1, since Lucity is the CCTV source of record. We include this section for reference only.

A list of pipes, their basic attributes, inspection dates and SCREAM scores can be seen, filtered and sorted by selecting “CCTV Inspections” from the Main Menu. Sort any column by clicking on the column header (or double clicking for descending order). Filter the list by selecting items in the drop down boxes above some columns.

If a pipe is inspected more than once, it will be listed more than once. Each inspection has its own row. The Review ID Raw refers to the raw review lD in the SQL raw inspection tables. The Final Scored ID refers to the final ID listed in the SCREAM tables.

CCTV Inspection Search Refresh Close

Show All	US Basin	US MH	DS Basin	DS MH	CCTVPipeID	Date	Review ID Raw	Final Scored ID	Total Score	Struct Score	Maint Score	II Score	Fixed Total
Go	-	3682		3665	940	10/9/2013	1290	62	80	80	0	0	80
Go	-	3682		3665	940	10/9/2013	1291	62	80	80	0	0	80
Go	-	4994		4992	3899	10/10/2013	1292	63	86	86	0	0	86
Go	-	4994		4992	3899	10/10/2013	1293	63	86	86	0	0	86
Go	-	4994		4992	3899	10/9/2013	1294	63	86	86	0	0	86
Go	-	8884		5007	6315	10/10/2013	1295	64	85	85	0	0	85
Go	-	8884		5007	6315	10/11/2013	1296	64	85	85	0	0	85
Go	-	7501		7493	2718	10/16/2013	1297	507	11	11	0	0	11
Go	-	7493		7491	2719	10/16/2013	1298	508	25	0	25	0	25
Go	-	7477		7493	2717	10/16/2013	1299	509	44	38	25	0	44
Go	-	7491		7478	2720	10/16/2013	1300	510	100	0	100	0	100
Go	-	10597		7491	533	10/16/2013	1301	511	57	57	0	0	57
Go	-	7510		7507	7057	10/16/2013	1302	512	61	61	0	0	61
Go	-	7512		7507	2722	10/16/2013	1303	513	0	0	0	0	0
Go	-	4981		4980	3897	10/8/2013	1304	65	70	70	45	0	70
Go	-	4981		4980	3897	10/8/2013	1305	65	70	70	45	0	70
Go	-	7507		7486	2721	10/18/2013	1306	516	72	70	48	0	72
Go	-	7486		7479	2716	10/18/2013	1307	517	74	71	62	0	74
Go	-	7478		7486	2715	10/18/2013	1308	518	14	14	0	0	14

Clicking a “Go” button on the left opens a form with inspection details (of the inspection you chose). This form allows you to review and update data. But, note that your updates will be lost if they came from ITpipes because a fresh set of data will be imported when the SQL scheduled upload job runs. Instead, update the inspections in ITpipes and they will be reflected in SCREAM.

The Inspection Detail form has four sections. The top section lists general information about the inspection (data, reviewer, comments). The second section, “Raw Data”, lists the CCTV observations that were entered in ITpipes (PACP codes on the right – if any - and SCREAM codes on the left). The third section list the observations compiled and scored by SCREAM. When observations are compiled, continuous defect lengths are summed or point defects are counted. Below the inspections, any related inspections are listed. Usually only one raw inspection is listed but if the inspection was a merged inspection (a reverse set up), then both raw inspections are listed.

SCREAM Results Close

Raw ReviewID (SQL): 1290 **Pipe ID:** 940 Skip to Another Review: 940

Insp Date	Sewer Type	Reviewer	CCTV Len	Direction	TVID
10/9/2013	Sanitary	anthony_stallwor	83.9	2	1252

Raw Data Comments

St ftg	End ftg	Code	Component	Type	Severity	PACP Code	PACP %	Defect Corrected	Date Corrected	PACP 1st	Comment
3		AMH	Access	Manhole		AMH	0	Mark			
28.79999924		LLOCU	Lateral	Location	Up	LLOCU	0	Mark			
50.5		LLOCU	Lateral	Location	Up	LLOCU	0	Mark			
56.79999924		LLOCU	Lateral	Location	Up	LLOCU	0	Mark			
24.10000038		LTAPHAM	Lateral	Tap Hammer	Location	LTAPHAM	0	Mark			
83.90000153		PINABZ	Pipe	Inspection Abandoned	Other Reason	PINABZ	0	Mark			
83.80000305		PSAG2	Pipe	Sag	2 (21-50% Dia.)	PSAG2	0	Mark			

CCTV Compiled Data

Code		Defect Score	Len or count	Source	Comment
AMh	Access- Manhole		2	Pull	point1
JBroPe3	Joint- Broken, Pieces 3 (Hole/Void Visible)	76.31926	2	Pull	point1
LLocR	Lateral- Location Right	0	1	Pull	point1
LLocU	Lateral- Location Up	0	4	Pull	point1
LTapHam	Lateral- Tap Hammer Location	0	1	Pull	point1
PInAbZ	Pipe- Inspection Abandoned Other Reason	0	2	Pull	point1
PSag2	Pipe- Sag 2 (21-50% Dia.)	26.54354	50	Compiled from # records: 1	Conti Defect - ReviewID:1290
PWtlMrk2	Pipe- Water Level Mark 2 (<75% Dia.)	0	1	Pull	point1

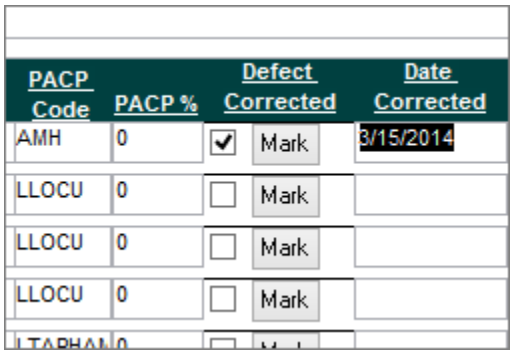
List of Raw CCTV Inspections that were merged together

FinalScoredReviewID	ReviewID_Ra	AssetUnique	Direction	RevDate	ReviewerID
62	1290	940	2	10/9/2013	anthony_stallworth

Section **Page**

If SD1 wants to keep track of defects that were corrected, they can. Marking a defect corrected will not be overwritten when new data is imported, as the corrected defects are tracked in a separate table "tblCCTVReviewDetails_RawCorrected" and re-applied after import. To mark a defect as corrected, click the "Mark" button next to the defect that was corrected.

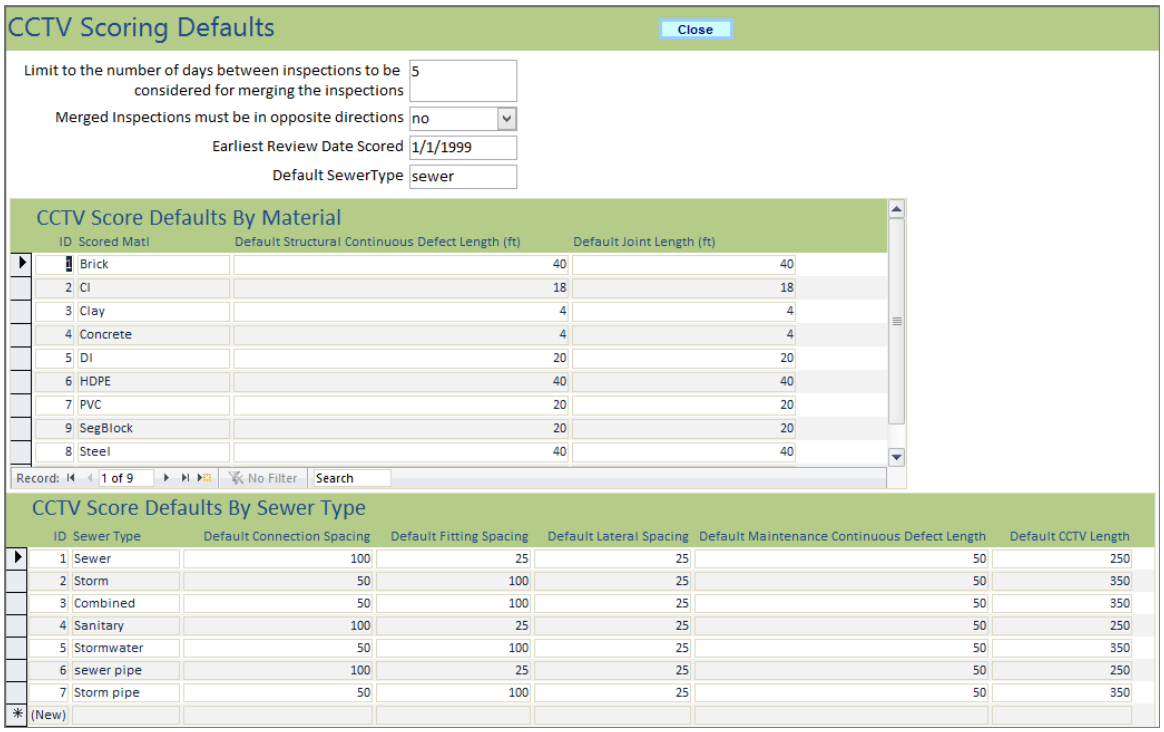
Corrected defects are scored in the regular SCREAM scores but are not incorporated into the SCREAM "fixed" scores. You will notice that tblCCTVReviews and tblCCTVPipes have both regular SCREAM scores and Fixed Scream scores. Currently, the SCREAM reports do not track fixed scores. If SD1 decides to track corrected defects, new reports can be made.



PACP Code	PACP %	Defect Corrected	Date Corrected
AMH	0	☑ Mark	3/15/2014
LLOCU	0	☐ Mark	
LLOCU	0	☐ Mark	
LLOCU	0	☐ Mark	

1.4 CCTV Scoring Defaults

SCREAM Scoring's logic is designed to be flexible. In order to be flexible, the logic's framework is held in several look up tables. The default values can be adjusted by choosing "Scoring Defaults" from the Main Menu. For more information on the different defaults, see the section "Default CCTV Settings".



CCTV Scoring Defaults — Close

Limit to the number of days between inspections to be considered for merging the inspections: 5

Merged Inspections must be in opposite directions: no

Earliest Review Date Scored: 1/1/1999

Default SewerType: sewer

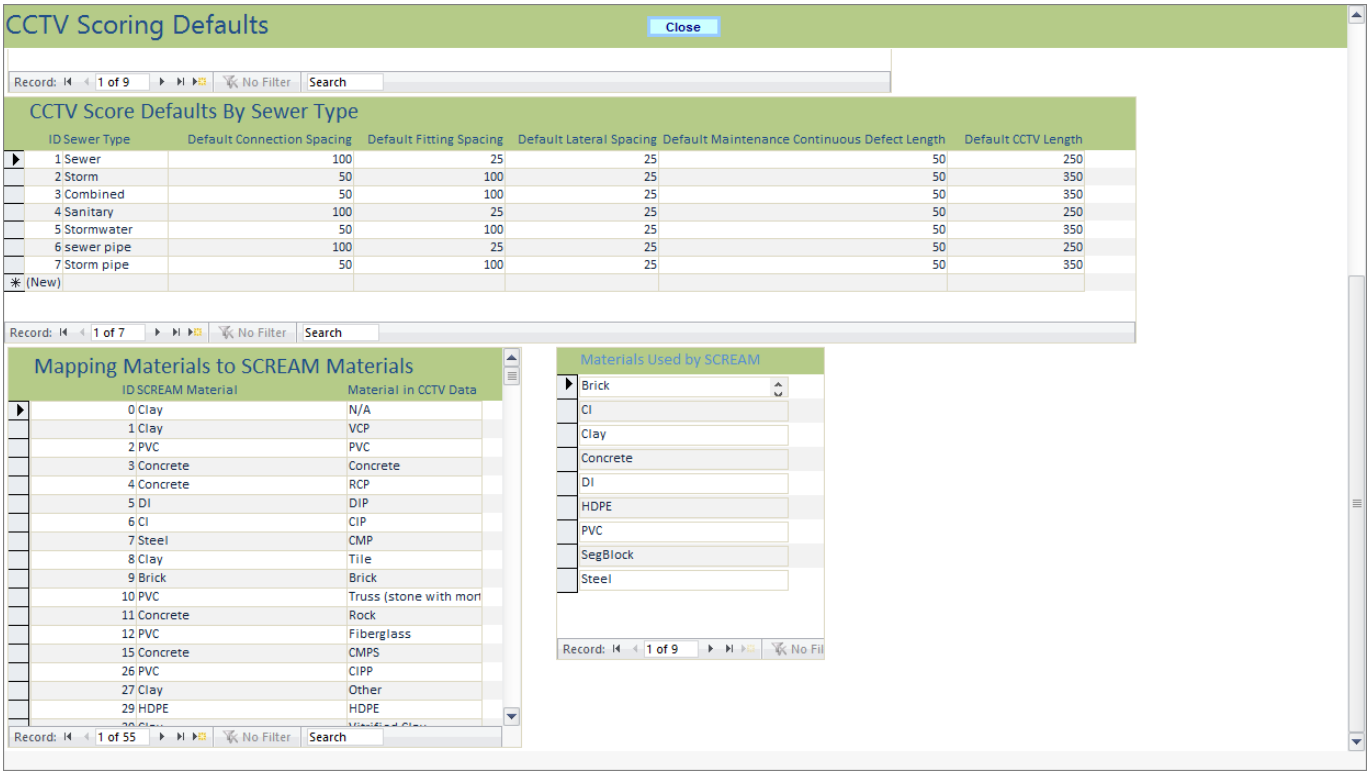
CCTV Score Defaults By Material

ID	Scored Matl	Default Structural Continuous Defect Length (ft)	Default Joint Length (ft)
1	Brick	40	40
2	CI	18	18
3	Clay	4	4
4	Concrete	4	4
5	DI	20	20
6	HDPE	40	40
7	PVC	20	20
9	SegBlock	20	20
8	Steel	40	40

Record: 1 of 9 | No Filter | Search

CCTV Score Defaults By Sewer Type

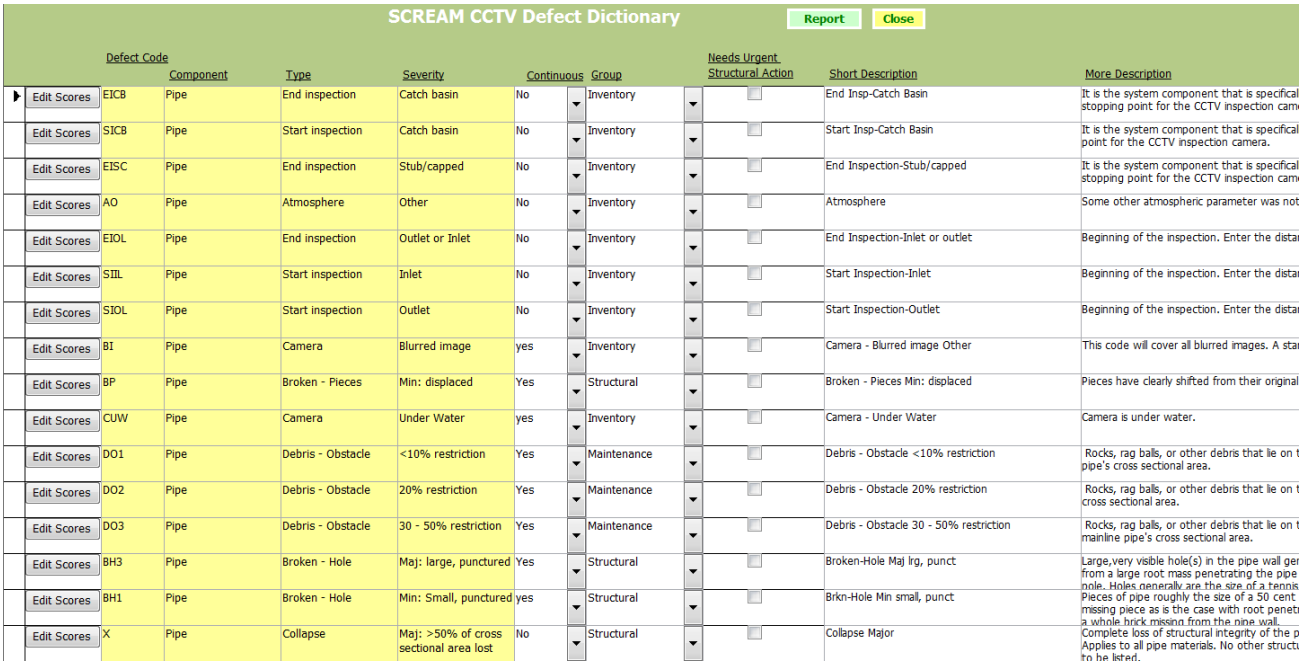
ID	Sewer Type	Default Connection Spacing	Default Fitting Spacing	Default Lateral Spacing	Default Maintenance Continuous Defect Length	Default CCTV Length
1	Sewer	100	25	25	50	250
2	Storm	50	100	25	50	350
3	Combined	50	100	25	50	350
4	Sanitary	100	25	25	50	250
5	Stormwater	50	100	25	50	350
6	sewer pipe	100	25	25	50	250
7	Storm pipe	50	100	25	50	350
(New)						



Note that the table “Materials Used by SCREAM” cannot be updated. It is shown only for reference. When entering values in the “Mapping Materials to SCREAM Materials” table, the SCREAM Materials can only be ones listed in the “Materials Used by SCREAM” table.

1.5 CCTV Dictionary and Scores

If you would like to view the SCREAM defect code dictionary or modify the scores associated with the codes, choose “SCREAM Dictionary” from the main menu. A read-only list of all the SCREAM codes is presented. You can sort the columns by clicking on the header.



Section **Page**

If you would like to see the associated scores, click on one of the “Edit Scores” buttons. The “Scores” form will open. This form shows all the base and max scores associated with the defect for different materials. You can adjust these scores here. You can update the white cells.

Scores Close

Defect Code		Material	Base Score	Max Score
SDC2	Surface damage- CorrosionMod	PVC	60	80
SDC2	Surface damage- CorrosionMod	Steel	70	90
SDC2	Surface damage- CorrosionMod	CI	65	85
SDC2	Surface damage- CorrosionMod	DI	65	85
SDC2	Surface damage- CorrosionMod	Clay	60	80
SDC2	Surface damage- CorrosionMod	Concrete	59	80
SDC2	Surface damage- CorrosionMod	Brick	65	90
SDC2	Surface damage- CorrosionMod	CIPP	65	85

Note that the pipe scores will not be impacted until the SCREAM scores are run that night via the Scoring job or until someone forces a rescore (see “Rescore”).

1.6 SCREAM Grades

The grades (score categories) can be adjusted by choosing “SCREAM Grade” from the Main Menu. SCREAM scores range from 1 to 100, with 100 being the worst. This scale is too large to easily show on a color-coded map or chart. So, grades are used to group like scores together. You can adjust the grade range by adjusting the minimum score in each category. The top grade, “5” in this case, includes every score above 91. For more information on the Grades, see the section “CCTV Grades.”

Note that grade ranges are repeated for structural, maintenance and total scores. We separate out the score to grade mapping in the rare case that someone wants different ranges for different score types.

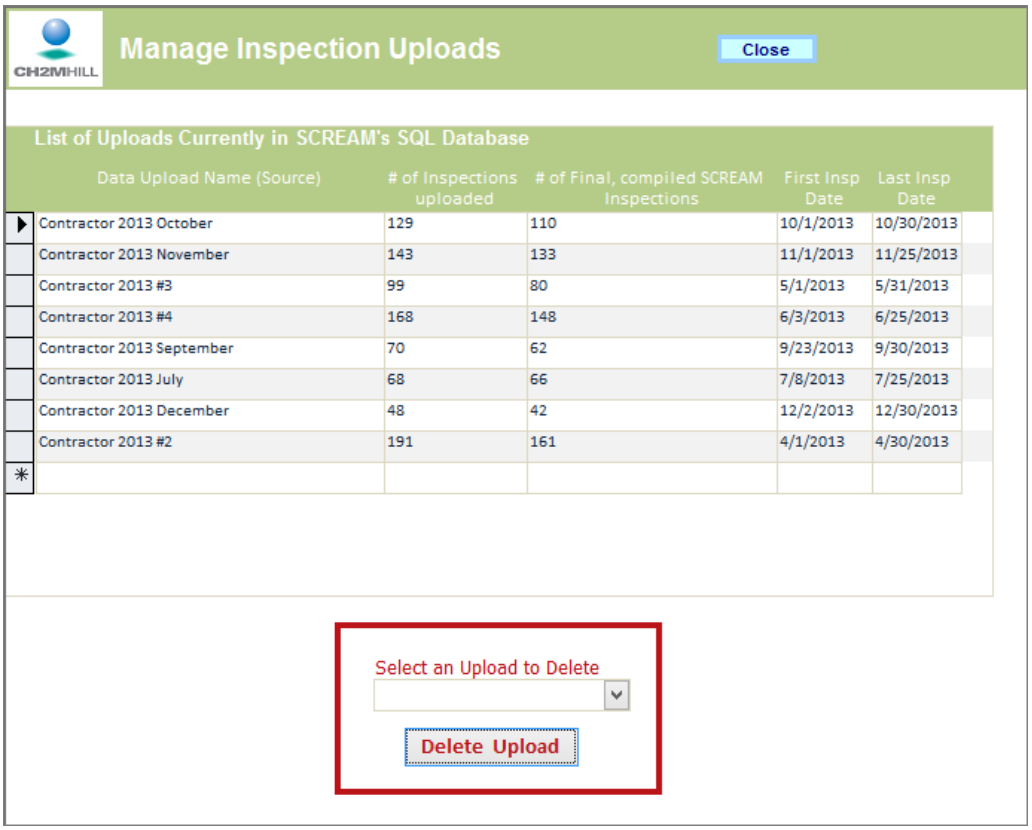
SCREAM Grades Close

Struct Maint Or Total	Grade	Minimum Score in this Category	Grade Description	Grade Range Description
Maint	0	0	No observed defects	0
Maint	1	2	Few observed defects	2 - 40
Maint	2	41	Minimum level of defects	41 - 60
Maint	3	61	Moderate level of defects	61 - 80
Maint	4	81	Major level of defects	81 - 90
Maint	5	91	Extreme defects/failure	91 - 100
Struct	5	91	Extreme defects/failure	91 - 100
Struct	4	81	Major level of defects	81 - 90
Struct	3	61	Moderate level of defects	61 - 80
Struct	2	41	Minimum level of defects	41 - 60
Struct	1	2	Few observed defects	2 - 40
Struct	0	0	No observed defects	0
Total	0	0	No observed defects	0
Total	1	2	Few observed defects	2 - 40
Total	2	41	Minimum level of defects	41 - 60
Total	3	61	Moderate level of defects	61 - 80
Total	4	81	Major level of defects	81 - 90
Total	5	91	Extreme defects/failure	91 - 100

1.7 Manage CCTV Uploads

Note, this form will not be used by SD1 since uploads are not tracked and all the CCTV data comes from Lucity. This section is only here for reference.

From the Main Menu, the option "Manage Uploads" takes the user to the following form.



The table at the top of the form displays a list of uploads of inspection data. An upload is defined as a group of inspection data that is imported at the same time, either from a contractor or from ITpipes. In this case, there are several contractor uploads and no ITpipes upload. The most important field in the table is the upload name (in SQL it is called "SourceCreated") and the number of inspections in each upload. In this example, 143 CCTV inspections were uploaded from a contractor data source in November. These inspections were merged into 133 SCREAM inspections (during scoring reverse inspections are merged together).

This table can help you target uploads that you may want to delete and re-upload. To delete an upload, use the red box at the bottom. Choose an upload to delete then click "Delete Upload". Note that you will need to rescore after deleting an upload so that your changes appear in SCREAM's scored tables.

Also note that deleting an upload is only reversible by re-uploading that data, so be careful. Contact the SCREAM team of ITpipes for help with uploading contractor data.

1.8 QC Queries

Several QC queries are available to target potential problems. The list of QC queries can be accessed by choosing "QC Queries" from the Main Menu. Click on any of the queries listed to open it. The names of the queries are ordered with the most important queries (priority 1) at the top and the least important (priority 4) at the bottom. The names also describe what types of problems are being queried. The queries should be empty unless marked otherwise. If the query is empty, there is no problem. IF the query has records, there could be a problem. See Appendix A for a description of the queries.

Section **Page**



Before running each query in the list, click on the “View QC Summary” button. It will show an overview of how many records (or potential errors) are listed in each QC query (like below). You can skip over the queries with no errors.

QC_Check	NumOfQCErrors
dbo_vwCCTVQC_1CCTVQuestionsAndScoresIDMismatch	0
dbo_vwCCTVQC_1MappedCodesNotInDict	3
dbo_vwCCTVQC_1MatlNotConverted	2
dbo_vwCCTVQC_1MatlNotInlstConversion	1
dbo_vwCCTVQC_1MissingSewerType	13
dbo_vwCCTVQC_1MultipleCodeConversion_DeleteOne	0
dbo_vwCCTVQC_1NotMappedToSCREAM	0
dbo_vwCCTVQC_1PACPMappedCodesNotInDict	3
dbo_vwCCTVQC_1PACPNotMappedToSCREAM	0
dbo_vwCCTVQC_1SewerTypeNotInlstBySewerType	0
dbo_vwCCTVQC_2OrphanInspectionOrWrongSewerType	14
dbo_vwCCTVQC_2ReviewWithoutPipe	14
dbo_vwCCTVQC_3MissingCCTVLength	24
dbo_vwCCTVQC_3MissingOperator	0
dbo_vwCCTVQC_3MissingPipeAttributes	3
dbo_vwCCTVQC_3MissingUSBasin	0
dbo_vwCCTVQC_3MoreThan2Insp_MayNotBeEmpty	285
dbo_vwCCTVQC_4DefectNotInFinal	1
dbo_vwCCTVQC_4MainReviewDetailIDMismatch	0

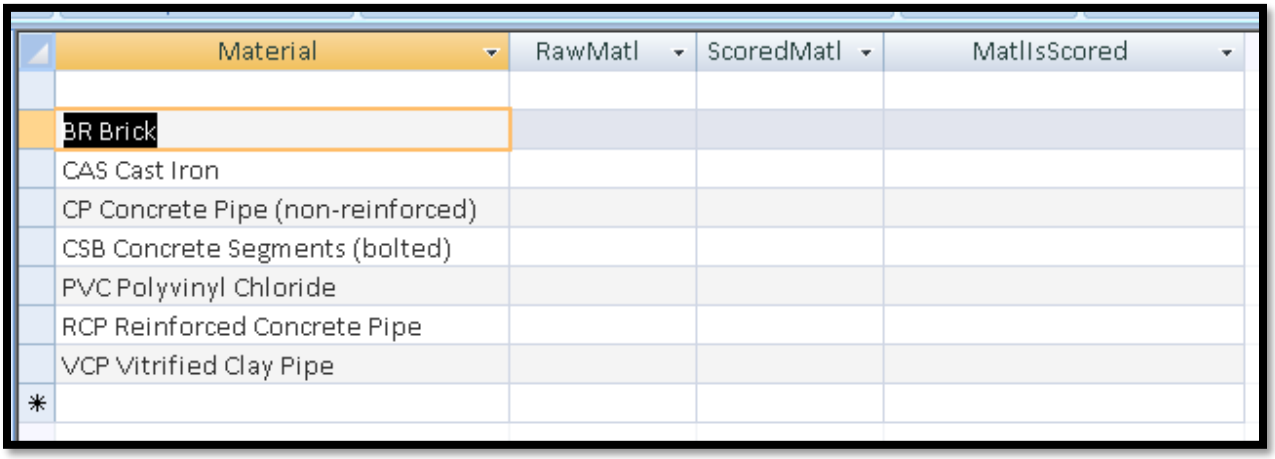
Next, open the queries that have results and see what the problem could be. Use Appendix A to guide you. For example, several results were returned in the screen shot of the “MissingSewerType” query. The pipes listed should be updated in the CCTV software, ITpipes or in the CCTVPipes table.

Use the down arrow button to move through the list easily. If you start to run into problems, start correcting the problems in the #1 queries. Be sure to re-score after correcting any problems, rescoring may eliminate problems in other queries.

1.8.1 An example: Mapping Materials to the SCREAM score list

An administrator ran the query “vwCCTVQC_1MatlNotCoverted”, which lists any material types in the inspections that haven’t been mapped to material types in SCREAM. It is important to have materials mapped since SCREAM scores can’t be applied to materials that aren’t listed in SCREAM’s scoring dictionary.

This is a frequent QC problem since different clients use different nomenclature. For example, one client enters the following “BR Brick” while SCREAM uses “brick”. We need to map “BR Brick” to “brick” so SCREAM knows how to score the pipe.



Material	RawMatl	ScoredMatl	MatlIsScored
BR Brick			
CAS Cast Iron			
CP Concrete Pipe (non-reinforced)			
CSB Concrete Segments (bolted)			
PVC Polyvinyl Chloride			
RCP Reinforced Concrete Pipe			
VCP Vitrified Clay Pipe			

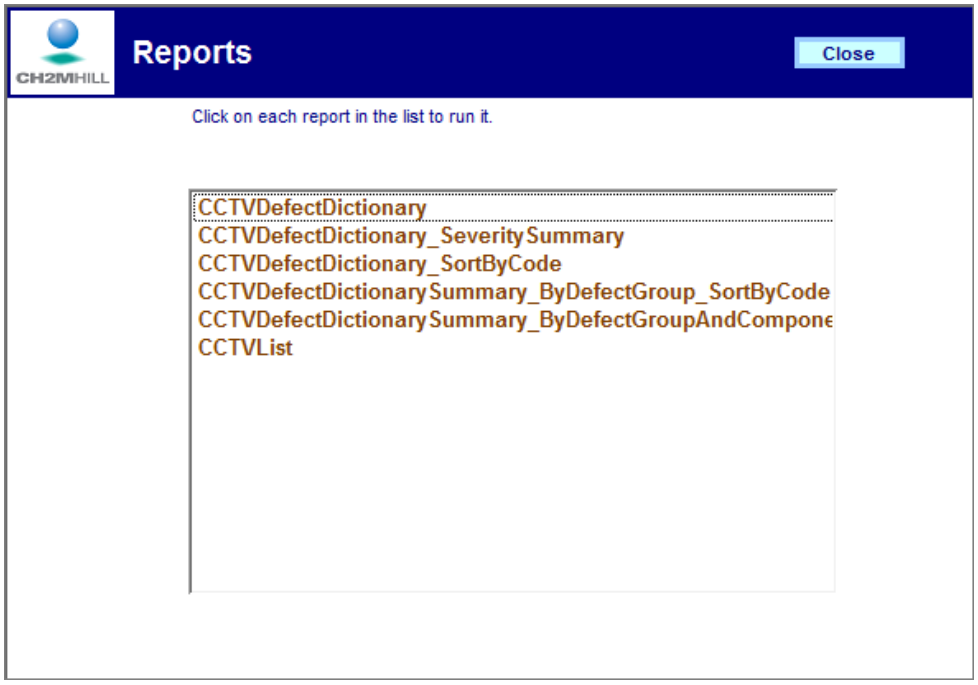
The administrator will need to add the unmapped materials, above to the lstCCTVMatScoreConversion table in SQL – or add them in the Admin Tool, under “Scoring Defaults”. See the sections “CCTV Scoring Defaults” and “Default CCTV Settings” for more information.

Once the administrator adds the unmapped materials, he or she will need to rescore the CCTV inspections. Once they do, the “vwCCTVQC_MatlNotCoverted” query will be empty.

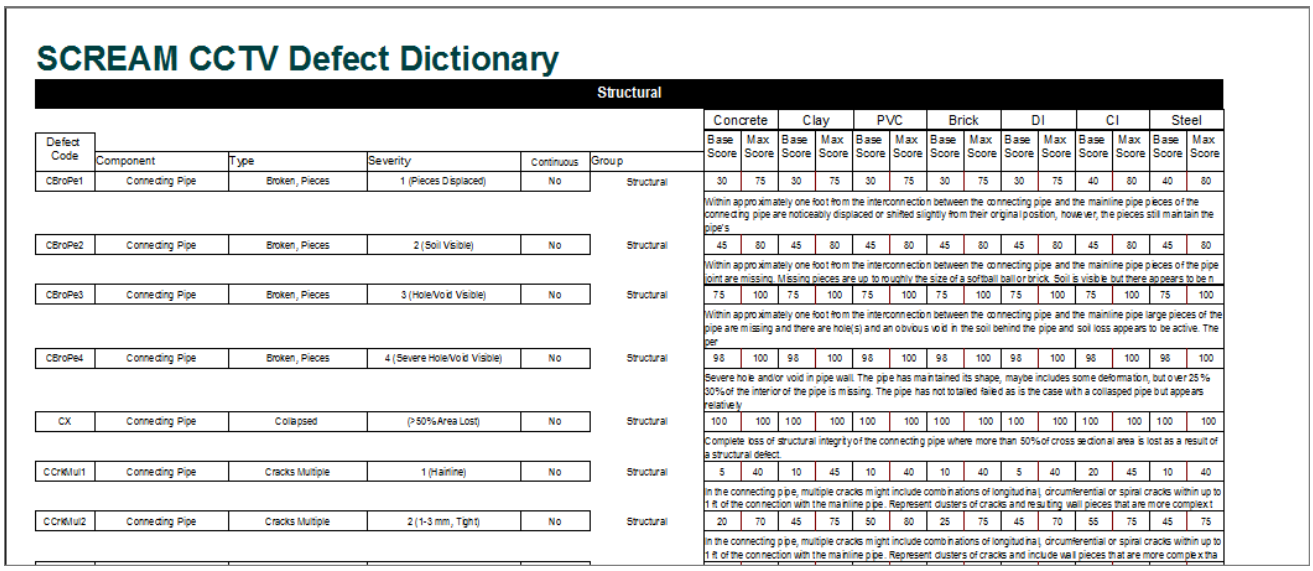
1.9 Dictionary Reports

Several Microsoft Access reports can be run by selecting the “Field Reports” option from the main menu. The reports can be exported to .xls using built-in Microsoft Access features. Click on any of the reports on the list to run them.

Section **Page**



Four of the reports display the dictionary in different formats and can be printed to help field crews who use SCREAM codes.



SCREAM CCTV Defect Dictionary

Structural

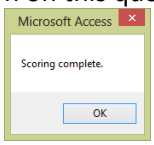
Defect Code	Component	Type	Severity	Continuous	Group	Concrete Base Score	Concrete Max Score	Clay Base Score	Clay Max Score	PVC Base Score	PVC Max Score	Brick Base Score	Brick Max Score	DI Base Score	DI Max Score	CI Base Score	CI Max Score	Steel Base Score	Steel Max Score
CBroPe1	Connecting Pipe	Broken, Pieces	1 (Pieces Displaced)	No	Structural	30	75	30	75	30	75	30	75	30	75	40	80	40	80
						Within approximately one foot from the interconnection between the connecting pipe and the mainline pipe pieces of the connecting pipe are noticeably displaced or shifted slightly from their original position, however, the pieces still maintain the pipe's										
CBroPe2	Connecting Pipe	Broken, Pieces	2 (Soil Visible)	No	Structural	45	80	45	80	45	80	45	80	45	80	45	80	45	80
						Within approximately one foot from the interconnection between the connecting pipe and the mainline pipe pieces of the pipe joint are missing. Missing pieces are up to roughly the size of a softball ball or brick. Soil is visible but there appears to be n										
CBroPe3	Connecting Pipe	Broken, Pieces	3 (Hole/Void Visible)	No	Structural	75	100	75	100	75	100	75	100	75	100	75	100	75	100
						Within approximately one foot from the interconnection between the connecting pipe and the mainline pipe large pieces of the pipe are missing and there are hole(s) and an obvious void in the soil behind the pipe and soil loss appears to be active. The per										
CBroPe4	Connecting Pipe	Broken, Pieces	4 (Severe Hole/Void Visible)	No	Structural	98	100	98	100	98	100	98	100	98	100	98	100	98	100
						Severe hole and/or void in pipe wall. The pipe has maintained its shape, maybe includes some deformation, but over 25% 30% of the interior of the pipe is missing. The pipe has not totalled failed as is the case with a collapsed pipe but appears relatively										
CX	Connecting Pipe	Collapsed	(>50% Area Lost)	No	Structural	100	100	100	100	100	100	100	100	100	100	100	100	100	100
						Complete loss of structural integrity of the connecting pipe where more than 50% of cross sectional area is lost as a result of a structural defect.										
CCrkMul1	Connecting Pipe	Cracks Multiple	1 (Hairline)	No	Structural	5	40	10	45	10	40	10	40	5	40	20	45	10	40
						In the connecting pipe, multiple cracks might include combinations of longitudinal, circumferential or spiral cracks within up to 1 ft of the connection with the mainline pipe. Represent clusters of cracks and resulting wall pieces that are more complex t										
CCrkMul2	Connecting Pipe	Cracks Multiple	2 (1-3 mm, Tight)	No	Structural	20	70	45	75	50	80	25	75	45	70	55	75	45	75
						In the connecting pipe, multiple cracks might include combinations of longitudinal, circumferential or spiral cracks within up to 1 ft of the connection with the mainline pipe. Represent clusters of cracks and include wall pieces that are more complex tha										

1.10 Rescore

SCREAM CCTV scoring job is scheduled to run on weekdays. If you need to force a re-score at another time, click on the “Rescore” option on the main menu. This may take some time, so don’t worry if it is marked as “running…” for a long time. Eventually a “Scoring complete” announcement will be displayed. See the new User guide for a description on how to update this feature.

If the scoring is not working, the odbc connection in the sql pass-through query “spSCREAMCCTV_Score” may be wrong. You have to go into the design view of this query and then to “properties” and “ODBC

connection" to update the odbc connection on this query. It is not updated with SQL's Linked Table Manager.



Appendix A
Administrative Tool QC Queries

Query	Priority	Description	Possible Resolution
CCTVQC_1CCTVQuestionsAndScoresIDMismatch	First	The ids of the defect codes don't match the ids listed in another table.	Run the "CCTV_Update_CCTVQuestionsAndScoresIDMismatch.sql" script.
CCTVQC_1MappedCodesNotInDict	First	The code mapped from PACP (or the SCREAM code) is not listed in the SCREAM CCTV dictionary (one of three ways of checking for problems)	Run the "CCTV_UpdateOldCodes.sql" sql script then make sure the CCTV software dictionary is up to date with the latest version of SCREAM.
CCTVQC_1MatlNotConverted	First	Some pipes have materials that are not mapped to SCREAM materials in the table "lstCCTVMatScoreConversion". As a result, they can't be properly scored.	Map the unmapped material to a SCREAM material in the table "lstCCTVMatScoreConversion" in SQL or add the material to the “Mapping Material to SCREAM Material” table in the Admin tool (see section “CCTV Scoring Defaults” for more information).
CCTVQC_1MatlNotInlstConversion	First	Some pipes have materials that are not mapped to SCREAM materials in the table "lstCCTVMatScoreConversion". As a result, they can't be properly scored.	Map the unmapped material to a SCREAM material in the table "lstCCTVMatScoreConversion" in SQL or add the material to the “Mapping Material to SCREAM Material” table in the Admin tool (see section “CCTV Scoring Defaults” for more information).
CCTVQC_1MissingSewerType	First	This query lists pipes without sewer types. Any inspections on these pipes will have a problem being scored without a sewer type.	Go back to the CCTV inspection software and correct the sewer type for these pipes. If this can't be done, correct the sewer types in "tblCCTVPipes" and "tblCCTVReviews_Raw".
CCTVQC_1MultipleCodeConversion_DeleteOne	First	A material was mapped more than once in "lstCCTVMatScoreConversion".	Open "lstCCTVMatScoreConversion" and delete one of duplicates. Or delete the duplicate in the Admin Tool. See section “CCTV Scoring Defaults” for more information.
CCTVQC_1NotMappedToSCREAM	First	The code mapped from PACP (or the SCREAM code) is not listed in the SCREAM CCTV dictionary (one of three ways of checking for problems)	Run the "CCTV_UpdateOldCodes.sql" sql script then make sure the CCTV software dictionary is up to date with the latest version of SCREAM.
CCTVQC_1PACPMappedCodesNotInDict	First	The code mapped from PACP (or the SCREAM code) is not listed in the SCREAM CCTV dictionary (one of three ways of checking for problems)	Run the "CCTV_UpdateOldCodes.sql" sql script then make sure the CCTV software dictionary is up to date with the latest version of SCREAM.
CCTVQC_1PACPNotMappedToSCREAM	First	The code mapped from PACP (or the SCREAM code) is not listed in the SCREAM CCTV dictionary (one of three ways of checking for problems)	Run the "CCTV_UpdateOldCodes.sql" sql script then make sure the CCTV software dictionary is up to date with the latest version of SCREAM.

Query	Priority	Description	Possible Resolution
CCTVQC_1SewerTypeNotInlstBySewerType	First	Some pipes have sewer types that aren't listed in the "lstCCTVScoreDefaultsByMatl" sql table. As a result, they can't be properly scored.	An pipe has a sewer type that is not on the list of defaults by sewer type. Add the missing sewer type in the “CCTV score defaults by sewer type” table using the admin tool. See section “CCTV Scoring Defaults” for more information.
CCTVQC_2OrphanInspectionOrWrongSewerType	Second	The inspection is an orphan or the sewer type listed in the inspection doesn't match a pipe with the same sewer type and ID.	Go back to the CCTV inspection software and correct the sewer type for these pipes. If this can't be done, correct the sewer types in "tblCCTVPipes" and "tblCCTVReviews_Raw".
CCTVQC_2ReviewWithoutPipe	Second	The inspection is an orphan because the pipeID was updated in the inventory or the sewer type listed in the inspection doesn't match a pipe with the same sewer type and ID.	Go back to the CCTV inspection software and correct the sewer type for these pipes. If the problem is not associated with sewer type, then the inspection is an orphan. This typically happens because a pipe ID has been updated in the inventory. You must update the ID in the inspection as well (in the CCTV Software or in tblCCTVReviews_raw).
CCTVQC_3MissingCCTVLength	Third	These pipes' last inspections do not have a calculated CCTV length	Investigate a few inspections and see if there is an obvious reason why SCREAM can't calculate a cctv length (for example, there weren't any observations). Contact the SCREAM team if needed.
CCTVQC_3MissingOperator	Third	These inspections are missing the operator/inspector. This will not cause SCREAM scoring to fail, but the inspector is an important piece of information.	Go back to the CCTV inspection software and add the inspector/operator to the inspection.
CCTVQC_3MissingPipeAttributes	Third	These pipes are missing diameter or material. This will not cause SCREAM scoring to fail, but the material and diameter play into SCREAM Next Step and Costing.	Go back to the CCTV inspection software and add the material/diameter. Or update the asset inventory and synchronize with "tblCCTVPipes".
CCTVQC_3MissingUSBasin	Third	These pipes are missing a basin designation. This will not cause SCREAM scoring to fail, but the basin is a main way to sort SCREAM reports. The reports will become less functional without the basin.	Go back to the CCTV inspection software and add the basin. Or update the asset inventory and synchronize with the CCTV software or "tblCCTVPipes".

Query	Priority	Description	Possible Resolution
CCTVQC_3MoreThan2Insp_MayNotBeEmpty	Third	This query may not be empty. It shows inspections that occur on the same date in the same direction. If many inspections have more than 2 (and upwards of 4) in the "numReviews" column of this query, there may be duplicate inspections in the dataset.	Review the inspections to see if duplicates may have been imported from the CCTV Software. Or, maybe the inspections were imported twice (once from an old contractor database and one from the software). You may need to delete an upload (see section “Manage CCTV Uploads” for more information).
CCTVQC_4DefectNotInFinal	Last	This may be a result of other problems. Try to correct the other problems first.	Correct other problems first; this problem is typically a side-effect of other issues. If it remains in the end, notify the SCREAM team.
CCTVQC_4MainReviewDetailIDMismatch	Last	This problem may occur occasionally for complex inspections.	Correct other problems first; this problem is typically a side-effect of other issues. Otherwise ignore unless the problem occurs for more than 25% of the observations. If it does, notify the SCREAM team.
CCTVQC_4MainReviewDetailIDNotRecorded	Last	This problem may occur occasionally for complex inspections.	Correct other problems first; this problem is typically a side-effect of other issues. Otherwise ignore unless the problem occurs for more than 25% of the observations. If it does, notify the SCREAM team.
CCTVQC_4MultipleCodesNotSplitOrNoLen	Last	This may be a result of other problems. Try to correct the other problems first.	Correct other problems first; this problem is typically a side-effect of other issues. If it remains in the end (for more than a few records), notify the SCREAM team.
CCTVQC_4NoCountOrLen	Last	This may be a result of other problems. Try to correct the other problems first.	Correct other problems first; this problem is typically a side-effect of other issues. If it remains in the end (for more than a few records), notify the SCREAM team.
CCTVQC_4NoDefectScore	Last	This may be a result of other problems. Try to correct the other problems first.	Correct other problems first; this problem is typically a side-effect of other issues. If it remains in the end (for more than a few records), notify the SCREAM team.
CCTVQC_4PointDefectThresholdLimitNotCalculated	Last	This problem occurs when a point defect's score can't be calculated.	Correct other problems first; this problem is typically a side-effect of other issues. If it remains in the end, notify the SCREAM team.
CCTVQC_4ScoreNoDefectScore	Last	This may be a result of other problems. Try to correct the other problems first.	Correct other problems first; this problem is typically a side-effect of other issues. If it remains in the end, notify the SCREAM team.

SCREAM Installation Overview, Logic review and Administrative Guide

Prepared for

City of SD1
Water and Sewer Department

Updated: May 2017

Contents

Section **Page**

Introduction 1
1.1 SCREAM Next Step Logic 1
1.1.1 Structural Logic 2
1.1.2 Maintenance Logic 3
1.2 SCREAM Costing and Basis of Cost Estimation 4
1.2.1 Adding options 5

SCREAM Installation: Integration with Lucity 7
2.1 Platform 9
2.2 Linking Pipe IDs 9
2.3 Linking Inspection IDs 10
2.4 Importing from Lucity 11

Running SCREAM 12
3.1 Troubleshooting SQL jobs and Stored Procedures 14

SCREAM Results 16
4.1 SCREAM Results in Lucity 16
4.2 SCREAM Results in SQL Reports 16
4.3 SCREAM Results in GIS 17
4.4 SCREAM Results in the Combined Table 18

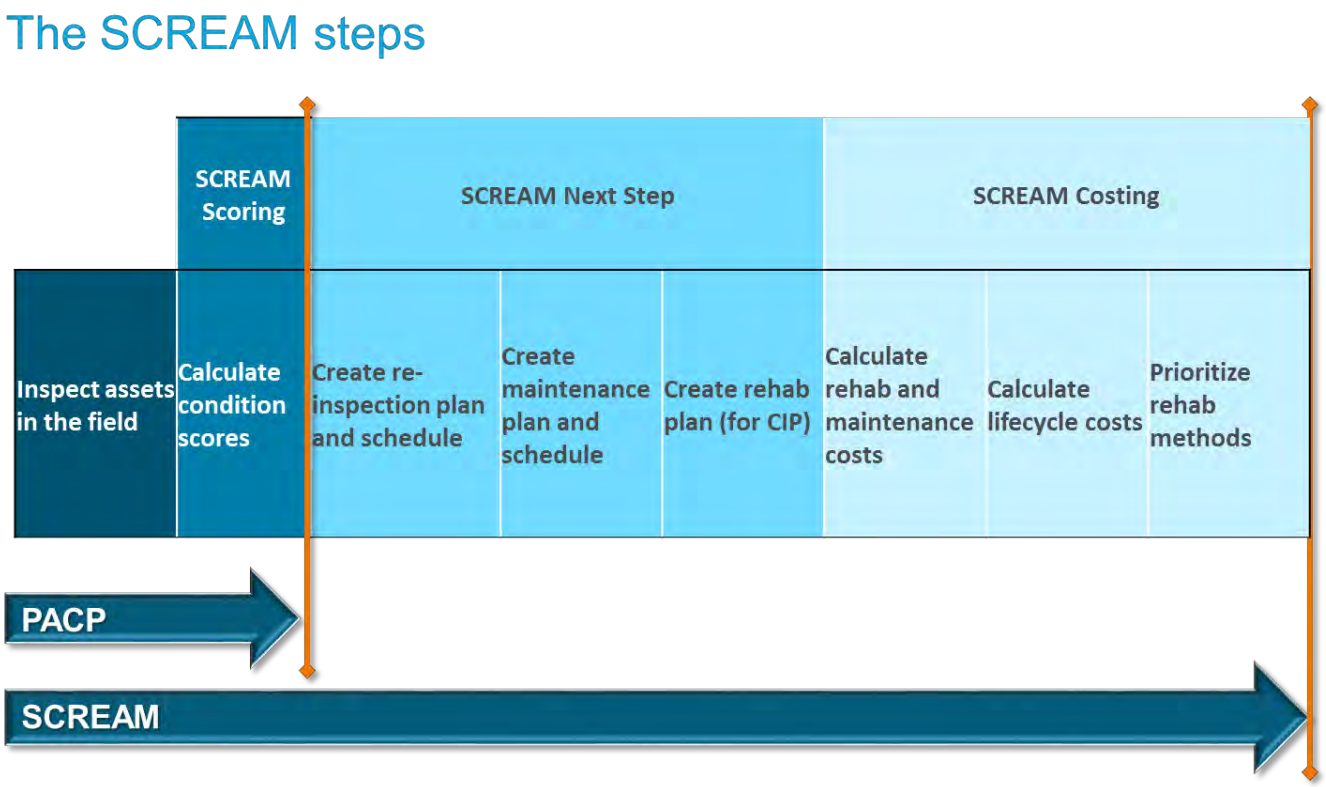
Customizing SCREAM – What can be updated? 19

Troubleshooting 20

Introduction

The SCREAM application was created with the goal of enhancing utilities' ability to process and prioritize vast collections of sewer condition data. SCREAM includes a suite of tools for data collection and analysis. In SCREAM Scoring, data is compiled and scored. Then, in SCREAM Next Step, the condition scores are combined with work order history to determine the best next action for the asset (e.g., should it be rehabilitated or monitored) and optimized scheduling is applied to create lists of recommend work orders. Finally, SCREAM Costing calculates the cost of repairs, replacement, rehab and continued maintenance over time and chooses the optimal methodology for addressing the utilities' priority assets. Armed with information from SCREAM Scoring, Next Step and Costing, utilities can create re-inspection, maintenance, and rehabilitation plans and utilities are given a collective view of their assets.

Some utilities include SCREAM Risk in their process, SCREAM risk calculates bottom-up risk scores. SD1 does not use SCREAM Risk so it is not included in the diagram below.



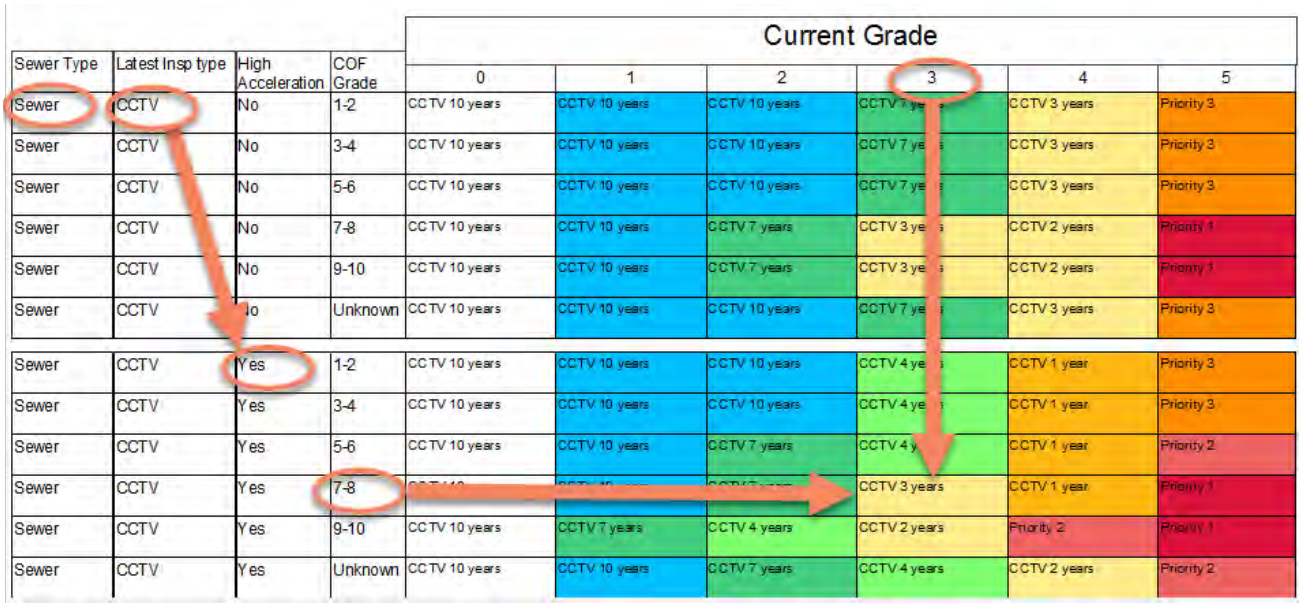
1.1 SCREAM Next Step Logic

Next Step uses the asset inventory, cctv logs, work order history, and several logic tables to determine the appropriate next maintenance and structural actions (next steps). The recommendations include, for example, "clean the pipe now", "place the pipe on a priority 1 rehab list", or "re-inspect the pipe in 3 years". SCREAM Next Step then schedules the recommended actions using an optimized scheduling routine.

Note that Maintenance recommendations and structural recommendations are separated. Both recommendations are given to each pipe. For example, a pipe may need to be cleaned immediately for maintenance purposes but may not need to be CCTVed again for ten years for structural purposes.

1.1.1 Structural Logic

SCREAM Next Step's structural logic is based on a matrix, where several variables associated with the pipe are used to determine the resulting action. In the example below, a pipe's last inspection type was CCTV. The pipe has not had high defect acceleration and has a risk consequence of failure (COF) grade of 4. Finally, the last CCTV structural grade was 4 (light blue column header). Following the red arrows, on the left and then stopping at the Structural grade column 4, Next Step's recommended structural action is "CCTV 18 months."



				Current Grade					
Sewer Type	Latest Insp type	High Acceleration	COF Grade	0	1	2	3	4	5
Sewer	CCTV	No	1-2	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 ye	CCTV 3 years	Priority 3
Sewer	CCTV	No	3-4	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 ye	CCTV 3 years	Priority 3
Sewer	CCTV	No	5-6	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 ye	CCTV 3 years	Priority 3
Sewer	CCTV	No	7-8	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 ye	CCTV 2 years	Priority 1
Sewer	CCTV	No	9-10	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 ye	CCTV 2 years	Priority 1
Sewer	CCTV	No	Unknown	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 ye	CCTV 3 years	Priority 3
Sewer	CCTV	Yes	1-2	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 4 ye	CCTV 1 year	Priority 3
Sewer	CCTV	Yes	3-4	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 4 ye	CCTV 1 year	Priority 3
Sewer	CCTV	Yes	5-6	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 4 y	CCTV 1 year	Priority 2
Sewer	CCTV	Yes	7-8				CCTV 3 years	CCTV 1 year	Priority 1
Sewer	CCTV	Yes	9-10	CCTV 10 years	CCTV 7 years	CCTV 4 years	CCTV 2 years	Priority 2	Priority 1
Sewer	CCTV	Yes	Unknown	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 4 years	CCTV 2 years	Priority 2

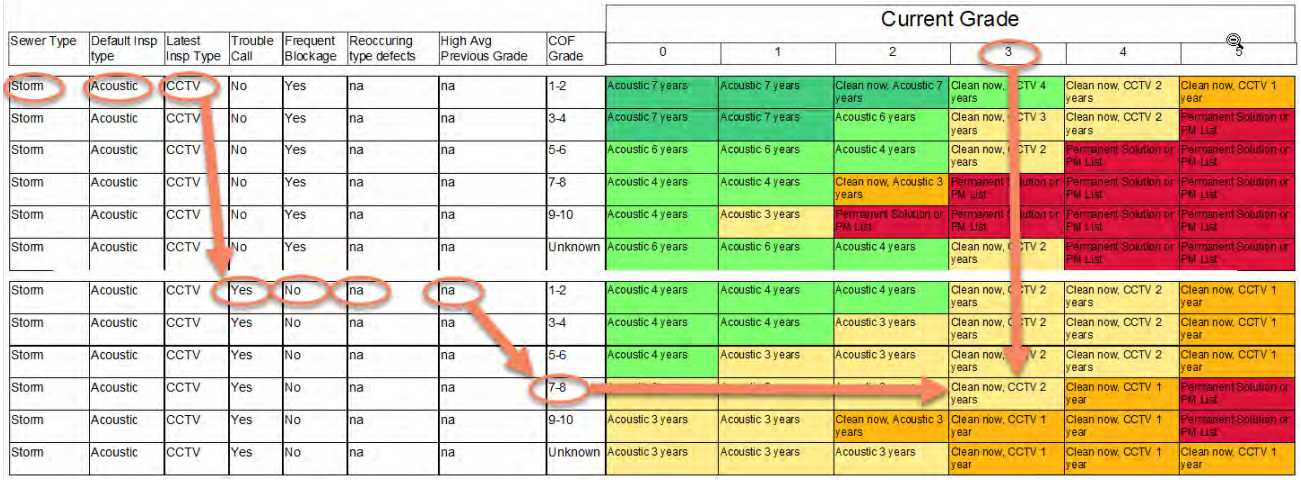
Next Step's structural logic considers the following variables. Note that the definition of "High Acceleration" can be customized.

Variable	Description	Source of Information
Sewer Type	Whether the pipe is part of the sewer, storm, combined or other system.	Lucity pipe inventory
Last Inspection Type	Last inspection type	Inspection records
High Acceleration	If the pipe's structural score has increased by a given amount since the last inspection	Inspection records
Consequence of Failure Grade (COF Grade)	If the pipe has had high-scoring previous inspections	Top-down analysis, stored in GIS
Latest Inspection Structural Grade	The pipe's latest inspection's structural grade	Inspection records

Once every pipe has a next action, SCREAM schedules the actions so work orders can be created. Then, SCREAM Next Step reviews open work orders to assure the work isn't already scheduled in the utility's CMMS.

1.1.2 Maintenance Logic

Like the structural logic, the maintenance logic is based on a matrix, where several variables associated with the pipe are used to determine the resulting action. The maintenance matrix is too large to display here because of the number of factors used, so we are only displaying a small part of it, but it works similarly to the structural logic matrix, above.



Sewer Type	Default Insp type	Latest Insp Type	Trouble Call	Frequent Blockage	Reoccuring type defects	High Avg Previous Grade	COF Grade	Current Grade 0	1	2	3	4	5
Storm	Acoustic	CCTV	No	Yes	na	na	1-2	Acoustic 7 years	Acoustic 7 years	Clean now, Acoustic 7 years	Clean now, CTV 4 years	Clean now, CCTV 2 years	Clean now, CCTV 1 year
Storm	Acoustic	CCTV	No	Yes	na	na	3-4	Acoustic 7 years	Acoustic 7 years	Acoustic 6 years	Clean now, CTV 3 years	Clean now, CCTV 2 years	Permanent Solution or PM List
Storm	Acoustic	CCTV	No	Yes	na	na	5-6	Acoustic 6 years	Acoustic 6 years	Acoustic 4 years	Clean now, CTV 2 years	Permanent Solution or PM List	Permanent Solution or PM List
Storm	Acoustic	CCTV	No	Yes	na	na	7-8	Acoustic 4 years	Acoustic 4 years	Clean now, Acoustic 3 years	Permanent Solution or PM List	Permanent Solution or PM List	Permanent Solution or PM List
Storm	Acoustic	CCTV	No	Yes	na	na	9-10	Acoustic 4 years	Acoustic 3 years	Permanent Solution or PM List	Permanent Solution or PM List	Permanent Solution or PM List	Permanent Solution or PM List
Storm	Acoustic	CCTV	No	Yes	na	na	Unknown	Acoustic 6 years	Acoustic 6 years	Acoustic 4 years	Clean now, CTV 2 years	Permanent Solution or PM List	Permanent Solution or PM List
Storm	Acoustic	CCTV	Yes	No	na	na	1-2	Acoustic 4 years	Acoustic 4 years	Acoustic 4 years	Clean now, CTV 2 years	Clean now, CCTV 2 years	Clean now, CCTV 1 year
Storm	Acoustic	CCTV	Yes	No	na	na	3-4	Acoustic 4 years	Acoustic 4 years	Acoustic 3 years	Clean now, CTV 2 years	Clean now, CCTV 2 years	Clean now, CCTV 1 year
Storm	Acoustic	CCTV	Yes	No	na	na	5-6	Acoustic 4 years	Acoustic 3 years	Acoustic 3 years	Clean now, CTV 2 years	Clean now, CCTV 2 years	Clean now, CCTV 1 year
Storm	Acoustic	CCTV	Yes	No	na	na	7-8				Clean now, CCTV 2 years	Clean now, CCTV 1 year	Permanent Solution or PM List
Storm	Acoustic	CCTV	Yes	No	na	na	9-10	Acoustic 3 years	Acoustic 3 years	Clean now, Acoustic 3 years	Clean now, CCTV 1 year	Clean now, CCTV 1 year	Permanent Solution or PM List
Storm	Acoustic	CCTV	Yes	No	na	na	Unknown	Acoustic 3 years	Acoustic 3 years	Acoustic 3 years	Clean now, CCTV 1 year	Clean now, CCTV 1 year	Clean now, CCTV 1 year

The maintenance logic matrix considers the following variables, which can be customized. Other factors, like hydraulic capacity can also be included.

Variable	Description	Source of Information
Sewer Type	Whether the pipe is part of the sewer, storm, combined or other system.	Lucity pipe inventory
Default Insp Type	SD1 assigns pipes a default inspection type, either CCTV, Sonar, or Accoustic. The values are listed in Lucity's nt_bed_ty field.	Lucity pipe inventory
Last Inspection Type	Last inspection type (e.g. CCTV or Acoustic)	Inspection records
Frequent Blockage	Yes/No: If the pipe has frequent blockage. See below for more information.	Work order and service request history
Trouble Call	Yes/No: If the pipe has a recent trouble call	Work order and service request history
Reoccurring Type Defect	If the latest inspection had defects that are likely to re-occur.	Inspection records
High Average Previous Grades	Yes/No: If the pipe has had high maintenance scores during previous inspections	Inspection records
Consequence of Failure Grade (COF Grade)	The risk consequence of failure score, scaled to a 1-10 range.	Top – down analysis, stored in GIS
Latest Inspection Maint Grade	The pipe's latest inspection's maintenance grade	Inspection records
Sewer Type	Whether the pipe is part of the sewer, storm, combined or other system.	Lucity pipe inventory

1.2 SCREAM Costing and Basis of Cost Estimation

SCREAM Costing calculates replace/repair/rehab/maintenance methodologies for each pipe. The following types of corrective actions are assumed when making the calculations:

- **Replacement:** Replacement involves the replacement of the entire original pipe with a new pipe and may include upsizing or realignment of the asset. Two options for estimating replacement costs are available. In the example below, the costs were based on open trench technologies and include the cost of reestablishing laterals in the trench. A secondary methodology can be added. See "Adding options" for more details.

- **Repair**: Repairs are generally point repairs or corrections to sections of the pipe. Point repairs are considered associated with defects that extend from 1 to 15 feet of linear length of pipe. One or more repairs can be performed on a pipe. A repair would be, for example, replacing a section or two of cracked or sagged pipe. Two options for repair estimation are available. In the example below, the costs were based on open trench technologies and include the cost of reestablishing laterals in the trench. Note that the cost for sectional repairs (greater than 15'), the costs are decreased by a given percent entered into the Next Step and Costing Admin tool's "Trench and cost Assumptions" form.

- **Rehabilitation:** Rehabilitation re-establishes the performance of the original pipe. Rehab can include a combination of point repairs and pipe lining. Three rehabilitation options can be estimated. See "Adding options" for more details.

- **Maintenance:** Maintenance included both CCTV inspection costs and cleaning costs, calculated by linear foot of pipe and were assigned increasing frequencies over the life of the pipes.

SCREAM Costing calculates costs for up to seven different options. The least expensive option for Replace, Rehab and Repair are selected then each selected option are compared to each other. In the end, eight scenarios for each pipe (four immediate or present worth costs and four lifecycle costs) are calculated. When calculating lifecycle costs, the pipe's remaining life is used to determine when, within the asset's life cycle period, the pipe should be replaced. Remaining life is estimated from the pipes' condition score.

Replace Immediate Costs		
	Option 1	Option 2
	Trench	
Costing Factor	1.33	-
Num laterals total	0	-
Lateral reinstate unit cost ($ per lat)	1,000.00	-
Replace unit cost ($/ft)	441.46	-
Total cost	$185,185	-
Selected Option	Trench	
Selected Option Cost	$185,185	

Repair Immediate Costs		
	Option 1	Option 2
	Trench	
Costing Factor	1.33	-
Num laterals in trenches	0	-
Lateral reinstate unit cost ($ per lat)	1000.00	-
Repair unit cost ($/ft)	421.27	-
Feet of trench costed as sectional	18	-
Feet of trench costed as point	0	-
Num trenches	1	-
Total cost	$8,068	-
Selected Option	Trench	
Selected Option Cost	$8,068	

Rehab Immediate Costs			
	Option 1	Option 2	Option 3
	CIPP		
Costing Factor	1.33	-	-
Num laterals in trenches	0	-	-
Lateral reinstate unit cost ($ per lat)	200.00	-	-
Rehab unit cost ($/ft)	209.08	-	-
Feet of trench costed as point	0	-	-
Feet of trench costed as sectional	18	-	-
Num trenches	1	-	-
Total cost	$95,773	-	-
Selected Option	CIPP		
Selected Option Cost	$95,773		

Maintenance Immediate Costs	
Inspection frequency (yrs)	2
Cleaning frequency (mo)	120
Cost of Inspection	$1,107
Cost of Cleaning	$419

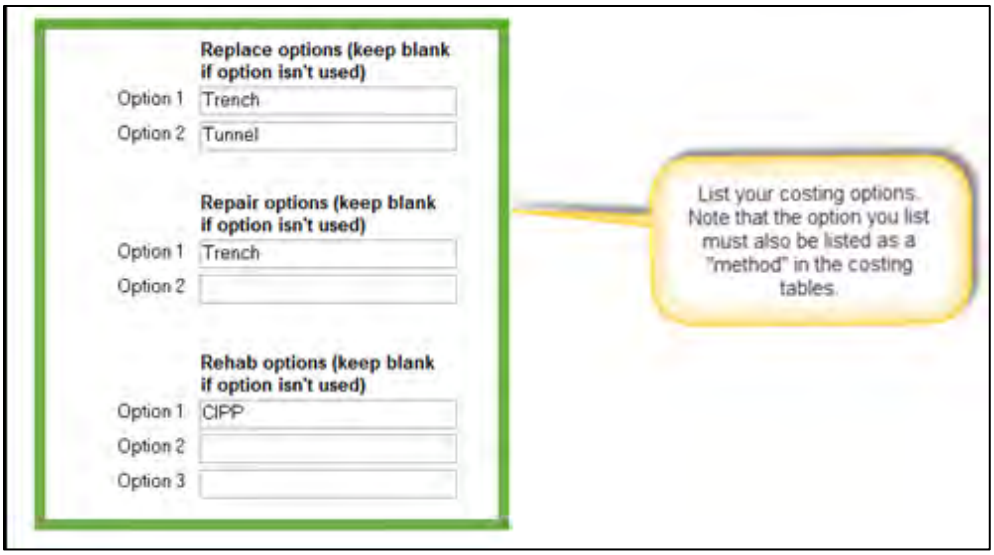
The following list summarizes and provides examples of the types of eight calculated costs. The lifecycle costs are more involved because they incorporate multiple costs over the assumed lifecycle period (typically over 100 years).

1. Immediate costs
    a. **Replace the pipe**: Cost of the least expensive option to replace the pipe in today's dollars.
    b. **Repair the pipe**: Cost of the least expensive option to repair any defects identified during the CCTV inspection needing trench repair.
    c. **Rehabilitate the pipe**: Cost of the least expensive option to line the pipe.
    d. **Maintain the pipe**: Cost to inspect or clean the pipe.
2. Lifecycle costs (over a 100-year lifecycle period)
    a. **Replace the pipe**: Cost to replace the pipe in year 1 (with the least expensive option), then maintain the pipe with increased frequency towards end of the pipe's estimated design service life
    b. **Repair the pipe**: Costs to repair the pipe in year 1 (with the least expensive option), maintain the pipe with increased frequency, then replace the pipe when the pipe's pre-established remaining life expires.
    c. **Rehabilitate the pipe**: Cost to rehabilitate the pipe in year 1 (with the least expensive option), maintain the pipe with increased frequency then replace the pipe when the remaining life expires.
    d. **Maintain the pipe**: Cost to maintain the pipe with increased frequency, then replace the pipe (with the least expensive option) when the remaining life expires.

Costing factors, such as if the pipe is on a major road or if the pipe would need dewatering, are applied to increase the estimated costs. Once the cost of each option is determined, the optimal current option and the optimal life-cycle option are selected.

1.2.1 Adding options

As noted above, utilities can create estimates for two replacement options, two repair options and three rehab options. To add or modify options, use the SCREAM Next Step and Costing Admin tool and to the "Trench and Cost Assumptions" form. Add the names of options in this form, shown below.

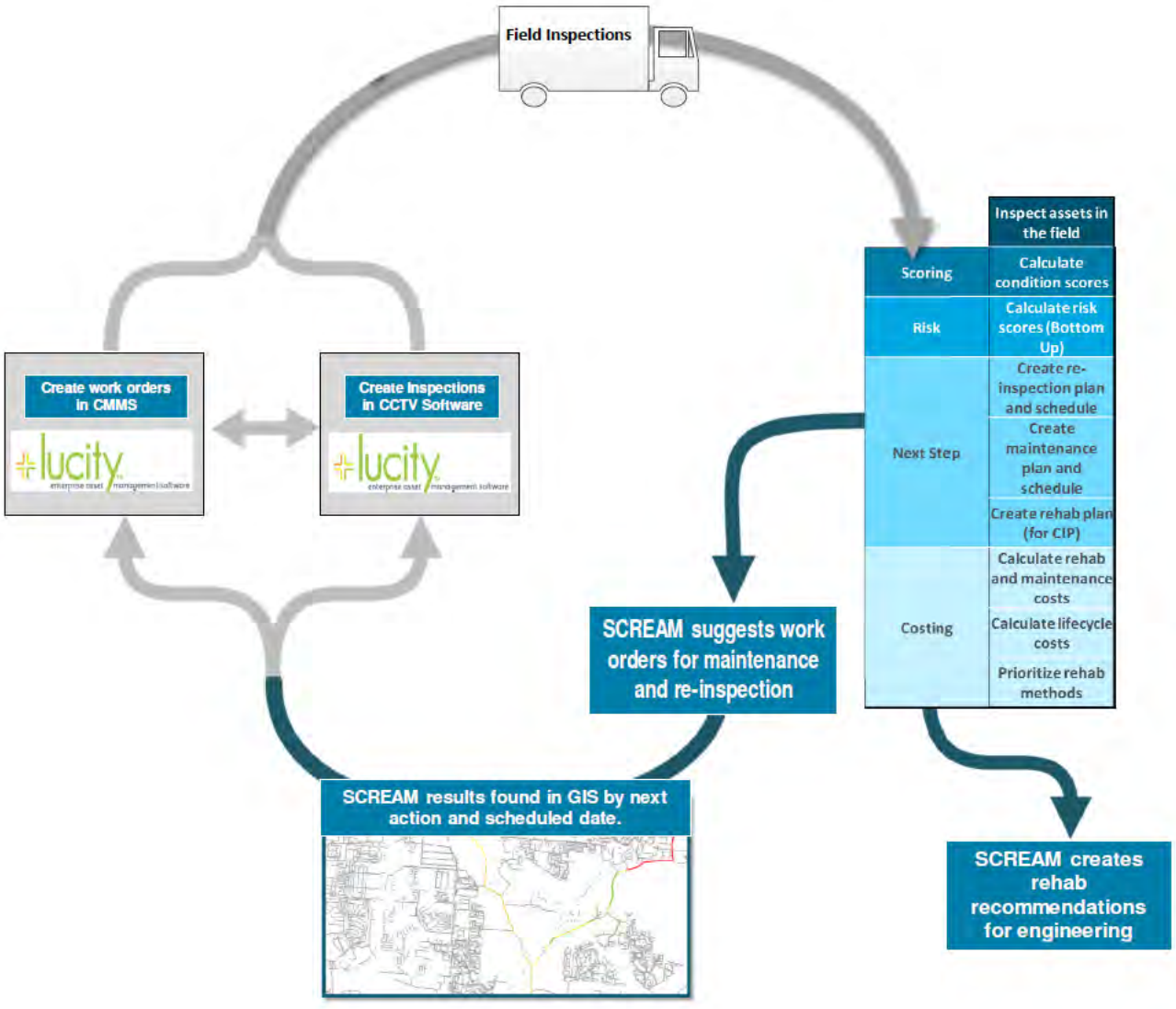


Once you add the options, you must add the corresponding costing information to the costing tables in the “Replacement Unit Costs”, “Repair Unit Costs”, and “Rehab Unit Costs” form. Note that each option must list the same diameters.

SCREAM Installation: Integration with Lucity

The Northern Kentucky SD1 (SD1) installed an SCREAM Scoring on their servers in 2008. Shortly afterward, SCREAM's CSAP (a beta version of SCREAM Next Step) and SCREAM Corrective action (a beta version of SCREAM Costing) were installed. In 2017, SD1 upgraded CSAP and Corrective action to the latest versions of SCREAM Next Step and Costing. The local install allows SCREAM to integrate with the City's GIS, CMMS (Lucity) and inspection software, and to help continually manage the complete work order – inspection cycle for pipes. This cycle includes the steps shown in the example flow diagram below.

The work order – inspection cycle begins in the field with field inspections using ITpipes, then runs through the SCREAM steps (scoring, prioritizing and scheduling), then it allows staff to either review pipes recommended for rehabilitation or to review SCREAM's recommended work orders in GIS or in SCREAM's work order tool. Finally, the cycle allows the City's CMMS, Lucity to manage work orders, assign crew, and return crews to the field. SCREAM can be incorporated into the CMMS and CCTV software in a variety of ways; it adjusts to each utilities' ideal work flow.



Note that SCREAM's data pull and calculations run through nightly jobs; allowing SCREAM to process the latest CCTV and CMMS data and present the results in GIS. This way, the SCREAM process requires little oversight.
Note that this manual does not cover updating SCREAM codes, scores or grades. These values are updated in the SCREAM Admin Tool. See the Admin Tool quick guide for more information.

At SD1, CCTV inspection information is collected by the CCTV crews using Lucity in the field. Because of this, Lucity is the source of record for CCTV inspection data. Any review, changes or deletions should happen in Lucity. If quality control changes happen in Lucity, administrators don't need to worry as the outdated inspections will be deleted and the updated inspections will appear in SCREAM nightly. The inspections are recreated in SCREAM using a SQL scheduled job to pull the latest copy of Lucity's data to SCREAM (deleting existing inspections in SCREAM and copying over a new dataset directly from ITpipes). **Appendix A** lists the data fields pulled from Lucity and how they are mapped to SCREAM fields.

Once SCREAM scores are calculated, the scores are pushed from SCREAM, recorded in Lucity, available in SQL Web reports, and made available to GIS via tblCombined_Pipes. SCREAM scores in a variety of places and to easily determine the status of the pipe. See "SCREAM Results" for more information

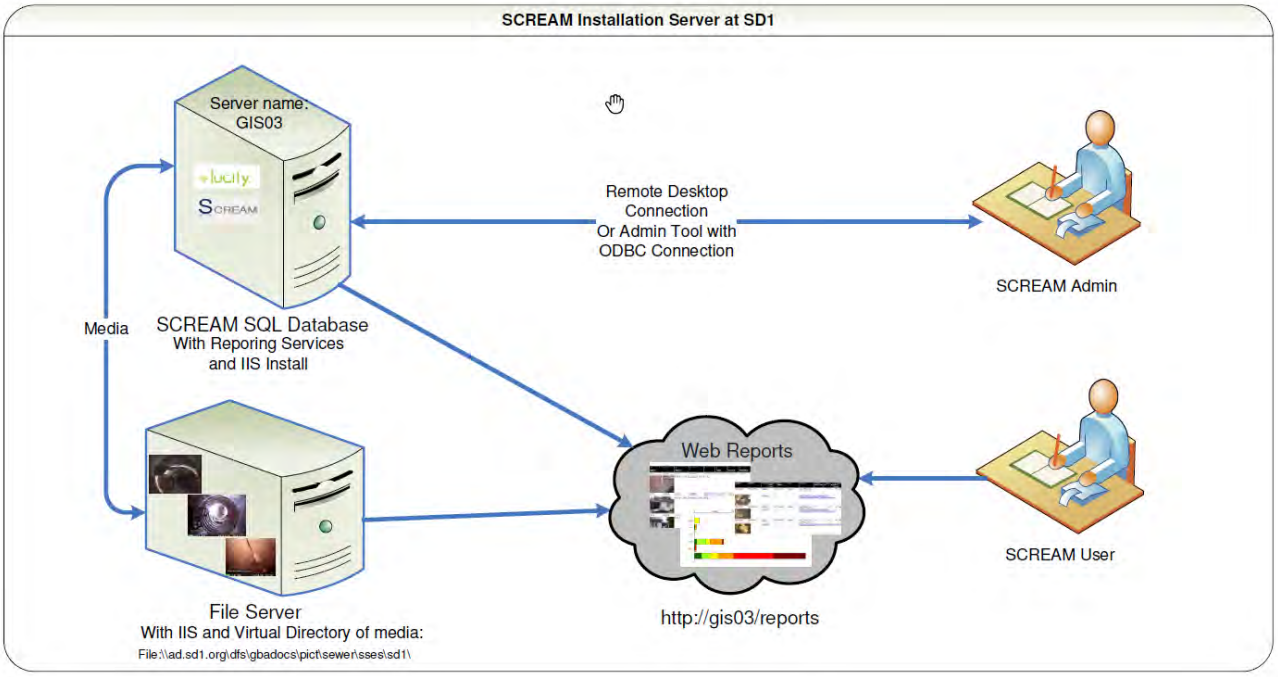
2.1 Platform

SCREAM's data and algorithms are housed in an open architecture database in SQL Server. The open architecture allows information to be passed to the database in a variety of ways. It also allows the SCREAM scores to be exported to a variety of sources.

The SQL database compiles the raw data, computes the SCREAM scores and then computes the Next Step and Costing recommendations.

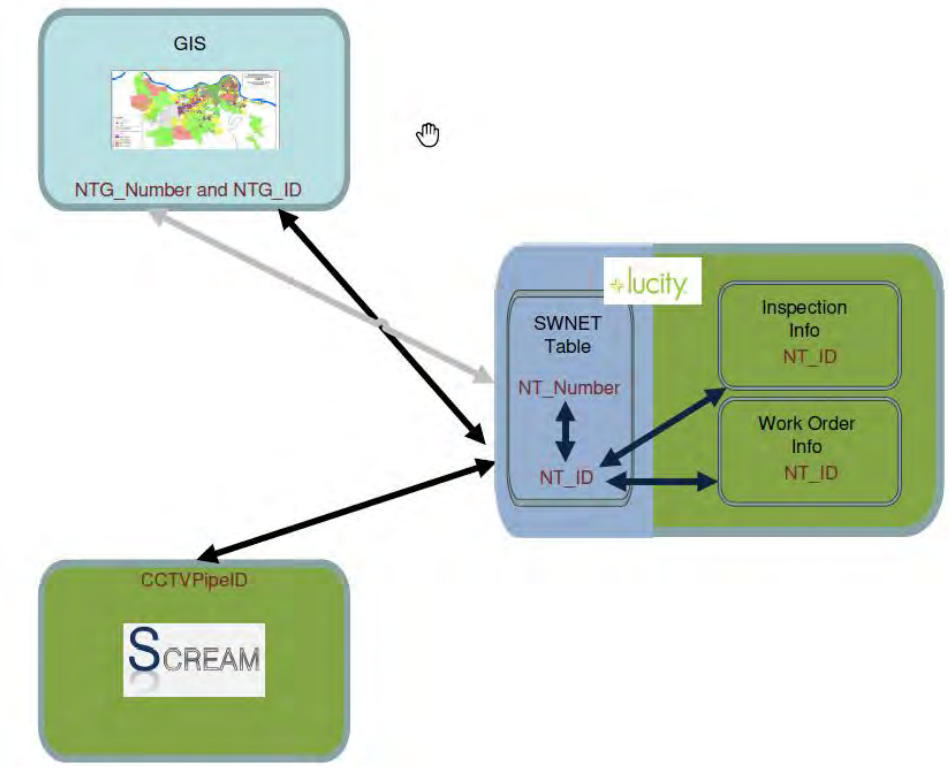
SQL Server Reporting Services, a web based reporting platform, is used as a reporting tool so users can access web based reports and download them in a variety of formats.

The following diagram displays the names of servers used in integrating SCREAM.



2.2 Linking Pipe IDs

When integrating data, it is critical to assure that a unique id for the pipes can be used to link pipe information across the software applications. At SD1, the PipeID originates from Lucity in the NT_ID field and is tracked in GIS and SCREAM using the NTG_ID and CCTVPipeID fields respectively. The figure below displays how the id are related. Note that Lucity and GIS also track the NT_Number field. This may be included in SCREAM as the PipeName field.



2.3 Linking Inspection IDs

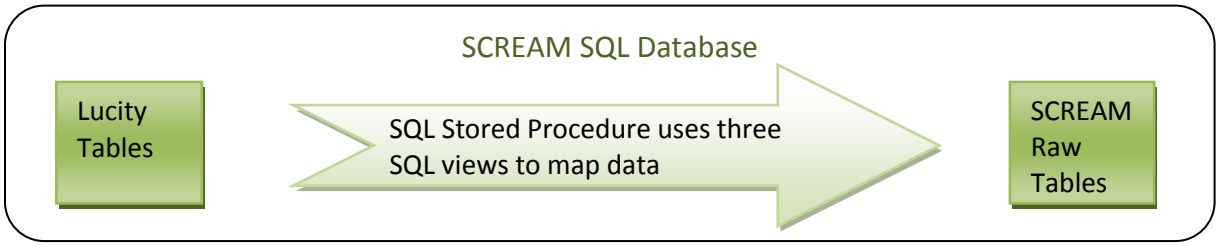
As with PipeIDs, it is important to be able to track CCTV inspections across the software applications using the inspection IDs. The Inspection IDs from Lucity, stored in SWTVLINE.TL_TVID are tracked in SCREAM's PACPInspectionID and FieldReviewID fields.

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2.4 Importing from Lucity

SCREAM's CCTV Scoring module, Next Step and Costing modules each need input from Lucity. The needed information is mapped to SCREAM fields through a variety of SQL views and stored procedures. Appendix A details all the information needed for each module, but the following steps give a general overview of how the information is transferred, using CCTV scoring as an example.

1. The SCREAM scoring algorithm, which resides in a SQL stored procedure, maps data to SCREAM using three SQL views.
2. The SQL views display the most current Lucity data in a specific format, filtering out unwanted records.



The following table lists the SQL views, SQL stored procedures used to score CCTV

Item	Name	Description
SQL view	vwInventory_Pipes	This view combines inventory information from Lucity's SWNET, SMVCONDT and SWSERV tables.
SQL view	vwGBA_SWTVLINE_All	This view combines inspection header information from Lucity's SWTVLINE, SMICONDT and SWSERVINS tables.
SQL view	vwGBA_SWTVOBSR_All	This view combines inspection observation information from Lucity's SWTVOBSR, smiconob and SWSERVOBS tables.
SQL stored procedure	spSCREAMCCTV_0Setup_2PullfromGBA	Contains code (in TSQL) that inserts data from Lucity and manipulated by the views into the SCREAM CCTV raw tables.
SQL job	SCREAM_Score	Runs the spSCREAMCCTV_0Setup_2PullfromGBA stored procedure (as the 3rd step in the job).

Some additional Lucity data is pulled into SCREAM for Next Step and Costing. For a complete list of all the mapped fields, **see Appendix A.**

Running SCREAM

The SCREAM modules run nightly, triggered by scheduled SQL jobs. The following table lists each job created on SD1's GIS03 server along with each job's steps and the stored procedure of script run during each step.

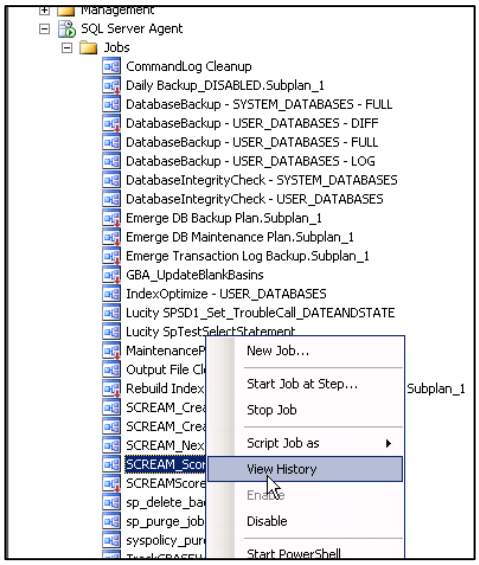
Job	Step	Description	Stored Procedure or Script
SCREAM_Score (run nightly)	1	Score smoke and push results to GBA.	spSCREAMSMOKE_1Score and spSCREAMSMOKE_2PushToGBA
	2	Run manhole scoring	spSCREAMMH_RunAllScores
	3	Pull CCTV data from Lucity	spSCREAMCCTV_0Setup_2PullfromGBA
	4	Score CCTV	spSCREAMCCTV_Score
	5	Push CCTV results to Lucity	spSCREAM_5CCTVPushToGBA
	6	Pull Acoustic	spSCREAMAcoustic_PullFromLucity
	7	Update Smoke addresses	--Delete the smoke addresses in tblSMOKEAddresses DELETE FROM [SCREAM].[dbo].[tblSMOKEAddresses] --Bring in a new set of addresses from Lisa''s Smoke view SD1vw_NKYParcels INSERT INTO [SCREAM].[dbo].[tblSMOKEAddresses] ([AddressID] ,[Adr_Bldg] ,[Adr_Street] ,[Adr_City]) SELECT TOP (100) PERCENT AddressID, MAX(Adr_Bldg) , MAX(Adr_Street) , MAX(Adr_City) FROM (SELECT TOP (100) PERCENT PIDN AS AddressID, Number AS Adr_Bldg, Street + N'' '' + Suffix AS Adr_Street, City AS Adr_City, COUNT(Class) AS count FROM dbo.SD1vw_NKYParcels GROUP BY Number, Street + N'' '' + Suffix, City, PIDN ORDER BY count DESC) AS addressesGrouped Where not(addressid is null) GROUP BY AddressID
	8	Create tblCombined_Pipes	spSCREAMCombined_Pipes_Populate
SCREAM_NextStepAndCosting	1	Assign next steps	spNextStep_Run
	2	Schedule next steps	spNextStep_Schedule
	3	Run costing	spCosting_Run
	4	Create tblCombined_Pipes	spSCREAMCombined_Pipes_Populate
	5	Clear Lucity custom fields where appropriate	N'Update Lucity.dbo.SWNET set NT_USER8 = 0, Lucity.dbo.SWNET.NT_USER10 = null, Lucity.dbo.SWNET.NT_USER11= null, Lucity.dbo.SWNET.NT_USER13= null, Lucity.dbo.SWNET.NT_USER18= null, Lucity.dbo.SWNET.NT_USER20= null, Lucity.dbo.SWNET.NT_USER21= null FROM (SELECT NT_ID, SewerType, NT_CREW, NT_BASIN, NT_USMAN, NT_DSMAN, NT_USID, NT_DSID, NT_DIST_CD, NT_DIST_TY, NT_S_T_R, NT_US_STA, NT_DS_STA, NT_PROJ_NO, NT_OWN_CD, NT_OWN_TY, NT_DIA, NT_WIDTH, NT_MAT_CD, NT_MAT_TY, NT_LINR_CD, NT_LINR_TY, NT_LENGTH, NT_LEN_CD, NT_LEN_TY, NT_US_RIM, NT_US_INV, NT_DS_RIM, NT_DS_INV, NT_SLOPE, NT_SLP_LCK, NT_DT_CONS, NT_MANNING, NT_CAPAC, NT_ST_URIM, NT_ST_DRIM, NT_ST_UINV, NT_ST_DINV, NT_LOCK, NT_CF_URIM, NT_CF_DRIM, NT_CF_UINV, NT_CF_DINV, NT_USRIMO, NT_USINVO, NT_DSRIMO, NT_DSINVO, NT_LOC_CD, NT_LOC_TY, NT_SHAP_CD, NT_SHAP_TY, NT_SURF_CD, NT_SURF_TY, NT_BED_CD, NT_BED_TY, NT_LINE_CD, NT_LINE_TY, NT_USER1CD, NT_USER1TY, NT_USER2CD, NT_USER2TY, NT_USER3CD, NT_USER3TY, NT_USER5, NT_USER6, NT_IMG_FLG, NT_MOV_FLG, NT_MOD_BY, NT_MOD_DT, NT_PSECLTH, NT_DOC_FLG, NT_WO_COMM, NT_USER9, NT_USER10, NT_USER11, NT_USER12, NT_USER13, NT_USER15, NT_STYPE_CD, NT_STYPE_TY, NT_INMAP, NT_FASSET, NT_BR_CD, NT_BR_TY, NT_USER16CD, NT_CLN_CD, NT_USER30, NT_USER25, NT_User24 FROM vwInventory_Pipes WHERE (SewerType = ''sewer'')) AS Filtered RIGHT OUTER JOIN Lucity.dbo.SWNET ON Filtered.NT_ID = Lucity.dbo.SWNET.NT_ID WHERE (Filtered.NT_ID IS NULL)
SCREAM_CreatePipeTrenches	1	Determine the trenches	spCosting_CreatePipeTrenches

		needed to repair pipes. This procedure takes time so it is only scheduled 3 nights a week.	
SCREAM_CreatePipeTrenches_Rehab	1	Determine the trenches needed to repair pipes. This procedure takes time so it is only scheduled 3 nights a week.	spCosting_CreatePipeTrenches_Rehab

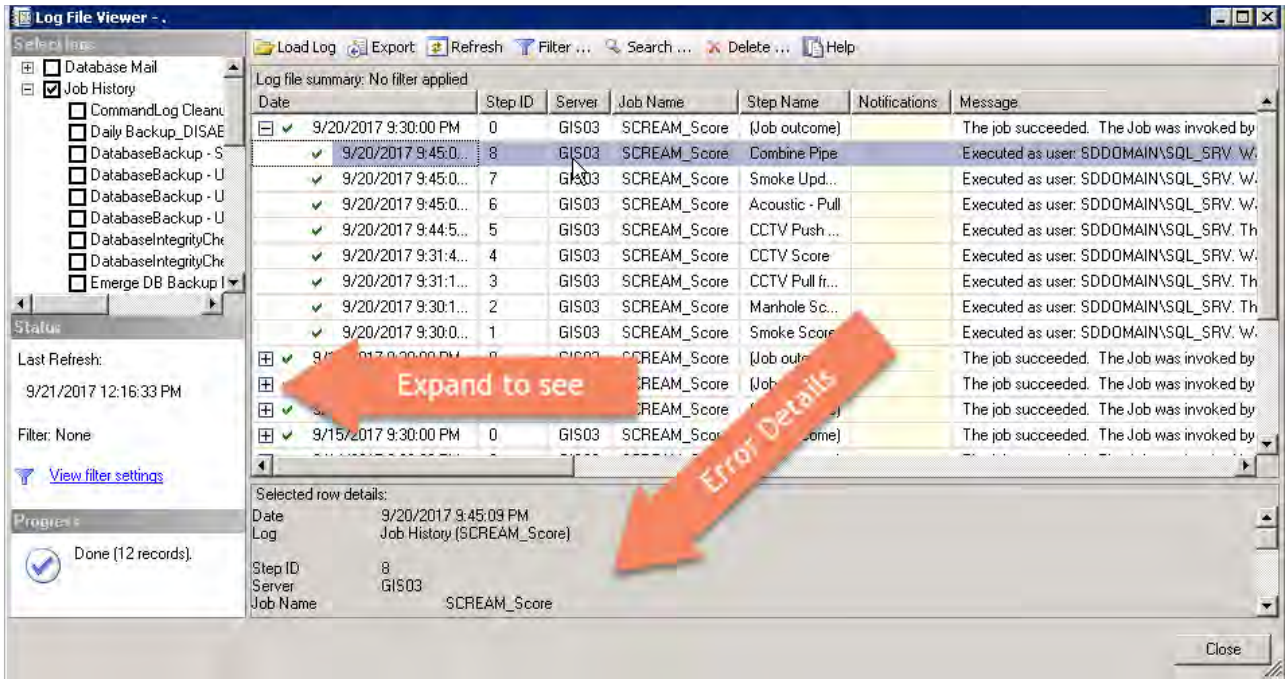
3.1 Troubleshooting SQL jobs and Stored Procedures

If any of the SCREAM jobs fail or if SCREAM does not seem to be running, you can follow a few troubleshooting steps, listed below.

To trouble shoot SQL jobs, look at the job history first to see if you can glean any information. Right click on the job and select “View History”.

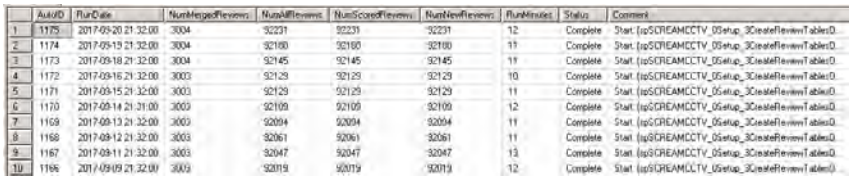
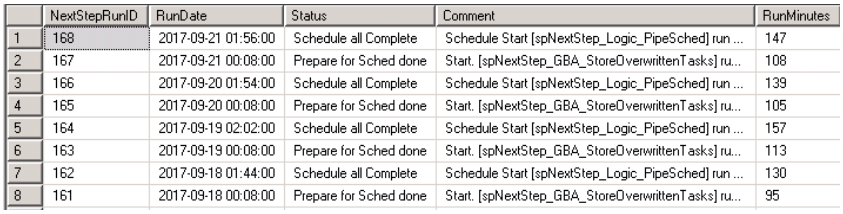
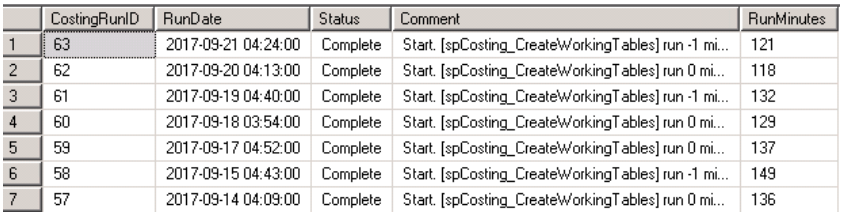
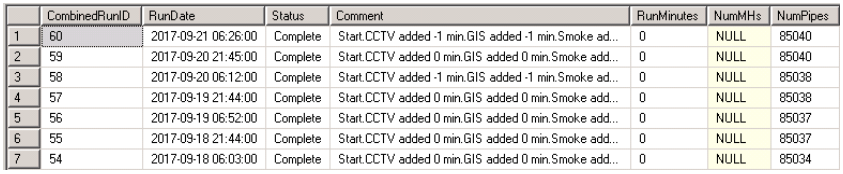


Be sure to expand any jobs to see which steps failed and to see any notifications.



Another tool to help troubleshoot is to look at the log files.
SCREAM includes several log tables that could help SD1 troubleshoot: the lstCCTVUpload_ITpipes_log table and the tblCCTVRunDates table, described below.

Note, that when DTS packages are created, the security setting can't have encryption.

Table	Purpose	Example
tblCCTVRunDates	Records every run of the CCTV scoring procedure, noting the time, number of reviews, number of merged reviews, number of scored reviews, the number of minutes required to run the stored procedure, and finally comments with details about how the procedure ran.	
tblNextStep_Log	Records every run of the Next Step procedure, noting the time, whether the recommendation or scoring portion of the procedure was run, the number of minutes required to run the stored procedure, and finally comments with details about how the procedure ran.	
tblCosting_Log	Records every run of the Costing procedure, noting the time, the number of minutes required to run the stored procedure, and finally comments with details about how the procedure ran.	
tblCombined_Log	Records every time the combined pipes table is recreated, noting the time, the number of pipes included and comments with details about how the procedure ran. Note that the combined table is only run for pipes at SD1.	

	NextStepRunID	RunDate	Status	Comment	RunMinutes
1	168	2017-09-21 01:56:00	Schedule all Complete	Schedule Start [spNextStep_Logic_PipeSched] run ...	147
2	167	2017-09-21 00:08:00	Prepare for Sched done	Start. [spNextStep_GBA_StoreOverwrittenTasks] ru...	108
3	166	2017-09-20 01:54:00	Schedule all Complete	Schedule Start [spNextStep_Logic_PipeSched] run ...	139
4	165	2017-09-20 00:08:00	Prepare for Sched done	Start. [spNextStep_GBA_StoreOverwrittenTasks] ru...	105
5	164	2017-09-19 02:02:00	Schedule all Complete	Schedule Start [spNextStep_Logic_PipeSched] run ...	157
6	163	2017-09-19 00:08:00	Prepare for Sched done	Start. [spNextStep_GBA_StoreOverwrittenTasks] ru...	113
7	162	2017-09-18 01:44:00	Schedule all Complete	Schedule Start [spNextStep_Logic_PipeSched] run ...	130
8	161	2017-09-18 00:08:00	Prepare for Sched done	Start. [spNextStep_GBA_StoreOverwrittenTasks] ru...	95

	CostingRunID	RunDate	Status	Comment	RunMinutes
1	63	2017-09-21 04:24:00	Complete	Start. [spCosting_CreateWorkingTables] run -1 mi...	121
2	62	2017-09-20 04:13:00	Complete	Start. [spCosting_CreateWorkingTables] run 0 mi...	118
3	61	2017-09-19 04:40:00	Complete	Start. [spCosting_CreateWorkingTables] run -1 mi...	132
4	60	2017-09-18 03:54:00	Complete	Start. [spCosting_CreateWorkingTables] run 0 mi...	129
5	59	2017-09-17 04:52:00	Complete	Start. [spCosting_CreateWorkingTables] run 0 mi...	137
6	58	2017-09-15 04:43:00	Complete	Start. [spCosting_CreateWorkingTables] run -1 mi...	149
7	57	2017-09-14 04:09:00	Complete	Start. [spCosting_CreateWorkingTables] run 0 mi...	136

	CombinedRunID	RunDate	Status	Comment	RunMinutes	NumMHs	NumPipes
1	60	2017-09-21 06:26:00	Complete	Start.CCTV added -1 min.GIS added -1 min.Smoke ad...	0	NULL	85040
2	59	2017-09-20 21:45:00	Complete	Start.CCTV added 0 min.GIS added 0 min.Smoke add...	0	NULL	85040
3	58	2017-09-20 06:12:00	Complete	Start.CCTV added -1 min.GIS added -1 min.Smoke ad...	0	NULL	85038
4	57	2017-09-19 21:44:00	Complete	Start.CCTV added 0 min.GIS added 0 min.Smoke add...	0	NULL	85038
5	56	2017-09-19 06:52:00	Complete	Start.CCTV added 0 min.GIS added 0 min.Smoke add...	0	NULL	85037
6	55	2017-09-18 21:44:00	Complete	Start.CCTV added 0 min.GIS added 0 min.Smoke add...	0	NULL	85037
7	54	2017-09-18 06:03:00	Complete	Start.CCTV added 0 min.GIS added 0 min.Smoke add...	0	NULL	85034

SCREAM Results

Once the special structure scores are calculated, SCREAM SQL reports can be run. The report link directly to the latest inspection data. Note that most reports run off of the non-raw tables of scored inspections. As a result, new inspections will not appear in the reports until the inspections are scored.

4.1 SCREAM Results in Lucity

Once the CCTV scores are calculated, some SCREAM CCTV Scoring information is returned to Lucity. The information is passed back to both the pipe inventory table (SWNET) and the related Lucity CCTV inspection table. Only scores from the latest inspection are passed to the pipe table. A sample of key data transferred to Lucity is listed in the table below.

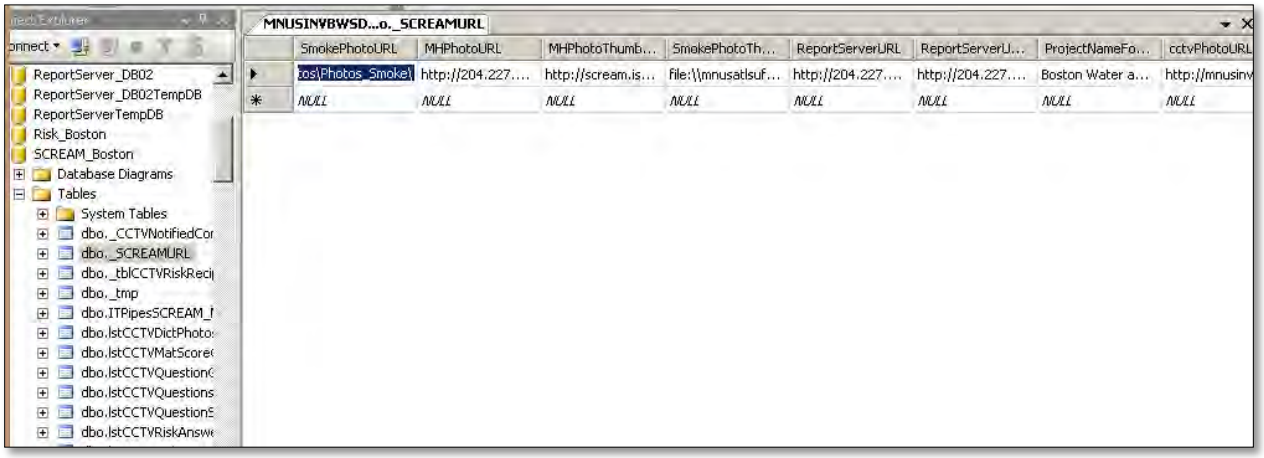
For a complete list of SCREAM information returned to Lucity, **see Appendix A** Returned data is flagged with an "x" in the first column "Results to Lucity."

SCREAM CCTV Scoring Output	Inspection or Pipe	Lucity Table/Field where information is stored
Latest Inspection Date	Pipe	SWNET.NT_USER10
SCREAM Total Condition Scores	Pipe	SWNET.NT_USER21
SCREAM Structural Scores	Pipe	SWNET.NT_USER13
SCREAM Maintenance Scores	Pipe	SWNET.NT_USER20
SCREAM Grade (score category)	Pipe	SWNET.NT_USER2CD and SWNET.NT_USER2TY

4.2 SCREAM Results in SQL Reports

SCREAM is designed to reference photos and videos from inside the application, but to have the actual photos located on a file share away from the database. For SQL reports to run effectively, the photos must be stored in a location where a url can point to it (in a virtual directory).

The SCREAM SQL database stored the path to the media separately from the media names. This way, the media can be moved and only impact one field, rather than all the photo fields.



The Media path locations are stored in the _SCREAMUrl table. A cell is available for photos and thumbnails, so thumbnails can be stored in a location separate from the full photos.

4.3 SCREAM Results in GIS

Pushing SCREAM results to GIS makes SCREAM information easily available to users who focus on GIS. Ideally, GIS would display the latest scores, the recommended next actions, and a link to the latest scream report. This information could pop up when a user “identifies an asset” on the map.

The best table to link to is SCREAM’s **tblCombined_Pipes** table in SQL. It has a row representing each pipe in the inventory and all the summarized SCREAM results. See “SCREAM Results to the Combined Table” for more information. Integration with tblCombined_Pipes can be performed by each utility in their preferred way.

Following is an example of how one utility integrates SCREAM with GIS:

A spatial view is updated between the tblCombined_Pipes table and the GIS inventory table each night. This spatial view is loaded 4 times into the arcserver site. Once for each score (structural, maintenance, total) and once to display score labels and survey begin/end points.

This spatial view behaves just like a regular geodatabase feature class and can be added to ArcMap for joins/relates, analysis and visualization. The oracle and sql versions of tblCombined_Pipes table can be added to Arc Map as well.

4.4 SCREAM Results in the Combined Table

To make integration with other software simple, SCREAM compiles results from a variety of inspections, from SCREAM Next Step and from SCREAM Costing into a single table. The following table lists the categories of information included. Note that the GIS matching fields are from Lucity, since GIS and Lucity work off the same inventory. This GIS match and GIS Attribute match fields are not necessary for SD1 since all their inspection information also comes from Lucity.

What	Description	Example fields
Pipe Inventory information	We have a generic defect dictionary with scores.	USMAN, USBasin, SewerType
GIS matching	If the pipe has a match in GIS and how it matches	InGIS, InGISNote
GIS Attribute matching	Attributes from the CCTV inspections are matched to the Attributes in GIS	Street, Street_GIS, Length, Length_GIS
CCTV inspection information	Information from the last CCTV inspection	LastCCTVDate, LastCCTVurl, SCREAMCCTVStructScore
Lamping inspection information	Information from the last manhole inspection where lamping was performed on the pipe (na for SD1)	LastLampDate, LastLampurl, LastLampUploadName
Smoke test inspection information	Information from the last smoke test on the pipe	LastSmokeDate, LastSmokeurl, SCREAMSmkDefectFlow_PipeAll
Acoustic inspection information	Information from the last acoustic test on the pipe	LastAcousticDate, SCREAMAcousticScore_Maint
Work order information	The latest work orders on the pipe of specific types	NOT CURRENTLY POPULATED
Combined scores	A combined score which represents all the various inspections on the pipe (taking inspection dates into account). The combined fields start with “c_”.	C_NumScores_StructII, C_CombinedMaint, C_Note
SCREAM Next Step results	SCREAM Next Step recommended actions	NextStep_Maint_NextTask, NextStep_NextTaskSchedDate
SCREAM Costing results	SCREAM Costing results	CostingSelectedLifecycleOption, CostingProcess, CostingSelectedImmedOptionCost

See **Appendix B** for a list of all the fields in tblCombined_Pipes with a description of each.

Customizing SCREAM – What can be updated?

What	Description	Is it Customizable	Has SD1 Customized it?
SCREAM CCTV Dictionary	SD1 has its own defect dictionary of CCTV defect codes	Yes, scores can be changed through the administrative tool. Defect codes can be changed and updated with CH help.	Yes
SCREAM scoring default values	Default values such as: • When to merge inspections • Default sewer type • How to map materials to scored materials • Default connection spacing • Default CCTV length • Default continuous maintenance defect lengths • Default lateral spacing • Default fitting spacing • Default continuous structural defect lengths • Default joint lengths	Yes – through the administrative tool	No
SCREAM scoring Algorithm	Compiles defects, scores them and calculates overall scores	No	No
Next Step Structural and Maintenance Logic	The Next step logic matrix	Yes, the next actions listed in the cells of the matrix can be updated to another existing value in the Next Step Admin tool.	Yes
Next Step Tasks and work order mapping	How the next tasks are scheduled and how the Lucity work orders are mapped to Next Step actions.	Yes, the number of weeks to schedule tasks out and the flexibility in weeks can be changed in the Next Step Admin tool.	No
Costing tables and cost factors	The unit costs for repair, replacement and rehab of pipes.	Yes, costs can be updated in the Next Step Admin tool.	Yes

Note that many of the changes can be made through the Administrative tools. See each tool's admin manual for more information.

Troubleshooting

Much of the Quality Control you will do as an administrator will be done through the CCTV Administrative tool (see “QC Queries” and “Deleting Uploads” below). But, occasionally administrators will need to trouble shoot problems with SQL jobs or stored procedures. See the section “Troubleshooting SQL Jobs and stored Procedures, above for more information”. This section is a working section. As problems arise and solutions are found, they will be recorded here

Appendix A
Lucity to SCREAM field mapping

Result To Lucity	Category	Sub Category	Description	SCREAM field	Lucity Sewer field	Lucity Storm field	Lamping field	Method of Transfer
	All	Pipe Attributes	Basin	USBASIN	NT_BASIN	CN_Basin	SV_Basin	spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe Attributes	Diameter	Diameter	NT_DIA	CN_DIA	SV_DIA	spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe Attributes	Downstream manhole ID	DSID	NT_DSID	CN_DSID	SV_CONNID	spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe Attributes	Downstream manhole name	DSMAN	NT_DSMAN	CN_DS_STR		spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe Attributes	Length	Length	NT_LENGTH	CN_LENGTH	SV_Length	spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe Attributes	Liner	PACPLining_Method	NT_LINR_TY	CN_LINR_TY		spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe Attributes	Material	Material	NT_MAT_TY	CN_MATR_TY	SV_MAT_TY	spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe Attributes	Upstream manhole ID	USID	NT_USID	CN_USID	SV_ADDID	spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe Attributes	Upstream manhole name	USMAN	NT_USMAN	CN_US_STR		spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe Attributes	Width	Width	NT_WIDTH	CN_WIDTH		spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe Attributes	Sewer system	SewerType	'Sewer'	Storm'	Lateral'	spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe Attributes	PipeID	CCTVPipeID or PipeID	SWNET.NT_ID	SMVCONDT.CN_ID	SV_SERVID	spSCREAMCCTV_0Setup_2PullfromGBA
	All	Pipe filter	Type of line (gravity, abandoned, etc)		SWNET.NT_LINE_CD	CN_LINE_CD		spNextStep_GBA_Inventory_Fill and more
	All	Pipe Attributes and filter	Owner		SW_NET.NT_OWN_CD	cn_own_cd		spNextStep_GBA_Inventory_Fill and spSCREAMCCTV_0Setup_2CreateInventoryAndRawTables and more
x	Scoring	CCTV	Last Insp Date on Pipe		SWNET.NT_USER10	SMVCONDT.CN_USER31	SWSERV.SV_User9	spSCREAM_5CCTVPushToGBA
x	Scoring	CCTV	Last Structural Score for pipe		SWNET.NT_USER13	SMVCONDT.CN_USER26	SWSERV.SV_User13	spSCREAM_5CCTVPushToGBA
x	Scoring	CCTV	Last Maintenance Score for pipe		SWNET.NT_USER20	SMVCONDT.CN_USER27	SWSERV.SV_User12	spSCREAM_5CCTVPushToGBA
x	Scoring	CCTV	Last Total Score for pipe		SWNET.NT_USER21	SMVCONDT.CN_USER28	SWSERV.SV_User4	spSCREAM_5CCTVPushToGBA

Result To Lucity	Category	Sub Category	Description	SCREAM field	Lucity Sewer field	Lucity Storm field	Lamping field	Method of Transfer
x	Scoring	CCTV	Last Total Grade for pipe		SWNET.NT_USER2CD and TY	SMVCONDT.CN_USER16CD and TY		spSCREAM_5CCTVPushToGBA
x	Scoring	CCTV	Maintenance Score (on inspection)		SWTVLINE.TL_USER12	SMICONDT.CI_USER8	SWSERVINS.SS_USER8	spSCREAM_5CCTVPushToGBA
x	Scoring	CCTV	Structural Score (on inspection)		SWTVLINE.TL_USER13	SMICONDT.CI_USER7	SWSERVINS.SS_USER9	spSCREAM_5CCTVPushToGBA
x	Scoring	CCTV	Total Grade (on inspection)		SWTVLINE.TL_USER1CD and TY			spSCREAM_5CCTVPushToGBA
x	Scoring	CCTV	Total Score (on inspection)		SWTVLINE.TL_USER4	SMICONDT.CI_USER9	SWSERVINS.SS_USER7	spSCREAM_5CCTVPushToGBA
	Scoring	Inspection header	Crew	ReviewerID	NT_CREW	CN_CREW		spSCREAMCCTV_0Setup_2PullfromGBA
	Scoring	Inspection header	Inspection date	RevDate	TL_DT_INSP	CI_DT_INSP	SS_DT_INSP	vwGBA_SWTVLINE_All and spSCREAMCCTV_0Setup_2PullfromGBA
	Scoring	Inspection header	Inspection comments	RevComments	TL_Purp_TY+TL_TAPE_ID + TL_Start	CI_Purp_TY+CI_TAPEID + CI_CONTST		vwGBA_SWTVLINE_All and spSCREAMCCTV_0Setup_2PullfromGBA
	Scoring	Inspection header	Name of data upload	SourceCreated	TL_TVID	CI_ID	SS_ID	vwGBA_SWTVLINE_All and spSCREAMCCTV_0Setup_2PullfromGBA
	Scoring	Inspection header	Field inspection id	PACPInspectionID	TL_TVID	CI_ID	SS_ID	vwGBA_SWTVLINE_All and spSCREAMCCTV_0Setup_2PullfromGBA
	Scoring	Inspection header	Inspection direction	Direction	TL_TVDR_CD	CI_TVDR_CD	SS_INDR_CD	vwGBA_SWTVLINE_All and spSCREAMCCTV_0Setup_2PullfromGBA
	Scoring	Inspection header	Field inspection id	FieldReviewID	TL_TVID	CI_ID	SS_ID	vwGBA_SWTVLINE_All and spSCREAMCCTV_0Setup_2PullfromGBA
	Scoring	Inspection header	Purpose (for reporting: if 12, then sonar, otherwise, CCTV, if "CSAP Post Cleaning" then clean too close)	PACPPurpose	TL_PURP_CD	CI_PURP_CD	SS_INSP_CD	vwGBA_SWTVLINE_All and spSCREAMCCTV_0Setup_2PullfromGBA
	Scoring	Inspection header	If the pipe was pre-cleaned	PACPPre-Cleaning	TL_PRKNIFE or TL_PRDBCTR			vwGBA_SWTVLINE_All and spSCREAMCCTV_0Setup_2PullfromGBA
x	Next Step	Next step results	NextStep next Action Type (Maintenance or Structural)		SWNET.NT_USER18	cn_user21		spNextStep_GBA_PushResults, spNextStep_GBA_StoreOverwrittenTasks and spNextStep_GBA_MarkResults

Result To Lucity	Category	Sub Category	Description	SCREAM field	Lucity Sewer field	Lucity Storm field	Lamping field	Method of Transfer
								_OverwrittenTasks
x	Next Step	Next step results	NextStep next task sched date		SWNET.NT_USER22	cn_user32		spNextStep_GBA_PushResults, spNextStep_GBA_StoreOverwrittenTasks and spNextStep_GBA_MarkResults_OverwrittenTasks
x	Next Step	Next step results	NextStep next task		SWNET.NT_USER26	cn_user22		spNextStep_GBA_PushResults, spNextStep_GBA_StoreOverwrittenTasks and spNextStep_GBA_MarkResults_OverwrittenTasks
x	Next Step	Overwrite	Action override (true false)		SWNET.NT_USER24	cn_user36		spNextStep_GBA_StoreOverwrittenTasks and spNextStep_GBA_MarkResults_OverwrittenTasks
	Next Step	Preventive Maintenance	PipeID		WKRTSYSID.RS_INFR_ID			vwNextStep_PreventiveMaint
	Next Step	Preventive Maintenance	Action listed in the PM	Task_CD	TO_ACTN_CD			vwNextStep_PreventiveMaint, vwNextStep_Logic_Tasks, and spNextStep_GBA_GetPMCycle_Clean
	Next Step	Preventive Maintenance	PMCycle which goes to PMCycle_Clean and PMCycle_inspect		TO_FRUN			vwNextStep_PreventiveMaint
	Next Step	Preventive Maintenance	PMNumber_inspect		WKROUTINE.TO_ID			vwNextStep_PreventiveMaint
	Next Step	Work orders	Did the WO originate from a trouble call	TroubleCall	WKORDER.WO_PriorCD and TY			vwNextStep_Wos …
	Next Step	Variable	DefaultInspType		nt_bed_ty	CN_BED_Ty		spNextStep_Get_DefaultInspType
	Next Step	Work orders	Activity performed in work order	lstNextStep_WOActionsMap.WOTaskAction	WKUTASK.TK_USER4			vwNextStep_Wos …
	Next Step and Costing	Scheduling and Costing Factor	On or off road	OnOffRoad	SWNET.NT_LOC_CD = 14 or 15			vwInventory_NextStep_Pipes
	Costing	Costing Factor	Is the pipe within 50 ft of a stream?		SWNET.NT_CLN_CD = 424			vwInventory_Pipes and spCosting_Get_50ftOfStream

Result To Lucity	Category	Sub Category	Description	SCREAM field	Lucity Sewer field	Lucity Storm field	Lamping field	Method of Transfer
	Costing	Costing Factor	Major Street (requires traffic control)		SWNET.NT_USER25			vwInventory_Pipes and spCosting_Get_MajorStreet
	Costing	Costing Factor	Sub Watersheds – if applicable		SWNET.NT_USER27	cn_user23		vwInventory_NextStep_Pipes
	Costing	Costing Factor	Utility Congestion		SWNET.NT_USER24 (at one point listed as 30)			vwInventory_Pipes and spCosting_Get_UtilityCongestion

Appendix B
Fields in SCREAM's Combined Pipes table

tblCombinedPipe field name	Data type	Category	Notes	Use
PipeID	nvarchar(100)	Inventory info	Main, unique pipe id	Required
PipeName	nvarchar(255)	Inventory info	used if additional pipe id desired	not required
FacilityID	nvarchar(150)	Inventory info	used if additional facility id desired	not required
USMAN	nvarchar(100)	Inventory info	upstream manhole id	Required
DSMAN	nvarchar(100)	Inventory info	downstream manhole id	Required
USBASIN	nvarchar(100)	Inventory info	basin of upstream manhole	Required
DSBASIN	nvarchar(100)	Inventory info	basin of downstream manhole	not required
SewerType	nvarchar(100)	Inventory info	sewer system (storm, sanitary, etc.) used with pipe ID to make pipe unique	Required
SewerType_Standardized	nvarchar(75)	Inventory info	standardized sewer system (storm, sewer, combined)	Required
USID	int	Inventory info	alternate upstream manhole id	not required
DSID	int	Inventory info	alternate upstream manhole id	not required
InGIS	int	Linkage	If the pipe is found in the GIS inventory	calculated
InGISNote	varchar(100)	Linkage	How the pipe matches the GIS inventory	calculated
InGISPipeID_DupPriority	int	Linkage	If this is one of duplicate pipeids, use this id if it is marked 1, >1 than it is a duplicate	calculated
InCMMS	int	Linkage	If the pipe is found in the CMMS inventory	calculated
InCMMSNote	varchar(100)	Linkage	How the pipe matches the CMMS inventory	calculated

tblCombinedPipe field name	Data type	Category	Notes	Use
InSource	varchar(200)	Linkage	How the pipe entered the SCREAM inventory (CCTV, Acoustic, GIS, etc)	calculated
PipeReporturl	nvarchar(max)	Linkage	Link to the pipe's SCREAM report	calculated
Street	nvarchar(100)	Inventory info	Street from source	not required
Street_GIS	nvarchar(100)	Inventory info	Street from GIS	not required
Diameter	varchar(50)	Inventory info	Diameter from source	Required
Diameter_GIS	varchar(50)	Inventory info	Diameter from GIS	not required
Width	smallint	Inventory info	Width from source	not required
Width_GIS	smallint	Inventory info	Width from GIS	not required
Material	nvarchar(100)	Inventory info	Material from source	Required
Material_GIS	nvarchar(100)	Inventory info	Material from GIS	not required
Length	int	Inventory info	Length from source	Required
Length_GIS	int	Inventory info	Length fron GIS	not required
COFGrade	varchar(20)	Risk	Risk consequence of failure Grade from source	not required
RemainingLife	int	Remaining life	Pipe's remaining life	calculated
LastInspectionType	varchar(15)	Inspection info	Most recent inspection type performed on pipe	from insp info
LastCCTVID	int	Inspection info	CCTV inspection id (link to tblCCTVReviews.ReviewID)	from insp info

tblCombinedPipe field name	Data type	Category	Notes	Use
LastCCTVDate	smalldatetime	Inspection info	CCTV inspection date	from insp info
LastCCTVLength	decimal(10, 2)	Inspection info	Length of pipe inspected with CCTV (combined if reverse inspection included)	calculated
LastCCTVUploadName	nvarchar(50)	Inspection info	Name given to the data upload wich included the last inspection on this pipe	from insp info
LastCCTVurl	nvarchar(max)	Inspection info	Link to the latest CCTV inspection SCREAM report	calculated
LastCCTVVideoName	nvarchar(max)	Inspection info	name of the last CCTV video	calculated
SCREAMCCTVStructScore	int	Condition scores	CCTV Score	calculated
SCREAMCCTVMaintScore	int	Condition scores	CCTV Score	calculated
SCREAMCCTVIIScore	int	Condition scores	CCTV Score	calculated
SCREAMCCTVTotalScore	int	Condition scores	CCTV Score	calculated
SCREAMCCTVScoreCategory	int	Condition scores	CCTV Score	calculated
SCREAMCCTVScoreCategory_Maint	int	Condition scores	CCTV Score	calculated
SCREAMCCTVScoreCategory_Struct	int	Condition scores	CCTV Score	calculated
HasAcoustic	varchar(2)	Inspection info	If an acoustic inspection was performed	calculated
HasSmoke	varchar(2)	Inspection info	If a smoke inspection was performed	calculated
LastLampReviewID	int	Inspection info	Last lamp review ID	from insp info
LastLampRevDate	smalldatetime	Inspection info	Last lamp inspection date	from insp info

tblCombinedPipe field name	Data type	Category	Notes	Use
LastLampDataSource	nvarchar(50)	Inspection info	Name given to the data upload wich included the last inspection on this pipe	from insp info
LastLampurl	nvarchar(255)	Inspection info	Link to the latest Lamp inspection SCREAM report	calculated
SCREAMLampStructScore	int	Condition scores	Lamping score	calculated
SCREAMLampMaintScore	int	Condition scores	Lamping score	calculated
SCREAMLampIIScore	int	Condition scores	Lamping score	calculated
SCREAMLampTotalScore	int	Condition scores	Lamping score	calculated
LastSmokeDate	smalldatetime	Inspection info	Last smoke inspection date	from insp info
LastSmokeID	int	Inspection info	Last smoke inspection review ID	from insp info
LastSmokeUploadName	nvarchar(50)	Inspection info	Name given to the data upload wich included the last inspection on this pipe	from insp info
LastSmokeurl	nvarchar(255)	Inspection info	Link to the latest smoke inspection SCREAM report	calculated
SCREAMSmkDefectFlow_PipeAll	real	Condition scores	Estimated potential infiltration/inflow from smoke defects	calculated
SCREAMSmkDefectFlow_Lats	real	Condition scores	Estimated potential infiltration/inflow from smoke defects	calculated
SCREAMSmkDefectFlow_PipeUSMH	real	Condition scores	Estimated potential infiltration/inflow from smoke defects	calculated
SCREAMSmkDefectFlow_PipeMainL	real	Condition scores	Smoke score	calculated
SCREAMSmkFlowVol_PipeAll	real	Condition scores	Estimated potential infiltration/inflow from smoke defects	calculated
SCREAMSmkFlowVol_Lats	real	Condition scores	Estimated potential infiltration/inflow from smoke defects	calculated

tblCombinedPipe field name	Data type	Category	Notes	Use
SCREAMSmkFlowVol_PipeUSMH	real	Condition scores	Estimated potential infiltration/inflow from smoke defects	calculated
SCREAMSmkFlowVol_PipeMainL	real	Condition scores	Smoke score	calculated
SCREAMSmkScore_PipeOverall	int	Condition scores	Smoke score	calculated
SCREAMSmkScore_PipeAllPublic	int	Condition scores	Smoke score	calculated
SCREAMSmkScore_PubStrucPipeLat	int	Condition scores	Smoke score	calculated
SCREAMSmkScore_PipeLaterals	int	Condition scores	Smoke score	calculated
SCREAMSmkScore_PipeUSMH	int	Condition scores	Smoke score	calculated
SCREAMSmkScore_PipeMainline	int	Condition scores	Smoke score	calculated
SCREAMSmkScore_MaxPubLatScore	int	Condition scores	Smoke score	calculated
SCREAMSmkScore_PubStructEst	int	Condition scores	Smoke score	calculated
SCREAMSmkScore_USMHStructEst	int	Condition scores	Smoke score	calculated
LastAcousticDate	smalldatetime	Inspection info	Last acoustic inspection date	from insp info
LastAcousticID	int	Inspection info	Last acoustic inspection review ID	from insp info
LastAcousticUploadName	nvarchar(50)	Inspection info	Name given to the data upload wich included the last inspection on this pipe	from insp info
SCREAMAcousticScore_Maint	int	Condition scores	Acoustic score	calculated
LastWOID_RehabRepair	int	Work order info	NOT CURRENTLY POPULATED - PLACEHOLDER	from CMMS

tblCombinedPipe field name	Data type	Category	Notes	Use
LastWOID_Clean	int	Work order info	NOT CURRENTLY POPULATED - PLACEHOLDER	from CMMS
LastWOID_Replace	int	Work order info	NOT CURRENTLY POPULATED - PLACEHOLDER	from CMMS
LastWOCompleteDate_RehabRepair	smalldatetime	Work order info	NOT CURRENTLY POPULATED - PLACEHOLDER	from CMMS
LastWOCompleteDate_Clean	smalldatetime	Work order info	NOT CURRENTLY POPULATED - PLACEHOLDER	from CMMS
LastWOCompleteDate_Replace	smalldatetime	Work order info	NOT CURRENTLY POPULATED - PLACEHOLDER	from CMMS
c_NumScores_StructII	int	Condition scores	Combined score, calculated using MIMam formula, combining multiple insp	calculated
c_NumScores_Maint	int	Condition scores	Combined score, calculated using MIMam formula, combining multiple insp	calculated
c_NumScores_Total	int	Condition scores	Combined score, calculated using MIMam formula, combining multiple insp	calculated
c_CombinedTotal	int	Condition scores	Combined score, calculated using MIMam formula, combining multiple insp	calculated
c_CombinedMaint	int	Condition scores	Combined score, calculated using MIMam formula, combining multiple insp	calculated
c_CombinedStruct	int	Condition scores	Combined score, calculated using MIMam formula, combining multiple insp	calculated
c_CombinedII	int	Condition scores	Combined score, calculated using MIMam formula, combining multiple insp	calculated
c_Note	nvarchar(200)	Condition scores	Combined score, calculated using MIMam formula, combining multiple insp	calculated
NextStep_Struct_NextAction	varchar(100)	SCREAM Next Step	SCREAM Next Step suggested next STRUCTURAL action	calculated
NextStep_Struct_NextTaskDate	datetime	SCREAM Next Step	SCREAM Next Step suggested next action date	calculated
NextStep_Struct_NextTask	varchar(100)	SCREAM Next Step	SCREAM Next Step next task (sub task of next action)	calculated

tblCombinedPipe field name	Data type	Category	Notes	Use
NextStep_Struct_NextTaskID	int	SCREAM Next Step	SCREAM Next Step next task id (used for creating work orders)	calculated
NextStep_Maint_NextAction	varchar(100)	SCREAM Next Step	SCREAM Next Step suggested next MAINTENANCE action	calculated
NextStep_Maint_NextTaskDate	datetime	SCREAM Next Step	SCREAM Next Step suggested next action date	calculated
NextStep_Maint_NextTask	varchar(100)	SCREAM Next Step	SCREAM Next Step next task (sub task of next action)	calculated
NextStep_Maint_NextTaskID	int	SCREAM Next Step	SCREAM Next Step next task id (used for creating work orders)	calculated
NextStep_NextTask	varchar(100)	SCREAM Next Step	SCREAM Next Step suggested next assigned task (either interim or other or struct or maint)	calculated
NextStep_NextTaskSchedDate	datetime	SCREAM Next Step	SCREAM Next Step suggested next assigned (either interim or other or struct or maint)	calculated
NextStep_NextTaskID	int	SCREAM Next Step	SCREAM Next Step task id	calculated
CostingProcess	varchar(40)	SCREAM Costing	SCREAM Costing category	calculated
PipeCostingID	int	SCREAM Costing	SCREAM Costing ID	calculated
CostingSelectedImmedOption	varchar(40)	SCREAM Costing	SCREAM Costing's suggested corrective action if performed now	calculated
CostingSelectedLifeOption	varchar(40)	SCREAM Costing	SCREAM Costing's suggested corrective action looking at the pipe's lifecycle	calculated
CostingSelectedImmedOptionCost	numeric(18, 2)	SCREAM Costing	SCREAM Costing's estimated cost associated with the immediate option	calculated
CostingSelectedLifeOptionCost	numeric(18, 2)	SCREAM Costing	SCREAM Costing's estimated cost associated with the lifecycle option	calculated
CostingSelectedImmedOptionNote	varchar(50)	SCREAM Costing	SCREAM Costing's note about why the option was selected	calculated
CostingSelectedLifeOptionNote	varchar(50)	SCREAM Costing	SCREAM Costing's note about why the option was selected	calculated

tblCombinedPipe field name	Data type	Category	Notes	Use
Repair_NumLateralsInTrench	int	SCREAM Costing	SCREAM Costing's estimated number of laterals in the trench, if repairs performed	calculated
Repair_FeetTrenched_Point	real	SCREAM Costing	SCREAM Costing's estimated number of ft needed trenching (as point), if repairs performed	calculated
Repair_FeetTrenched_Sect	real	SCREAM Costing	SCREAM Costing's estimated number of ft needed trenching (as sectional repair), if repairs performed	calculated
Repair_NumTrenches	int	SCREAM Costing	SCREAM Costing's estimated number of trenches needed, if repairs performed	calculated

SCREAM Next Step, Costing, and Work Order Creation Tool Manual

Prepared for

Northern Kentucky SD1, OH

September 2017

CH2M

1.0 The Main Menu 1

2.0 Work Order Creation 1

2.0 Next Step Administration 1

2.1 QC Reports 1
2.2 Maintenance Logic 1
2.3 Structural Logic 2
2.4 Tasks and Factors – Update the Scheduling defaults and Map to Lucity 1
2.4 Work Order Mapping – Mapping CMMS Work orders to Next Step WO Types 1

3.0 Costing Administration 1

3.1 Trench and Cost Assumptions 1
3.2 Maintenance Unit Costs 3
3.3 Rehab Unit Costs 4
3.4 Replacement Unit Costs 4
3.5 Repair Unit Costs 4
3.7 Costing Factors 6
3.8 Next Step to Costing Mapping 7

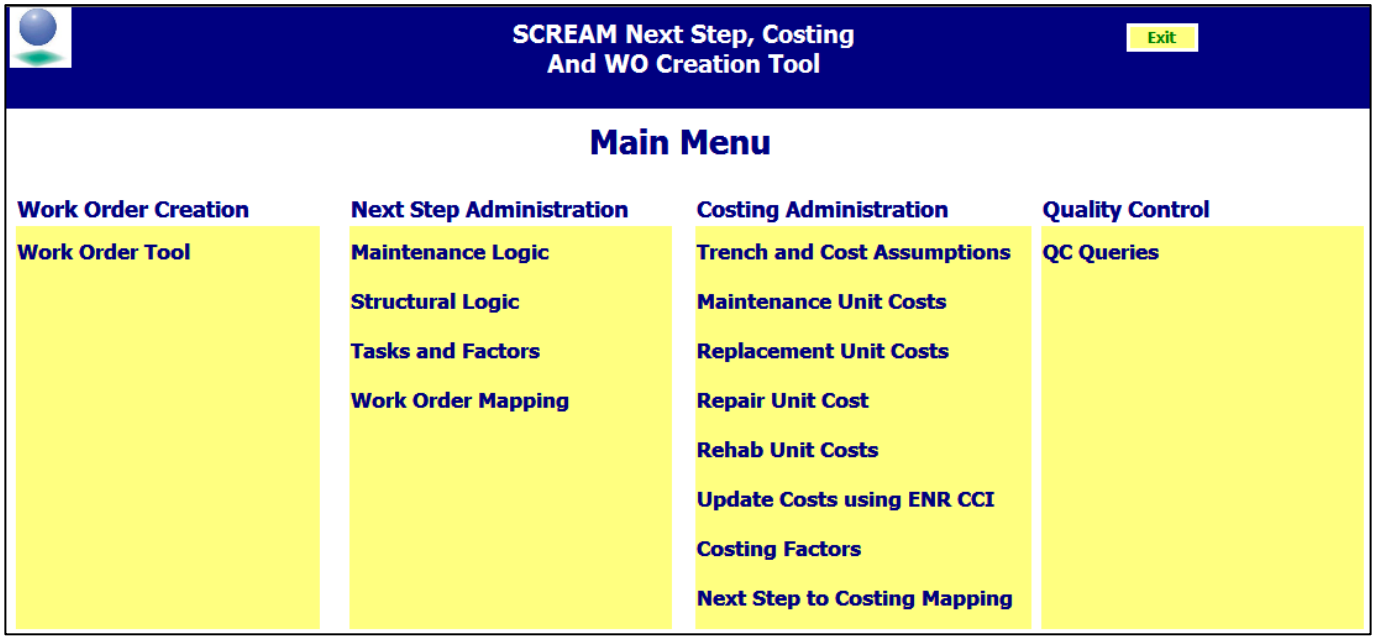
Appendixes

A SCREAM Next Step Logic Activity Details

1.0 The Main Menu

The SCREAM Next Step, Costing and Work Order Creation Tool (SCREAM WO Tool), was designed to allow SCREAM users to manage SCREAM's Next Step and Costing logic and to automatically create work orders in Lucity. Note that SD1 prefers to create work orders through the Lucity GIS tools, so these features will not be used. Administration of the logic starts in section 3.0. The tool is a Microsoft Access Database with tables linked to the SCREAM tables in SQL server. Any changes made to the information in the SCREAM WO tool are automatically made to the SCREAM SQL database. As a result, users should use care. Unwanted changes can be rolled back only by asking your SQL administrator to restore SQL database backups.

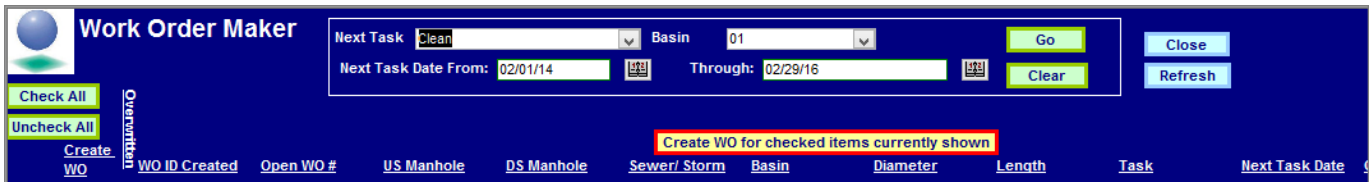
The Main Menu, shown below, automatically opens when the MS access tool is opened. Each of the WO tool's four main features (work order creation, next step administration, costing administration, and quality control) are listed in the four yellow boxes on the Main Menu. Note that tables in the tool must be linked via ODBC connection to the SCREAM SQL database. If the connection is not established, the forms will not work. If you have problems using the tool, ask a system administrator to create an ODBC connection for you.



2.0 Work Order Creation

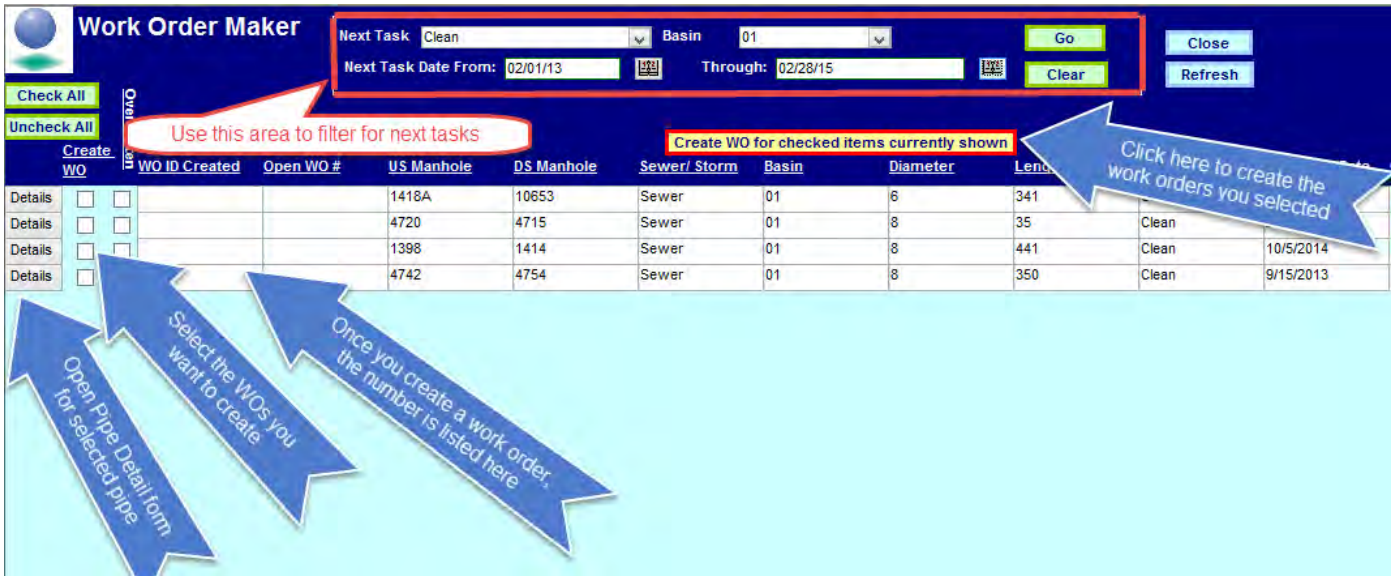
Note that SD1 prefers to create work orders through the Lucity GIS tools, so this tool will not be used to create work orders. It may be used to overwrite next actions, which occurs in the Pipe Details form (see section 2.1).

By selecting the "Work order Tool" option on the main menu, users can review suggested Next Steps and create work orders. The "Work Order Maker" form displays SCREAM Next Step's recommended next actions. This form allows you to turn the recommended actions into Lucity work orders.



When the form is first opened, it is empty. You must select the criteria in the box at the top to display next actions. Choose from a list of possible next tasks, basins, and scheduled dates, then click “Go” to apply the filter and display next actions. The filter can be cleared by using the “Clear” button.

Once a list of next actions is displayed, you can review and select the actions that should become Lucity work orders. Check the “Create WO” box to the right of each listed action you want to turn into a work order. Once all the work orders are selected, check the “Create WO for checked items currently shown”. Note that these actions will be added to one work order in Lucity with a date you select.

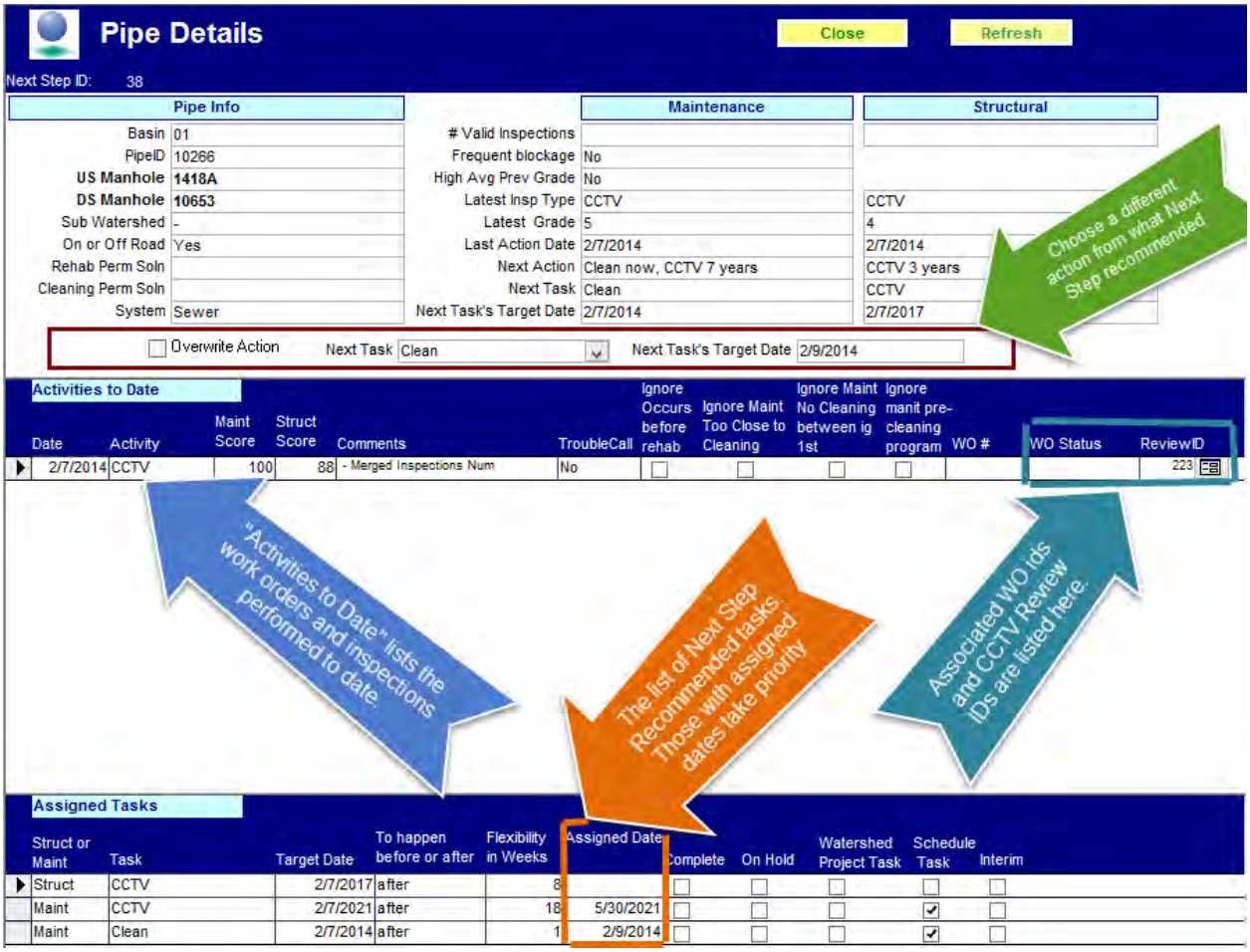


If you need more information about a recommended next action, click the “Details” button to see details about the Next Step recommendations for the pipe. The “Pipe Details” form will open and allow you to better understand the pipes activities to date and the tasks SCREAM Next Step assigns.

2.1 Pipe Details Form

Once you select a “Details” button next to a pipe, the Pipe Details form opens. Here you can review the pipe’s information and overwrite a pipe’s next action.

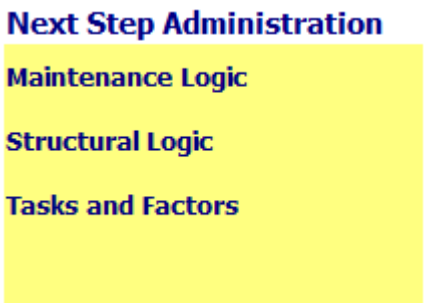
The “Pipe Details” form is divided into three sections. The top section displays basic pipe info and a summary of the maintenance and structural logic that was applied to the pipe. The middle section, “Activities to date” lists work orders and inspections performed on the pipe to date. The work order ID or CCTV review ID will be listed in one of the two right-hand cells on each row. The bottom section, “Assigned Tasks” lists SCREAM Next Step’s recommended next actions and scheduled dates. Note that each action is either a structural action or a maintenance action. Not all the actions have assigned dates, either the structural or maintenance actions do, not both. Once dates are assigned, the next actions are available in the “Work Order Maker” form.



The red box on the “Pipe Details” form allows you to ignore SCREAM Next Step’s recommended next action and to assign your own. We refer to this as an “overwritten task”. Once you overwrite a task and assign a new date for the task, you can create a work order for it. The pipe’s next actions will continue to be overwritten until the new task’s work order is complete in Lucity.

3.0 Next Step Administration

Users can perform Quality Control and manage some of the SCREAM Next Step Logic factors from the "Next Step Administration" portion of the Main Menu. You can change the next actions that SCREAM's Next Step logic assigns for both structural and maintenance perspectives. You can also update the defaults used when scheduling the next actions in the "Tasks and Factors" feature. Each option is detailed below.

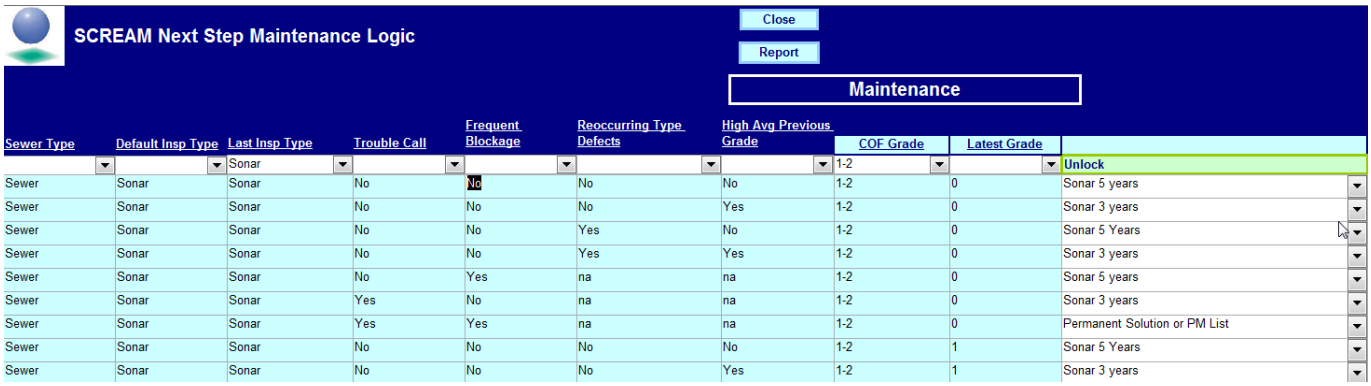


3.1 Maintenance Logic

The "Maintenance Logic" option on the Main Menu opens the "SCREAM Next Step Maintenance Logic" form, where you can update the recommended next actions for various logic combinations. The form lists each possible combination of the variables used by SCREAM's Next Step maintenance logic. The maintenance logic considers the following variables:

1. **Sewer Type:** If the pipe is part of the sewer or storm drain system.
2. **Default Inspection Type:** SD1 assigns pipes a default inspection type, either CCTV, Sonar, or Accoustic. The values are listed in Lucity's nt_bed_ty field.
3. **Last Insp Type:** Last inspection type, either CCTV, Sonar or Acoustic.
4. **Trouble Call:** If the pipe has a recent trouble call (yes/no)
5. **Frequent Blockage:** If the pipe has frequent blockage (yes/no)
6. **Reoccurring Type Defect:** If the latest inspection had defects that are likely to reoccur (yes/no)
7. **High Avg Previous Grade:** If the pipe has had high-scoring previous inspections (yes/no)
8. **COF Grade:** The pipe's consequence of failure grade
9. **Latest Grade:** The pipe's latest inspection's maintenance grade

To the right of each of the scenarios, in the white, drop-down box, is SCREAM's recommended next action. If you would like to change the recommended action, first click the "Unlock" button at the top, then select another option. The next time SCREAM Next Step is run, your changes to the logic will be applied to the sewer system.



Sewer Type	Default Insp Type	Last Insp Type	Trouble Call	Frequent Blockage	Reoccurring Type Defects	High Avg Previous Grade	COF Grade	Latest Grade	Unlock
		Sonar					1-2		
Sewer	Sonar	Sonar	No	No	No	No	1-2	0	Sonar 5 years
Sewer	Sonar	Sonar	No	No	No	Yes	1-2	0	Sonar 3 years
Sewer	Sonar	Sonar	No	No	Yes	No	1-2	0	Sonar 5 Years
Sewer	Sonar	Sonar	No	No	Yes	Yes	1-2	0	Sonar 3 years
Sewer	Sonar	Sonar	No	Yes	na	na	1-2	0	Sonar 5 years
Sewer	Sonar	Sonar	Yes	No	na	na	1-2	0	Sonar 3 years
Sewer	Sonar	Sonar	Yes	Yes	na	na	1-2	0	Permanent Solution or PM List
Sewer	Sonar	Sonar	No	No	No	No	1-2	1	Sonar 5 Years
Sewer	Sonar	Sonar	No	No	No	Yes	1-2	1	Sonar 3 years

If you would like to filter the logic, use the white drop-down boxes at the top of the blue columns. In the example above, the list is filtered by “Sonar.”

If you would like to run and print a report of the current logic, click the “Report” button. A printable report will appear.

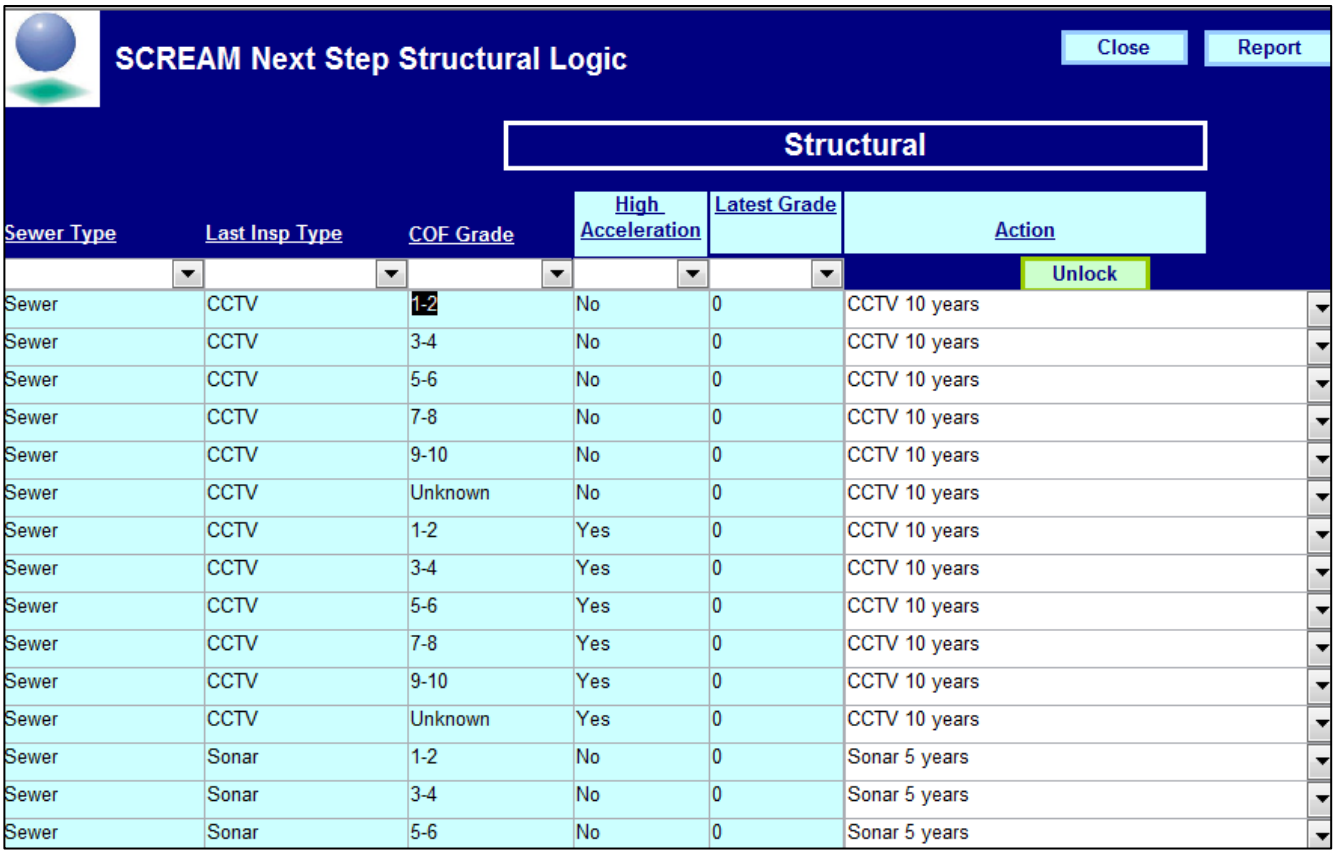
								Current Grade					
Sewer Type	Default Insp type	Latest Insp Type	Trouble Call	Frequent Blockage	Reoccuring type defects	High Avg Previous Grade	COF Grade	0	1	2	3	4	5
Sewer	Acoustic	CCTV	No	Yes	na	na	1-2	Acoustic 5 years	Acoustic 5 years	Clean now, Acoustic 5 years	Clean now, CCTV 3 years	Clean now, CCTV 2 years	Clean now, CCTV 1 year
Sewer	Acoustic	CCTV	No	Yes	na	na	3-4	Acoustic 5 years	Acoustic 5 years	Acoustic 4 years	Clean now, CCTV 3 years	Clean now, CCTV 1 year	Permanent Solution or PM List
Sewer	Acoustic	CCTV	No	Yes	na	na	5-6	Acoustic 4 years	Acoustic 4 years	Acoustic 3 years	Clean now, CCTV 2 years	Permanent Solution or PM List	Permanent Solution or PM List
Sewer	Acoustic	CCTV	No	Yes	na	na	7-8	Acoustic 3 years	Acoustic 3 years	Clean now, Acoustic 2 years	Permanent Solution or PM List	Permanent Solution or PM List	Permanent Solution or PM List
Sewer	Acoustic	CCTV	No	Yes	na	na	9-10	Acoustic 3 years	Acoustic 1 year	Permanent Solution or PM List	Permanent Solution or PM List	Permanent Solution or PM List	Permanent Solution or PM List
Sewer	Acoustic	CCTV	No	Yes	na	na	Unknown	Acoustic 4 years	Acoustic 4 years	Acoustic 3 years	Clean now, CCTV 2 years	Permanent Solution or PM List	Permanent Solution or PM List
Sewer	Acoustic	CCTV	Yes	No	na	na	1-2	Acoustic 3 years	Acoustic 3 years	Acoustic 2 years	Clean now, CCTV 2 years	Clean now, CCTV 2 years	Clean now, CCTV 1 year
Sewer	Acoustic	CCTV	Yes	No	na	na	3-4	Acoustic 3 years	Acoustic 3 years	Acoustic 2 years	Clean now, CCTV 2 years	Clean now, CCTV 1 year	Clean now, CCTV 1 year
Sewer	Acoustic	CCTV	Yes	No	na	na	5-6	Acoustic 3 years	Acoustic 2 years	Acoustic 2 years	Clean now, CCTV 1 year	Clean now, CCTV 1 year	Clean now, CCTV 1 year
Sewer	Acoustic	CCTV	Yes	No	na	na	7-8	Acoustic 2 years	Acoustic 2 years	Clean now, Acoustic 2 years	Clean now, CCTV 1 year	Clean now, CCTV 1 year	Permanent Solution or PM List
Sewer	Acoustic	CCTV	Yes	No	na	na	9-10	Acoustic 2 years	Acoustic 1 year	Clean now, Acoustic 1 year	Clean now, CCTV 1 year	Clean now, CCTV 1 year	Permanent Solution or PM List
Sewer	Acoustic	CCTV	Yes	No	na	na	Unknown	Acoustic 2 years	Acoustic 1 year	Clean now, Acoustic 1 year	Clean now, CCTV 1 year	Clean now, CCTV 1 year	Clean now, CCTV 1 year

3.2 Structural Logic

The “Structural Logic” option on the Main Menu opens the “SCREAM Next Step Structural Logic” form, where you can update the recommended next actions for various logic combinations. The form lists each possible combination of the variables used by SCREAM’s Next Step Structural logic. The structural logic considers the following variables:

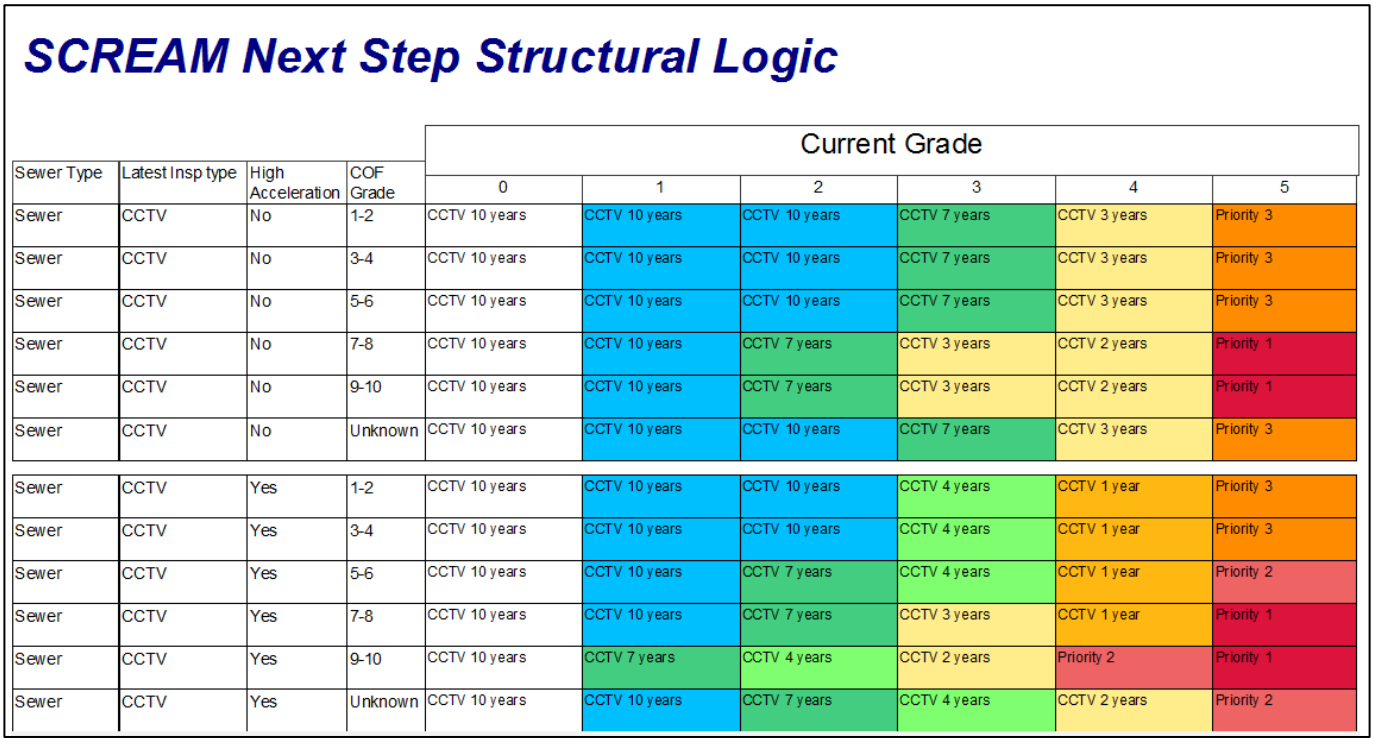
1. **Last Insp Type:** Last inspection type
2. **COF Grade:** The pipe’s consequence of failure grade
3. **High Acceleration:** If the pipe’s structural score has increased by a given amount since the last inspection
4. **Latest Grade:** The pipe’s latest inspection’s structural grade

To the right of each of the scenarios, in the white, drop-down box, is SCREAM’s recommended next action. If you would like to change the recommended action, first click the “Unlock” button at the top, then select another option. The next time SCREAM Next Step is run, your changes to the logic will be applied to the sewer system.



If you would like to filter the logic, use the white drop-down boxes at the top of the blue columns.

If you would like to run and print a report of the current logic, click the “Report” button. A printable report will appear.



SCREAM Next Step Structural Logic

Sewer Type	Latest Insp type	High Acceleration	COF Grade	Current Grade 0	1	2	3	4	5
Sewer	CCTV	No	1-2	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	Priority 3
Sewer	CCTV	No	3-4	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	Priority 3
Sewer	CCTV	No	5-6	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	Priority 3
Sewer	CCTV	No	7-8	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	CCTV 2 years	Priority 1
Sewer	CCTV	No	9-10	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	CCTV 2 years	Priority 1
Sewer	CCTV	No	Unknown	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	Priority 3
Sewer	CCTV	Yes	1-2	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 4 years	CCTV 1 year	Priority 3
Sewer	CCTV	Yes	3-4	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 4 years	CCTV 1 year	Priority 3
Sewer	CCTV	Yes	5-6	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 4 years	CCTV 1 year	Priority 2
Sewer	CCTV	Yes	7-8	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	CCTV 1 year	Priority 1
Sewer	CCTV	Yes	9-10	CCTV 10 years	CCTV 7 years	CCTV 4 years	CCTV 2 years	Priority 2	Priority 1
Sewer	CCTV	Yes	Unknown	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 4 years	CCTV 2 years	Priority 2

3.3 Tasks and Factors – Update the Scheduling defaults and Map to Lucity

The “Tasks and Factors” option on the Main Menu opens the “SCREAM Next Step Actions and Tasks Factors” form, where you can update defaults associated with scheduling and you can update mapping to Lucity tasks. The form lists each of the possible next actions (both structural and maintenance) and each of the sub-tasks associated with the actions. For example, the action “Clean now, CCTV 7 years” has two tasks, one to “clean” and one to “CCTV”. The tasks are separated because they are scheduled at different times.

This form allows you to modify the way the tasks are scheduled, by using the two left, white columns. The two columns are defined as follows:

- **Flexibility in Weeks**: when scheduling, SCREAM Next Step tries to schedule similar tasks on pipes in the same watershed together. In order to do this, the pipes are given ranges of time, or scheduling flexibility in weeks. Increase the flexibility to allow for more pipes to be scheduled together, but be careful not to make your flexibility larger than appropriate. For example, if the “Time in Mo” field is set to 12 months, you wouldn’t want to have the flexibility in weeks be equal to a year (or even more than probably 10 weeks) or you may end up scheduling the task before it is ready to be performed.
- **Task Complete if Done Within x Weeks Before Due Date:** In some cases, tasks are completed before scheduled due to outside factors. If this occurs, the task may be marked as “complete”. In some cases, you may not want the task to be marked as complete because enough time has not lapsed until the task was due. You can manage when a task can be marked as complete by adjusting the values in this field. Tasks performed outside the given range around the due date, will not be marked as complete.

SCREAM Next Step Actions And Tasks Factors Close

Show All

Action	Task	Time In Mo	Before or After	Flexibility in Weeks	Task Complete if Done within x Weeks Before Due Date	CMMS Task ID	CMMS Task Descr	Schedule both Struct and Maint Together	Report Color
				Unlock					
Sonar 5 years	Sonar	60	after	13	160	1202	TV line	False	Lime
Sonar 3 years	Sonar	36	after	18	96	1202	TV line	False	Yellow
Sonar 2 years	Sonar	24	after	5	64	1202	TV line	False	Yellow
Sonar 1 year	Sonar	12	after	6	32	1202	TV line	False	Gold
Priority 3	Priority 3	0	after	1	0		NULL	True	Orange
Priority 2	Priority 2	0	after	1	0		NULL	True	Tomato
Priority 1	Priority 1	0	after	1	0		NULL	True	Red
Permanent Solution or PM List	Permanent Solution or PM List	0	after	1	1		NULL	False	Red
Immediate	Immediate	0	after	1	0		NULL	True	Violet
Clean now, Sonar 5 years	Sonar	60	after	13	160	1202	TV line	False	Lime
Clean now, Sonar 5 years	Clean	0	after	1	1	1201	Jet line	False	Gold
Clean now, Sonar 3 years	Sonar	36	after	18	96	1202	TV line	False	Yellow
Clean now, Sonar 3 years	Clean	0	after	1	1	1201	Jet line	False	Gold
Clean now, Sonar 2 years	Sonar	24	after	13	64	1202	TV line	False	Yellow
Clean now, Sonar 2 years	Clean	0	after	1	1	1201	Jet line	False	Gold
Clean now, Sonar 1 year	Sonar	12	after	3	32	1202	TV line	False	Gold
Clean now, Sonar 1 year	Clean	0	after	1	1	1201	Jet line	False	Gold
Clean now, CCTV 7 years	CCTV	84	after	18	224	1202	TV line	False	Green
Clean now, CCTV 7 years	Clean	0	after	1	1	1201	Jet line	False	Green

:

This form also allows you to modify the way work orders are created in Lucity, by mapping the tasks to Lucity tasks in the "CMMS Task ID" and "CMMS Task Descr" columns. The two columns are defined as follows

- **CMMS Task ID**: when a work order is created for this task in Lucity, the work order will have this task ID associated to it in the Task_CD field.
- **CMMS Task Descr:** when a work order is created for this task in Lucity, the work order will have this task description associated to it in the Task_TY field.

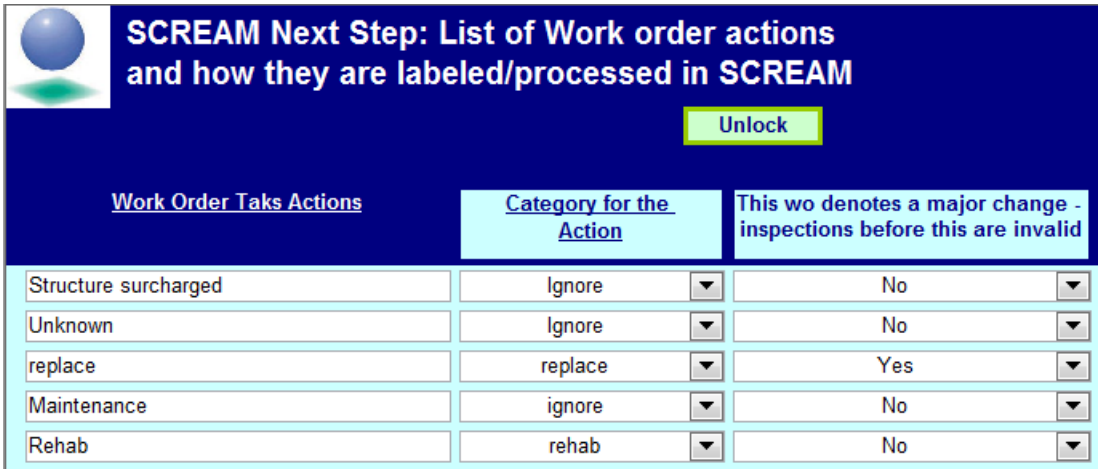
The second to last column, "Schedule both Struct and Maint Together" allows you to select tasks that require both the recommended maintenance tasks and the recommended structural task be scheduled. Otherwise, only the tasks that come first will be scheduled. This is beneficial in the case when a task might not be performed for a while. For example, if the selected structural task is "Priority 3", the rehab work may not be performed for years. In the mean-time, the utility will want to continue to schedule maintenance work. In most cases, only the more urgent of the structural or maintenance activities are scheduled to avoid duplicate work.

If you would like to filter the actions, use the white drop-down boxes at the top of the blue columns.

3.4 Work Order Mapping – Mapping CMMS Work orders to Next Step WO Types

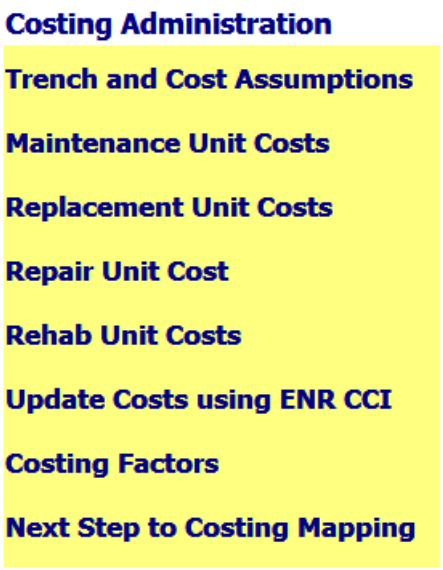
The "Work Order Mapping" option on the Main Menu opens the "SCREAM Next Step: List of Work order actions and how they are labeled/processed in SCREAM" form, where you can update the list of work order task activities

- **Category for the action:** Choose from a list of possible categories used in SCREAM next step
  - Inspect – the work order details a cctv inspection
  - Repair – the work order refers to a repair on the pipe
  - Rehab – the work order refers to rehabilitation of the pipe
  - Replace – the work order refers to the pipe being replaced
  - Clean – the work order refers to cleaning of the pipe
  - Ignore – the work order is not one of the above types, but may be interesting to see in the reports, simply ignore for logic purposes, but display on reports.
- **This wo denotes a major change – inspections before this are invalid:** Choose either yes or no. Note that usually only work orders that make a significant change to the structure of the pipe are marked "Yes".
  - Yes – any inspection that happened before this work order occurs will not be valid in SCREAM Next Step.
  - No – a work order of this type will not impact the validity of any inspections.



4.0 Costing Administration

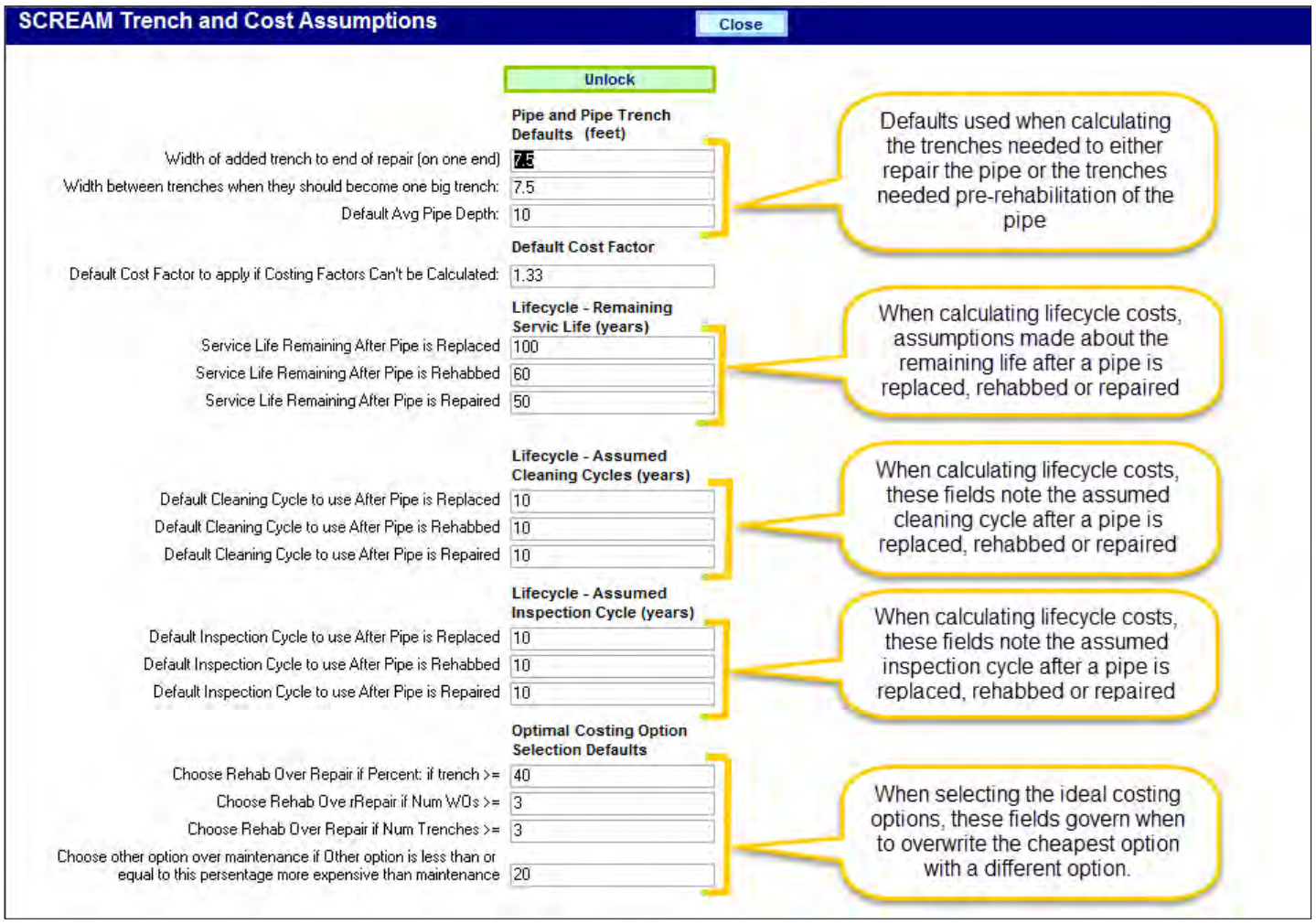
Users can update the costing logic and unit cost tables from the "Costing Administration" portion of the Main Menu. You can change the default costing logic assumptions, the five unit cost tables, the cost factors (that mark up costs) and you can alter the way Next Step actions are mapped to Costing processes from this section. Each option is detailed below.



4.1 Trench and Cost Assumptions

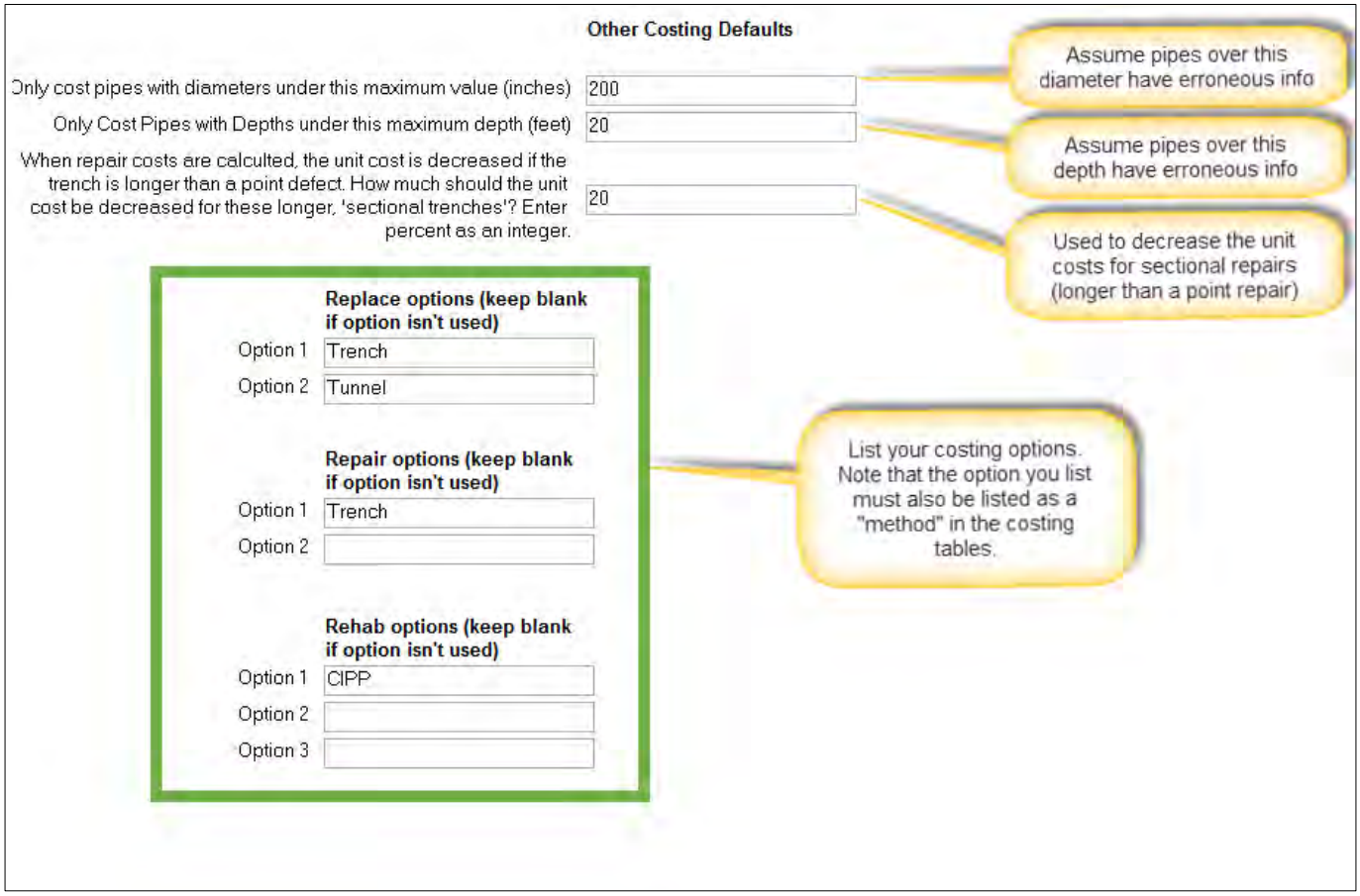
The "Trench and Cost Assumptions" option on the Main Menu opens the "SCREAM Trench and Cost Assumptions" form. In this form, you can update defaults associated with calculating trenches on the pipe as well as assumptions made while calculating immediate and lifecycle costs. The form describes each of the options.

The following two diagrams detail each of the options listed on the form. Once a change is made here, it is automatically made in the logic on the SCREAM SQL server, so be careful. Note that the logic won't be applied to the pipes until the next time the SCREAM Costing job runs.



The third option down, starting with “When repair costs are calculated…” decreases the unit costs for sectional trenches. Sectional trenches are longer than small point repair trenches. For example, if the default trench lengths are 7.5 feet on either side of a point defect, the point trench length is 15 feet. Trenches longer than 15 feet are called ‘sectional’ trenches and have lower costs per foot. In the example below, the sectional costs will be 20%

less per foot.



4.2 Maintenance Unit Costs

The “Maintenance Unit Costs” option on the Main Menu opens the “SCREAM Costing Default values” form, where you can update the unit maintenance costs used to calculate immediate and lifecycle maintenance costs. The costs are listed by liner foot of pipe and divided into diameter ranges. The costs to clean or inspect a larger diameter pipe are typically more than the cost to clean or inspect a smaller diameter pipe.

Note that the diameter ranges start with -1 so that pipes with a wrongly-recorded diameter of 0 can still have costs applied. You may adjust the ranges or add new diameter ranges, but be careful to assure that you don’t accidentally skip over possible diameters.

SCREAM Costing Maintenance Unit Costs Close

Diameter is larger than	Largest Diameter in this category	Inspection Cost Per Ft	Cleaning Cost Per Ft
-1	8	$2.00	$1.33
8	10	$1.40	$1.33
10	18	$1.70	$1.33
18	30	$3.51	$1.33
30	42	$4.87	$2.33
42	52	$6.40	$2.33
52	60	$8.59	$2.33
60	72	$11.53	$2.33
72	96	$18.48	$2.33
96	200	$25.69	$2.33

4.4 Replacement Unit Costs

The “Replace Unit Costs” option on the Main Menu opens the “SCREAM Costing Replace Unit Costs” form, where you can update the unit replacement costs used to calculate the cost to completely replace a pipe in the short term (immediate costs) and over the lifecycle of the pipe. The costs are divided into diameter/depth ranges. The cost to replace a larger diameter pipe is typically more than the cost to replace a smaller diameter pipe. Likewise, the cost to replace a deeper pipe is typically more than the cost to replace a shallower pipe. Splitting the unit costs into diameter/depth ranges helps make the cost estimates more accurate.

The four columns on the right list the unit costs per depth while the column on the left lists the cost to reinstate a lateral after the pipe is replaced. You can update these unit costs by clicking on “Unlock” and then making your change. If you would like to filter the information by pipe diameter or method, use the white drop-down box at the top of the column.



Method	Diameter	Lateral Reinstatement $ Each	Replace Unit cost ($/ft) Depth: 0 to 4 ft	Depth: 5 to 10 ft	Depth: 11 to 16 ft	Depth: 17 to 25 ft
Trench	8	$3,287.00	$210.67	$210.67	$232.00	$1,472.00
Trench	10	$3,287.00	$213.60	$213.60	$234.40	$1,472.00
Trench	12	$3,287.00	$217.33	$217.33	$236.00	$1,472.00
Trench	15	$3,287.00	$226.40	$226.40	$249.60	$1,481.60
Trench	18	$3,287.00	$232.53	$232.53	$256.80	$1,484.00
Trench	21	$3,287.00	$236.53	$236.53	$260.80	$1,488.00
Trench	24	$3,287.00	$250.67	$250.67	$276.00	$1,704.00
Trench	27	$3,287.00	$263.73	$263.73	$296.80	$1,704.00
Trench	30	$3,287.00	$277.07	$277.07	$305.60	$1,724.00
Trench	36	$3,287.00	$484.00	$484.00	$484.00	$1,724.00
Trench	42	$3,287.00	$542.40	$542.40	$542.40	$1,724.00
Trench	48	$3,287.00	$583.20	$583.20	$583.20	$1,724.00
Trench	60	$3,287.00	$687.20	$687.20	$687.20	$1,724.00

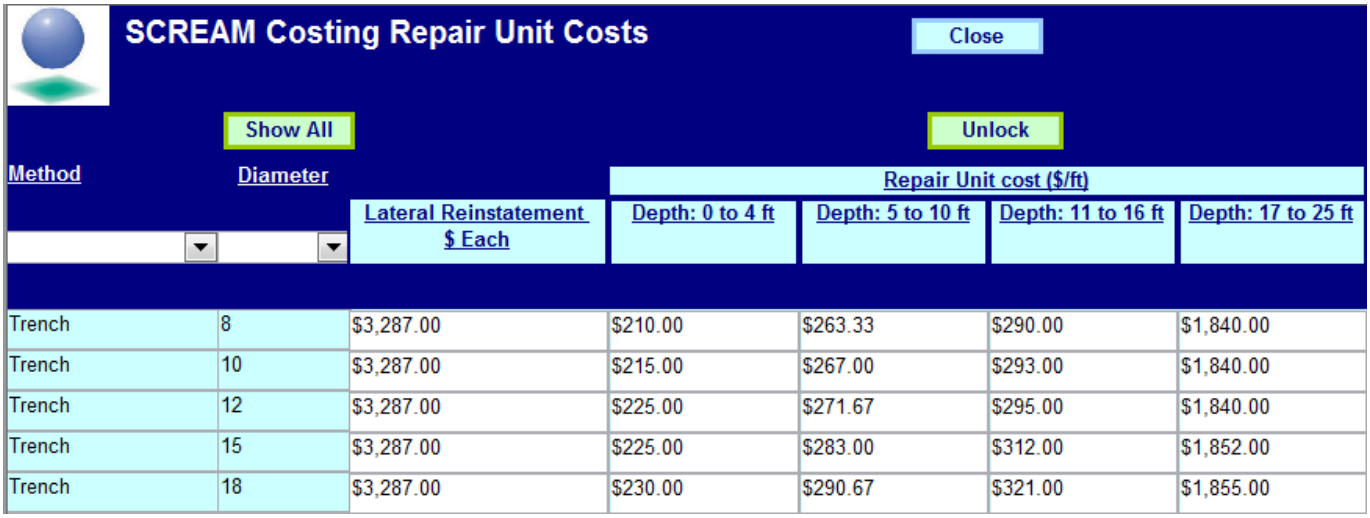
Note that the depth ranges are pre-defined and not adjustable. If needed, new diameters can be added to the SQL table. Also note that when costing is applied, pipes are assigned the diameter closest to their own diameter.

4.5 Repair Unit Costs

The “Repair Unit Costs” option on the Main Menu opens the “SCREAM Costing Replace Unit Costs” form, where you can update the unit repair costs used to calculate a pipe’s immediate and lifecycle repair costs. Unit costs on this form are related to the trench needed to make a single point repair with default trench lengths on each end.

The costs are divided into diameter/depth ranges. The costs to repair a larger diameter pipe are typically more than the cost to repair a smaller diameter pipe. Likewise, the costs to repair a deeper pipe are typically more than the cost to repair a shallower pipe. Splitting the unit costs into diameter/depth ranges helps make the cost estimates more accurate.

The four columns on the right list the unit costs per depth while the column on the left lists the cost to reinstate a lateral in the area of the repair. You can update these unit costs by clicking on “Unlock” and then making your change. If you would like to filter the information by pipe diameter or method, use the white drop-down box at the top of the column.



Note that the depth ranges are pre-defined and not adjustable. If needed, new diameters can be added to the SQL table. Also note that when costing is applied, pipes are assigned the diameter closest to their own diameter.

4.3 Rehab Unit Costs

The “Rehab Unit Costs” option on the Main Menu opens the “SCREAM Costing Rehab Unit Costs” form, where you can update the unit rehab costs used to estimate a pipe’s immediate and lifecycle rehabilitation expense. At the time of this writing, only CIPP technology was listed as a rehab method. The costs are divided into diameter/depth ranges. The cost to rehab a larger diameter pipe is typically more than the cost to rehab a smaller diameter pipe. Likewise, the costs to rehab a deeper pipe can be more than the cost to rehab a shallower pipe. Splitting the unit costs into diameter/depth ranges helps make the cost estimates more accurate.

The four columns on the right list the unit costs per depth while the column on the left lists the cost to reinstate a lateral after lining occurs. You can update these unit costs by clicking on “Unlock” and then making your change. If you would like to filter the information by pipe diameter or method, use the white drop-down box at the top of the column. Note that the depth ranges are pre-defined and not adjustable. If needed, new diameters can be added to the SQL table. Also note that when costing is applied, pipes are assigned the diameter closest to their own diameter.



4.7 Costing Factors

The “Costing Factors” option on the Main Menu opens the “SCREAM Costing Factors” form. In this form, you can update the cost factors, which are used to increase the estimated costs. If any of the factors apply to a pipe, the factor is used to increase the estimated costs.

In other words, each criterion shown in Table 4-1, if true, will cause the corrective action to cost more. Costing factors are used to mark up the calculated costs of rehabilitation, repair, and replacement. Each costing factor that applies is added to “1” then multiplied by the cost per foot listed in the costing tables. Costing factors are not applied to the cost to reinstate a lateral.

If some of the pipe attributes are not listed in the pipe inventory (for example, the diameter of the pipe is unknown or the distance to the stream has not been measured) and the costing factors can’t be calculated, a default costing factor is used. See the Assumptions form for the default costing factor.

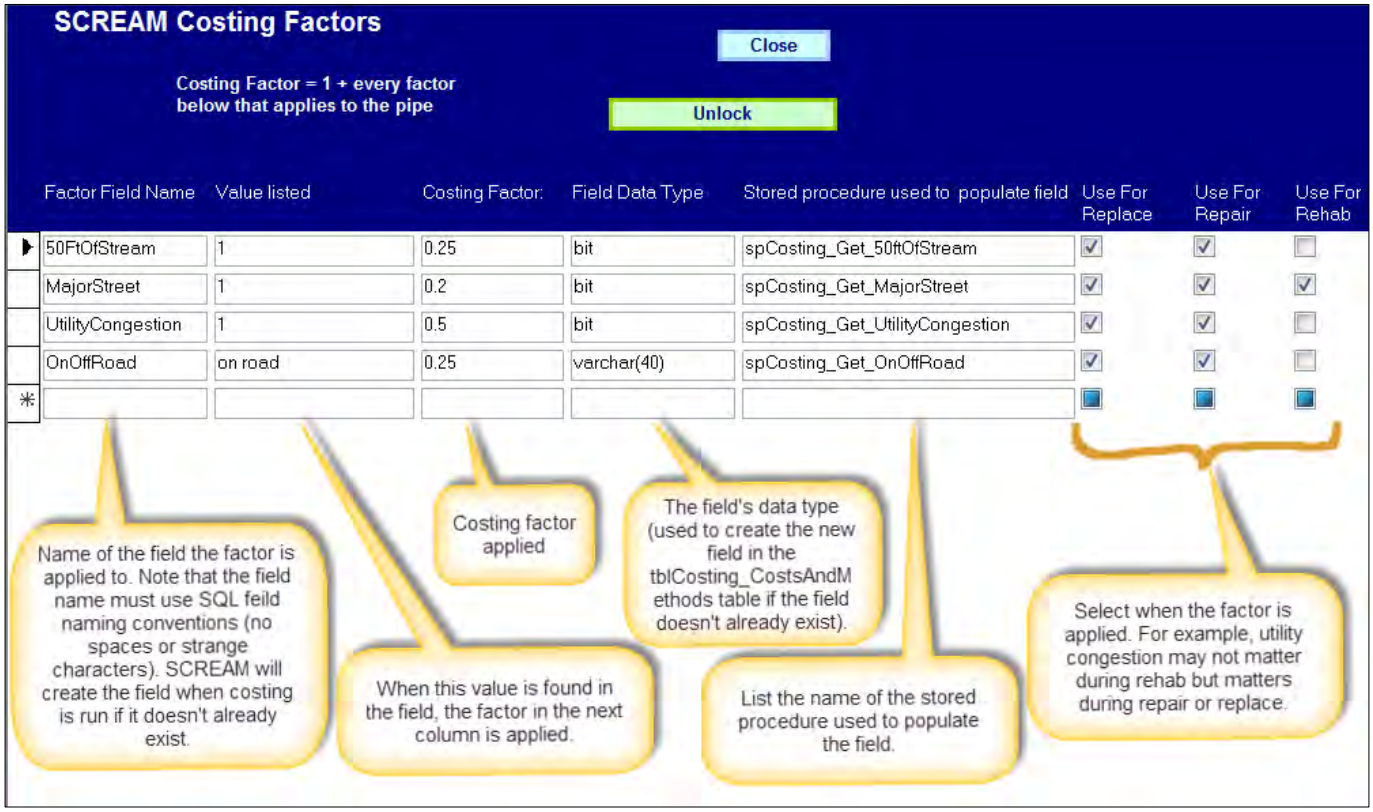
Here is an example application of costing factors applied to construction costs.

Example Pipe -

Factor	**Factor’s value**	**Does it apply?**	**Applied factor**
Near a stream	0.15	No	0
Located on a major street	0.25	Yes	0.45
Utility congestion	0.35	No	0
Under pavement	0.15	Yes	0.25

With this criteria, the costing factor = 1(the starting value) + 0+0.45 +0.25+ 0 = 1.70. The factor is multiplied by the unit costs.

Costing factors can be adjusted in the “SCREAM Costing Factors” form.



Users can easily adjust the “Costing Factor” field, but we recommend consulting a SCREAM technician before adding new factors or making large adjustments.

When adding new factors, note that SCREAM will automatically add the field to the costing tables if it doesn’t already exist, but you will need to create a new stored procedure with code in it to populate the new factor.

4.8 Next Step to Costing Mapping

The “Next Step to Costing” option on the Main Menu opens the “SCREAM Next Step to Costing Mapping” form. In this form, you can update assumed cleaning and inspection cycles used to calculate lifecycle costs. The cycles are applied to the pipe at year 0 for the maintenance option. The cycles are estimated for each of the possible Next Step structural and maintenance action combinations. For example, if the recommended next structural action was to CCTV in 2 years, the assumed inspection cycle is 2 years, but if the recommended action was to CCTV in 10 years, the assumed inspection cycle is 10 years. We don’t recommend having an inspection cycle below 2 years.

You can update the two assumed cycles and you can comment on your decision by clicking on “Unlock” and then making your change. If you would like to filter the information by maintenance action or structural action, use the white drop-down box at the top of the “Diameter” column.

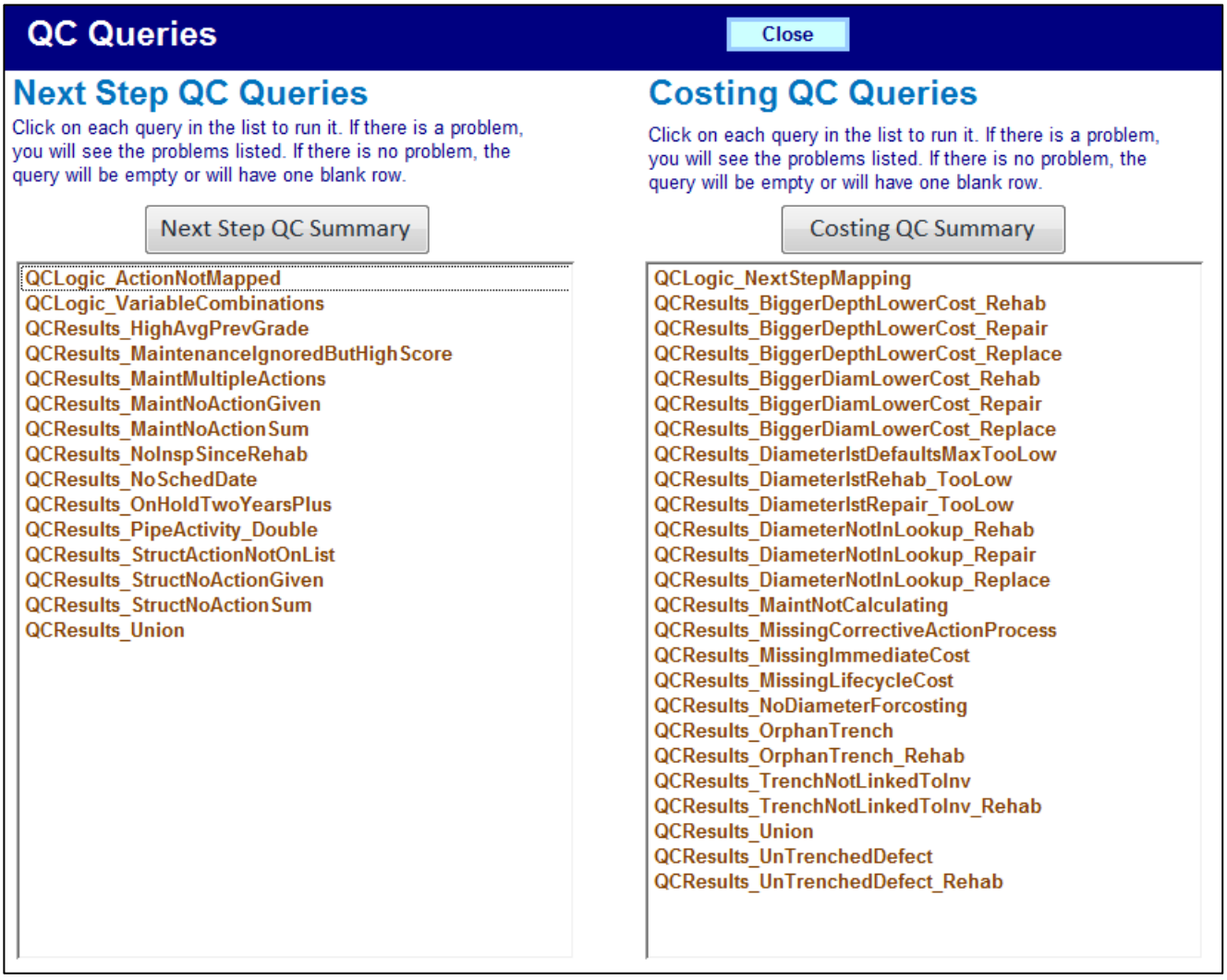
5.0 QC Queries

The “QC Queries” option on the Main Menu opens the “QC Queries” form, where quality control (QC) steps are automated. A list of SCREAM Next Step and SCREAM Costing QC queries are available.

You can run each query by simply clicking on any of the queries listed to open them. Typically, the queries should be empty. If the query returns results, there may be a QC problem. Refer to Appendix A for possible resolution.

Before running each query in the list, click on the “Next Step QC Summary” button or the “Costing QC Summary” button. It will show an overview of how many records (or potential errors) are listed in each QC query and give a description of each problem. You can ignore the queries with no results or any queries marked “will not be empty”. Note that some newer queries may not be listed under the “Next Step QC Summary” and “Costing QC Summary” buttons. We recommend running each query separately, by clicking on each, as well. Us your down arrow to quickly move from one query to the next.

For more information about each QC query, what each contains, and potential solutions, see Appendix A.



New QC queries can be added to the list by first creating a new view in SQL server and then linking the view to the WO Tool. The view’s name must start with “vwNextStep_QC” and “vwCosting_QC”. Once the view is created, link it to WO tool using the “import data” feature in MS Access and an ODBC connection (the same as with the rest of the tables). When linked, the query will be renamed to start with “dbo_” like “dbo_vwNextStep_QC” and “dbo_vwCosting_QC”.

Appendix A
SCREAM Next Step and Costing QC Queries

Next Step QC Query (name begins with vwNextStep_ in SQL)	Description	Possible Resolution
QCLogic_ActionNotMapped	A pipe has a work order action that is not listed in the work order mapping table. The action is listed as the second note in the "RevComments" column. Each note is divided by |.	Add the new value to the "Work order Mapping" form (or the lstNextStep_WOActionsMap table). Frequently, the action is simply blank and can't be mapped. If so, find the work order in your CMMS (using the Wo_Number as reference) and make the correction.
QCLogic_VariableCombinations	Information only: See if all the variables are being used. Each column lists a next step variable. If it is being used, you should see both "yes" and "no" listed in the column.	If a column is all "no", then you may want to see if the variable is applied. Consult a SCREAM technician.
QCResults_HighAvgPrevGrade	Information only: Query used to see if any pipes were marked as having a high average previous grade	No action needed
QCResults_MaintenanceIgnoredButHighScore	The pipe does not have a maintenance next action but has a high maintenance score.	Look at the associated pipe report and see why maintenance was ignored. Check the pipes's Next Step detail. Look at the maintenance variables and use the Next Step maintenance logic table to see if an option exists to match the pipe's variables. If an option exists, check the pipe's attributes. Is an attribute like "USMan" or "Diameter" missing? If the problem is not clear, contact a SCREAM technician.
QCResults_MaintMultipleActions	Maintenance logic contains multiple actions as outcome	The logic may be off, listing the same activity more than once. Check the list of Tasks and Factors.
QCResults_MaintNoActionGiven	A maintenance action was not assigned.	Check the pipes's Next Step detail. Look at the maintenance variables and use the maintenance logic table to see if an option exists to match the pipe's variables. If an option exists, check the pipe's attributes. Is an attribute like "USMan" or "Diameter" missing?
QCResults_MaintNoActionSum	A summary of the types of pipe variables that don't have maintenance next actions.	Look at the maintenance variables and use the maintenance logic table to see if an option exists to match the pipe's variables. If an option exists, check the pipe's attributes. Is an attribute like "USMan" or "Diameter" missing? Look at the next QC query, "StructNoActionGiven" for more detail.

Next Step QC Query (name begins with vwNextStep_ in SQL)	Description	Possible Resolution
QCResults_NoInspSinceRehab	Information Only: An inspection was not performed since rehab. Needs inspection.	Have field crews inspect the pipe to create a basline CCTV inspection.
QCResults_NoSchedDate	No scheduled next task	The recommended next actions on the pipe were not scheduled. Try running the NextStepScheduling job. Then check the pipe's Next Step detail and see if any variables are missing.
QCResults_OnHoldTwoYearsPlus	A repair, rehab or replace work order has been on the pipe for over 2 years, causing the Next Step scheduled task to be on hold.	Look in your CMMS and see if the rehab/repair/replace work order is a mistake.
QCResults_PipeActivity_Double	An activity on the pipe (usually a work order) is listed more than once. This may not be a problem.	Often, multiple tasks are performed on a pipe and they are each listed with the same work order number. This may not be a problem.
QCResults_StructActionNotOnList	The assigned structural action is not on the list of possible actions	The assigned Next Step task is not listed on the list of possible tasks. Check the list of Tasks and Factors.
QCResults_StructNoActionGiven	A structural action was not assigned.	Check the pipes's Next Step detail. Look at the structural variables and use the structural logic table to see if an option exists to match the pipe's variables. If an option exists, check the pipe's attributes. Is an attribute like "USMan" or "Diameter" missing?
QCResults_StructNoActionSum	A summary of the types of pipe variables that don't have structural next actions.	Look at the structural variables and use the structural logic table to see if an option exists to match the pipe's variables. If an option exists, check the pipe's attributes. Is an attribute like "USMan" or "Diameter" missing? Look at the next QC query, "StructNoActionGiven" for more detail.
QCResults_Union	A list of all the QC problems, listed by pipe. This is the same as the QC summary button, but is not summarized.	-

Costing QC Query (name begins with vwCosting_ in SQL)	Description	Possible Resolution
QCLogic_NextStepMapping	Pipe not mapped from Next Step Activity to Costing Activity.	Look at the pipe's next step details. See what the next maintenance actions and structural actions are. Assure that the combination is mapped in the "Next Step Mapping" form. If not, additions need to be made to the mapping in the lstCosting_NextStepMapping table.
QCResults_BiggerDepthLowerCost_Rehab, QCResults_BiggerDepthLowerCost_Repair, QCResults_BiggerDepthLowerCost_Replace, QCResults_BiggerDiamLowerCost_Rehab, QCResults_BiggerDiamLowerCost_Repair, QCResults_BiggerDiamLowerCost_Replace	The unit costs listed in the costing tables do not appear logical. Either the cost is lower with increased depth or the cost is lower with increased diameter.	Review and update the costing tables as needed. From the Main Menu, go to "Replacement Unit Costs", "Rehab Unit Costs" or "Repair Unit Costs."
QCResults_DiameterlstDefaultsMaxTooLow	Information Only: The default maximum pipe diameter is less than what is listed in the costing tables. You may want to include larger pipes.	Increase the max allowable diameter in the costing assumptions form. – or ignore.
QCResults_DiameterlstRehab_TooLow	The default maximum pipe diameter is greater than the diameters listed in the costing tables.	Decrease the max allowable diameter in the costing assumptions form. – or increase the range of diameters in the Rehab costing table.
QCResults_DiameterlstRepair_TooLow	The default maximum pipe diameter is greater than the diameters listed in the costing tables.	Decrease the max allowable diameter in the costing assumptions form. – or increase the range of diameters in the Repair, point costing table.
QCResults_DiameterlstReplace_TooLow	The default maximum pipe diameter is greater than the diameters listed in the costing tables.	Decrease the max allowable diameter in the costing assumptions form. – or increase the range of diameters in the Replace costing table.
QCResults_DiameterNotInLookup_Rehab	The diameter value is not in the rehab Costing look up table.	Decrease the max allowable diameter in the costing assumptions form. – or increase the range of diameters in the rehab costing table.
QCResults_DiameterNotInLookup_Repair	The diameter value is not in the repair Costing look up table.	Decrease the max allowable diameter in the costing assumptions form. – or increase the range of diameters in the Repair costing table.

Costing QC Query (name begins with vwCosting_ in SQL)	Description	Possible Resolution
QCResults_DiameterNotInLookup_Replace	The diameter value is not in the replace Costing look up table.	Decrease the max allowable diameter in the costing assumptions form. – or increase the range of diameters in the Replace costing table.
QCResults_MaintNotCalculating	A maintenance cost was not calculated for the pipe. The diameter used for costing was not in the maintenance cost table.	See if the diameter listed for this pipe is null or zero. See if the diameter is listed in the range of maintenance costs. Add to the range if needed.
QCResults_MissingCorrectiveActionProcess	A corrective action process was not mapped to the pipe. See lstcosting_NextStepMapping.	Look at the pipe's next step details. See what the next maintenance actions and structural actions are. Assure that the combination is mapped in the "Next Step Mapping" form. If not, additions need to be made to the mapping in the lstCosting_NextStepMapping table.
QCResults_MissingImmediateCost	An ideal immediate cost was not calculated for the pipe.	See if the pipe is missing attributes that would prevent an immediate cost from being selected. Is the pipe length null or the diameter out of the range of the costing tables? Resolve the problem.
QCResults_MissingLifecycleCost	An ideal lifecycle cost was not calculated for the pipe even though it was mapped to a corrective action process to be costed.	Is the pipe's length or diameter null or 0? Correct this. Is there no total score listed? If so, the pipe does not have a valid CCTV inspection. Ignore.
QCResults_NoDiameterForcosting	Before calculating costs, each pipe is assigned a "diameter for costing" based on the diameters listed in the rehab costing table. Pipes are assigned to a diameter in the table that is closest to the diameter listed in the rehab costing table. For some reason a diameter was not assigned	The pipe's diameter is either missing or too small. See the rehab costing table for example diameters.
QCResults_OrphanTrench	When trenches were calculated, one is not listed in the defects table.	The CCTV inspections have been updated since the trenches were last calculated. Check again after the trenches are re-calculated. If problem remains, ask a SCREAM admin.
QCResults_OrphanTrench_Rehab	When rehab trenches were calculated, one is not listed in the defects table. Could be that CCTV was updated.	The CCTV inspections have been updated since the trenches were last calculated. Check again after the trenches are re-calculated. If problem remains, ask a SCREAM admin.

Costing QC Query (name begins with vwCosting_ in SQL)	Description	Possible Resolution
QCResults_TrenchNotLinkedToInv	When trenches were calculated, one was not linked to the inventory. It could be an orphan.	The CCTV inspections have been updated since the trenches were last calculated. Check again after the trenches are re-calculated. If not, ask a SCREAM admin.
QCResults_TrenchNotLinkedToInv_Rehab	When Rehab trenches were calculated, one was not linked to the inventory. It could be an orphan.	The CCTV inspections have been updated since the trenches were last calculated. Check again after the trenches are re-calculated. If problem remains, ask a SCREAM admin.
QCResults_UnTrenchedDefect	A defect worthy of trenching was not included in list of trenches.	Could be that CCTV was updated or some defects are orphaned and do not have a related inspection. Check again after the trenches are re-calculated. If not, ask a SCREAM admin.
QCResults_UnTrenchedDefect_Rehab	A rehab defect worthy of trenching was not included in list of trenches.	Could be that CCTV was updated or some defects are orphaned and do not have a related inspection. Check again after the trenches are re-calculated. If problem remains, ask a SCREAM admin.

Quick Guide: SCREAM Web Reports

Prepared for

Northern Kentucky SD1

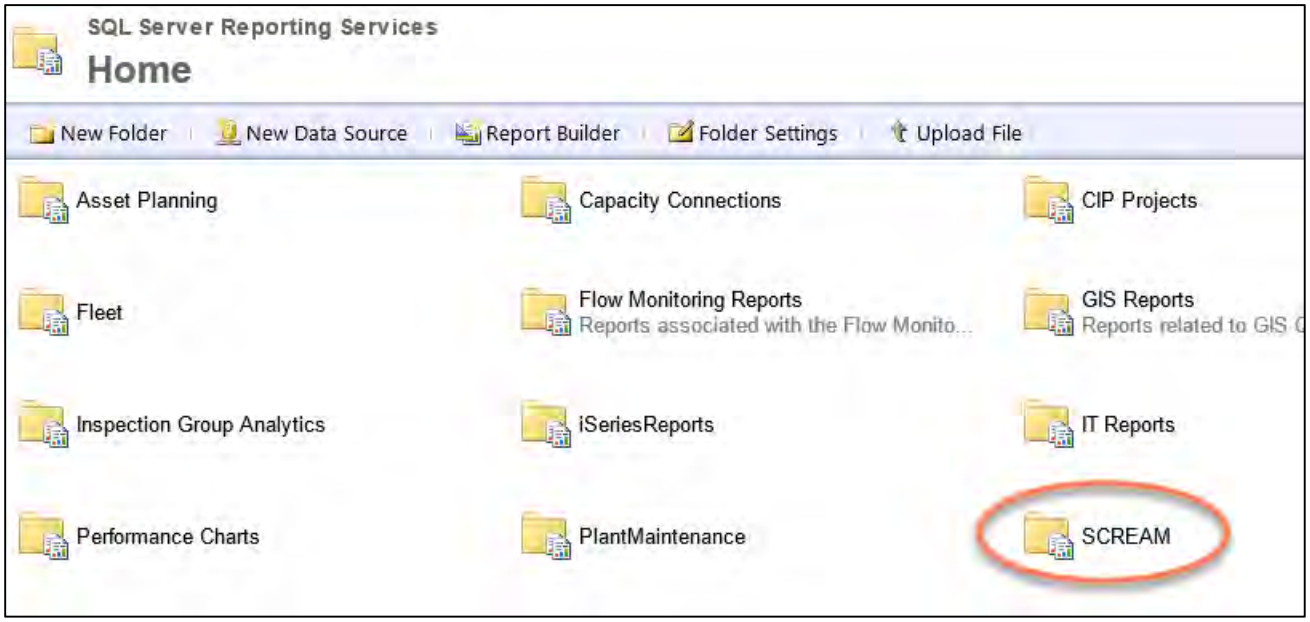
September, 2017

SCREAM's web reports allow users to access the latest information in a variety of pre-defined reports. Users can filter, sort and export the data into several formats for further analysis. The SCREAM Web reports are best accessed using Internet Explorer. Some other browsers, like Google Chrome, can distort the reports.

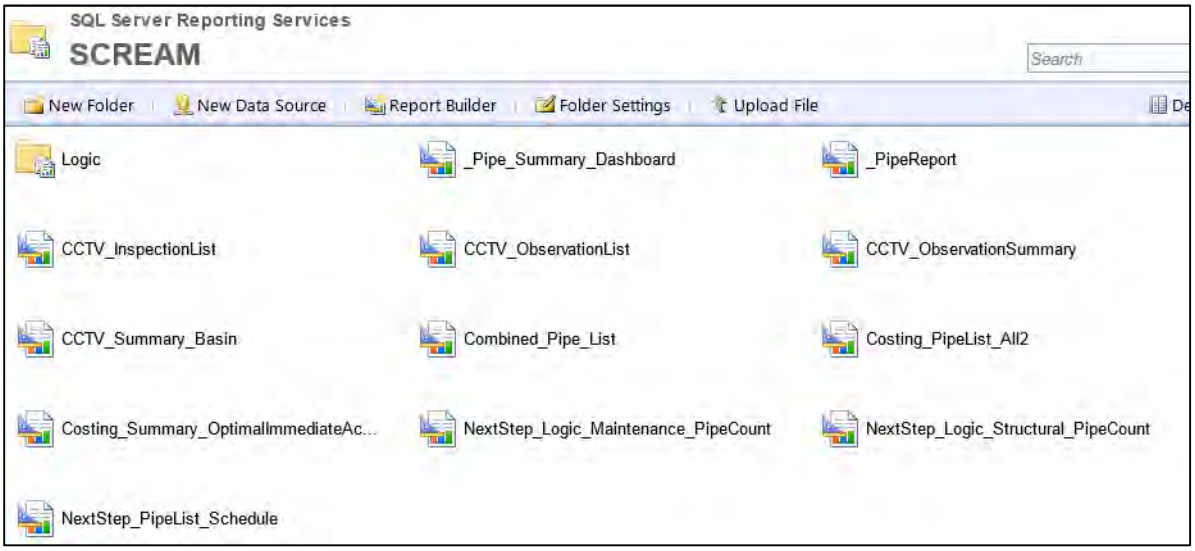
Quick Guide

Following are the steps to access the SD1's web reports:

1. Use the following link to navigate to the reports (only available in SD1's intranet):
    a. http://gis03/Reports/
    b. You should not be prompted for a user name of password, but if you are, use your own network user name and password.
    c. Note when you first enter SQL reports, they may respond slowly. They will respond more quickly in time.
2. The link will take you to the SCREAM reports home page, select the folder: "SCREAM."

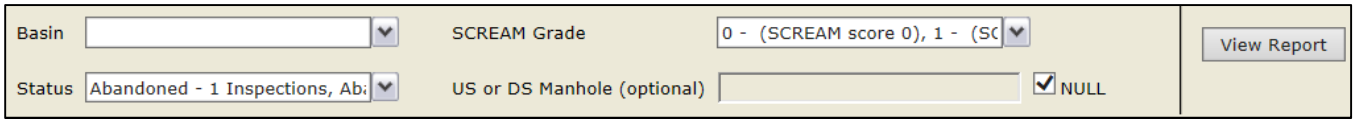


3. In the folder, you will find a listing of each report plus a logic folder which contains reports about the Next Step and Costing Logic



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4. Click on the report you would like to run. If the report requires parameters, or filters, like the CCTV_InspectionList, the report will be empty until you enter the parameters in the Parameter bar and choose "View Report". If you don't want to filter the report, choose "Select All" for each parameter then click "View Report." If you want to see a specific manhole, uncheck the "Null" box and enter a manhole ID.



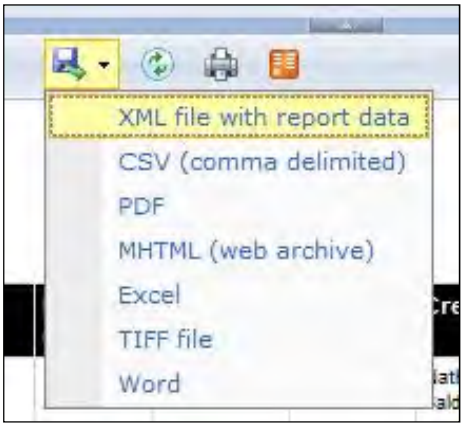
5. The report will run and display results. Note that you can do the following:



   a. Move to other pages of the report using the page navigation buttons
   b. Zoom in or out using the Zoom feature
   c. Search for key words using the search options. When searching by key word, note that sometimes the tool bar will hide the result so you may need to scroll up slightly to find the result.

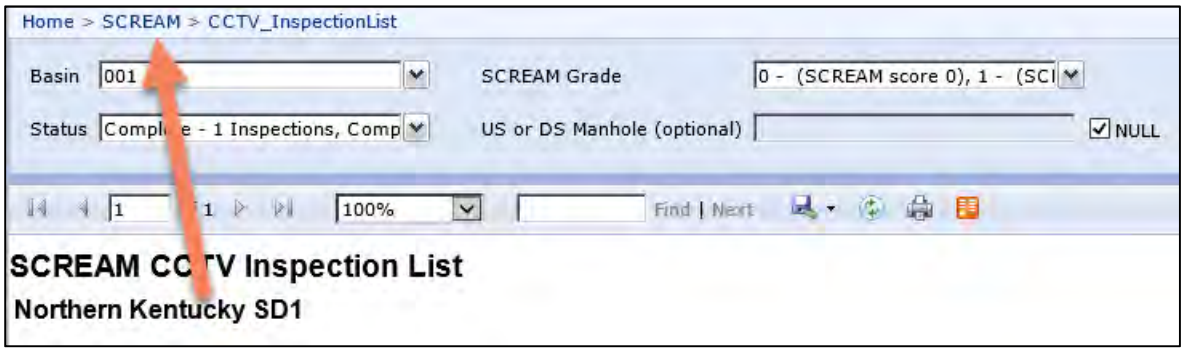
6. The report can be exported into seven different formats including Excel, Word and PDF formats. Note that some reports will export into different formats more smoothly. For example, a spreadsheet type report (like the CCTV Inspection Status list, above) will export into Excel easily, while a graph will be best exported into a pdf format. If one format doesn't suit your needs, try another format.

   After you select a format, click "Export". You will be prompted to either save the report or open it. We recommend saving the export first and then navigating to it to open it. This way you will be sure you have saved a copy.



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7. To navigate back, use the snail trail in the upper right corner of the screen. Choose CCTV to go back to the list of CCTV reports. To navigate back to the SCREAM reports home page, click on the Home link on the upper right corner of the screen.



Options to Avoid

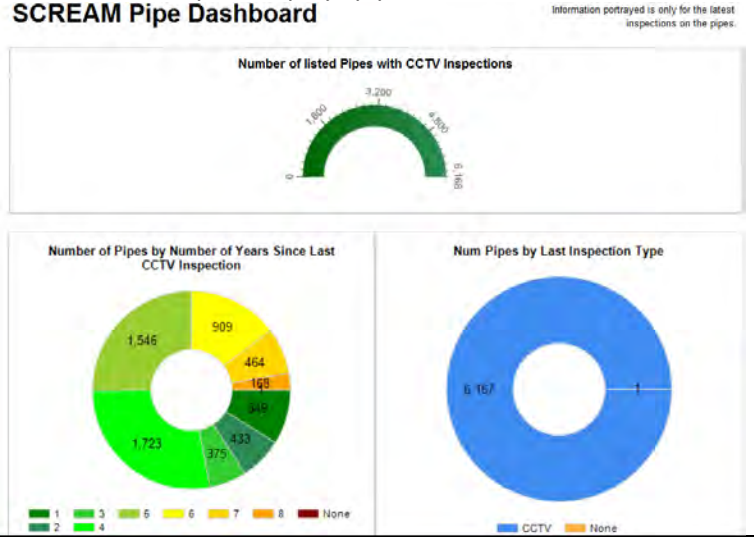
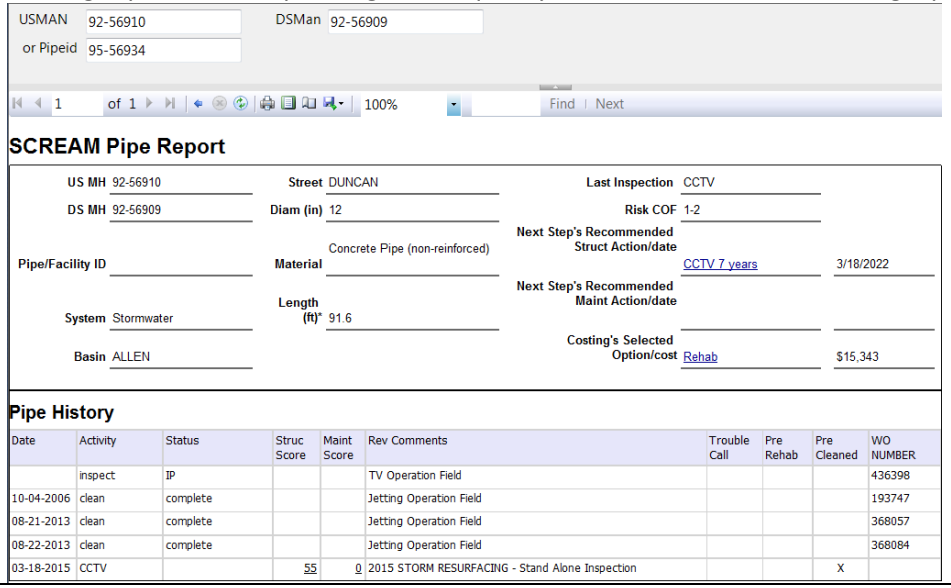
As a SCREAM SQL Web Reports user, you will not need to use the following options:

- "New Data Source" – you will not need this option
- "Upload File" –this feature will upload a file and is not needed

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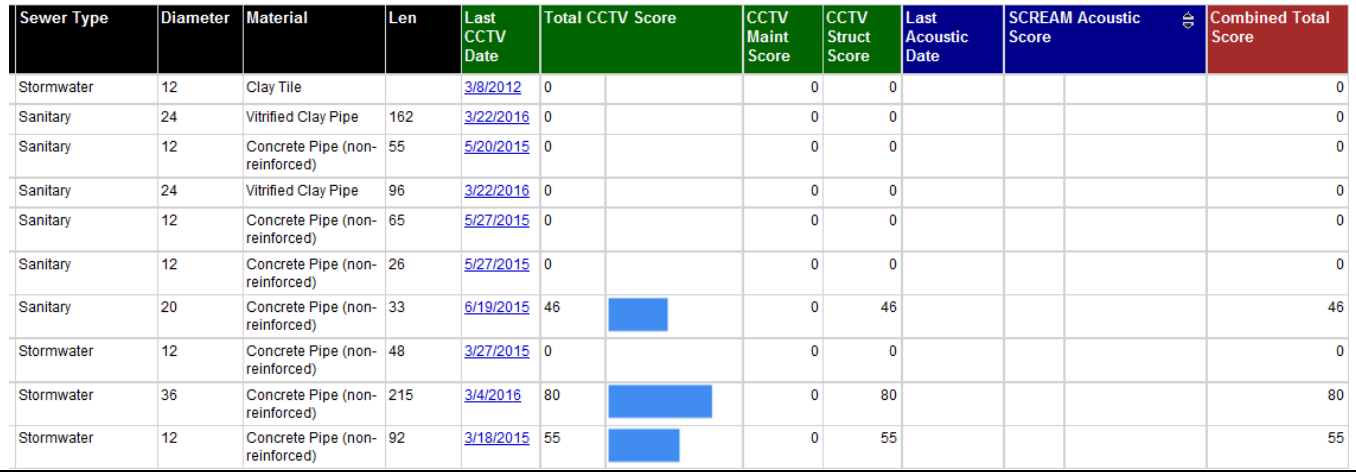
SD1's Overview Reports

At the time of this document, the following overview reports were available in the SCREAM folder.

Name	Definition
_Pipe_Summary_Dashboard	This overview report displays pipe and cctv information in a dashboard style (not all graphs shown below). 
_PipeReport	Displays all the pertinent information associated with a pipe, including links to inspection reports, Next Step reports and Costing reports. This report is great to quickly find information about a single pipe. 

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Name	Definition
Combined_Pipe_List	A list of all the pipes and their associated inspections. Click on a pipeid to see the latest pipe report for that pipe. Click on a date to go to the latest inspection.

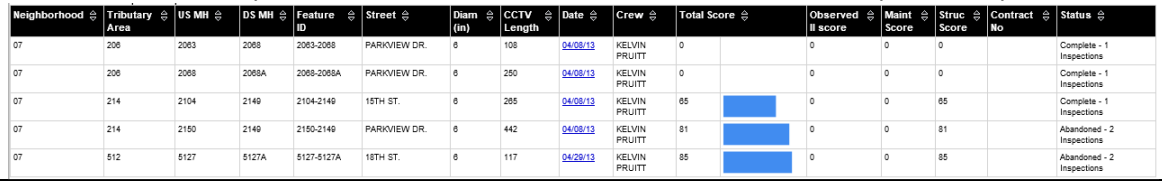


Sewer Type	Diameter	Material	Len	Last CCTV Date	Total CCTV Score	CCTV Maint Score	CCTV Struct Score	Last Acoustic Date	SCREAM Acoustic Score	Combined Total Score
Stormwater	12	Clay Tile		3/8/2012	0	0	0			0
Sanitary	24	Vitrified Clay Pipe	162	3/22/2016	0	0	0			0
Sanitary	12	Concrete Pipe (non-reinforced)	55	5/20/2015	0	0	0			0
Sanitary	24	Vitrified Clay Pipe	96	3/22/2016	0	0	0			0
Sanitary	12	Concrete Pipe (non-reinforced)	65	5/27/2015	0	0	0			0
Sanitary	12	Concrete Pipe (non-reinforced)	26	5/27/2015	0	0	0			0
Sanitary	20	Concrete Pipe (non-reinforced)	33	6/19/2015	46	0	46			46
Stormwater	12	Concrete Pipe (non-reinforced)	48	3/27/2015	0	0	0			0
Stormwater	36	Concrete Pipe (non-reinforced)	215	3/4/2016	80	0	80			80
Stormwater	12	Concrete Pipe (non-reinforced)	92	3/18/2015	55	0	55			55

SD1's CCTV Reports

At the time of this document, the following CCTV reports were available in the SCREAM folder.

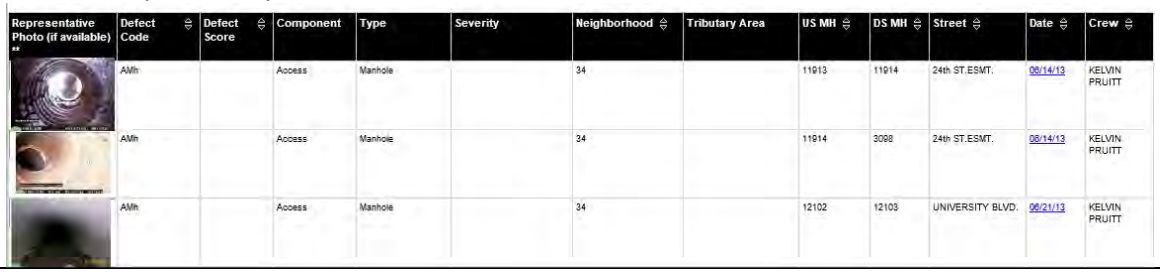
Name	Definition
CCTV_InspectionList	Table of SCREAM inspections and scores. Click on date to see detailed inspection reports.



Neighborhood	Tributary Area	US MH	DS MH	Feature ID	Street	Diam (in)	CCTV Length	Date	Crew	Total Score	Observed II score	Maint Score	Struc Score	Contract No	Status
07	206	2063	2068	2063-2068	PARKVIEW DR.	6	108	04/08/13	KELVIN PRUITT	0	0	0	0		Complete - 1 Inspections
07	206	2068	2068A	2068-2068A	PARKVIEW DR.	6	250	04/08/13	KELVIN PRUITT	0	0	0	0		Complete - 1 Inspections
07	214	2104	2149	2104-2149	15TH ST.	6	265	04/08/13	KELVIN PRUITT	65	0	0	65		Complete - 1 Inspections
07	214	2150	2149	2150-2149	PARKVIEW DR.	6	442	04/08/13	KELVIN PRUITT	81	0	0	81		Abandoned - 2 Inspections
07	512	5127	5127A	5127-5127A	18TH ST.	6	117	04/29/13	KELVIN PRUITT	85	0	0	85		Abandoned - 2 Inspections

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Name	Definition
CCTV_ObservationList	Table and photos of CCTV observations/defects. Photos are only shown when available. Click on date to see detailed inspection reports.

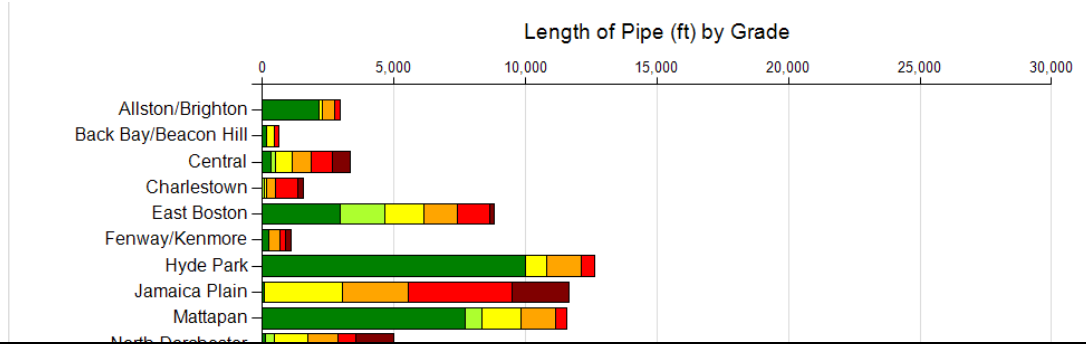


Representative Photo (if available) **	Defect Code	Defect Score	Component	Type	Severity	Neighborhood	Tributary Area	US MH	DS MH	Street	Date	Crew
	AMh		Access	Manhole		34		11913	11914	24th ST.ESMT.	08/14/13	KELVIN PRUITT
	AMh		Access	Manhole		34		11914	3098	24th ST.ESMT.	08/14/13	KELVIN PRUITT
	AMh		Access	Manhole		34		12102	12103	UNIVERSITY BLVD.	06/21/13	KELVIN PRUITT

CCTV_ObservationSummary	Summary table which quantifies defects found on each pipe. The defects are categorized by defect family and type (inventory, structural, maintenance, I/I)

Pipe	SCREAM Total Score	Inventory						
		Information				Inspection Abandoned	Broken pieces	
		Abandoned, Capped (Count)	Flow Level (Count)	Material Changed To (Count)	Tee (Count)	Inspection Abandoned (Count)	Broken, Pieces (Count)	Crack Circumferential (Count)
2150 - 2149	81	1	2	2	1	2	0	1
5127 - 5127A	85	1	2	0	2	2	1	1
Total		2	4	2	3	4	1	2

CCTV_Sumary_Basin	Graph and summary tables of inspections in each basin. This report includes a table at the bottom, which may be more useful if the number of basins is too numerous to show nicely on the graph.



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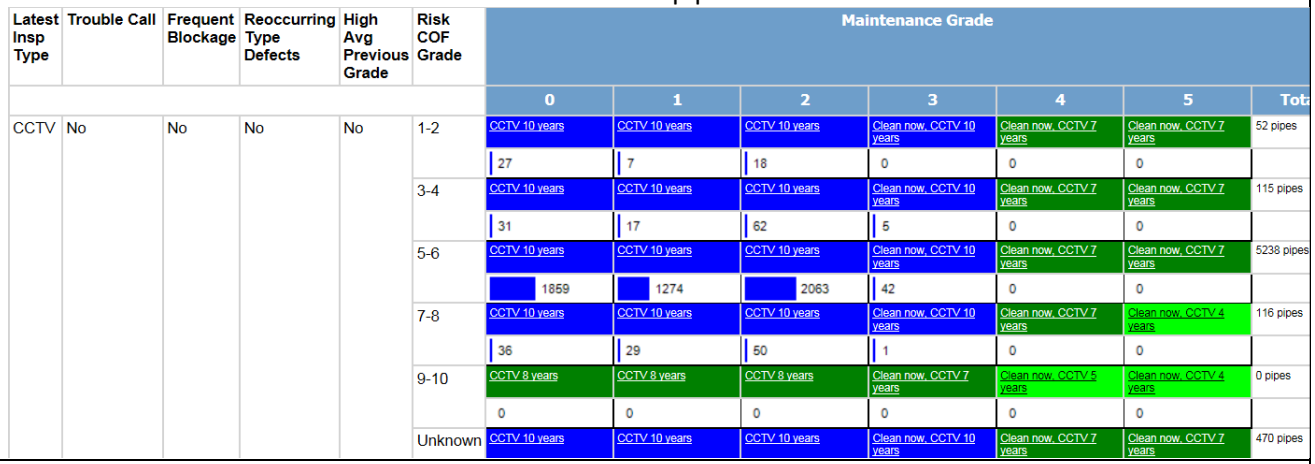
SD1's Next Step and Costing Reports

At the time of this document, the following CCTV reports were available in the SCREAM folder.

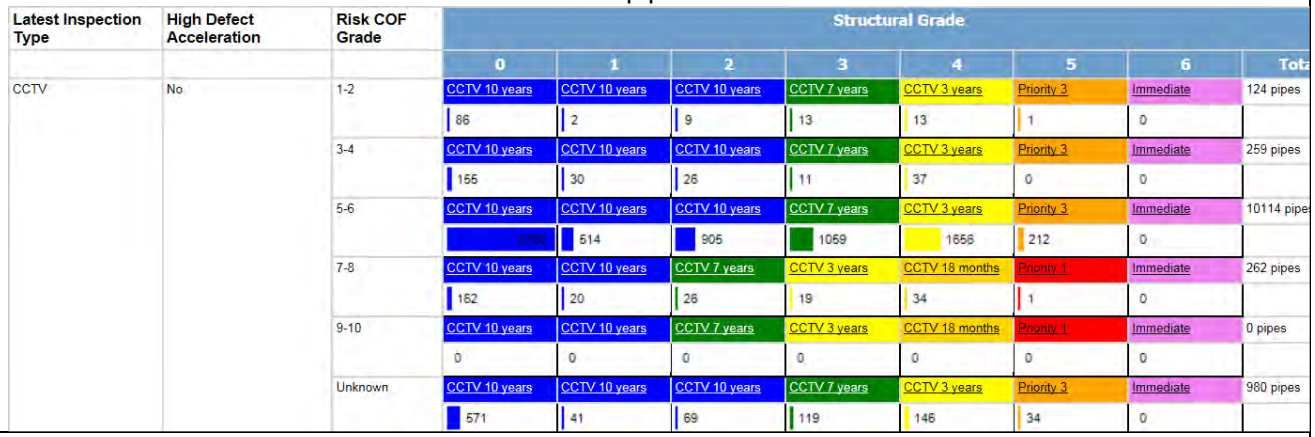
<table>
<tr><th>Name</th><th>Definition</th></tr>
<tr><td>Costing_PipeList_All2</td><td>A list of pipes with their calculated costs and recommendations. Click on the "Process" to see costing details or "Pipe ID" to see Next Step details.
<table>
<tr><th></th><th></th><th></th><th></th><th colspan="3">Corrective Action - Immediate Costs</th><th>Selected</th><th colspan="4">Corrective Action - Lifecycle Costs</th></tr>
<tr><th>Sewer/ Storm</th><th>Pipe ID</th><th>US MAN</th><th>DS MAN</th><th>Replace Cost</th><th>Repair Cost</th><th>Rehab Cost</th><th>Cost Running Sum</th><th>Replace Cost</th><th>Repair Cost</th><th>Rehab Cost</th><th>Maintain Cost</th></tr>
<tr><td>Sewer</td><td>92-54803-92-54804</td><td>92-54803</td><td>92-54804</td><td>$202,593</td><td>$0</td><td>$79,964</td><td>79964.38</td><td>$215,282</td><td></td><td>$92,653</td><td>$7,700</td></tr>
<tr><td>Sewer</td><td>92-54804-92-54862</td><td>92-54804</td><td>92-54862</td><td>$189,409</td><td>$0</td><td>$74,761</td><td>154725.06</td><td>$201,272</td><td></td><td>$86,624</td><td>$7,199</td></tr>
<tr><td>Sewer</td><td>92-54844-92-54862</td><td>92-54844</td><td>92-54862</td><td>$481,935</td><td>$0</td><td>$233,539</td><td>388264.13</td><td>$513,416</td><td></td><td>$265,020</td><td>$17,202</td></tr>
<tr><td>Sewer</td><td>92-54862-92-54861</td><td>92-54862</td><td>92-54861</td><td>$365,234</td><td>$66,750</td><td>$243,737</td><td>455014.13</td><td>$389,092</td><td>$100,557</td><td>$275,924</td><td>$22,736</td></tr>
<tr><td>Sewer</td><td>71-62241-71-62242</td><td>71-62241</td><td>71-62242</td><td>$53,790</td><td>$0</td><td>$29,450</td><td>484463.67</td><td>$56,144</td><td></td><td>$31,803</td><td>$1,548</td></tr>
<tr><td>Sewer</td><td>71-62242-71-63351</td><td>71-62242</td><td>71-63351</td><td>$68,668</td><td>$0</td><td>$37,595</td><td>522058.50</td><td>$71,672</td><td></td><td>$40,600</td><td>$1,976</td></tr>
<tr><td>Sewer</td><td>71-63351-71-63367</td><td>71-63351</td><td>71-63367</td><td>$67,403</td><td>$0</td><td>$36,902</td><td>558960.76</td><td>$70,352</td><td></td><td>$39,852</td><td>$1,940</td></tr>
<tr><td>Sewer</td><td>71-63367-71-63328</td><td>71-63367</td><td>71-63328</td><td>$68,613</td><td>$0</td><td>$37,565</td><td>596525.48</td><td>$71,615</td><td></td><td>$40,567</td><td>$1,974</td></tr>
<tr><td>Sewer</td><td>71-67684-71-67681</td><td>71-67684</td><td>71-67681</td><td>$21,835</td><td>$0</td><td>$11,954</td><td>608479.94</td><td>$22,790</td><td></td><td>$12,910</td><td>$628</td></tr>
<tr><td>Sewer</td><td>71-67685-71-67684</td><td>71-67685</td><td>71-67684</td><td>$73,645</td><td>$0</td><td>$40,320</td><td>648799.91</td><td>$76,868</td><td></td><td>$43,543</td><td>$2,119</td></tr>
<tr><td>Sewer</td><td>71-67686-71-67685</td><td>71-67686</td><td>71-67685</td><td>$15,593</td><td>$0</td><td>$8,537</td><td>657336.66</td><td>$16,275</td><td></td><td>$9,219</td><td>$449</td></tr>
</table>
</td></tr>
<tr><td>Costing_Summary_OptimalImmediateActions_ By Action</td><td>Summary of the selected optimal rehab action for pipes, grouped by the pipes' recommended actions from Next Step. We recommend looking at only the pipes listed as "Select immediate action."
<table>
<tr><th></th><th></th><th></th><th></th><th colspan="4">Costing - Immediate Action</th></tr>
<tr><th>Costing Process</th><th>Next Step Action</th><th>Num Pipes</th><th></th><th>Replace</th><th>Repair</th><th>Rehab</th><th>Optimal Total</th></tr>
<tr><td>Find Permanent Solution</td><td>Permanent Solution or PM List</td><td>32</td><td>COST</td><td>$0</td><td>$82,500</td><td>$907,476</td><td>$989,976</td></tr>
<tr><td></td><td></td><td></td><td>LENGTH</td><td>0</td><td>641</td><td>5,926</td><td>6,567</td></tr>
<tr><td>Select Immediate Action</td><td>Priority 3</td><td>47</td><td>COST</td><td>$318,028</td><td>$546,285</td><td>$50,563</td><td>$914,876</td></tr>
<tr><td></td><td></td><td></td><td>LENGTH</td><td>1,030</td><td>4,251</td><td>302</td><td>5,584</td></tr>
<tr><td></td><td></td><td>79</td><td>Total Cost</td><td>$318,028</td><td>$628,785</td><td>$958,039</td><td>$1,904,852</td></tr>
</table>
</td></tr>
</table>

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Name	Definition
NextStep_Logic_Mainenance_PipeCount	A report of the SCREAM Next Step maintenance logic along with the number of pipes that fell into each of the cells. Click on one of the matrix cells for a list of the pipes included in the count.
NextStep_Logic_Structural_PipeCount	A report of the SCREAM Next Step structural logic along with the number of pipes that fell into each of the cells. Click on one of the matrix cells for a list of the pipes included in the count.

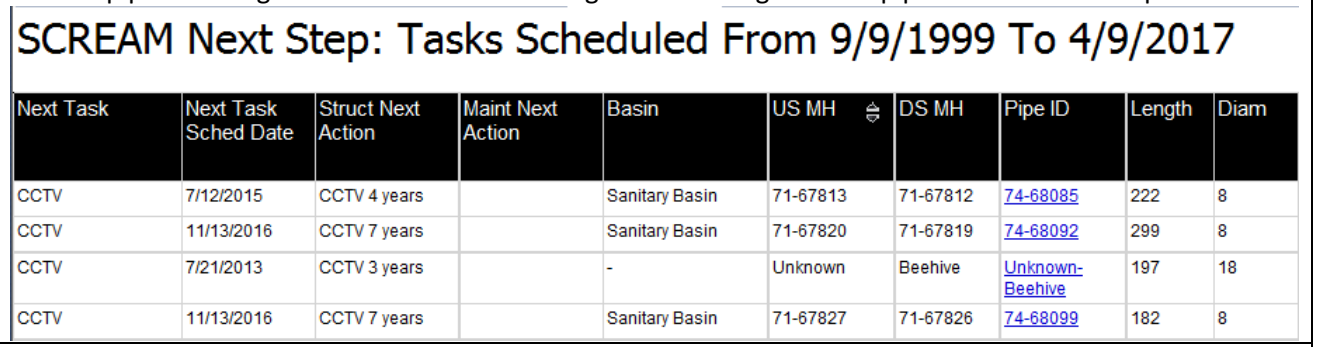
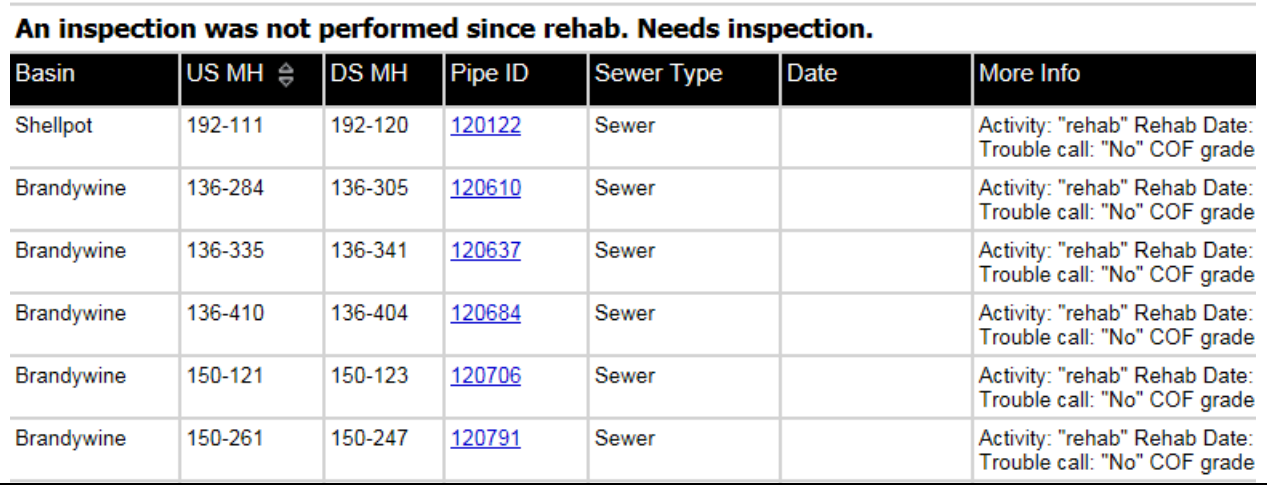


Latest Insp Type	Trouble Call	Frequent Blockage	Reoccurring Type Defects	High Avg Previous Grade	Risk COF Grade	Maintenance Grade						
						0	1	2	3	4	5	Tot
CCTV	No	No	No	No	1-2	CCTV 10 years	CCTV 10 years	CCTV 10 years	Clean now, CCTV 10 years	Clean now, CCTV 7 years	Clean now, CCTV 7 years	52 pipes
						27	7	18	0	0	0	
					3-4	CCTV 10 years	CCTV 10 years	CCTV 10 years	Clean now, CCTV 10 years	Clean now, CCTV 7 years	Clean now, CCTV 7 years	115 pipes
						31	17	62	5	0	0	
					5-6	CCTV 10 years	CCTV 10 years	CCTV 10 years	Clean now, CCTV 10 years	Clean now, CCTV 7 years	Clean now, CCTV 7 years	5238 pipes
						1859	1274	2063	42	0	0	
					7-8	CCTV 10 years	CCTV 10 years	CCTV 10 years	Clean now, CCTV 10 years	Clean now, CCTV 7 years	Clean now, CCTV 4 years	116 pipes
						36	29	50	1	0	0	
					9-10	CCTV 8 years	CCTV 8 years	CCTV 8 years	Clean now, CCTV 7 years	Clean now, CCTV 5 years	Clean now, CCTV 4 years	0 pipes
						0	0	0	0	0	0	
					Unknown	CCTV 10 years	CCTV 10 years	CCTV 10 years	Clean now, CCTV 10 years	Clean now, CCTV 7 years	Clean now, CCTV 7 years	470 pipes



Latest Inspection Type	High Defect Acceleration	Risk COF Grade	Structural Grade							
			0	1	2	3	4	5	6	Tot
CCTV	No	1-2	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	Priority 3	Immediate	124 pipes
			86	2	9	13	13	1	0	
		3-4	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	Priority 3	Immediate	259 pipes
			155	30	26	11	37	0	0	
		5-6	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	Priority 3	Immediate	10114 pipes
			8766	514	905	1059	1656	212	0	
		7-8	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	CCTV 18 months	Priority 1	Immediate	262 pipes
			162	20	26	19	34	1	0	
		9-10	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	CCTV 18 months	Priority 1	Immediate	0 pipes
			0	0	0	0	0	0	0	
		Unknown	CCTV 10 years	CCTV 10 years	CCTV 10 years	CCTV 7 years	CCTV 3 years	Priority 3	Immediate	980 pipes
			571	41	69	119	146	34	0	

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<table>
<tr><th>Name</th><th>Definition</th></tr>
<tr><td>NextStep_PipeList_Schedule</td><td>A list of pipes with a given action scheduled in a given date range. Click a pipeID to see Next Step details.

SCREAM Next Step: Tasks Scheduled From 9/9/1999 To 4/9/2017
<table>
<tr><th>Next Task</th><th>Next Task Sched Date</th><th>Struct Next Action</th><th>Maint Next Action</th><th>Basin</th><th>US MH</th><th>DS MH</th><th>Pipe ID</th><th>Length</th><th>Diam</th></tr>
<tr><td>CCTV</td><td>7/12/2015</td><td>CCTV 4 years</td><td></td><td>Sanitary Basin</td><td>71-67813</td><td>71-67812</td><td>74-68085</td><td>222</td><td>8</td></tr>
<tr><td>CCTV</td><td>11/13/2016</td><td>CCTV 7 years</td><td></td><td>Sanitary Basin</td><td>71-67820</td><td>71-67819</td><td>74-68092</td><td>299</td><td>8</td></tr>
<tr><td>CCTV</td><td>7/21/2013</td><td>CCTV 3 years</td><td></td><td>-</td><td>Unknown</td><td>Beehive</td><td>Unknown-Beehive</td><td>197</td><td>18</td></tr>
<tr><td>CCTV</td><td>11/13/2016</td><td>CCTV 7 years</td><td></td><td>Sanitary Basin</td><td>71-67827</td><td>71-67826</td><td>74-68099</td><td>182</td><td>8</td></tr>
</table></td></tr>
<tr><td>NextStep_QC</td><td>A list of pipes or work orders that do not pass QC tests for SCREAM Next Step. Various QC steps may be listed. For example, a list of pipes that have not had re-inspection since rehabilitation is included.

An inspection was not performed since rehab. Needs inspection.
<table>
<tr><th>Basin</th><th>US MH</th><th>DS MH</th><th>Pipe ID</th><th>Sewer Type</th><th>Date</th><th>More Info</th></tr>
<tr><td>Shellpot</td><td>192-111</td><td>192-120</td><td>120122</td><td>Sewer</td><td></td><td>Activity: "rehab" Rehab Date: Trouble call: "No" COF grade</td></tr>
<tr><td>Brandywine</td><td>136-284</td><td>136-305</td><td>120610</td><td>Sewer</td><td></td><td>Activity: "rehab" Rehab Date: Trouble call: "No" COF grade</td></tr>
<tr><td>Brandywine</td><td>136-335</td><td>136-341</td><td>120637</td><td>Sewer</td><td></td><td>Activity: "rehab" Rehab Date: Trouble call: "No" COF grade</td></tr>
<tr><td>Brandywine</td><td>136-410</td><td>136-404</td><td>120684</td><td>Sewer</td><td></td><td>Activity: "rehab" Rehab Date: Trouble call: "No" COF grade</td></tr>
<tr><td>Brandywine</td><td>150-121</td><td>150-123</td><td>120706</td><td>Sewer</td><td></td><td>Activity: "rehab" Rehab Date: Trouble call: "No" COF grade</td></tr>
<tr><td>Brandywine</td><td>150-261</td><td>150-247</td><td>120791</td><td>Sewer</td><td></td><td>Activity: "rehab" Rehab Date: Trouble call: "No" COF grade</td></tr>
</table></td></tr>
</table>

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SD1's Logic Reports

At the time of this document, the following CCTV reports were available in the SCREAM folder.

<table>
<tr><th>Name</th><th>Definition</th></tr>
<tr><td>Costing_Logic_Assumptions</td><td>Details the assumptions used when Costing is run. Note that these assumptions can be changed in the Admin tool.
SCREAM Costing Assumptions
<table>
<tr><th colspan="2">Lifecycle Costing: Remaining Service Life</th></tr>
<tr><td>Service life after replace (yrs)</td><td>100</td></tr>
<tr><td>Min Service life after rehab (yrs)</td><td>60</td></tr>
</table>
<table>
<tr><th>Optimal Costing Method: Criteria to Ov</th></tr>
<tr><td>Percent of Pipe Trenched ></td></tr>
<tr><td>Number of Work Orders ></td></tr>
</table></td></tr>
<tr><td>Costing_Logic_CostingFactors</td><td>Lists the costing factors applied when costs are estimated. Note that these assumptions can be changed in the Admin tool.
SCREAM Costing Assumptions
<table>
<tr><th colspan="2">Lifecycle Costing: Remaining Service Life</th></tr>
<tr><td>Service life after replace (yrs)</td><td>100</td></tr>
<tr><td>Min Service life after rehab (yrs)</td><td>60</td></tr>
</table>
<table>
<tr><th>Optimal Costing Method: Criteria to Ov</th></tr>
<tr><td>Percent of Pipe Trenched ></td></tr>
<tr><td>Number of Work Orders ></td></tr>
</table></td></tr>
<tr><td>Costing_Logic_CostingMaintTable</td><td>List all the maintenance unit costs for CCTV and cleaning. Note, these costs can be adjusted in the Admin tool.
<table>
<tr><th>Avg Diameter ></th><th>Avg Diameter <=</th><th>Inspection Cost per ft</th><th>Cleaning Cost per ft</th></tr>
<tr><td>-1</td><td>18</td><td>$1.50</td><td>$1.00</td></tr>
<tr><td>18</td><td>36</td><td>$3.80</td><td>$2.00</td></tr>
<tr><td>36</td><td>60</td><td>$3.80</td><td>$10.00</td></tr>
<tr><td>60</td><td>72</td><td>$3.80</td><td>$15.00</td></tr>
<tr><td>72</td><td>200</td><td>$3.80</td><td>$30.00</td></tr>
</table></td></tr>
</table>

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Name	Definition
Costing_Logic_CostingTable	List all the unit costs for all rehab/repair/replace methods. Note, these costs can be adjusted in the Admin tool.

Type	Method	Diameter	Unit Cost for depth 0 To 4	Unit Cost for depth 5 To 10	Unit Cost for depth 11 To 16	Unit Cost for depth 17 To 25	Unit Cost for depth 26+	Cost to Reinstate Lats
Replace	Trench	8	$210.67	$210.67	$232.00	$1,472.00	$1,968.00	$3,287.00
Replace	Trench	10	$213.60	$213.60	$234.40	$1,472.00	$1,968.00	$3,287.00
Replace	Trench	12	$217.33	$217.33	$236.00	$1,472.00	$1,968.00	$3,287.00
Replace	Trench	15	$226.40	$226.40	$249.60	$1,481.60	$1,982.40	$3,287.00
Replace	Trench	18	$232.53	$232.53	$256.80	$1,484.00	$1,988.00	$3,287.00
Replace	Trench	21	$236.53	$236.53	$260.80	$1,488.00	$1,992.00	$3,287.00
Replace	Trench	24	$250.67	$250.67	$276.00	$1,704.00	$2,304.00	$3,287.00

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APPENDIX D:

FY 2017 Industrial Pretreatment Violations Summary Report

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Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00014** **Camco Chemical Co. Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	10/12/2016	Oil & Grease, Hydrocarbon Technical Review Criteria (TRC) Non-Compliance Daily Limit The sample result for the sample collected on 10/12/16 was 397 mg/L while the Daily Limit is 50 mg/L and the TRC Limit is 70 mg/L.	12/28/2016	W	21-Nov-16	Written Notice of Violation (NOV)

Permit: **IND-00019** **Blue Grass Quality Meats**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	12/1/2016	Received an email notification regarding a violation to their permit. This is a follow-up to a phone call notification that was made to the control room. The pH dipped below 5.0 for roughly 15 minutes and then spiked above 11.0 briefly. An explanation detailing the cause of the occurrence and corrective action measures will be sent within 5 business days, as required in the permit.	12/1/2016	V	02-Dec-16	Verbal Notice of Violation (NOV) issued for accidental discharge resulting in pH excursions below 5.0 and above 11.0.

Permit: **IND-00034** **L'Oreal USA Products, Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	4/27/2017	The pH dropped below 5.0 to 4.9 for a total of three minutes.	4/27/2017	V	31-May-17	Verbal Notice of Violation (NOV)

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00036** **Ameripride Linen & Apparel Services**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	8/29/2016	Oil & Grease, Hydrocarbons parameter violation Non-Compliance. The daily limit was exceeded in a sample taken on 8/29/2016. The result was 62.4 mg/L while the daily Limit is 50 mg/L.	11/22/2016	W	21-Oct-16	Written Notice of Violation (NOV)

Permit: **IND-00045** **A.O. Smith Corp., Protective Coating Division**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-E	8/29/2016	Left a voicemail issuing a verbal NOV for the late response to the NOV from 07222016. The response was received on 8/29 while the due date was 8/26.	8/29/2016	V	21-Sep-16	Verbal Notice of Violation (NOV)
NC-P	9/21/2016	Copper, Total parameter violation Non-Compliance The daily limit was exceeded in a sample taken on 9/21/2016. The result was 1.54 mg/L while the daily limit is 1.48 mg/L.	11/22/2016	W	19-Oct-16	Written Notice of Violation (NOV)
NC-P	5/2/2017	Non-Compliance Parameter Violation - Total Selenium Daily Maximum Limit was exceeded. The sample result for the sample collected on 5/2/17 was 0.629 mg/L while the Maximum Daily Limit is 0.572 mg/L.	6/29/2017	W	31-May-17	Written Notice of Violation (NOV)

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00050** **Highway Transport Chemical, LLC**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	7/25/2016	Self Monitoring Oil & Grease, Hydrocarbons TRC Daily Limit was exceeded . The concentration result was 104 mg/L while the concentration daily limit was 50 mg/L.		W	06-Sep-16	Written Notice of Violation (NOV)
NC-P	4/24/2017	Oil & Grease, Hydrocarbons Daily Limit was exceeded. The Result was 69.0 mg/L while the Daily Limit was 50 mg/L. The Violation occurred for Sample 'Self Monitoring' on the Sample Date of '4/24/2017' and for Monitoring Point 'End of Pretreatment'.	4/25/2017			
NC-P	4/26/2017	Oil & Grease, Hydrocarbons TRC Daily Limit was exceeded. The Result was 76.9 mg/L while the Daily Limit was 50 mg/L. The Violation occurred for Sample 'Self Monitoring' on the Sample Date of '4/26/2017' and for Monitoring Point 'End of Pretreatment'.	4/27/2017	V	20-Jun-17	Verbal Notice of Violation (NOV)

Permit: **IND-00054** **Perfetti Van Melle USA**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement	Penalty

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00054** **Perfetti Van Melle USA**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	4/6/2017	Multiple pH violations occurred on 4/6/17 and 4/7/17. There were 11 excursions that were recorded below 5.0 and 1 excursion that was recorded below 6.0 and lasted for 96 minutes for a total of 12 violations.	6/22/2017	W	22-May-17	Written Notice of Violation (NOV)

Permit: **IND-00063** **Ultra Environmental Services, Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	6/15/2017	Oil & Grease, Hydrocarbons Non-Compliance. Daily Limit was exceeded. The Concentration Result was 50.4 mg/L while the Concentration Daily Limit was 50 mg/L. The Violation occurred for Sample "AD09103" on the Sample Date of "6/15/2017 11:18:00 AM" and for Monitoring Point "End of Process".	6/19/2017	V	26-Jun-17	Verbal Notice of Violation (NOV)
NC-P	6/16/2017	Oil & Grease, Hydrocarbons Non-Compliance. Daily Limit was exceeded. The Concentration Result was 59.3 mg/L while the Concentration Daily Limit was 50 mg/L. The Violation occurred for Sample "AD09144" on the Sample Date of "6/16/2017 10:40:00 AM" and for Monitoring Point "End of Process".	6/19/2017	V	26-Jun-17	Verbal Notice of Violation (NOV)

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00064** **Wild Flavors, Inc. (Pacific ave)**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	11/23/2016	ph of 5.33 during annual facility inspection	11/23/2016	V	23-Nov-16	Verbal Notice of Violation (NOV)
NC-P	3/28/2017	IU sent email notification stating that the pH dropped below 5.0 on 3/28/17.	3/28/2017	V	29-Mar-17	Verbal Notice of Violation (NOV)
NC-P	4/7/2017	IU notification sent via email that they had three pH excursions below 6.0 for greater than one hour during the week of 4/7/17.	4/7/2017	V	11-Apr-17	Verbal Notice of Violation (NOV)

Permit: **IND-00076** **Hillshire Brands**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	10/21/2016	Chloride TRC monthly violation on 4th qtr. 2016 self monitoring data. October 2016 Chloride monthly violation was 1970 mg/L the TRC Chloride monthly limit is 1826.4 mg/L A Sample Event violation occurred on 10/21/2016 Sample Event Type: IU Sample - 4th Qtr. 2016 Self Monitoring Sample Name: Self Monitoring Monitoring Point: Sample Shack Event Due Date: 1/20/2016 Event Complete Date: 10/21/2016	2/28/2017	W	03-Feb-17	Written Notice of Violation (NOV)

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00076** **Hillshire Brands**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	11/2/2016	Total Oil & Grease daily TRC violation 324mg/L on SD1 sample data A Sample Event violation occurred on 11/2/2016 12:29:00 PM Sample Event Type: ASAMP - Sample Name: AD00309 Monitoring Point: 2430206 Event Due Date: 11/2/2016 12:29:00 PM Event Complete Date: 11/2/2016 12:29:00 PM	11/3/2016	W	01-Feb-17	Written Notice of Violation (NOV)
SNC-P	1/1/2017	Chloride TRC SNC monthly violation on 4th qtr. 2016 self monitoring data. October 2016 Chloride monthly violation was 1970 mg/L the TRC Chloride monthly limit is 1826.4 mg/L 1 of 3 monthly averages for Chloride was over the TRC limit for the July to December 2016 SNC determination period.	2/28/2017	WF	03-Feb-17	Written Notice of Violation (NOV) and fine.
				P	03-Feb-17	Publish in local newspaper
NC-P	4/28/2017	Oil & Grease, Total Technical Review Criteria (TRC) Non-Compliance. The Concentration Result was 161 mg/L, the effluent limit is 100 mg/L, the TRC effluent limit is 140 mg/L	6/20/2017	W	10-May-17	Written Notice of Violation (NOV)Written Notice of Violation (NOV) and fine.

Permit: **IND-00077** **Iofina Chemical, Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement	Penalty

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00077** **Iofina Chemical, Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	6/6/2017	Chloroform Daily Limit was exceeded. The Result was 0.362 mg/L while the Daily Limit was 0.325 mg/L. The Violation occurred for Sample 'Self Monitoring' on the Sample Date of '6/6/2017' and for Monitoring Point 'TCM pH Neutralization Tank'.	9/22/2017	W	18-Aug-17	Written Notice of Violation (NOV)
NC-P	6/30/2017	Chloroform TRC Non-Compliance. Average Limit was exceeded. The Concentration Result was .1899 mg/L while the Concentration Average Limit was 0.111 mg/L. The Violation occurred for Sample "Jun-17-Avg" on the Sample Date of "6/30/2017" and for Monitoring Point "TCM pH Neutralization Tank".	9/22/2017	W	22-Aug-17	Written Notice of Violation (NOV)
SNC-P	6/30/2017	Chloroform Concentration TRC Significant Non-Compliance. 1 of 2 Concentration Average Results (50.00%) exceeded their allowed limits for report dates 1/1/2017 thru 6/30/2017.	9/22/2017	W	18-Aug-17	Written Notice of Violation (NOV)

Permit: **IND-00079** **Tressa, Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement	Penalty

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00079** **Tressa, Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	11/28/2016	Non-Compliance Parameter Violation - Oil & Grease, Hydrocarbon Daily Maximum Limit was exceeded. The sampling result for the sample collected on 11/28/16 was 53 mg/L while the Daily Maximum Limit is 50 mg/L.	2/1/2017	W	13-Jan-17	Written Notice of Violation (NOV)
NC-P	4/20/2017	Technical Review Criteria (TRC) Non-Compliance Parameter Violation - Oil & Grease, Hydrocarbon The sampling result for the sample collected on 4/20/17 was 80.4 mg/L while the Daily Maximum Limit is 50 mg/L and the TRC Limit is 70 mg/L.	6/27/2017	W	01-Jun-17	Written Notice of Violation (NOV)

Permit: **IND-00085** **Mubea Inc. (8224 Dixie HWY)**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-E	4/21/2017	Incomplete self-monitoring report submitted. Quench Bath self-monitoring data not included with report.	8/17/2017	V	15-Aug-17	Verbal Notice of Violation (NOV)

Permit: **IND-00272** **Kiswel Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement	Penalty

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00272** **Kiswel Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-E	7/21/2016	Non-Compliance Event Violation - Event not completed on time. The 1st Half Semi-Annual Self Monitoring Report was not received by the due date of July 20, 2016.	7/27/2016	W	01-Aug-16	Written Notice of Violation (NOV)
NC-R	7/21/2016	Non-Compliance Reporting Violation - Total Toxic Organics (TTO) or Toxic Organic Management Plan (TOMP) not submitted with 1st Half Semi-Annual Self Monitoring Report. 40 CFR 433.17 requires semi-annual sampling of TTO. In lieu of this requirement, Kiswel may submit an approved TOMP as required by 40 CFR 433.12.	8/11/2016	W	01-Aug-16	Written Notice of Violation (NOV)

Permit: **IND-00411** **Zumbiel Packaging**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	8/2/2016	Copper, total TRC Non-Compliance. The TRC daily limit was exceeded in a sample taken on 8/2/2016. The result was 41.7 mg/L while the daily limit is 1.48 mg/L.	12/15/2016	W	16-Nov-16	Written Notice of Violation (NOV)
NC-P	8/3/2016	Copper, total TRC Non-Compliance. The TRC daily limit was exceeded in a sample taken on 8/3/2016. The result was 56.3 mg/L while the daily limit is 1.48 mg/L.	12/15/2016	W	16-Nov-16	Written Notice of Violation (NOV)

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00411** **Zumbiel Packaging**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	8/4/2016	Copper, total TRC Non-Compliance. The TRC daily limit was exceeded in a sample taken on 8/4/2016. The result was 85.7 mg/L while the daily limit is 1.48 mg/L.	12/15/2016	W	16-Nov-16	Written Notice of Violation (NOV)
NC-P	8/5/2016	Copper, total TRC Non-Compliance. The TRC daily limit was exceeded in a sample taken on 8/5/2016. The result was 86.8 mg/L while the daily limit is 1.48 mg/L.	12/15/2016	W	16-Nov-16	Written Notice of Violation (NOV)
SNC-P	9/30/2016	Copper, total Concentration Chronic Significant Non-Compliance. 4 of 4 Concentration Daily Results (100.00%) exceeded their allowed limits for report dates 4/1/2016 thru 9/30/2016.	2/9/2017	P	10-Mar-17	Publish in local newspaper
				W	09-Feb-17	Written Notice of Violation (NOV)
SNC-P	9/30/2016	Copper, total Concentration TRC Significant Non-Compliance. 4 of 4 Concentration Daily Results (100.00%) exceeded their allowed limits for report dates 4/1/2016 thru 9/30/2016.	2/9/2017	P	10-Mar-17	Publish in local newspaper
				W	09-Feb-17	Written Notice of Violation (NOV)

Permit: **IND-00451** **Angstrom Technologies, Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	9/9/2016	Cyanide Amenable daily TRC		W	09-Sep-16	Written Notice of Violation (NOV)

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00451** **Angstrom Technologies, Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	9/9/2016	Cyanide Total monthly TRC		W	09-Sep-16	Written Notice of Violation (NOV)

Permit: **IND-00606** **US Nonwovens**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-R	7/20/2016	Late reporting for 2nd QTR 2016	8/16/2016	V	16-Aug-16	Verbal Notice of Violation (NOV)
NC-P	8/16/2016	Zinc, total Non-Compliance. The Concentration Result was 4.058 mg/L while the Concentration Daily Limit was 3.5 mg/L. The violation occurred on 8/16/2016 and for monitoring point Building 1 pretreatment tank.	6/23/2017	W	19-May-17	Written Notice of Violation (NOV)
				W	19-May-17	Written Notice of Violation (NOV)
NC-E	10/21/2016	Failure to respond to Notice of Violation detailing multiple Zinc, Total parameter concentration violations occurring in June 2016.	6/23/2017	W	21-May-17	Written Notice of Violation (NOV)
NC-P	10/25/2016	Zinc, total Non-Compliance. The Concentration Result was 3.926 mg/L while the Concentration Daily Limit was 3.5 mg/L. The violation occurred on 10/25/2016 1 and for monitoring point Building 1pretreatment tank	6/23/2017	W	19-May-17	Written Notice of Violation (NOV)

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00606** **US Nonwovens**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
SNC-R	1/21/2017	4th Qtr. 2016 self-monitoring sampling not performed and no report was received. The report was due 1-20-16. Self-monitoring reports over 45 days late are determined to be in Significant Non-Compliance.	6/30/2017	W	21-May-17	Written Notice of Violation (NOV)
				P	30-Jun-17	Publish in local newspaper
NC-O	2/23/2017	Failure to maintain foam retain samples.	2/23/2017	V	23-Feb-17	Verbal Notice of Violation (NOV)
NC-P	3/21/2017	Zinc, total Non-Compliance. The Concentration Result was 4.017 mg/L while the Concentration Daily Limit was 3.5 mg/L. Monitoring Point "Bldg 1 PT".	6/23/2017	WF	21-May-17	Written Notice of Violation (NOV) and fine.
NC-R	4/21/2017	1st Qtr. 2017 self-monitoring report not received. The report was due 4-20-17.	6/23/2017	WF	21-May-17	Written Notice of Violation (NOV) and fine.
NC-P	5/18/2017	Zinc, Total TRC Daily Limit was exceeded. The Result was 10.8 mg/L while the Daily Limit was 3.5 mg/L. The Violation occurred for Sample 'Self Monitoring' on the Sample Date of '5/18/2017' and for Monitoring Point 'Bldg 1 PT'.		WF	22-Aug-17	Written Notice of Violation (NOV) and fine.

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00606** **US Nonwovens**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	6/6/2017	Zinc, Total TRC Daily Limit was exceeded. The Result was 5.23 mg/L while the Daily Limit was 3.5 mg/L. The Violation occurred for Sample 'Self Monitoring' on the Sample Date of '6/6/2017' and for Monitoring Point 'Bldg 1 PT'.		WF	22-Aug-17	Written Notice of Violation (NOV) and fine.

Permit: **IND-00656** **Meggitt, LLC**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-E	4/20/2017	90 Day Compliance sampling report was not received by the due date of 4-1-17.	4/20/2017	V	20-Apr-17	Verbal Notice of Violation (NOV)

Permit: **IND-00957** **Rumpke of Kentucky, Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	6/20/2017	Lead, Total TRC Non-Compliance. The concentration result was 0.151 mg/L, the effluent limit is 0.06 mg/L, the TRC effluent limit is 0.072 mg/L	6/22/2017	W	01-Nov-17	Written Notice of Violation (NOV)
				W	01-Nov-17	Written Notice of Violation (NOV)

Sanitation District # 1
Industrial Pretreatment Program
Violations Summary Report

Filter Criteria:
All Permits
Event Category that Contain Violation
NC Date: Jul 1 2016 - Jun 30 2017

Permit: **IND-00957** **Rumpke of Kentucky, Inc.**

Violation Type	Date of NC	Violation Description	Date In Compliance	Enforcement		Penalty
NC-P	6/20/2017	Zinc, Total TRC Non-Compliance. The concentration result was 9.045 mg/L the effluent limit is 1.15 mg/L, the TRC effluent limit is 1.38 mg/L	6/22/2017	W	01-Nov-17	Written Notice of Violation (NOV)
				W	01-Nov-17	Written Notice of Violation (NOV)
NC-P	6/21/2017	Copper, Total Technical Review Criteria (TRC) Non-Compliance. The concentration result was 2.546 mg/L, the effluent limit is 0.58 mg/L, the TRC effluent limit is 0.696 mg/L	6/22/2017	W	01-Nov-17	Written Notice of Violation (NOV)
NC-P	6/21/2017	Lead, Total TRC Non-Compliance The Concentration Result was 0.309 mg/L the effluent limit is 0.06 mg/L, the TRC effluent limit is 0.072 mg/L	6/22/2017	W	01-Nov-17	Written Notice of Violation (NOV)
				W	01-Nov-17	Written Notice of Violation (NOV)
NC-P	6/21/2017	Zinc, Total TRC Non-Compliance. The concentration result was 14.182 mg/L the effluent limit is 1.15 mg/L, the TRC effluent limit is 1.38 mg/L	6/22/2017	W	01-Nov-17	Written Notice of Violation (NOV)
				W	01-Nov-17	Written Notice of Violation (NOV)

APPENDIX E:

FY 2017 Water Quality Reports

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BASELINE CHARACTERIZATION
SAMPLING SURVEY REPORT
2016
FOR NORTHERN KENTUCKY WATERSHEDS



Northern Kentucky Sanitation District No.1
1045 Eaton Drive
Fort Wright, KY 41017

2016

TABLE OF CONTENTS

List of Tables 1
List of Figures 1
1. Introduction 2
2. Summary of Field Activities 4
2.1 In-Stream Water Quality Measurements 5
2.2 Grab Samples 5
2.3 QA/QC Samples 5
3. Results 6
3.1 In-Stream Water Quality Measurements 8
3.2 Grab Samples 8
3.3 QA/QC Samples 8
Appendix A 9
Equipment Calibration Sheets 9
Appendix B 10
2016 Base Flow Field Data Sheets 10
Appendix C 11
Chain of Custody Forms 11

List of Tables

Table 1. East Basin Sampling locations 3
Table 2. Summary of Baseline Parameters and Number of Samples. 5
Table 3. In- stream water quality measurements for 2016 sampling sites 7

List of Figures

Figure 1. Baseline Characterization Survey Sampling Locations 4

1. Introduction

Sanitation District No. 1 (SD1), a clean water agency that serves over 30 communities in Campbell, Kenton, and Boone Counties, Kentucky, as both the wastewater and storm water utility, is implementing a watershed management approach to cost-effectively meet numerous regulatory requirements (e.g., Combined Sewer Overflow (CSO) Program and Municipal Separate Storm Sewer System (MS4) Program). Additionally, SD1 has entered into a Consent Decree (CD) with state and federal environmental regulators to address sewer overflows in these communities. In complying with these regulatory requirements, SD1 is applying an adaptive approach for identifying impairments and prioritizing areas for action. This approach will help ensure that available resources are most effectively used. SD1 has developed an Adaptive Watershed Management Plan that includes Watershed Characterization in sixteen sub watersheds to relate in-stream conditions to watershed characteristics. The results of this Watershed Characterization will be used to identify impaired watersheds and prioritize them for consideration of control alternatives.

SD1 initiated a comprehensive monitoring program in 2006 to inform the watershed characterization and included collection of in-stream water quality, aquatic habitat, fish, and macroinvertebrate data. The baseline characterizations of Northern Kentucky Watersheds include a field sampling program to support these assessments. A Field Monitoring and Sampling Plan (FMSP) was developed along with a Quality Assurance Program Plan (QAPP), which together describe the water quality monitoring activities to be completed. The FMSP includes Standard Operating Procedures (SOPs) for water quality sampling and instrumentation.

As described in the FMSP, the East Basin was sampled once during the contact recreation season (May-October), which was conducted during dry weather conditions (minimum 72 hour period of no precipitation). The sampling event included grab sample collection and in-stream water quality measurements at each of the 17 identified sampling sites throughout Northern Kentucky (Table 1). Laboratory analysis of grab samples was performed by SD1's Dry Creek Laboratory.

The East Basin survey area is located in Campbell County (Figure 1). Sampling was conducted in the East Study Basin on June 28-29, 2016. This report contains the results of the activities associated with the 2016 sampling event. Unless otherwise noted, all activities associated with this sampling event followed procedures described in the FMSP, QAPP and associated SOPs.

Table 1. East Basin Sampling Locations

Station ID	Stream	Location	Study Basin
FMC0.5	Fourmile	Silver Grove Pump Station off Rt 8	East
FMC6.9	Fourmile	USGS Gage Station on Poplar Ridge Rd	East
FMC8.2	Fourmile	Off 547, bridge on Appleblossom Ln	East
OWC0.4	Owl	Rt 547 to Owl Creek Road	East
TUC0.4	Tug	Bridge on Darlington Road	East
TEC1.3	Tenmile	Intersection of Ten Mile and Fender Rd	East
TIC0.2	Threemile	Upstream of Highland Heights PS on Blangey Rd	East
TYC0.6	Taylor	USGS Station on Donnermeyer Dr under I-471	East
TYC1.6-UNT0.4	Taylor	Alexandria Pike in Southgate, KY	East
TYC0.9-WLC1.3	Woodlawn	Waterworks Road	East
TYC0.7-CVR0.2	Covert Run	Across from Ben Flora Gym on Tiger Lane	East
TMC1.9	Twelvemile	Bridge @ intersection of 1566 & 2921	East
TMC3.0	Twelvemile	USGS Gage Station on 1997	East
TMC3.9	Twelvemile	Bridge on Route 10	East
TMC9.3	Twelvemile	Intersection of Route 10 and California Cross Rds	East
BRC0.3	Brush	Bridge on Route 10	East
BRC2.0	Brush	Eastern Regional Water Reclamation Facility	East

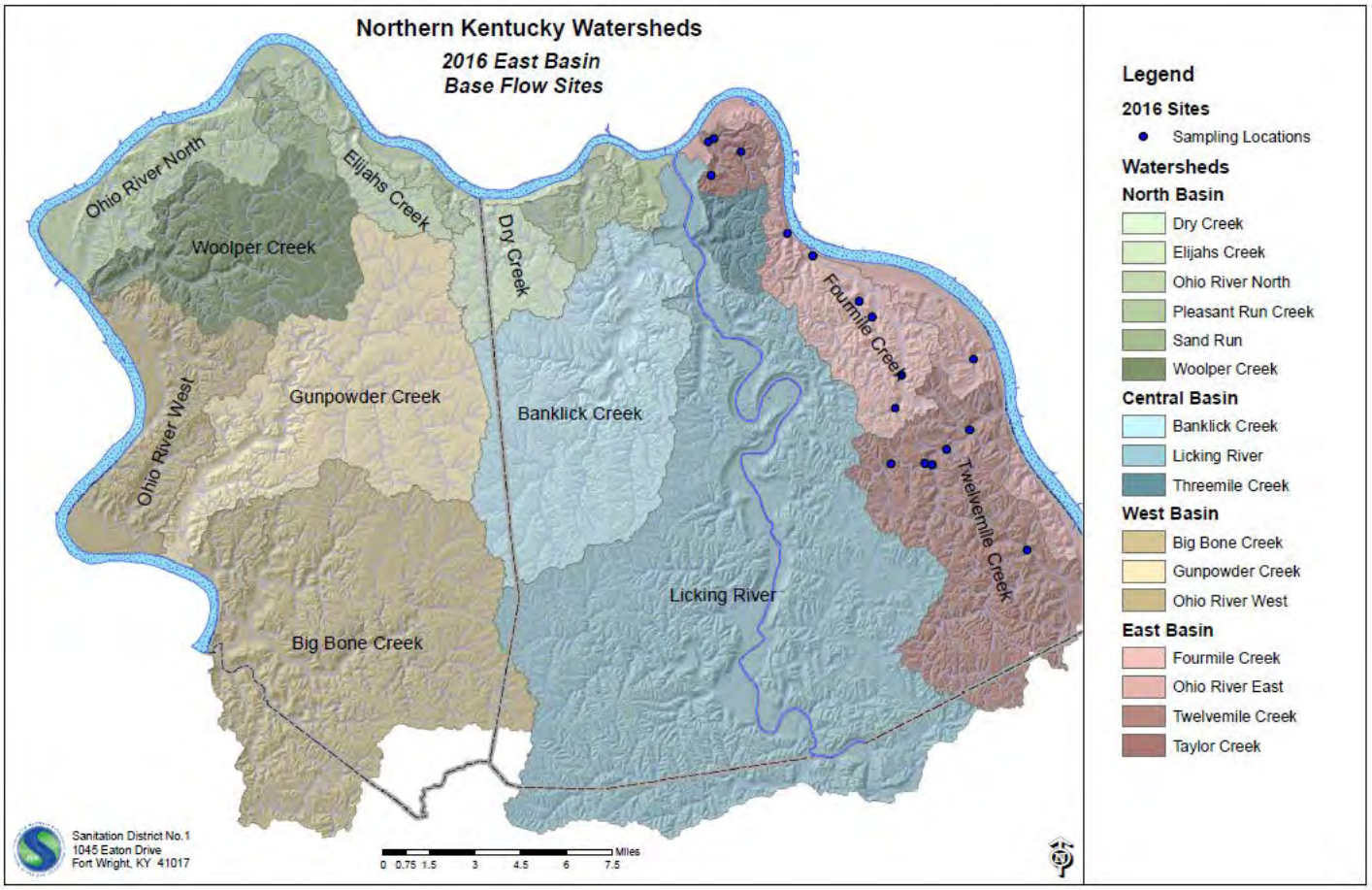


Figure 1. Baseline Characterization Survey Sampling Locations

2. Summary of Field Activities

Samples were collected from the East Study Basin on June 28-29, 2016. Review of USGS rainfall data indicate the last rainfall event prior to sampling occurred on June 23, satisfying the 72 hour criteria absence of rainfall criteria. Observations by field crews were also indicative of dry weather conditions during each sampling occurrence.

One field crew (2-3 persons) was used to perform the sampling involved within the study basin. At each site, the required grab samples were collected, and all in-stream water quality measurements were completed. Due to the logistics required during the sampling, each study basin generally required two days of sampling.

2.1 In-Stream Water Quality Measurements

In-stream water quality measurements for pH, conductivity, temperature, turbidity, and dissolved oxygen were conducted at each sample location. Each crew utilized a Hydrolab Datasonde 5 to collect these parameters as described in the *Hydrolab Series 5 Water Quality Instrumentation SOP*. Calibration sheets pertinent to each instrument and survey are provided in Appendix A.

2.2 Grab Samples

Grab samples were collected at all of the 17 sample locations. Table 3 presents a summary of the parameters that were analyzed at each location. In most cases, sample containers were filled directly from the stream. In all other cases, samples were collected by either filling a one liter bottle attached to a sampling pole, or utilizing a stainless steel bucket. In both cases, samples were collected by pouring water from the bottle or bucket into an appropriate sample container. When possible, samples were collected from the mid-channel portion of each stream.

Orthophosphate samples were filtered in the field utilizing disposable 60 ml syringes with 0.45 micron nylon filters.

Table 2. Summary of Baseline Parameters and Number of Samples

Parameter	No. of Sites	No. of Samples per Site	Total No. of Events per Year	Total No. of Samples	Type of Sample
Bacteria *E. coli*	17	1	1	17	Grab
Nutrients NO_3-NO_2, NH_3, TKN, TP, o-PO_4 (field filtered)	17	1	1	17	Grab
Total Suspended Solids	17	1	1	17	Grab
$CBOD_5$	17	1	1	17	Grab

2.3 QA/QC Samples

Three types of QA/QC samples were collected in the field to assist in validating sampling results: sample duplicates, method blanks and field blanks.

One duplicate set of samples was collected during the surveys. The purpose of the duplicate was to evaluate sample collection and analysis precision by comparing the duplicate analytical results.

Method blanks (MB) were collected for laboratory analysis for orthophosphate only. The purpose of these blanks were to assess potential cross-contamination of samples by the method in which the sample was collected. These blanks were taken at the conclusion of each sampling shift by each crew and were collected in the field by filtering DI water into the sample container.

Field blanks were collected for laboratory analysis for all parameters sampled. The purpose of the field blanks were to determine if collected samples were contaminated by field handling. These blanks were taken at the conclusion of each sampling shift by each crew and were collected in the field by directly filling each sample container with DI water. No intermediate containers or equipment was used during this process.

3. Results

Table 3 summarizes the in-stream water quality measurements and the laboratory analysis results of the grab samples for each parameter. The in-stream water quality measurement completeness was 100%. The laboratory analysis completeness was 100%.

Flow measurements were also taken at sites where flow could be measured. These results are also included in table 3. Calibration sheets are included in Appendix A, field data sheets are included in Appendix B; Chain of Custody records are included in Appendix C.

Table 3
In-stream Water Quality Measurements
East Basin 2016

						Field Readings							Analytical Results							
													Bacteria	Nutrients					Solids	Other
Site ID	Sample Type	Lab ID	Basin	Date	Time	Temp	pH	D.O.	Sp. Cond.	Turbidity	Depth	Flow	*E. coli*	Nitrate-Nitrite as N	Total Phosphorous	TKN	NH_3 as N	Orthophosphate	TSS	$CBOD_5$
					24- HR	(C)		(mg/L)	(µS/cm)	(NTU)	(ft)	(CFS)	CFU/100ml	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
													1	0.01	0.045	0.153	0.038	0.009	1.2	<2
TMC9.3	G		East	6/28/2016	9:35	23.7	7.59	3.43	416	20.8	Surface	0.04	688	0.41	0.166	0.974	0.122	0.056	9	2
TMC1.9	G		East	6/28/2016	10:05	24.3	7.99	7.45	944	19.7	Surface	0.15	176	1.08	0.156	1.06	<0.038	0.051	12	<2
TEC1.3	G		East	6/28/2016	10:25	21.8	8.01	6.84	675	64.6	Surface	0.01	740	0.17	0.130	0.57	<0.038	0.043	7	<2
TMC3.0	G		East	6/28/2016	10:50	25.3	8.15	7.24	915	26.2	Surface	0.05	408	3.00	0.162	1.21	0.045	0.067	12	<2
TMC3.9	G		East	6/28/2016	11:15	24.0	7.91	6.01	370	37.2	Surface	0.04	216	0.20	0.152	0.985	<0.038	0.032	3	<2
DUP													328	0.21	0.155	0.819	<0.038	0.034	8	2
RPD													**41**	**3**	**NA**	**18**	**NA**	**NA**	**91**	**NA**
BRC0.3	G		East	6/28/2016	11:35	24.3	8.12	9.22	1709	19.1	Surface	0.91	496	0.12	0.179	0.115	<0.038	0.109	11	<2
BRC2.0	G		East	6/28/2016	12:35	26.1	8.11	9.64	788	16	Surface	0.04	408	11.90	0.129	0.633	<0.038	0.025	11	<2
FMC8.2	G		East	6/28/2016	13:00	25.0	8.12	8.86	793	27	Surface	0.15	588	0.19	0.170	0.631	<0.038	0.1	8	<2
FMC6.9	G		East	6/28/2016	13:15	22.7	7.79	4.41	718	24.5	Surface	0.29	608	0.17	0.194	0.813	<0.038	0.114	18	2
TUC0.4	G		East	6/28/2016	13:30	24.0	7.97	8.05	815	27.5	Surface	0.01	1040	0.18	0.152	0.961	<0.038	0.035	14	3
OWC0.4	G		East	6/28/2016	13:55	25.7	8.13	9.31	877	30.1	Surface	0.07	364	0.55	0.165	0.791	<0.038	0.063	32	<2
FMC0.5	G		East	6/29/2016	8:35	23.0	7.60	2.54	477	7.7	Surface	backwater	324	0.40	0.141	0.889	0.1	0.043	15	<2
TIC0.2	G		East	6/29/2016	8:55	19.7	8.15	9.53	869	0	Surface	0.03	48	0.13	0.092	0.415	<0.038	0.038	<1.2	<2
TYC0.6	G		East	6/29/2016	9:35	19.2	8.09	7.54	1136	15.1	Surface	0.22	2316	0.68	0.115	0.674	<0.038	0.082	2	<2
TYC0.7-CVR0.2	G		East	6/29/2016	9:55	19.0	8.08	8.25	1042	2.1	Surface	0.01	5480	0.55	0.133	0.712	<0.038	0.049	<1.2	<2
TYC0.9-WLC1.3	G		East	6/29/2016	10:20	19.4	8.13	8.89	1036	12.3	Surface	0.14	1040	1.28	0.134	0.641	<0.038	0.112	6	<2
TYC1.6-UNT0.4	G		East	6/29/2016	10:55	19.3	8.14	8.9	1746	0	Surface	0	2316	1.59	0.107	0.479	<0.038	0.07	<1.2	<2
FB			East	6/28/2016	14:05								<1	<0.010	0.093	0.21	<0.038	<0.009	<1.2	<2
MB			East	6/28/2016	14:10													<0.009		
FB			East	6/29/2016	11:05								<1	<0.010	<0.045	0.242	<0.038	<0.009	<1.2	<2
MB			East	6/29/2016	11:10													<0.009		

3.1 In-Stream Water Quality Measurements

Generally, in-stream water quality measurements fell within expected ranges with the exception of a couple of dissolved oxygen readings. Dissolved oxygen ranged from 2.54 mg/L to 9.64 mg/L, pH ranged from 7.59 to 8.15, temperature ranged from 19.0°C to 26.1°C, conductivity ranged from 370 µs/cm to 1,746 µs/cm and turbidity ranged from 0 to 64.6 NTU (Table 3).

3.2 Grab Samples

Grab samples were collected at all of the 17 sites in order to quantify *E. coli*, nitrate-nitrite, total phosphorus, Total Kjeldahl Nitrogen (TKN), ammonia, orthophosphate, total suspended solids (TSS), and carbonaceous biological oxygen demand ($CBOD_5$) as listed in Table 3.

Across the East Basin, *E. coli* values ranged from 48 CFU/100ml to 5,480 CFU/100ml. Nitrate-nitrite values ranged from 0.12 mg/l to 11.90 mg/l. Total phosphorus values ranged from 0.092 mg/l to 0.194 mg/l. TKN values ranged from 0.115 mg/l to 1.21 mg/l. Ammonia values ranged from <0.038 mg/l to 0.122 mg/l. Orthophosphate values ranged from 0.025 mg/l to 0.114 mg/l. TSS values ranged from <1.2 mg/l to 32 mg/l. $CBOD_5$ values ranged from <2 mg/l to 3 mg/l.

For all samples, the TKN values exceeded ammonia as nitrogen and the total phosphorus values exceeded orthophosphate values.

3.3 QA/QC Samples

For each duplicate parameter analyzed, the relative percent difference (RPD) was calculated and can be located in table 3. The RPD for *E.coli* is 100%, for $CBOD_5$ 40% and for the nutrients and sediment 30%.

The RPD objectives during the East Basin sampling were met for the duplicate samples.

There were two method blanks and two field blanks collected throughout the East Basin. Equipment blanks were not collected as a result of not using any equipment to collect the samples (stainless steel bucket). All laboratory analysis of the blanks resulted in less than the detection limit of that parameter except for total phosphorus and TKN. These results were discussed with the laboratory via email. Since these results are in the “noisy” area of the calibration curve for both analysis even after being rerun, it was decided to flag these results.

Appendix A

Equipment Calibration Sheets

Appendix B

2016 Base Flow Field Data Sheets

Appendix C

Chain of Custody Forms

SANITATION DISTRICT NO.1 OF NORTHERN KENTUCKY
1045 Eaton Drive
Fort Wright, KY 41017
Phone: (859)578-7460 Fax: (859)331-2436

Chain Of Custody Record

Project Name	Watershed	Survey Location
Base Flow	East Basin	Base Flow 2016 East Basin

Contact Person	Sampler(s) Signature	Survey Type (Circle One)
Mindy Scott	MScott	Wet or (Dry)

	Lab ID	Sample ID Code	Date	Time	Composite / Grab	Pole / Bucket / Glove	Sample Location	No. of Containers	Analysis Required: E. coli	TSS	CBOD5	TP, N-N, TKN, NH3	Orthophosphate					Remarks
1	AC94849	~~BRC0.3~~ BRC2.0	6/28/16	1235	G	Gr	Bridge on Route 10 - Brush Creek	5	X	X	X	X	X					Cooler 5
2	850	~~BRC2.0~~ BRC3.3		1135	G	Gr	Eastern Regional Water Reclamation Facility	5	X	X	X	X	X					Cooler 2
3	851	TMC1.9		1005	G	Gr	Bridge on Wasington Trace Rd	5	X	X	X	X	X					Cooler 3
4	852	TMC3.0		1050	G	Gr	USGS Gauge Station on 1997	5	X	X	X	X	X					Cooler 3
5	853	TMC3.9		1115	Gr	Gr	Bridge on Rt 10	5	X	X	X	X	X					Cooler 2
6	854	TMC9.3		935	Gr	Gr	Intersection of Rt 10 and California Cross Rd	5	X	X	X	X	X					Cooler 3
	~~855~~ PEH																	
	~~856~~ PEH																	
7	855	FB	6/28/16	1405	Gr	—	Field Blank	5	X	X	X	X	X					Cooler 4
8	856	DUP 1 East	6/28/16	—	G	Gr	Duplicate sample	5	X	X	X	X	X					Cooler 2
9	857	MB	6/28/16	1410	Gr	—	Method Blank	1					X					Cooler 4

Relinquished By: Sampler	Date	Time	Accepted By: Lab Runner	Date	Time	Remarks
MScott	6/28/16	1450				
Relinquished By: Lab Runner	**Date**	**Time**	**Received By: Laboratory**	**Date**	**Time**	**Remarks**
			pch	6/28/16	1459	

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Chain Of Custody Record

Project Name	Watershed	Survey Location
Base Flow	East Basin	Base Flow 2016 East Basin

Contact Person	Sampler(s) Signature	Survey Type (Circle One)
Mindy Scott	M Scott	Wet or (Dry)

Lab ID	Sample ID Code	Date	Time	Composite / Grab	Pole / Bucket / Glove	Sample Location	No. of Containers	Analysis Required: E. coli	TSS	CBOD5	TP, N-N, TKN, NH3	Orthophosphate					Remarks
AC94858(10)	TEC1.3	6/28/16	1025	G	G	Intersection of Ten Mile and Fender Rd	5	X	X	X	X	X					Cooler 3
	~~TIC0.2~~			G		~~Upstream of Highland Heights PS~~	5	X	X	X	X	X					
	~~FMC0.5~~			G		~~Silver Grove Pump Station~~	5	X	X	X	X	X					
859(11)	OWC0.4	6/28/16	1355	G	G	RT 547 to Owl Creek Rd	5	X	X	X	X	X					
860(12)	TUC0.4	6/28/16	1330	G	G	Bridge on Darlington Rd	5	X	X	X	X	X					Cooler 4
861(13)	FMC6.9	6/28/16	1315	G	G	USGS Gauge Station	5	X	X	X	X	X					
862(14)	FMC8.2	6/28/16	1300	G	G	Appleblossom Lane off RT 547	5	X	X	X	X	X					Cooler 5

Relinquished By: Sampler	Date	Time	Accepted By: Lab Runner	Date	Time	Remarks
M Scott	6/28/16	1450				
Relinquished By: Lab Runner	**Date**	**Time**	**Received By: Laboratory**	**Date**	**Time**	**Remarks**
			pch	6/28/16	1459	

SANITATION DISTRICT NO.1 OF NORTHERN KENTUCKY
1045 Eaton Drive
Fort Wright, KY 41017
Phone: (859)578-7460 Fax: (859)331-2436

Chain Of Custody Record

Project Name	Watershed	Survey Location
Base Flow	East Basin	Base Flow 2016 East Basin

Contact Person	Sampler(s) Signature	Survey Type (Circle One)
Mindy Scott	M Scott	Wet or Dry

	Lab ID	Sample ID Code	Date	Time	Composite / Grab	Pole / Bucket / Glove	Sample Location	No. of Containers	Analysis Required: E. coli	TSS	CBOD5	TP, N-N, TKN, NH3	Orthophosphate					Remarks
15	AC94905	TYC0.6	6/29/16	935	G	G	USGS Station on Donnermyer Drive	5	X	X	X	X	X					Cooler 5
16	906	TYC0.7-CVR0.2		955	G	G	Across from Ben Flora Gym on Tigers Ln	5	X	X	X	X	X					
17	907	TYC1.6-UNT0.4		1055	G	G	Grand Ave off Memorial Pkwy	5	X	X	X	X	X					Cooler 3
18	908	TYC0.9-WLC1.3		1020	G	G	Waterworks Road	5	X	X	X	X	X					
19	909	FMC0.5		835	G	G	Silver Grove Pump	5	X	X	X	X	X					Cooler 5
20	910	TIC0.2		855	G	G	Upstream Highland Heights	5	X	X	X	X	X					
21	AC94911	FB	6/29/16	1105	—	—	Field Blank	5	X	X	X	X	X					Cooler 3
22	912	MB	6/29/16	1110	—	—	Method Blank	1					X					

Relinquished By: Sampler	Date	Time	Accepted By: Lab Runner	Date	Time	Remarks
M Scott	6/29/16	1130				
Relinquished By: Lab Runner	**Date**	**Time**	**Received By: Laboratory**	**Date**	**Time**	**Remarks**
			Crystal Lamb	6/29/16	11:40	

BIOLOGICAL AND HABITAT SURVEY RESULTS

FOR WATERSHEDS IN NORTHERN KENTUCKY

May – October 2016

Sanitation District No. 1 of Northern Kentucky
1045 Eaton Drive
Fort Wright, KY 41017

March 2017

Table of Contents

1.0 Background 4
2.0 Study Area 4
3.0 Site Selection 5
4.0 Methods 6
4.1 Habitat 6
4.2 Macroinvertebrates 7
5.0 Results 7
5.1.0 Survey Sites 7
5.1.1 Habitat Assessment 7
5.1.2 Macroinvertebrate Assessment 9
5.1.3 Fish Assessments 11
5.2.0 Least impacted sites (Least Disturbed) 12
5.2.1 Habitat Assessment 12
5.2.2 Macroinvertebrate Assessment 13
6.0 Comparison of Phase I to Phase II Surveys 15
6.1.0 Survey Sites 15
6.1.1. Habitat Assessment – 2016 vs. Previous Years 15
6.1.2. Macroinvertebrate Assessment – 2016 vs. Previous Years 17
6.2.0 Least impacted sites 21
6.2.1 Habitat Assessment – 2016 vs. Previous Years 21
6.2.2. Macroinvertebrate Assessment – 2016 vs. Previous Years 21
7.0 Conclusions 23
8.0 References 24

List of Tables

Table 1. Use support scoring for headwater and wadeable streams. 6
Table 2. Kentucky macroinvertebrate metric and index scores for 2016 sampling sites. 11
Table 3. Kentucky macroinvertebrate metric and index scores for 2016 least impacted sites. 15

List of Figures

Figure 1. 2016 Survey Sites. 5
Figure 2. MBI scale with categories. 7
Figure 3. Habitat Assessment scores (headwater- blue; wadeable - orange; red line minimum score for fully supporting) for 2016 sampling sites. 8
Figure 4. Top 5 abundant species for 2016 sampling sites. 9
Figure 5. Taxa Richness (G-TR) values for 2016 sampling sites. 10
Figure 6. EPT Taxa Richness (G-EPT) values for 2016 sampling sites. 10
Figure 7. Taxa Richness values for 2016 fish sampling sites. 12
Figure 8. Habitat Assessment scores for 2016 least impacted sites. 13
Figure 9. Top 5 abundant species for 2016 least impacted sites. 13
Figure 10. Taxa Richness (G-TR) values for 2016 least impacted sites. 14
Figure 11. EPT Taxa Richness (G-EPT) values for 2016 least impacted sites 14
Figure 12. East Basin headwater habitat assessment scores between 2016 and 2012. 16
Figure 13. East Basin wadeable habitat assessment scores between 2016 and 2012 16
Figure 14. Make- up sites from Central and West Basins- wadeable habitat assessment scores between 2016 and previous sampling years. 17
Figure 15. Comparison of 2016 wadeable site MBI scores to previous years from East, Central and West Basins 18
Figure 16. Comparison of 2016 wadeable site Taxa Richness (G-TR) scores to previous years from East, Central and West Basins. 18
Figure 17. Comparison of 2016 wadeable site EPT Taxa Richness (G-EPT) scores to previous years from East, Central and West Basins. 19
Figure 18. Comparison of 2016 headwater East basin sites MBI scores to previous years scores. 19
Figure 19. Comparison of 2016 headwater East basin sites Taxa Richness (G-TR) values to previous years scores. 20
Figure 20. Comparison of 2016 headwater East basin sites EPT Taxa Richness (G-EPT) values to previous years scores. 20
Figure 21. Comparison of 2016 least impacted site habitat Assessment scores to previous years. 21
Figure 22. Comparison of 2016 least impacted site MBI scores to previous years. 22
Figure 23. Comparison of 2016 least impacted site Taxa Richness (G-TR) values to previous years. 22
Figure 24. Comparison of 2016 least impacted site EPT Taxa Richness (G-EPT) values to previous years. 23

1.0 Background

Sanitation District No. 1 (SD1), a clean water agency that serves over 30 communities in Campbell, Kenton, and Boone Counties, Kentucky, as both the wastewater and storm water utility, is implementing a watershed management approach to cost-effectively meet numerous regulatory requirements (e.g., Combined Sewer Overflow (CSO) Program and Municipal Separate Storm Sewer System (MS4) Program). Additionally, SD1 has entered into a Consent Decree (CD) with state and federal environmental regulators[1] to address sewer overflows in these communities. In complying with these regulatory requirements, SD1 is applying an adaptive approach for identifying impairments and prioritizing areas for action. This approach will help ensure that available resources are most effectively used. SD1 has developed an Adaptive Watershed Management Plan that includes Watershed Characterization in sixteen sub watersheds to relate in-stream conditions to watershed characteristics. The results of this Watershed Characterization were used to identify impacted watersheds and prioritize them for consideration of control alternatives.

SD1 initiated a comprehensive monitoring program in 2006 to inform the watershed characterization and included collection of in-stream water quality, aquatic habitat, fish, and macroinvertebrate data. Prior to the initiation of the SD1 monitoring program, biological assessments conducted in the watersheds of Northern Kentucky in the past have been limited. This program was designed to initiate a comprehensive record of biological diversity and habitat quality in Northern Kentucky streams. This record will be used to establish baseline conditions to measure efficiency of future water quality projects. As the rounds of sampling continue, and more data is collected, it will be used to look at trends within Northern Kentucky. This report presents the findings of the 2016 sampling and assessment effort.

2.0 Study Area

The 2016 field season was the first sampling season in the third phase of monitoring which focused on several watersheds within the East Basin: Fourmile Creek, Ohio River East, Twelve Mile Creek, and Taylor Creek watersheds, as well as the annually monitored least impacted sites located within the Ohio River North, Woolper, and Ohio River West watersheds. Additionally, several sites that were excluded from previous years due to scouring events were sampled (Figure 1). All Northern Kentucky creeks monitored by SD1 are located entirely within the Outer Bluegrass eco-region (Woods et al. 2005) and are all within the three counties, Boone, Kenton and Campbell.

[1] USEPA, Kentucky Environmental Public Protection Cabinet and US Department of Justice.

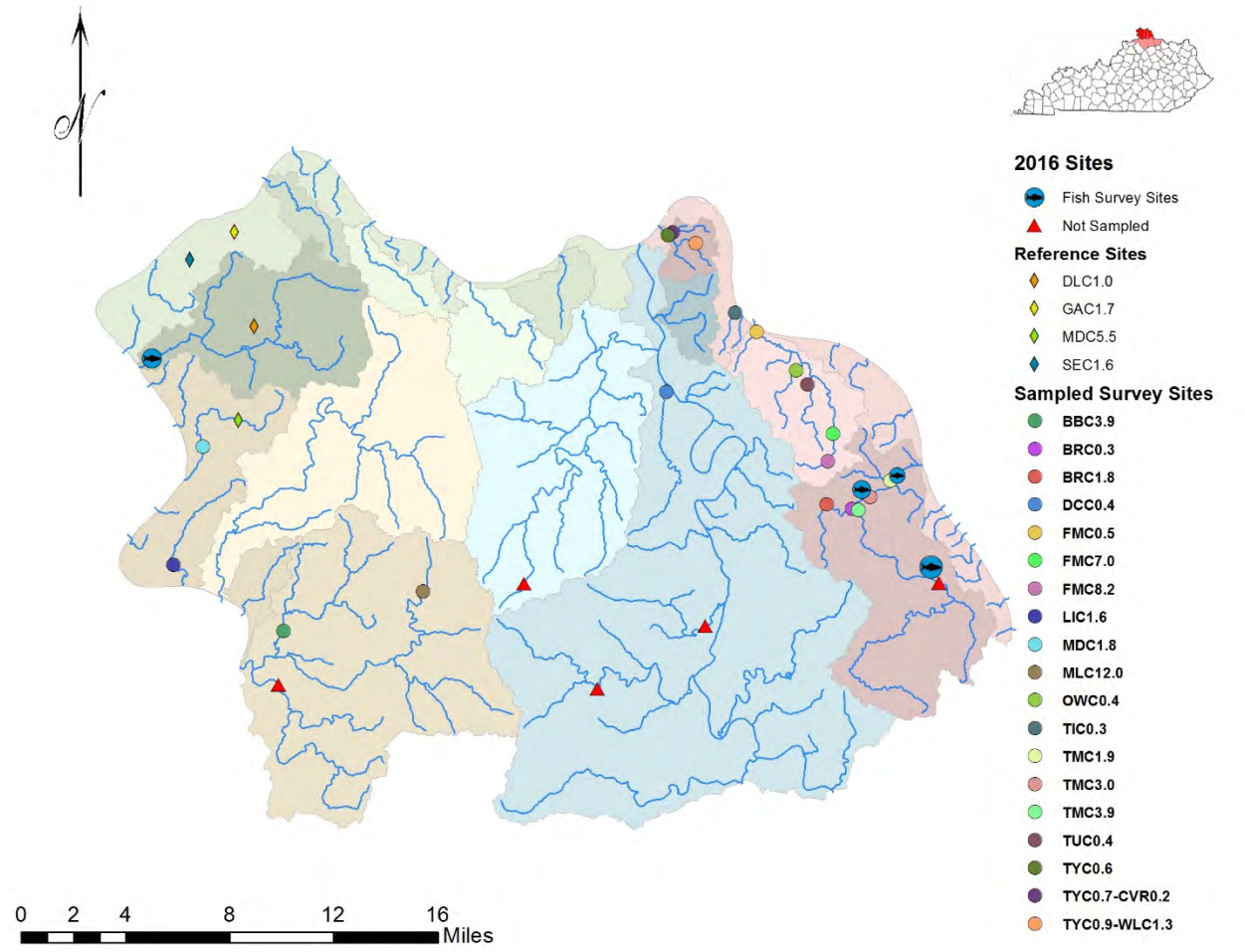


Figure 1. 2016 Survey Sites.

3.0 Site Selection

Sampling site locations and the number of sites per watershed were selected using several criteria including, but not limited to; drainage area, accessibility, stream heterogeneity, adjacent land use, past studies, rotational schedule and available resources (i.e. funding). Watersheds with sites scheduled to be resurveyed in the East Basin were as follows: Fourmile (n=6), Taylor (n=3), Twelve Mile (n=6), as well as the annual least impacted sites located in the Ohio River North (n=2), Woolper (n=1) and Ohio River West (n=1) watersheds. Nine sites from other watersheds that were originally scheduled for completion in previous years, were placed on the 2016 schedule. They are as follows: Licking (DCC0.4, CRC8.1, BLC17.7, and BMC1.7), Ohio River West (LIC1.6 and MDC1.8), and Big Bone (BBC3.9, BSF1.8, and MLC12.0). Additionally, fish population surveys were completed at four sites: Twelvemile (TMC1.9, TMC3.0, and TMC3.9) and Woolper (WPC1.4).

Two sites were not sampled due to scouring events during the index period: BMC1.7 and BSF1.8. Additionally, BLC17.7, CRC8.1 and TMC9.3 was deemed to be unsuitable for further biological surveys, mainly due to riffle habitat disappearance or availability of flow.

4.0 Methods

Habitat and macroinvertebrate data was collected at sampling sites based on Kentucky Division of Water (KDOW) criteria. One round of sampling was conducted done during the year, ideally late spring/early summer for headwater sites and late summer/early fall for wadeable sites. Samples were collected for each site based on KDOW/EPA guidance (Barbour *et al*. 1999, KDOW 2001). Additionally, Kentucky Macroinvertebrate index scores were generated for each site (KDOW, 2008).

4.1 Habitat

A habitat assessment evaluates physical and chemical components of the stream along with biotic interactions. Altered habitat can be a major stressor to aquatic systems and these assessments help determine if chemical or non-chemical stressors are present. The measurement of physical characteristics and parameters provide insight to the condition of the biological community. Habitat parameters included; epifaunal substrate/available cover, embeddedness, water velocity and depth regime, sediment deposition, channel flow status, channel alteration, frequency of riffles, bank stability, vegetative protection, and riparian vegetative zone. Habitat parameters were summed to give a final score (Table 1). The habitat assessment information was used to qualitatively characterize the aquatic bottomland communities along the reaches of Northern Kentucky streams. Habitat observations included notations of other factors potentially influencing the character and quality of the aquatic communities.

	Area Scoring	
User Support	**Headwater (< 5.0 mi²)**	**Wadeable(> 5.0 mi²)**
Fully	≥156	≥130
Partial	142-155	114-129
Non	≤141	≤113

Table 1. Use support scoring for headwater and wadeable streams.

4.2 Macroinvertebrates

The macroinvertebrate community was sampled at all sites using the rapid bioassessment multi-habitat approach (Barbour *et al.* 1999) and modified to reflect KDOW protocol requirements (KDOW 2008). Specifically, two methods were used – riffle kicks (quantitative) and multi-habitat (qualitative) at each site. After collection, samples were immediately preserved in a 70% alcohol solution and shipped to laboratory for processing. Macroinvertebrate Biotic Index scores are generated for each sample and then given a ranking.

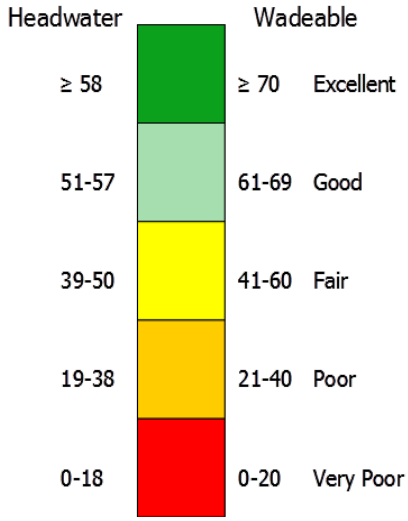


Figure 2. MBI scale with categories.

5.0 Results

Results for survey sites are discussed in section 5.1 and results for least impacted sites are discussed in section 5.2.

5.1.0 Survey Sites

5.1.1 Habitat Assessment

Habitat surveys were conducted at nineteen sites. Streams within the interior plateau eco-region, according to KDOW guidance are divided into two groups; headwater streams (<5 mi ^{2}) and wadeable streams (>5 mi ^{2}). Table 1 presents the habitat scores based on KDOW criteria, which categorizes habitat as either "fully supporting", "partially supporting" or "non-supporting". Among the nineteen sites surveyed, nine were considered headwater and ten wadeable. Of the wadeable sites, four were classified as "non- supporting", and three as "partially supporting". Three sites were classified as "fully supporting". All nine headwater sites were considered "non-supporting". Total habitat scores ranged from a maximum score of 144 at MDC1.8 to a minimum score of 82 at FMC1.8 (Figure 3).

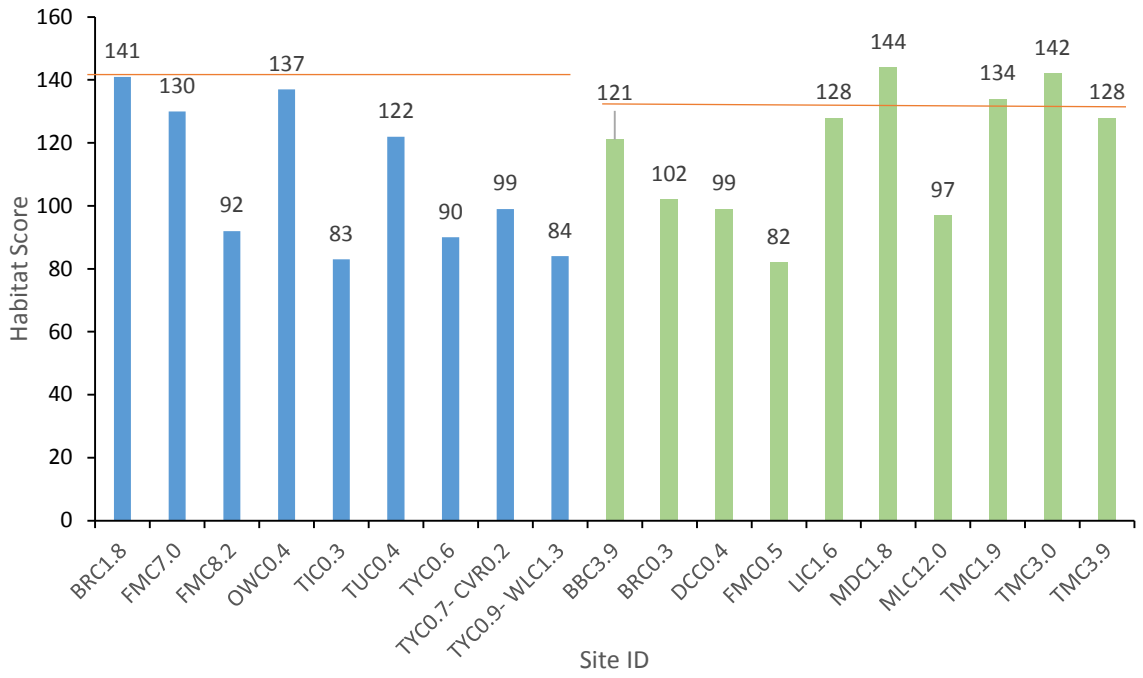


Figure 3. Habitat Assessment scores (headwater- blue; wadeable - orange; red line minimum score for fully supporting) for 2016 sampling sites.

5.1.2 Macroinvertebrate Assessment

A total of 172 taxa of were collected from the sampling sites. Figure 4 shows the five most common species. The most abundant species was *Cheumatopsyche* sp, a caddisfly. Taxa richness values ranged from 25 to 48 and EPT values ranged from 2 to 14 (Figures 5 and 6). Kentucky Macroinvertebrate Biotic Index (MBI) scores were generated for each site sampled (KDOW, 2008) (Table 2). MBI scores ranged from 19.43 (Poor) to 69.63 (Excellent). Of the eighteen sites sampled, six were classified as "Poor", eight were "Fair", three "Good" and one "Excellent". Individual metric performance can also be viewed in Table 2.

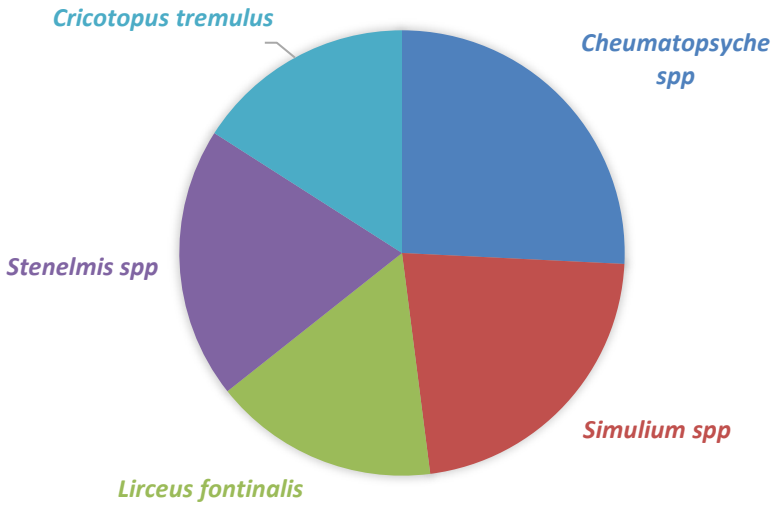


Figure 4. Top 5 abundant species for 2016 sampling sites.

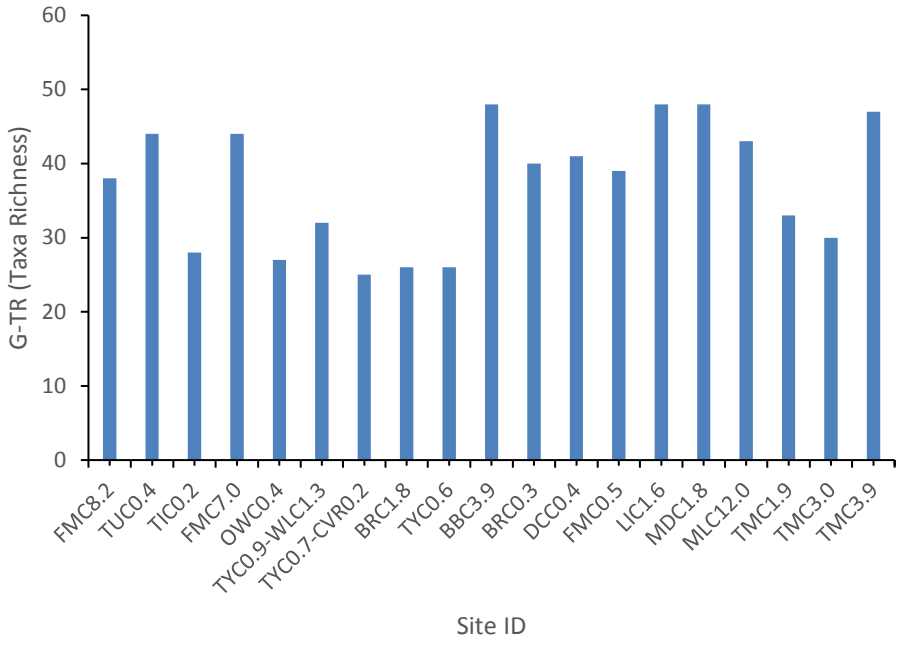


Figure 5. Taxa Richness (G-TR) values for 2016 sampling sites.

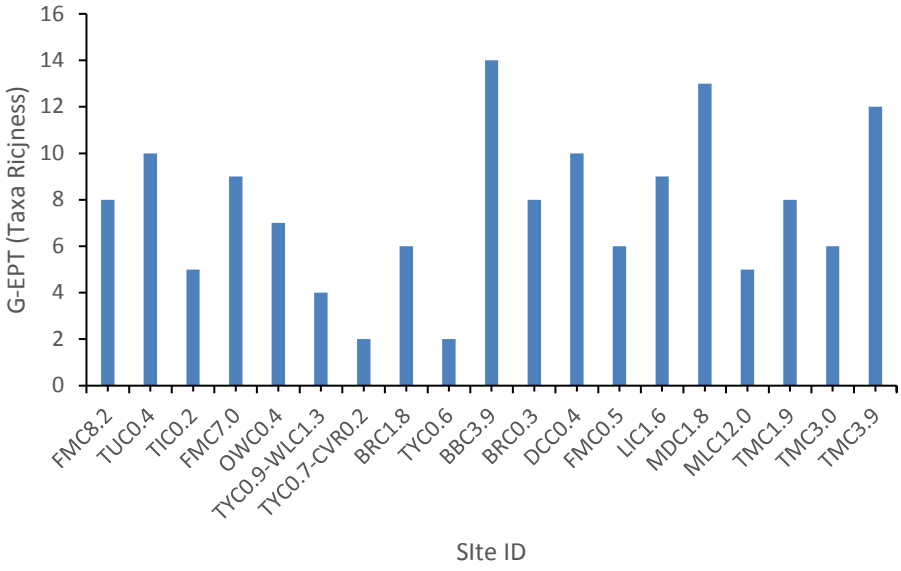


Figure 6. EPT Taxa Richness (G-EPT) values for 2016 sampling sites.

Site ID	G-TR	G-EPT	mHBI	m%EPT	%Ephem	%C+O	%ClngP	MBI	Rating
FMC8.2	38	8	6.66	0.96	0.96	71.88	18.85	26.97	Poor
TUC0.4	44	10	5.46	2.74	2.74	42.12	42.46	40.96	Fair
FMC7.0	44	9	6.24	4.62	3.3	37.29	47.19	41.09	Fair
OWC0.4	27	7	5.65	6.11	4.82	44.37	37.62	34.87	Poor
TYC0.9-WLC1.3	32	4	5.59	3.41	2.79	55.59	25.46	30.02	Poor
TYC0.7-CVR0.2	25	2	6.48	2.63	1.97	72.69	7.24	19.56	Poor
BRC1.8	26	6	5.57	6.37	0.33	69.13	21.81	26.84	Poor
TYC0.6	26	2	6.73	7.82	7.49	84.04	5.54	19.43	Poor
BBC3.9	48	14	5.35	24.84		7.52	78.1	68.98	Good
BRC0.3	40	8	4.55	51.79		10.12	66.96	69.63	Excellent
DCC0.4	41	10	5.97	30.6		36.8	50	54.43	Fair
FMC0.5	39	6	6.13	2.24		30.13	67.95	49.95	Fair
LIC1.6	48	9	5.93	16.5		15.86	69.26	60.31	Fair
MDC1.8	48	13	5.47	26.76		30.1	45.48	58.31	Fair
MLC12.0	43	5	5.76	6.08		26.69	66.22	52.32	Fair
TMC1.9	33	8	5.18	39.07		29.8	58.28	58.22	Fair
TMC3.0	30	6	5.03	45.28		17.59	75.24	63.7	Good
TMC3.9	47	12	5.42	21.66		22.61	62.74	61.59	Good

Table 2. Kentucky macroinvertebrate metric and index scores for 2016 sampling sites.

G-TR = genus level taxa richness
G-EPT = genus level Ephemeroptera, Plecoptera, and Trichoptera taxa richness
mHBI = *modified* Hilsenhoff Biotic Index
%Ephem= relative abundance of mayflies
m%EPT = relative abundance of EPT individuals, minus the genus *Cheumatopsyche* sp.
%C+O = relative abundance of Chironomidae and Oligochaeta
%CLING = relative abundance of Clingers

5.1.3 Fish Assessments

In 2016, three sites were surveyed to assess fish populations including TMC1.9, TMC3.9 and WPC1.4. As part of an independent project taking place in the East basin, TMC1.9 and TMC3.9 were resampled in 2016 along with macroinvertebrates. These sites were originally sampled in 2007, and 2016 data will be used to look at community differences over time. Backpack electrofishing was used to collect fish samples at sites TMC1.9 and TMC3.9. The most common fish found in both TMC1.9 and TMC3.9 was *Campstoma anomalum*, also known as the Central Stoneroller. Site WPC1.4 fish surveys were conducted via boat electrofishing. The most common fish found in this site was the *Dorosoma cepedianam*, (Gizzard Shad). Between all three sites, a total of 41 different taxa were found. Taxa richness values range from 18 to 26 (Figure 7).

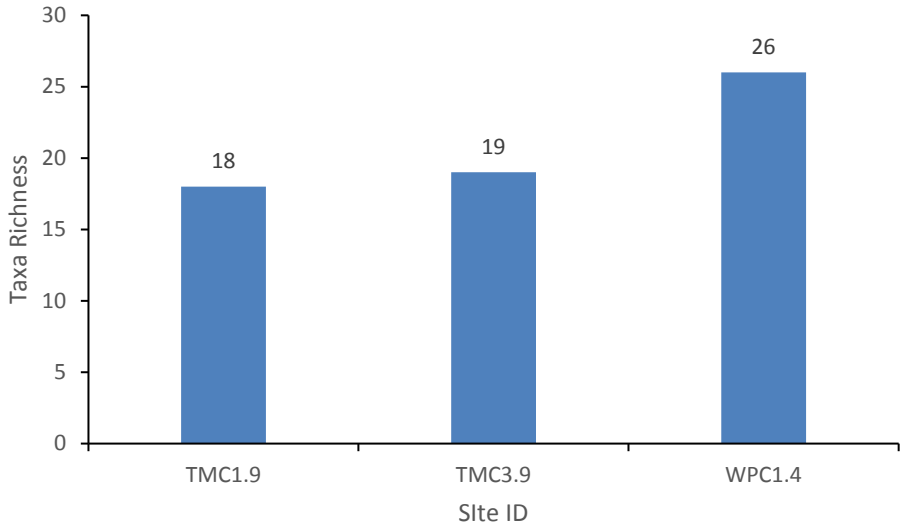


Figure 7. Taxa Richness values for 2016 fish sampling sites.

5.2.0 Least impacted sites (Least Disturbed)

5.2.1 Habitat Assessment

Habitat surveys were completed at four sites in four different watersheds that have been determined to be least impacted and serve as "reference" conditions for streams in Northern Kentucky (established 2008). These watersheds include Middle Creek (MDC5.5), Garrison Creek (GAC1.7), Second Creek (SEC1.6), and Double Lick Creek (DLC1.0). Three of the four watersheds are direct tributaries to the Ohio River, the exception being Double Lick Creek, which is a sub-watershed in the Woolper Creek watershed. All four sites surveyed are considered headwater streams (<5.0 mi^2 drainage area). Additionally, stream segments in these least impacted watersheds can be further characterized as relatively undeveloped with fairly intact riparian areas throughout the watershed. DLC1.0 was considered "fully supportive" while MDC5.5 and GAC1.7 were considered "partially supporting" SEC1.6 was classified as "non-supporting" (Figure 8). Riparian zone and bank stability were the most impacted.

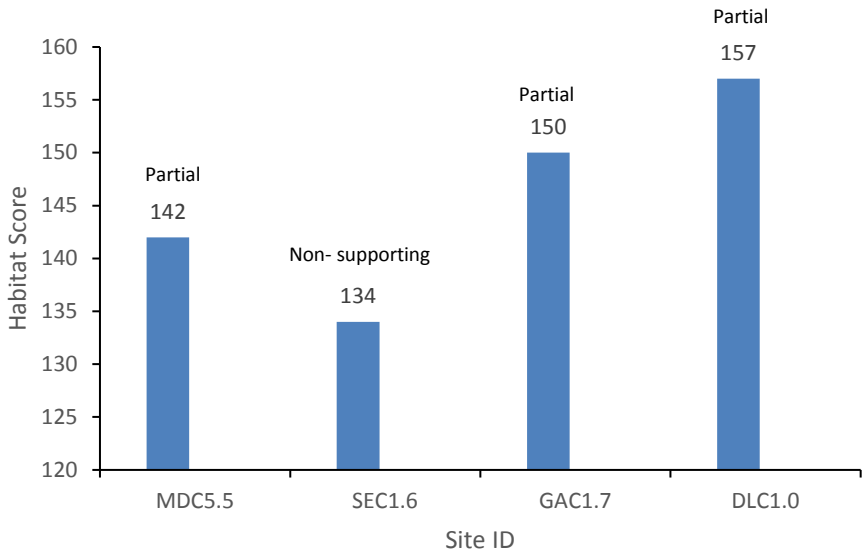


Figure 8. Habitat Assessment scores for 2016 least impacted sites.

5.2.2 Macroinvertebrate Assessment

A total of 78 taxa were collected from the least impacted watersheds. The most abundant (by number of individuals) being Diptera (n=408), Trichoptera (n=297), and Ephemeroptera (n=246). The top five species within the least impacted sites, had a fairly even distribution (Figure 9). Taxa richness values ranged from 38 to 45 (Figure 10) and EPT values ranged from 13 to 19 (Figure 11). Several species (n=12) were only found at GAC1.7. Macroinvertebrate Biotic Index (MBI) results are displayed in Table 3.

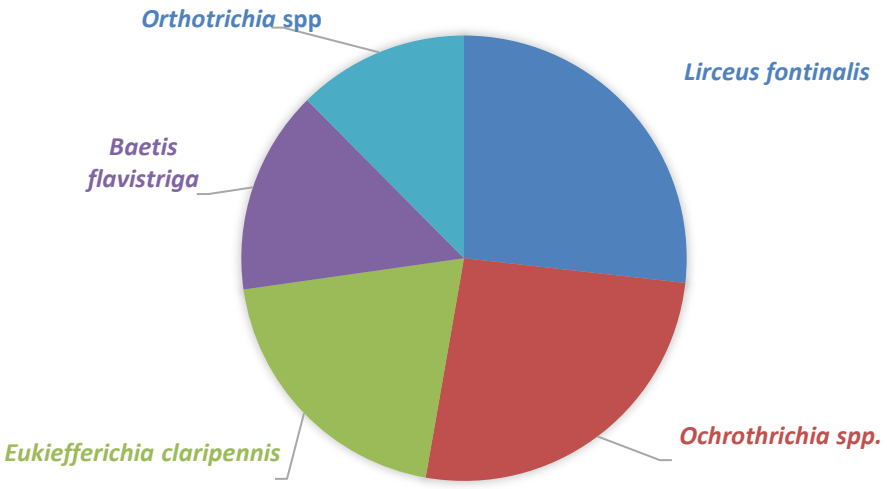


Figure 9. Top 5 abundant species for 2016 least impacted sites.

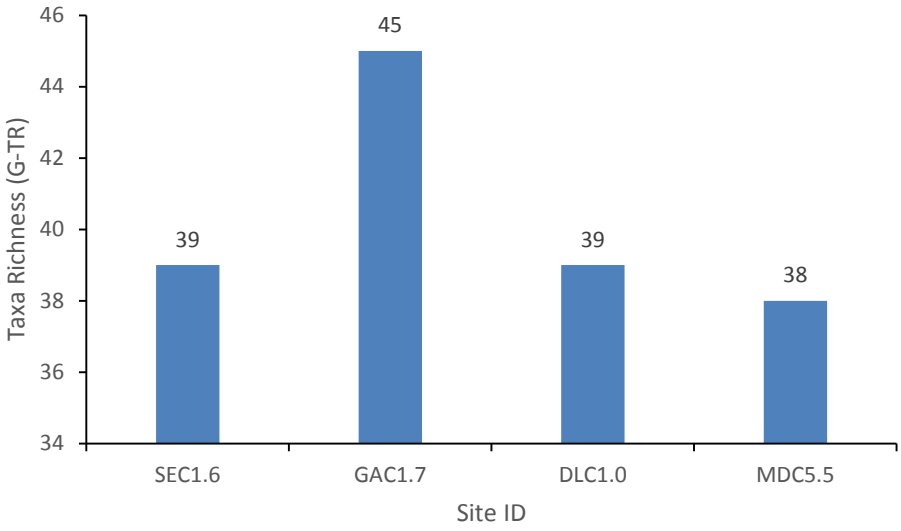


Figure 10. Taxa Richness (G-TR) values for 2016 least impacted sites.

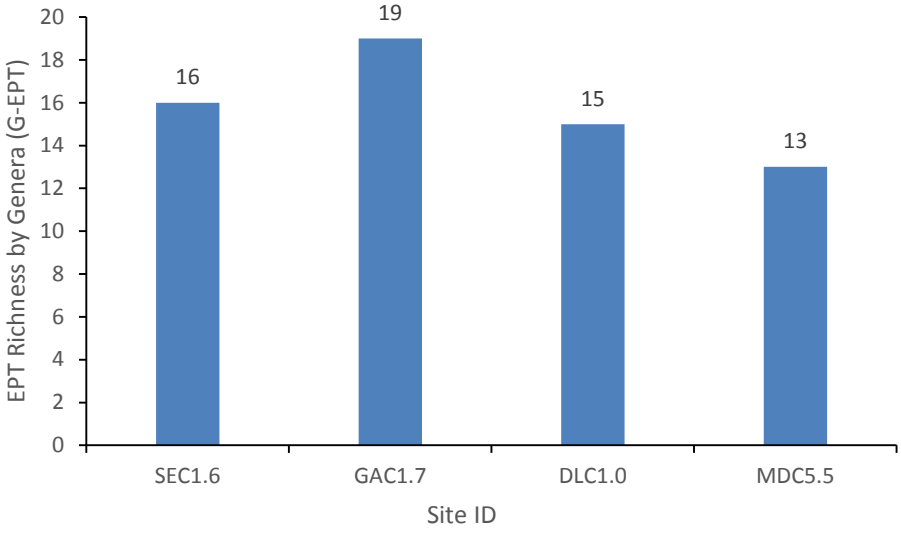


Figure 11. EPT Taxa Richness (G-EPT) values for 2016 least impacted sites.

Site ID	G-TR	G-EPT	mHBI	m%EPT	%Ephem	%C+O	%ClngP	MBI	Ratings
SEC1.6	39	16	4.71	50.79	21.4	17.25	24.92	56.05	Good
GAC1.7	45	19	5.16	43.34	10.92	32.42	41.98	55.63	Good
DLC1.0	39	15	4.94	67.76	12.17	10.19	51.64	62.04	Excellent
MDC5.5	38	13	5.81	35.84	26.96	50.85	14.68	44.38	Fair

Table 3. Kentucky macroinvertebrate metric and index scores for 2016 least impacted sites.

G-TR = genus level taxa richness
G-EPT = genus level Ephemeroptera, Plecoptera, and Trichoptera taxa richness
mHBI = *modified* Hilsenhoff Biotic Index
m%EPT = relative abundance of EPT individuals, minus the genus *Cheumatopsyche* sp.
%Ephem= relative abundance of Ephemoeroptera (mayflies)
%C+O = relative abundance of Chironomidae and Oligochaeta
%CLING = relative abundance of Clingers

6.0 Comparison of Phase I to Phase II Surveys

6.1.0 Survey Sites

With the availability of multiple years of data at the same site, a cursory look at developing patterns was reviewed.

6.1.1. Habitat Assessment – 2016 vs. Previous Years

The survey sites had a mixture of habitat results, many sites increased in habitat score while a few sites showed marked degradation. Within the East Basin, ten sites depicted increased scores (TMC1.9, TMC3.0, FMC7.0, FMC8.2, TUC0.4, BRC1.8, TYC0.7-CVR0.2, TYC0.9-WLC1.3, TIC0.2 and TYC0.6), while two sites depicted degraded habitat (BRC0.3, and FMC0.5), and OWC0.4 stayed consistent (Figures 12-14).

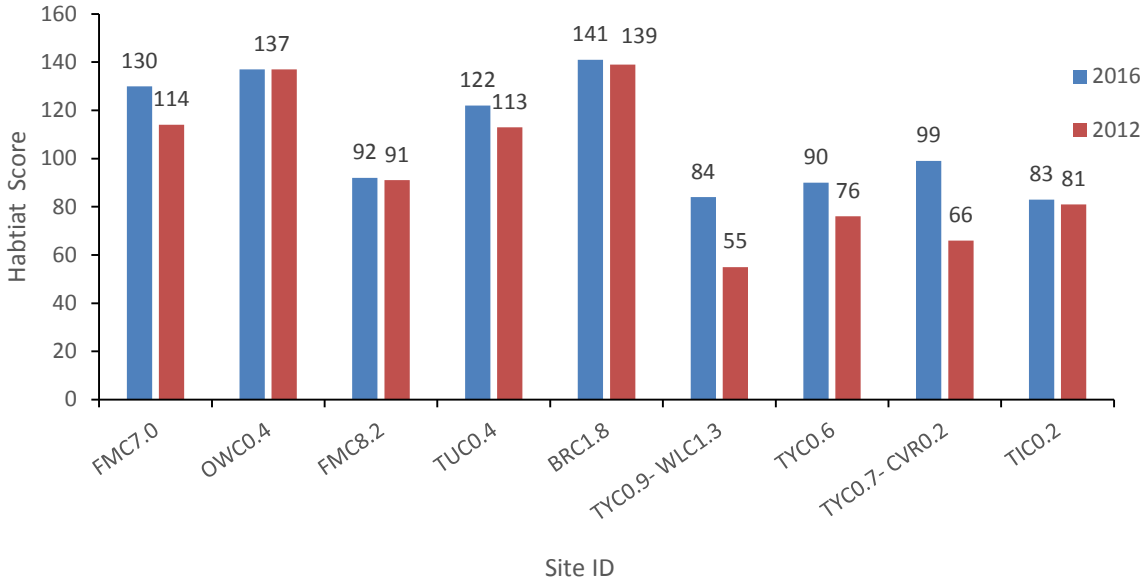


Figure 12. East Basin headwater habitat assessment scores between 2016 and 2012.

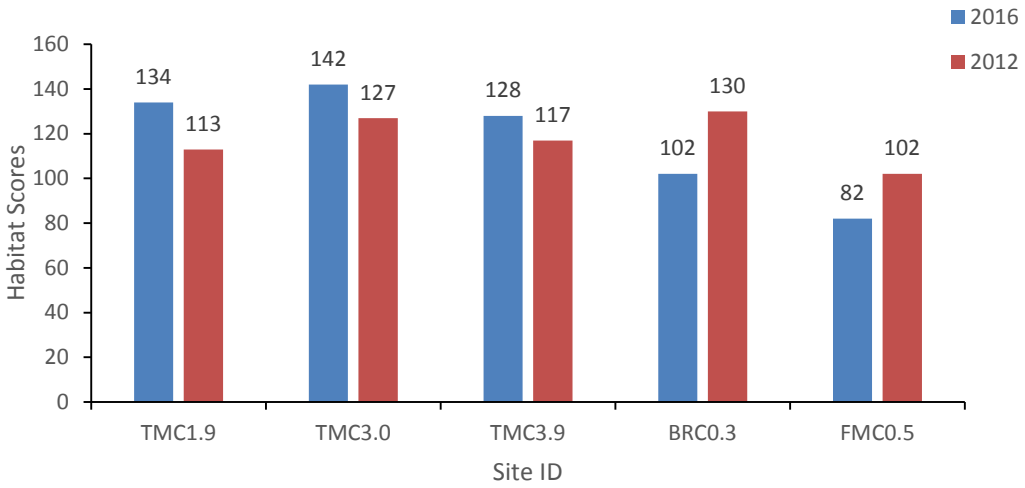


Figure 13. East Basin wadeable habitat assessment scores between 2016 and 2012.
****TMC3.9 score is from 2007.***

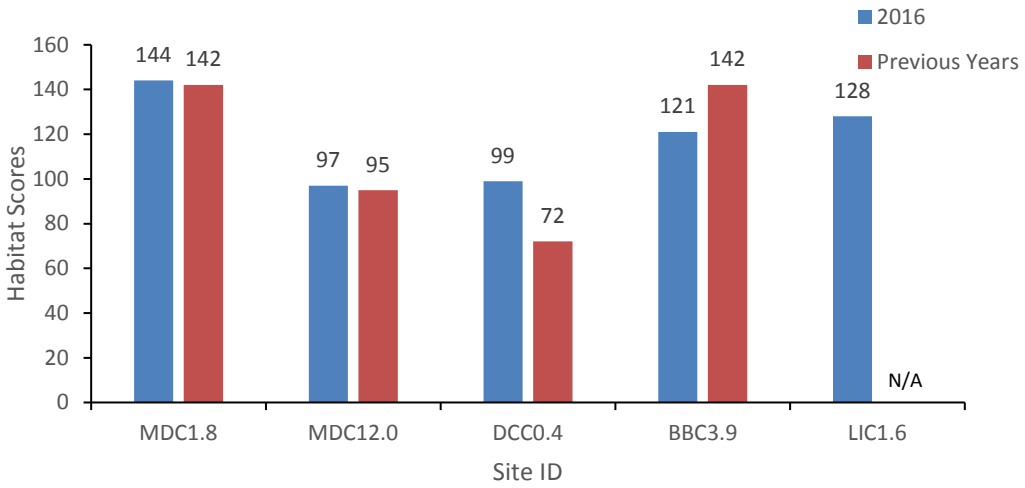


Figure 14. Make- up sites from Central and West Basins- wadeable habitat assessment scores between 2016 and previous sampling years.

6.1.2. Macroinvertebrate Assessment – 2016 vs. Previous Years

Ten wadeable sites were resampled during 2016. FMC0.5, TMC1.9, and TMC.3.0 were previously surveyed in 2012, however the others were surveyed in earlier years. BBC3.9, MLC12.0 sampled in 2010 amd BRC0.3 and TMC3.9 sampled in 2007. In 2011, DCC0.4, LIC1.6, and MDC1.8 were last sampled. MBI scores increased in the many of the sites, as compared to previous data. Only FMC0.5, and TMC1.9 decreased in 2016. BRC0.3 and DCC0.4 showed the greatest improvement in MBI scores (Figure 15). Taxa richness (G-TR) increased among every site (Figure 16). However, BBC3.9, TMC3.0, TMC3.9, MLC12.0, and FMC0.5 decreased in G-EPT (Figure 17).

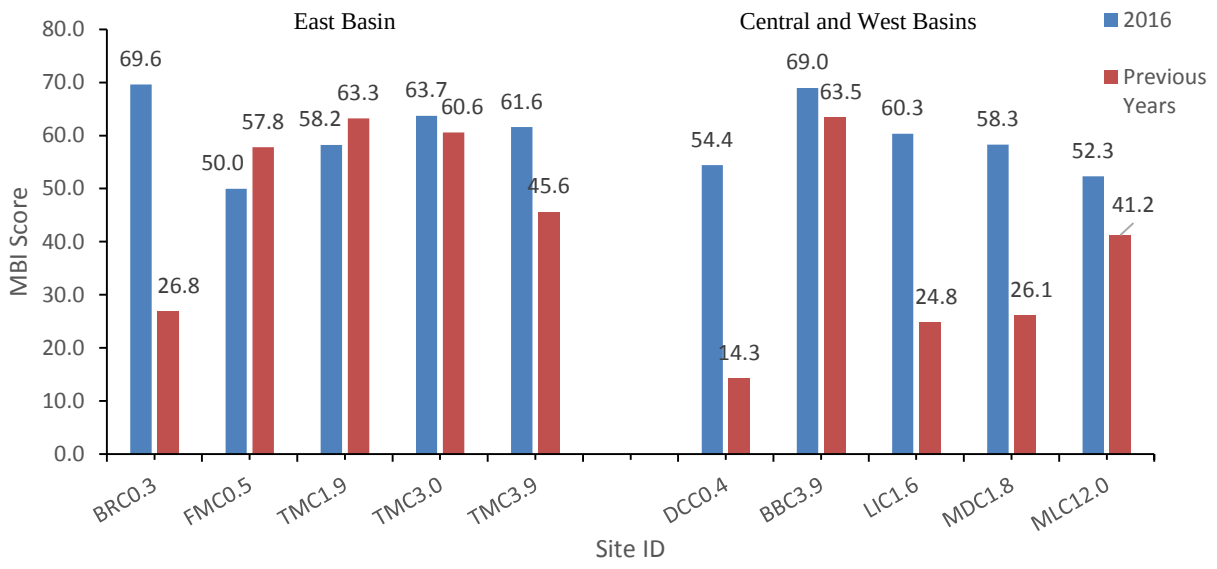


Figure 15. Comparison of 2016 wadeable site MBI scores to previous years from East, Central and West Basins

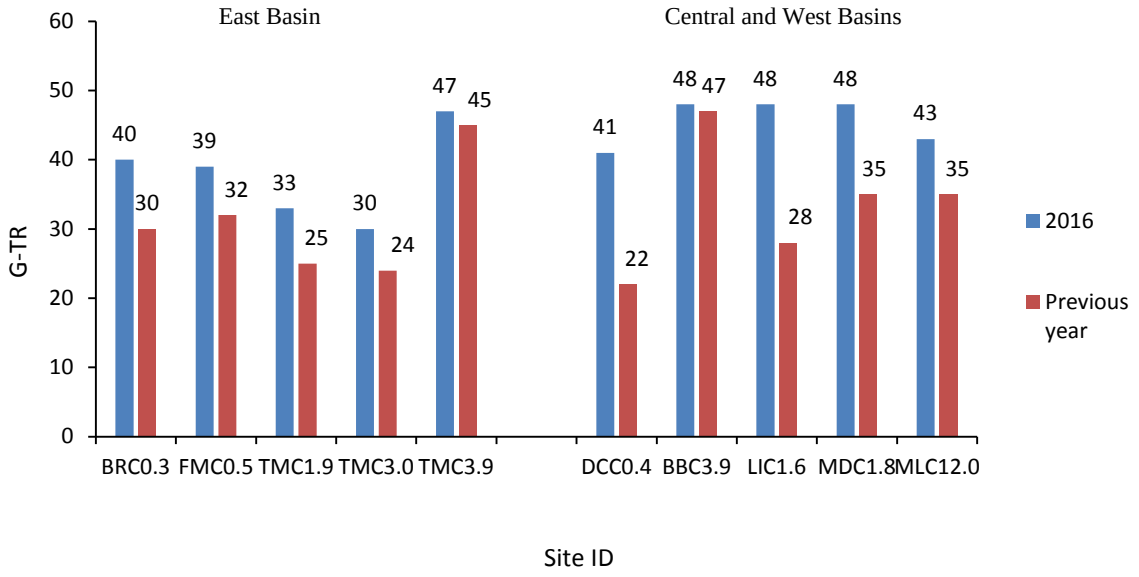


Figure 16. Comparison of 2016 wadeable site Taxa Richness (G-TR) scores to previous years from East, Central and West Basins.

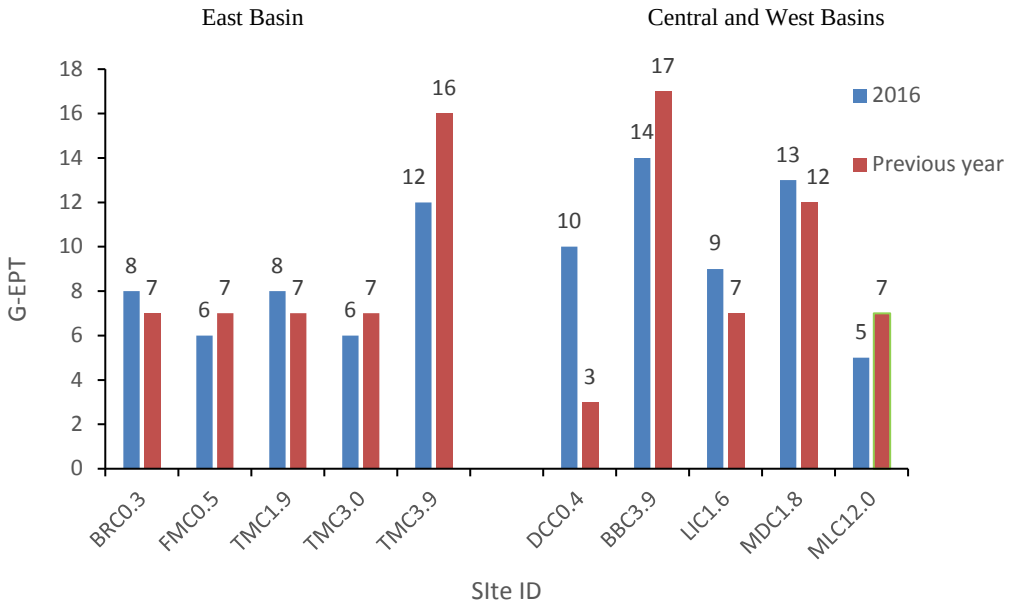


Figure 17. Comparison of 2016 wadeable site EPT Taxa Richness (G-EPT) scores to previous years from East, Central and West Basins.

The remaining nine headwater sites showed a decrease in MBI scores over the years at seven sites except FMC7.0 increased from "Poor" to "Fair" (Figure 18). Taxa richness increased at 5 sites, stayed the same at 2 sites, and decreased at one site (Figure 19). TUC0.4 had the highest number of EPT (n=10) out of the headwater sites (Figure 20).

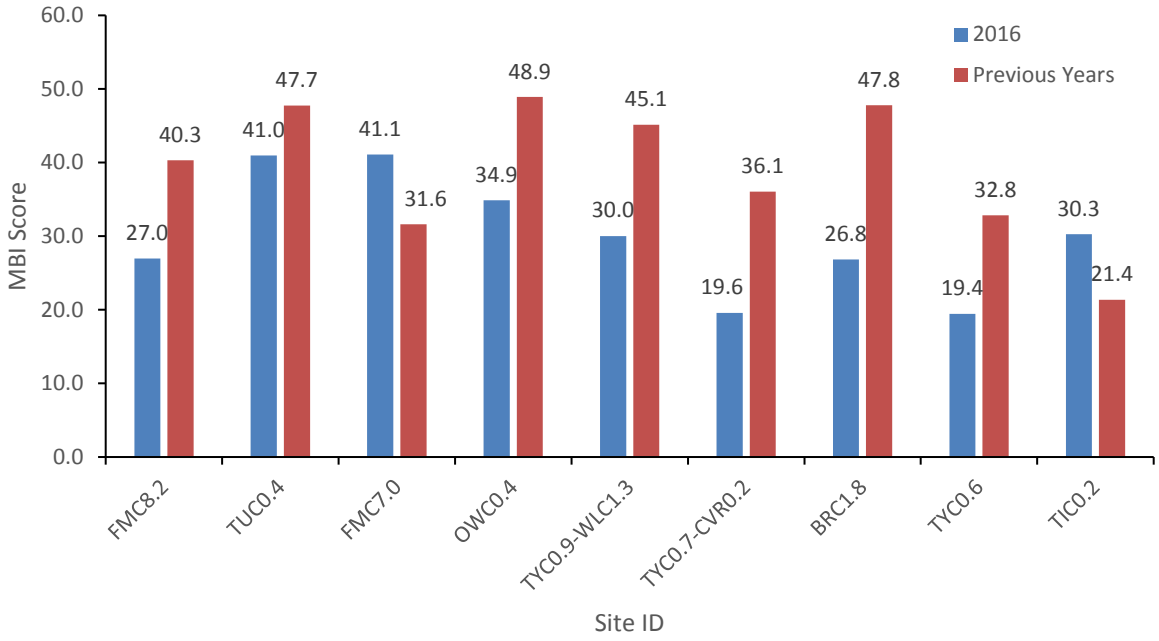


Figure 18. Comparison of 2016 headwater East basin sites MBI scores to previous years scores.

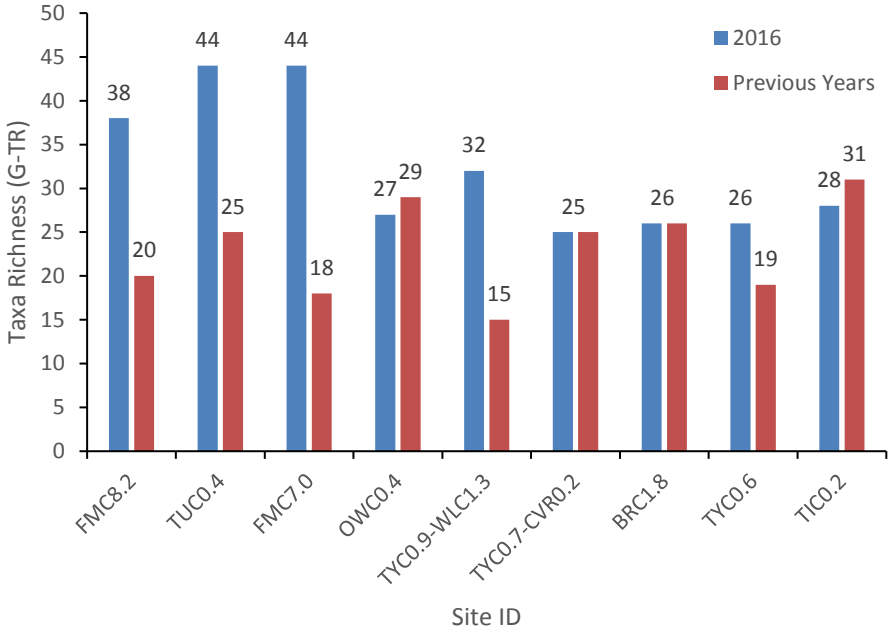


Figure 19. Comparison of 2016 headwater East basin sites Taxa Richness (G-TR) values to previous years scores.

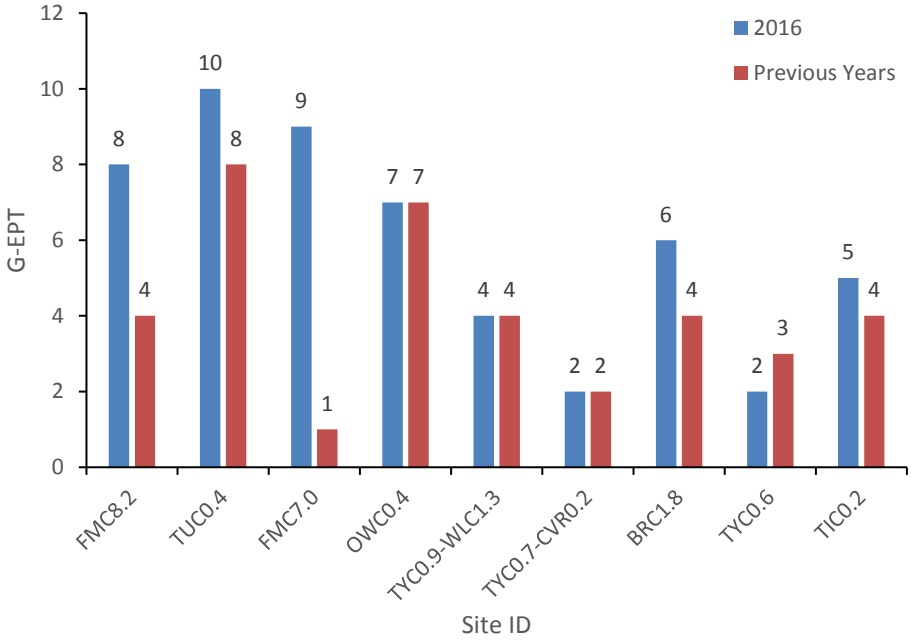


Figure 20. Comparison of 2016 headwater East basin sites EPT Taxa Richness (G-EPT) values to previous years scores.

6.2.0 Least impacted sites

Least impacted sites are sampled annually. Thus, 2016 samples are compared to all previous years (2008-2015).

6.2.1 Habitat Assessment – 2016 vs. Previous Years

The least impacted sites show consistent scores with natural variation throughout the years. Scores decreased in 2010 and began to show recovery during 2011-2013 (Figure 21).

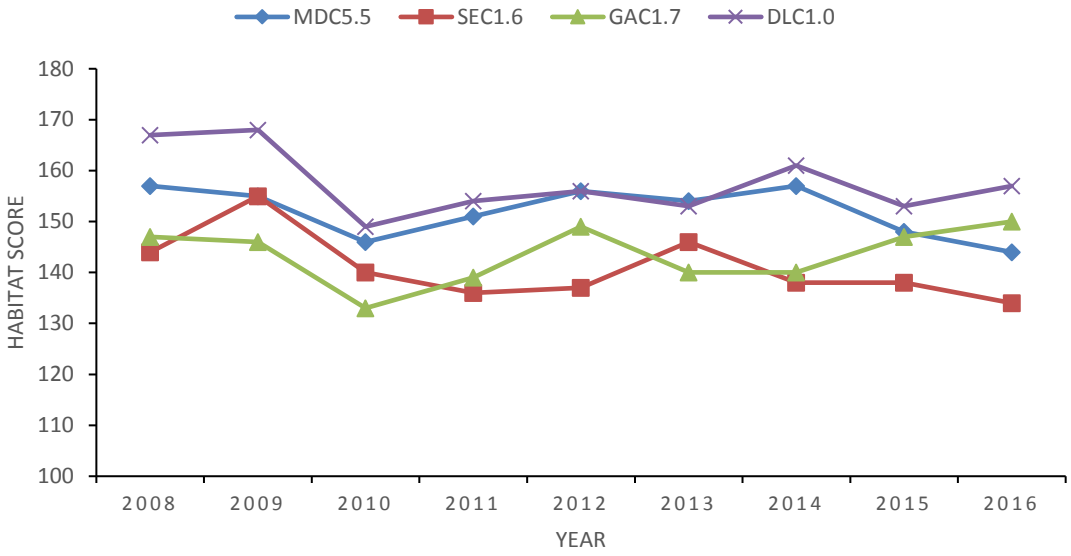


Figure 21. Comparison of 2016 least impacted site habitat Assessment scores to previous years.

6.2.2. Macroinvertebrate Assessment – 2016 vs. Previous Years

MBI scores showed natural variation, including a sharp decrease in 2011, which was a direct result of twice the average annual rainfall for the area (Hawley et al. 2016; Phase I report). As the annual surveys continued, the macroinvertebrate communities showed a recovery (Figure 22). Taxa richness and EPT values also showed natural variation. G-TR increased greatly at DLC1.0 in 2012, this was also apparent in G-EPT numbers (Figures 23 and 24). Number of EPT genera decreased in 2016 at MDC5.5 and DLC1.0 and increased at SEC1.6 and GAC1.7 (Figure 24).

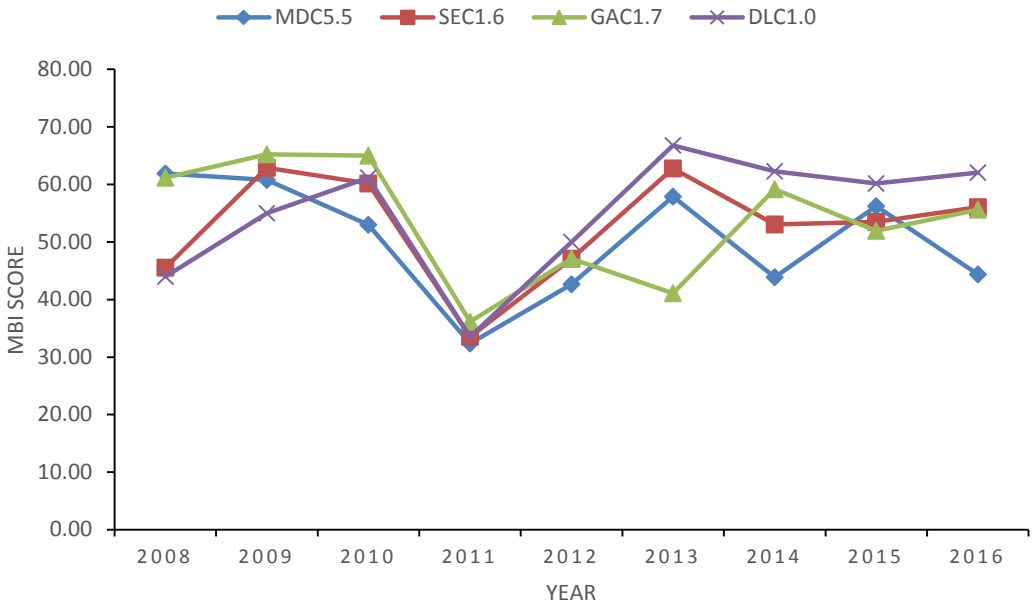


Figure 22. Comparison of 2016 least impacted site MBI scores to previous years.

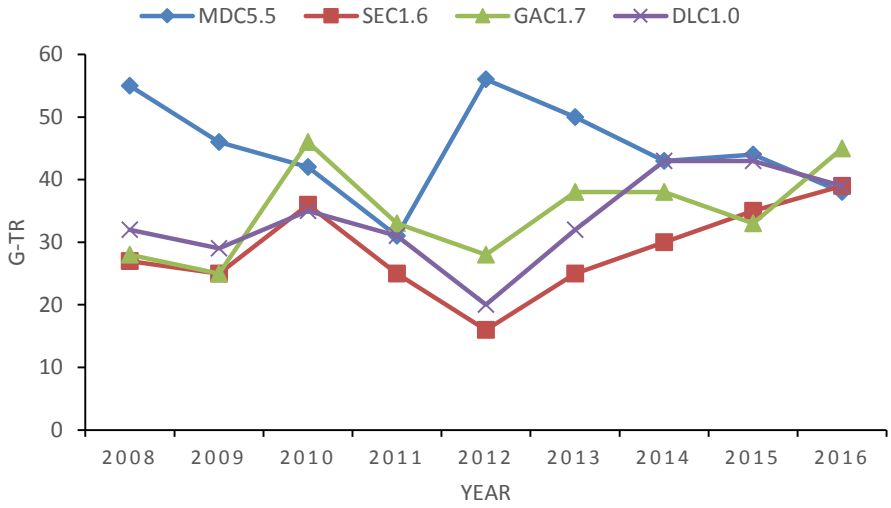


Figure 23. Comparison of 2016 least impacted site Taxa Richness (G-TR) values to previous years.

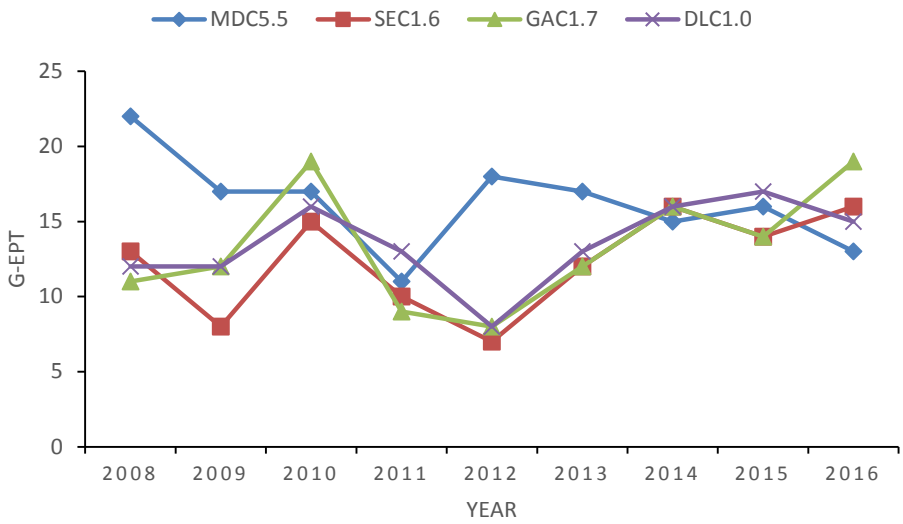


Figure 24. Comparison of 2016 least impacted site EPT Taxa Richness (G-EPT) values to previous years.

7.0 Conclusions

It is beyond the scope of the report to analyze the data, however preliminary observations can be made. Habitat scores for the wadeable survey sites fell into all three categories. Some sites maintained ranking, while others improved, e.g., MDC1.8 remained in the "Fully-supporting" category, and TMC1.9 and BRC0.3 improved from "Non" to "Fully-supporting" category. All headwater survey sites were found to be "Non-supporting". The least impacted sites have continued to stay reasonably stable but minute differences in site conditions leads them to straddle the habitat categories between "fully supporting" and "partial supporting".

Macroinvertebrate rankings for the survey sites were mainly "Fair" with few in the "Good" and "Poor" range. The survey sites are located in more developed areas, and the increase in impervious surfaces can degrade these urban streams. Approximately half of the survey sites showed an increase in MBI scores, and half showed a decrease in MBI scores. Least impacted sites, located in more rural, forested areas, exhibit consistently higher MBI scores than other sites. Two of the four least impacted sites were ranked "Good", one "Fair", and DLC1.0 was ranked as "Excellent" (Figure 22).

8.0 References

Barbour, M.T., J. Gerritsen, B.D. Synder, and J.B. Stribling. 1999. Rapid bioassessment protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates and fish, second edition. EPA 840-B-99-002. USEPA; Office of Water: Washington, D.C.

Boone, Campbell and Kenton County Conservation Districts (BCKCD), 2007. Personal communication.

Hawley, R.J., Wooten, M.S., MacMannis, K.R. and Fet, E.V., 2016. When do macroinvertebrate communities of reference streams resemble urban streams? The biological relevance of Q critical. Freshwater Science, 35(3), pp.778-794.

(KDOW) Kentucky Division of Water. 2008. Methods for Assessing Biological Integrity of Surface Waters in Kentucky. Kentucky Department of Environmental Protection, Division of Water. Frankfort, KY.

Woods, A.J., J.M. Omernik, W.H. Martin, G.J. Pond, W.M. Andrews, S.M. Call, J.A. Comstock, and D.D. Taylor. 2002. Ecoregions of Kentucky (2-sided color poster with map, descriptive text, summary tables and photographs): Reston, VA, US Geological Survey (map scale 1:1,000,000).

Also, see SD1 Phase I reports, available upon request.s

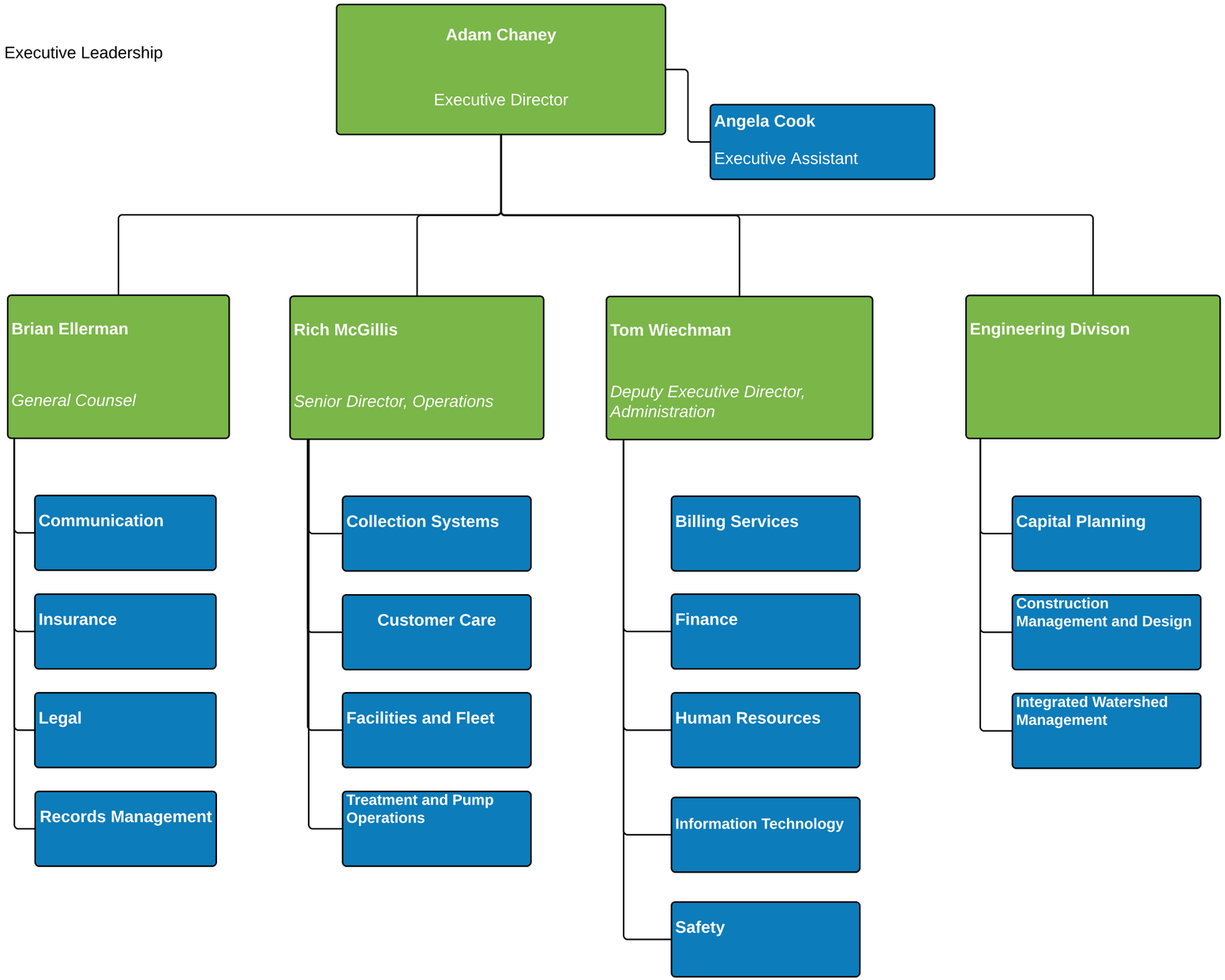
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APPENDIX F:

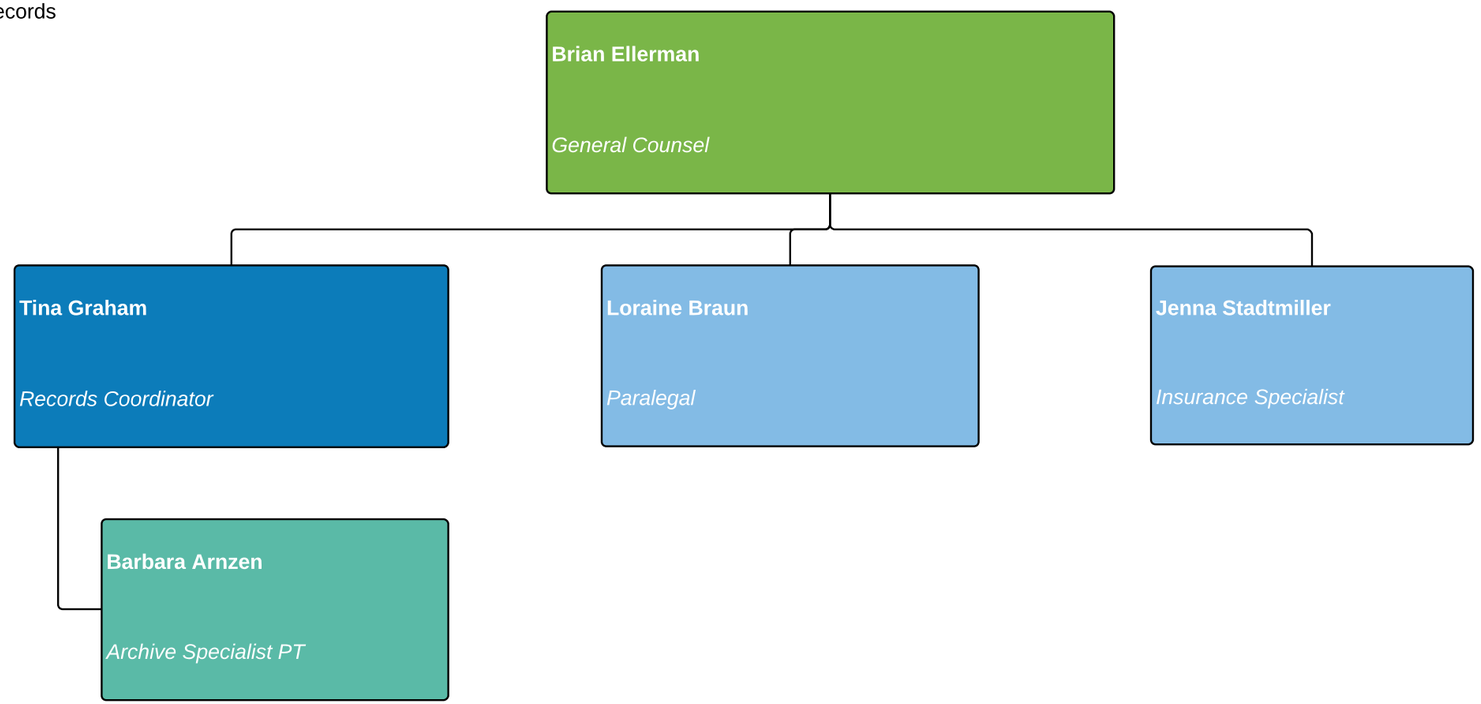
Current Organizational Charts

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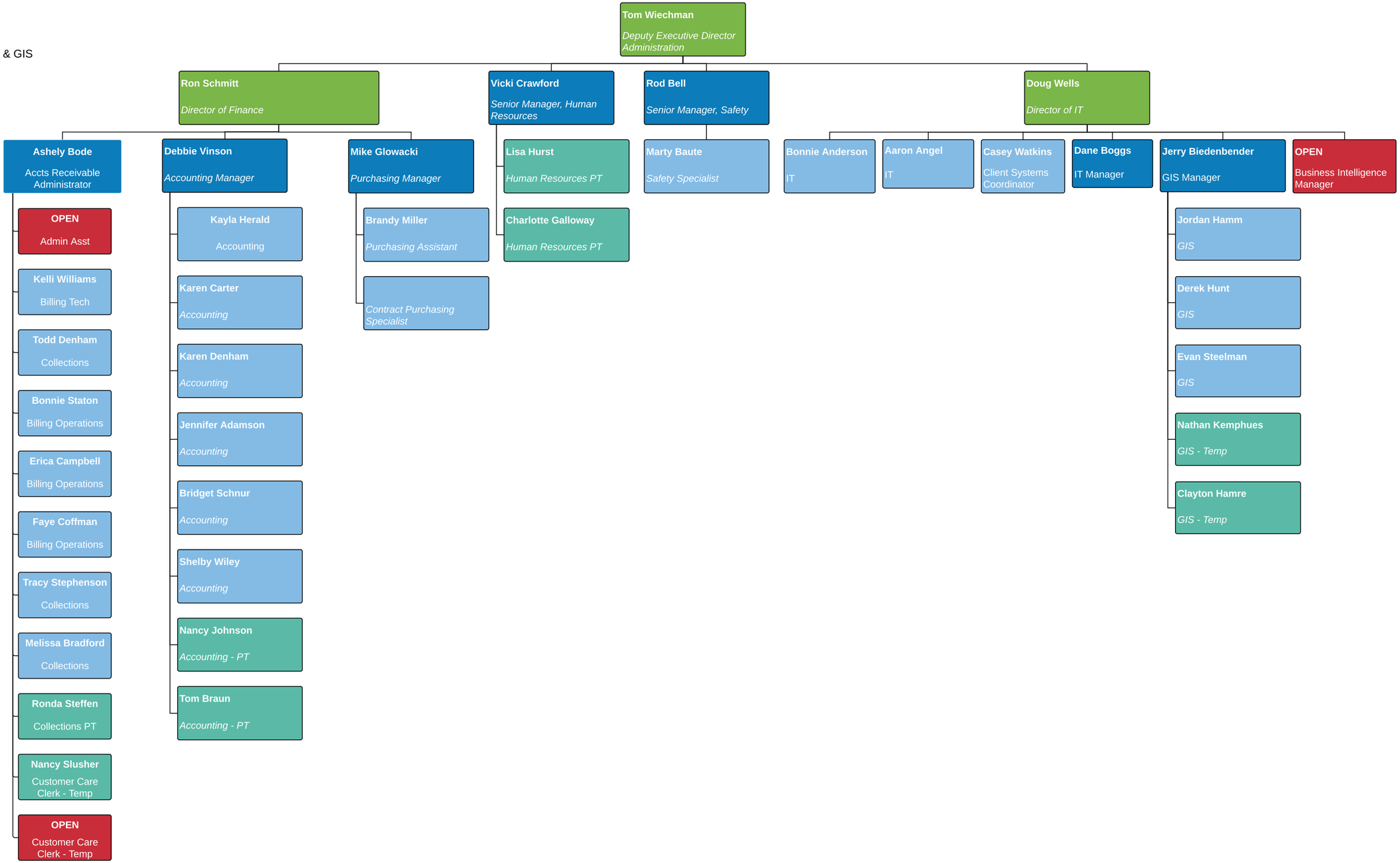
Executive Leadership



Dept 3:
Legal & Records



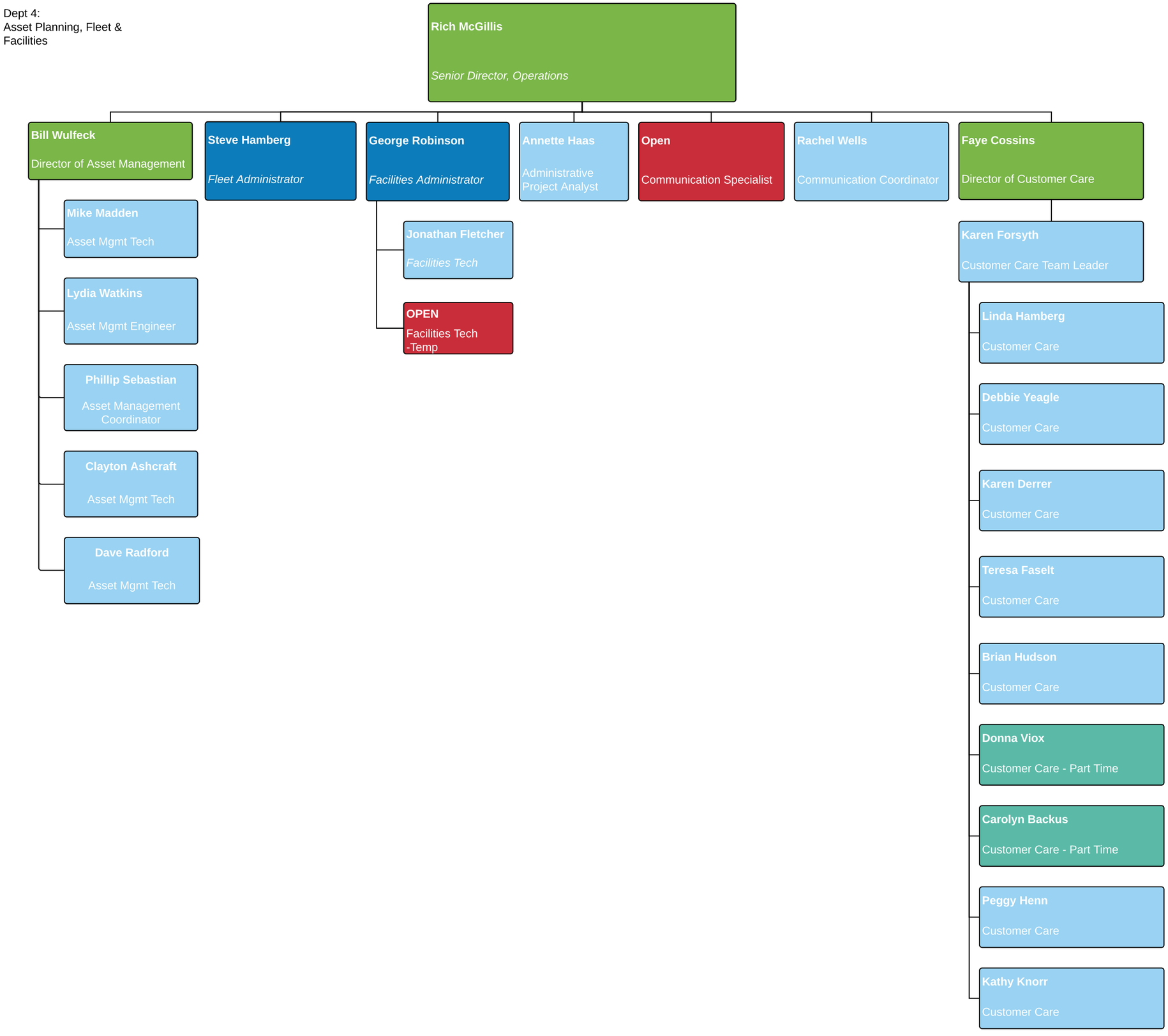
Dept 3:
Billing Services
Finance & Purchasing
Human Resources
Safety
Information Technology & GIS



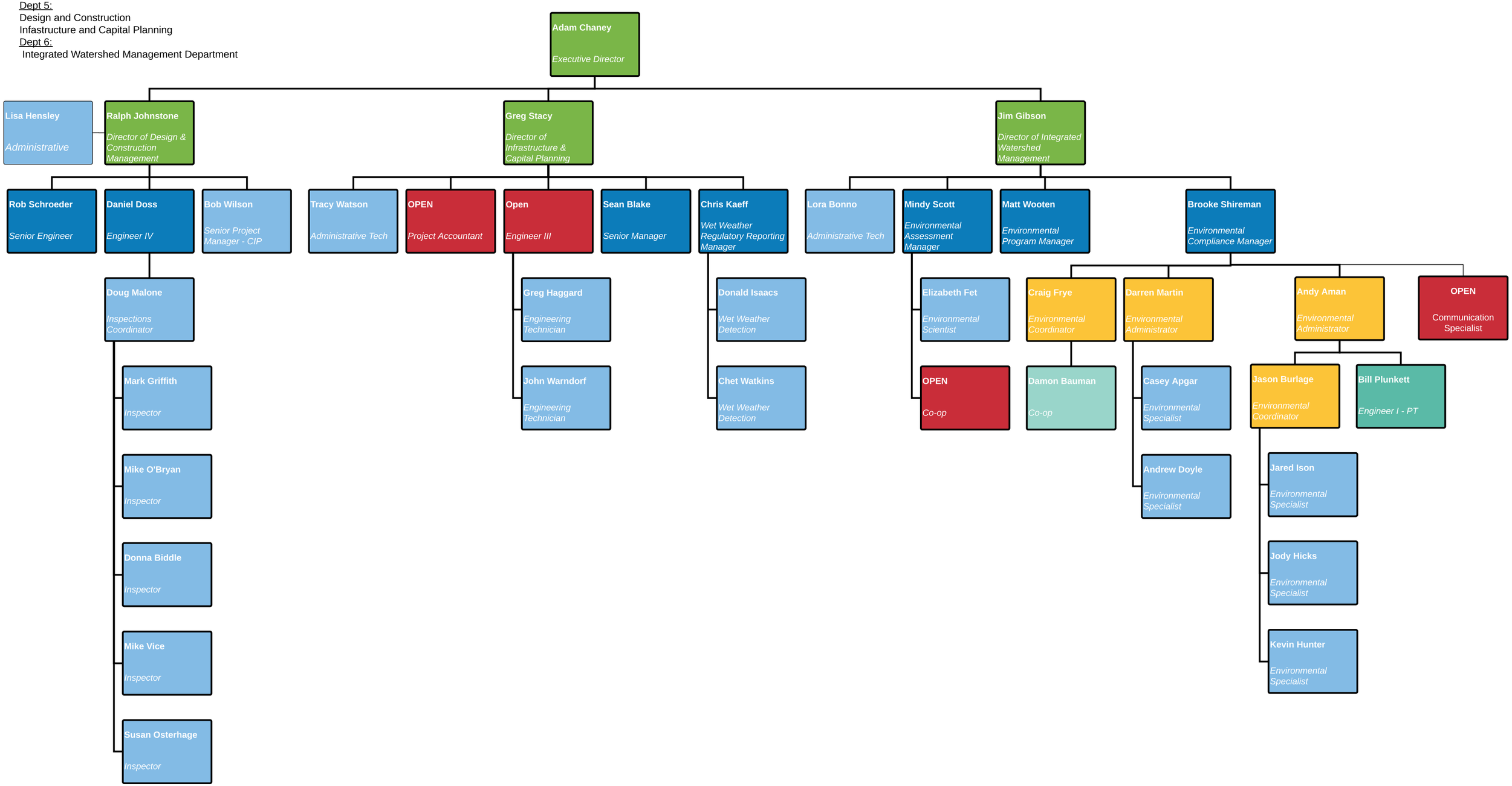
Dept 2: Collection Systems -
Asset Maintenance and Asset Renewal
Asset Planning & Inventory

- **Rich McGillis** — *Senior Director, Operations*
  - **OPEN** — Admin Asst
  - **Kyle Boyle** — *Director of Collection Systems*
    - **Donnie Couch** — *Asset Maintenance Manager*
      - **Craig Massie** — *Corrective Maint Coordinator*
        - **Cap Kiser** — *Asset Maint Team Leader*
          - **Greg Hedlund** — *Asset Maintenance Crew*
          - **John Runge** — *Asset Maintenance Crew*
          - **Andy Tomlinson** — *Asset Maintenance Crew*
          - **Elmo Young** — *Asset Maintenance Crew*
          - **Chris Wesselman** — *Asset Maintenance Crew*
          - **Mark Groger** — *Asset Maintenance Crew*
          - **Mike Hurst** — *Asset Maintenance Crew*
          - **Chris Peters** — *Asset Maintenance Crew*
          - **OPEN** — Asset Maintenance - Crew - Temp
      - **Greg Braunwart** — *Preventative Maint Coordinator*
        - **Kerry Huff** — *Asset Maintenance Crew*
        - **Ray Simpson** — *Asset Maintenance Crew*
        - **Paul Hartman** — *Asset Maintenance Crew*
      - **Jeremy Spada** — *Preventative Maint Coordinator*
        - **Bill Mullins** — *Asset Maintenance Team Leader*
          - **Todd Houston** — *Asset Maintenance Crew*
          - **Richard Baker** — *Asset Maintenance Crew*
          - **Dalton Edmonds** — *Asset Maintenance Crew*
          - **Jimmy Stephenson** — *Asset Maintenance Crew*
          - **Brian Moore** — *Asset Maintenance Crew*
          - **Jacob Lightner** — *Asset Maintenance Crew*
          - **Brian Warken** — *Asset Maintenance Crew*
        - **Darrell Meader** — *Asset Maintenance Team Leader*
          - **John Stephenson** — *Asset Maintenance Crew*
          - **Robert Shanker** — *Asset Maintenance Crew*
          - **Chris Cornett** — *Asset Maintenance Crew*
          - **Randy Moore** — *Asset Maintenance Crew*
          - **Kevin Stenger** — *Asset Maintenance Crew*
          - **Andy Cotton** — *Asset Maintenance Crew*
      - **Bill Branch** — *Asset Maintenance Tech (Scheduler)*
      - **Donnie Roberts** — *Asset Maintenance Fleet & Equipment Team Leader*
        - **Al Carson** — *Asset Maintenance Tech II (Fleet/Equip)*
    - **Dave Ross** — Asset Renewal Coordinator
      - **Omer Blackburn** — *Asset Renewal Team Leader*
        - **Mike Bach** — *Asset Renewal Crew*
        - **Tony Hicks** — *Asset Renewal Crew*
        - **Ben Racke** — *Asset Renewal Crew*
        - **Gary Wedding** — *Asset Renewal Crew*
        - **Alex Woods** — *Asset Renewal Crew*
        - **Rick Mullikin** — *Asset Renewal Crew*
        - **Scott Justin** — *Asset Renewal Crew*
        - **Tony Roell** — *Asset Renewal Crew*
      - **Scott Breeze** — *Asset Renewal Team Leader*
        - **Tony Jenkins** — *Asset Renewal Crew*
        - **Preston Mathis** — *Asset Renewal Crew*
        - **OPEN** — *Asset Renewal Crew*
        - **Aaron Moore** — *Asset Renewal Crew*
        - **Steve Rump** — *Asset Renewal Crew*
        - **Ramiro Garcia** — *Asset Renewal Crew*
        - **Todd Runge** — *Asset Renewal Crew*
        - **Tim Friedhof** — *Asset Renewal Crew*
        - **Justin Lafollette** — *Asset Renewal Crew*
        - **Zach Atkerson** — *Asset Renewal Crew*
        - **Kobie Baker** — *Asset Renewal Crew*
    - **Jim Ishmael** — Asset Renewal Tech (Scheduler)
    - **Steve Willhoite** — Asset Renewal Tech (Inspector)
    - **Karen Wesselman** — Asset Renewal Tech
    - **Jerry Howe** — Trenchless Technology Coordinator
      - **Tom Lind** — Asset Renewal Tech II (Inspector)
    - **Darleen McGuire** — Asset Renewal Administrator
      - **Mark Manning** — *Asset Renewal Team Leader*
    - **Tom Foster** — Inventory Coordinator
    - **Chris Rabe** — Inventory Specialist
    - **Dave Johnson** — Asset Renewal Tech (Inspector)
    - **Debbie Rizzo** — Asset Planning Coordinator
      - **Jim Giles** — Asset Planning Tech
      - **Alex Stamper** — Asset Planning Tech

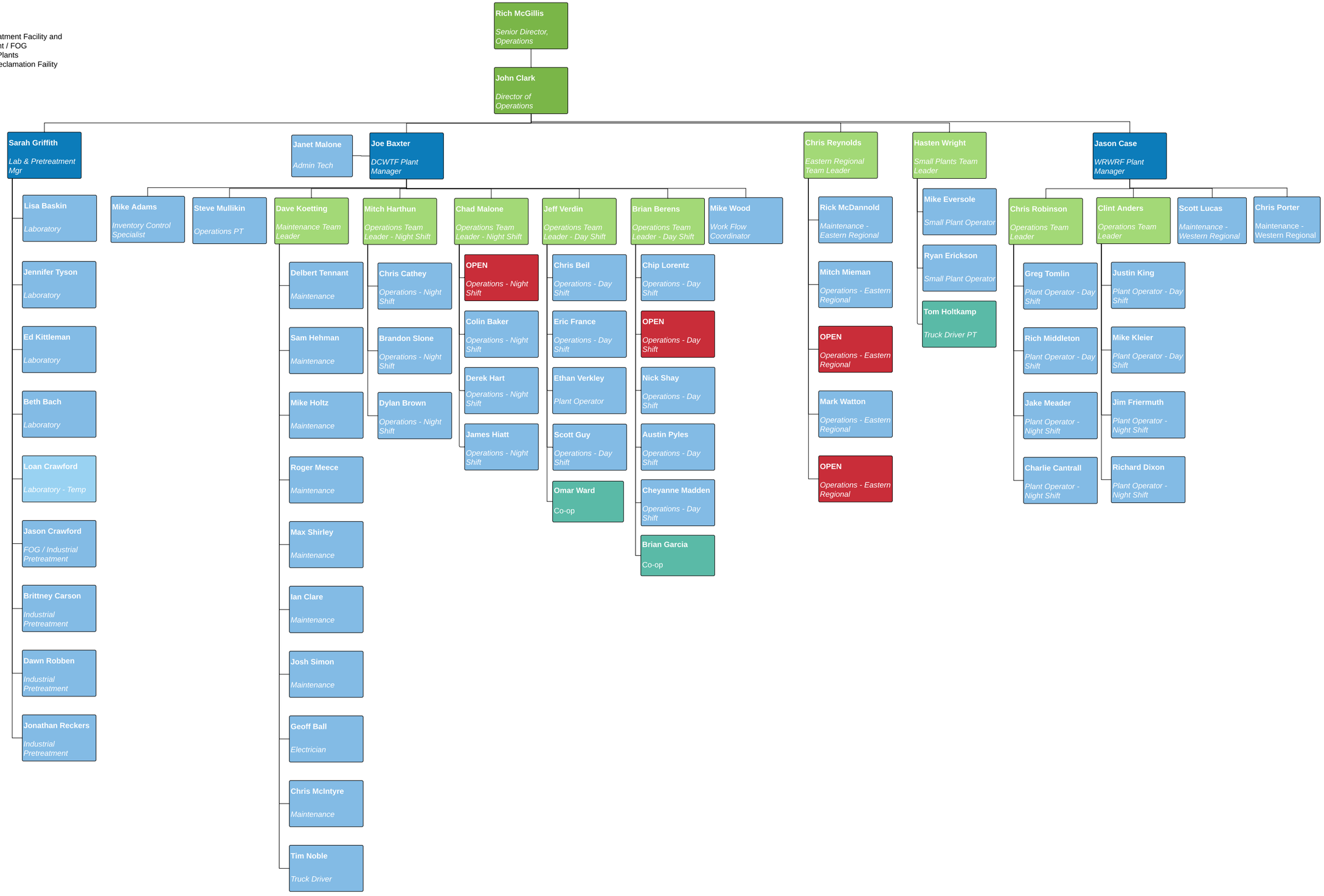
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Asset Planning, Fleet & Facilities



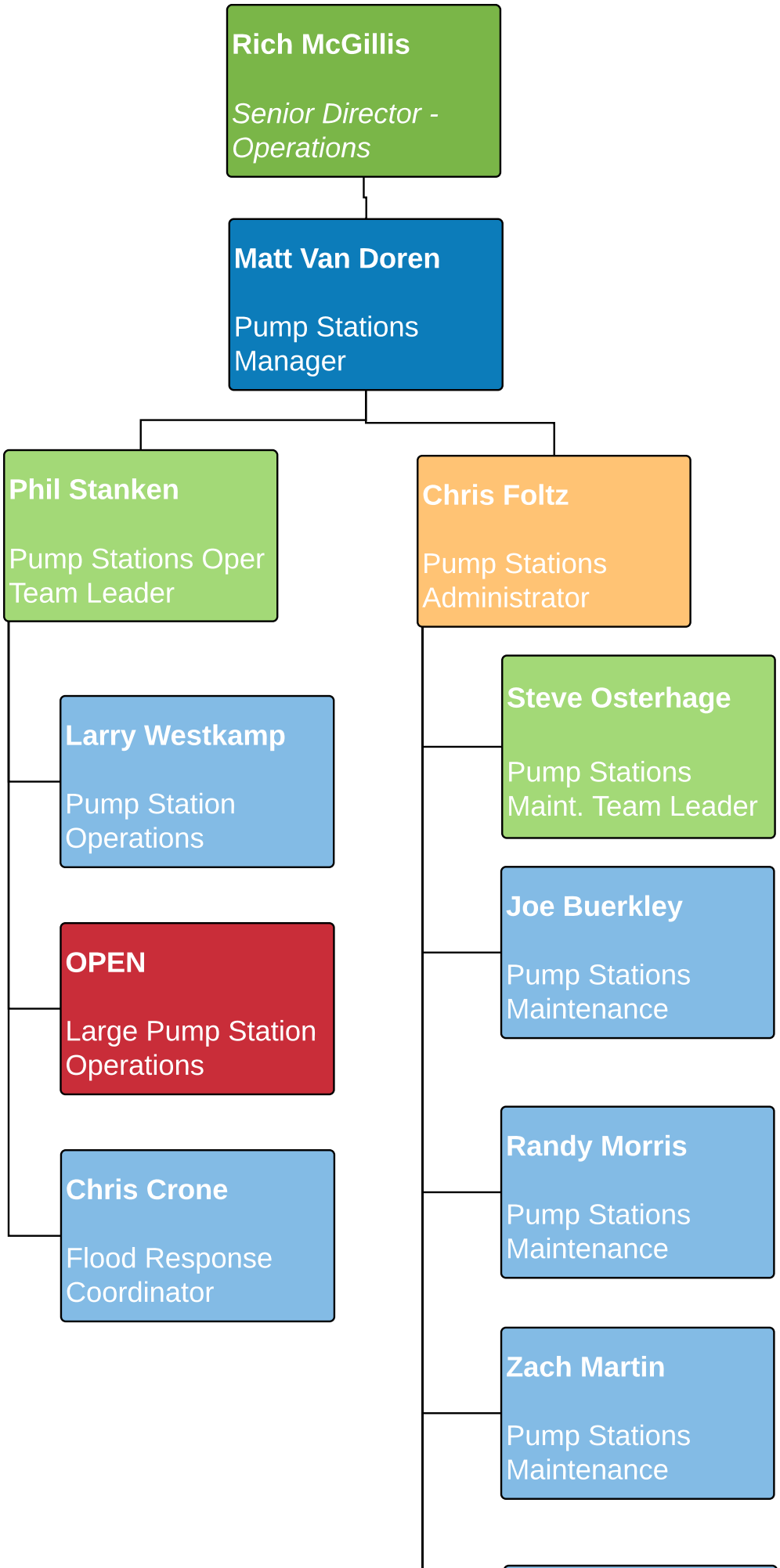
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Design and Construction
Infastructure and Capital Planning
Dept 6:
Integrated Watershed Management Department

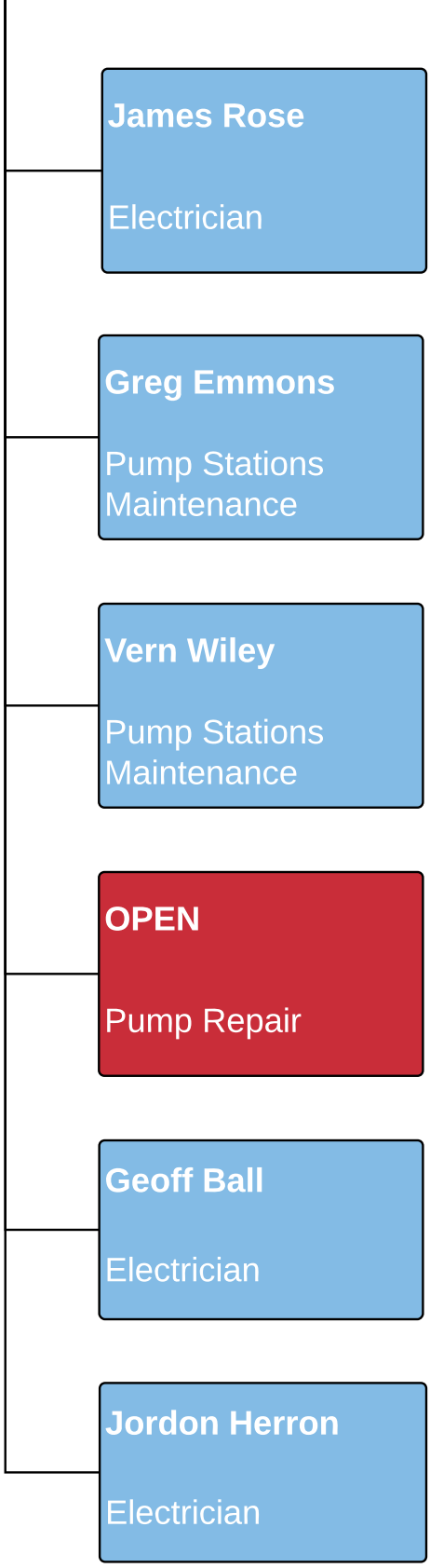


Dept 1: Dry Creek Wastewater Treatment Facility and Laboratory & Industtial Pretreatment / FOG
Dept 8: Eastern Regional & Small Plants
Dept 9: Western Regional Water Reclamation Faility



Dept 7 - Pump Stations




James Rose
Electrician
Greg Emmons
Pump Stations Maintenance
Vern Wiley
Pump Stations Maintenance
OPEN
Pump Repair
Geoff Ball
Electrician
Jordon Herron
Electrician

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APPENDIX G:

Backup Assistance Program Information and Brochures

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SANITATION DISTRICT NO. 1
BACKUP ASSISTANCE PROGRAM

I. Background

Sanitation District No. 1 ("SD1") strives to provide programs and services that benefit the Northern Kentucky community. Since the region consolidated its sanitary sewer system under SD1 in 1995, private property owners have been responsible for damages caused by sewer backups that result from Acts of God or excessive rainfall as stated in Article 3, Section 301.5, of SD1's Sanitary Rules and Regulations. SD1 has had no formal program to assist its customers in alleviating these sewer backups.

Over the last decade, several large magnitude storm events in the Northern Kentucky area have resulted in numerous wet-weather sewer backups in buildings. Understanding that private property owners remain responsible for damages caused by sewer backups, SD1 staff and the Board of Directors have committed to develop a program to help customers prevent certain sewer backups.

At the April 18, 2017 board meeting, the Board of Directors approved this new Backup Assistance Program, which shall commence on May 1, 2017. SD1 has no obligation to offer this Backup Assistance Program and may discontinue or revise the Program or funding for this Program at any time.

II. Definitions

A. Backup Assistance means Financial Assistance toward the Eligible Expenses necessary for the Backup Solution.

B. Backup Solution means a mechanical device, such as a backflow preventer valve or pump, installed by a Qualified Plumber to prevent Qualified Backups.

C. Eligible Expenses shall mean expenses directly related to the installation and effectiveness of the Backup Solution. Eligible Expenses include but are not limited to labor and materials required to remove and redirect storm water flow from downspouts, area drains, foundation drains and other private sources that legally discharge to a private sewer lateral directly connected to SD1's combined sewer system. Eligible Expenses shall not include the costs stemming from or associated with the labor and materials needed to correct or otherwise address Illegal Connections, defective internal plumbing, a defective/failing private lateral, violations of plumbing code, interference of trees and roots, subsurface utility conflicts, electric requirements and property restoration.

D. Financial Assistance means an amount not to exceed Five Thousand and 00/100 Dollars ($5,000.00) or such other amount as the SD1 Board of Directors shall determine from time to time.

E. Illegal Connections mean the direct or indirect discharge of surface water, groundwater, roof runoff, subsoil drains, or subsurface drainage to the separate sanitary sewer system which is prohibited by Article 3, Sections 302.1 and 302.2, of SD1's Sanitary Rules and Regulations.

F. Property means the real property (residential and nonresidential), located within the SD1 service area and connected to SD1 infrastructure that Property Owner is seeking to improve through participation in this Backup Assistance Program.

G. Property Owner means the owner or owners of the Property qualifying for the Backup Solution.

H. Qualified Backup shall mean a sewer backup related to wet weather, as identified in Article 3, Section 301.5, of SD1's Sanitary Rules and Regulations. Qualified Backups as defined herein shall not include sewer backups caused by inadequate internal private plumbing or defective sewer laterals as determined by SD1 in its sole discretion.

I. Qualified Plumber means a plumber licensed by the State of Kentucky.

III. Policy

SD1's Backup Assistance Program seeks to provide Financial Assistance for qualifying Property Owners for the installation of typical and cost-effective Backup Solutions. The amount of Financial Assistance is based on historical costing information and current local plumbing rates for similar work in a building with properly functioning internal and external plumbing and sanitary service lateral that only receives flow from indoor plumbing fixtures, including sinks, toilets, showers and floor drains. Private property issues not associated with the installation of the Backup Solution will remain the responsibility of the individual Property Owner and will not be deemed Eligible Expenses.

IV. Process

A. Program Eligibility. A Property Owner shall only be eligible for Financial Assistance if the Property Owner has experienced two (2) or more Qualified Backups at the Property within a five (5) year period of time as verified by SD1.

B. Problem Identification. The Property Owner is responsible for contacting SD1 to investigate the cause of a sewer backup to determine if the backup is a Qualified Backup and whether Property Owner meets the Program Eligibility. If SD1's investigation is not conclusive, the Property Owner may be responsible for hiring a Qualified Plumber to confirm that the sewer backup is not caused by inadequate internal private plumbing or by a defective sewer lateral. The Qualified Plumber

must confirm that the private sewer lateral is open and clear for the entire distance from the private building to SD1's public sewer system. If requested, the Property Owner will provide SD1 with a video inspection of the sewer lateral, which clearly shows an unobstructed sewer lateral. If it is determined that the private sewer lateral is defective and not fully operational, SD1 will notify the Property Owner that he or she must address the defect. The Property Owner is responsible for all costs associated with confirming that the private sewer lateral and internal plumbing is fully operational. A sewer backup caused by a defective lateral or inadequate private plumbing will not meet the requirements of a Qualified Backup as determined by SD1 in its sole discretion.

C. **Illegal Connections.** If, during the Problem Identification process or Verification of the Backup Solution, SD1 or the Qualified Plumber discovers any Illegal Connections, SD1 may notify the Property Owner that these Illegal Connections must be removed in accordance with SD1's Sanitary Rules and Regulations. Labor and materials needed to remove Illegal Connections will not be considered Eligible Expenses.

D. **Backup Solution Determination.** SD1 will review the Qualified Plumber's proposed Backup Solution for the limited purpose of approving the Backup Solution as qualifying for Backup Assistance. SD1 does not and will not warrant the effectiveness of the Backup Solution. SD1 representatives may request additional information from the Property Owner as needed.

E. **Backup Assistance Agreement.** Upon confirmation that Property Owner is eligible for Financial Assistance, Property Owner shall enter into a Backup Assistance Agreement in the form approved by SD1.

F. **Backup Solution Installation.** SD1 will provide Financial Assistance to the Property Owner toward the installation of a Backup Solution. The Property Owner will initiate the Backup Solution process by contacting a Qualified Plumber to investigate, design, and install the Backup Solution and complete all associated work required to ensure the effectiveness of the Backup Solution. The Property Owner must hire a Qualified Plumber to install the Backup Solution inside or outside of the building at the Property Owner's sole oversight and direction. All private property restoration must be final and approved by the Property Owner before SD1 will consider the work substantially complete. The Property Owner will remain responsible for all private property issues not associated with the installation of the Backup Solution. These Property Owner responsibilities include but are not limited to defective internal plumbing, a defective/failing private lateral, violation of code, interference of trees and roots, subsurface utility conflicts, electric requirements, property restoration, or other factors that may contribute to the cost and ineffectiveness of a Backup Solution.

G. Application for Backup Assistance. Upon completion of the Backup Solution, Property Owner shall submit an Application for Backup Assistance in the form approved by SD1.

H. Verification. Upon receipt of the Property Owner's Application for Assistance, SD1 must verify that installation of the Backup Solution is substantially complete before SD1 will release Financial Assistance funds. Property Owners must submit itemized invoicing for all work performed, which will be compared to Eligible Expenses.

I. Release of Claims. In order for the Property Owner to receive the Financial Assistance, it will be necessary for the Property Owner to sign the Release of Claims which will be recorded in the Office of the County Clerk in the County where the property is located.

J. Financial Assistance. Once SD1 has confirmed the Backup Solution is substantially complete and the Release of Claims has been executed, SD1 will contribute Financial Assistance funds towards a Backup Solution in accordance with the provisions of this Backup Assistance Program.

K. Ownership and Maintenance. Ownership and all maintenance and replacement responsibilities of the Backup Solution shall remain with the Property Owner.

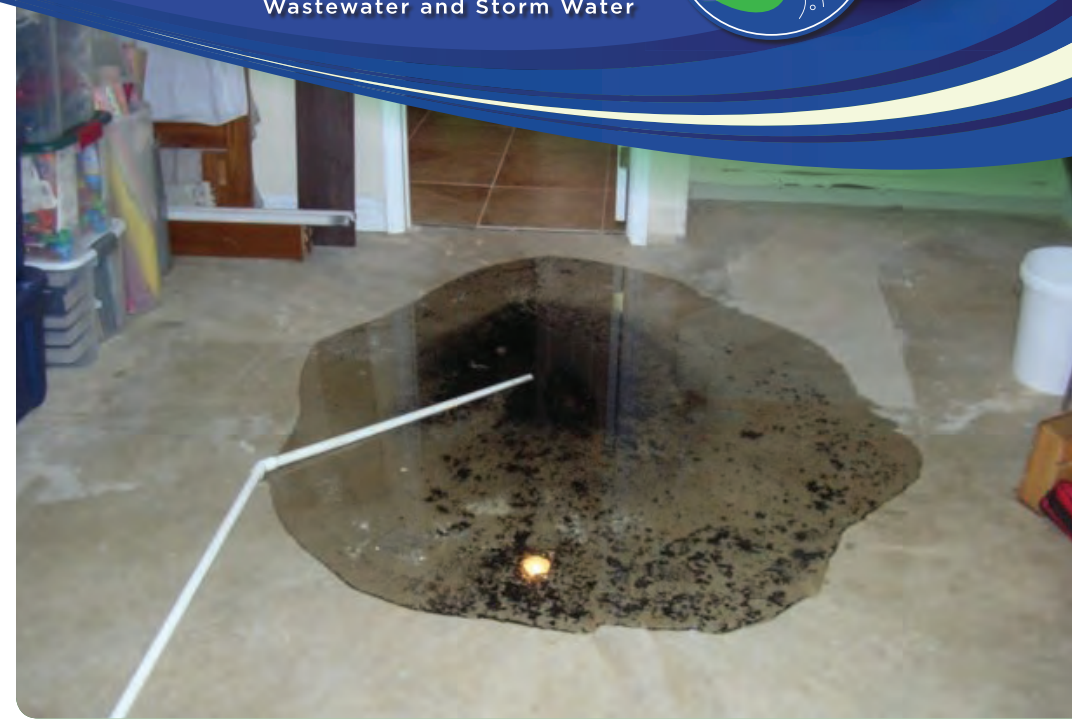
L. Waiver of Criteria. SD1 may, in its sole discretion, waive the eligibility criteria or any other requirements on a case-by-case basis.

V. Funding

SD1 is not obligated to provide this Backup Assistance Program and will review funding for the Program each fiscal year. Funding for the Backup Assistance Program will typically be included in SD1's fiscal year budget that is approved annually by the SD1 Board of Directors and the County Judges Executive. For example, the budget for fiscal year 2018 shall contain allowances for up to $300,000.00 for this Backup Assistance Program. Funding for the Backup Assistance Program is approved at a "not to exceed" budget amount. In the case of unforeseen wet-weather circumstances, the Board of Directors may reappropriate operation funds within the approved fiscal year budget to provide additional program funds. SD1 reserves the right to prioritize and assign available program funding for Backup Solutions based on criticality and other applicable criteria to adhere to public health and safety standards. At no time shall SD1 act without good faith to reject any Application for Backup Assistance. Once all properties receiving a high priority status have been addressed, any remaining buildings requiring a Backup Solution will be scheduled for assistance based on a level of service rating in combination with the order in which it was received.

SD1

Managing Northern Kentucky's Wastewater and Storm Water



Understanding Wet-Weather Sewer Backups

Sewer backups are caused by a buildup in pressure in the sewer system that sends sewage back up into homes or businesses through floor drains, toilets or other plumbing fixtures. As more water enters the system, the pressure builds, and the sewage goes wherever it can – including back up into homes or businesses. Blocked pipes also can cause or contribute to sewer backups.

What can I do to prevent future backups?

Every situation is unique, but it may be possible to reduce the risk of sewer backups through plumbing improvements. When considering the options listed below, consult with a licensed plumber to determine the best approach for your property.

Maintain your private sewer lateral. A blocked or otherwise damaged private lateral can cause any number of expensive, inconvenient and hazardous problems, including sewer backups and sinkholes. To avoid these issues, periodically have your lateral inspected and cleaned by a licensed professional.

Disconnect downspouts and other storm water drains. Especially in older neighborhoods, downspouts, driveway drains and other private storm water connections often flow to private sewer laterals. When it rains, these connections can overburden laterals, leading to backups of raw sewage. Before disconnecting storm water lines, check to see how changes could affect surrounding properties and that you are following all city and county regulations.

Install a backflow preventer. Backflow preventers ensure water can onl flow through your private sewer lateral in one direction – away from your home. When it rains, the backflow preventer closes o f your lateral from the public sewer pipe to which it normally flows. Until the water l vels in the public sewer pipe decrease, the backflow preventer remains closed. Wit a backflo preventer, you may need to limit water usage in your home during rain events.

Install a sump pump or whole-house sewage ejector pump. Sump pumps remove only storm water from inside a building and send it back up above ground and out onto the surrounding landscape or to a public sewer designed only to carry storm water. Whole-house sewage ejector pumps remove both storm water and wastewater, and they send the mixture to a public sewer pipe that's designed to carry both storm water and wastewater. Both pump types are typically installed in the basement.

SD1
1045 Eaton Drive | Ft. Wright, KY 41017
859-578-7450 | www.sd1.org

Who is responsible for sewer backups?

Issues in either private sewer laterals or public sewer pipes can lead to sewer backups.

Private sewer laterals are private property owners' responsibility. Your private sewer lateral is the pipe that connects your home's plumbing to the public sewer system. Your private lateral may be blocked or otherwise damaged if water is slow to drain from your home during dry weather or after a rain event. If you believe your private lateral is blocked or damaged, contact a licensed plumber to investigate. If your lateral damage is under the public roadway, you may be eligible for assistance from SD1. Learn more at www.sd1.org/PrivateLateralRepairProgram.

Public sewer pipes are maintained by SD1. Public pipes that carry both wastewater and storm water are not designed to handle extreme amounts of storm water. SD1 proactively inspects and cleans all of our sewer pipes on a rotating basis. With a holistic approach to addressing storm water issues, SD1 prioritizes funding and improvements based on risk to public health, risk to sensitive areas and magnitude of any problems.

Do I need to report all backups to SD1?

If you experience a sewer backup in your home or business, contact SD1 immediately at 859-578-7450 to report the issue. SD1 will respond to your call by sending a crew out to investigate what caused the backup and will later notify you about the results. SD1 considers customers' backup reports when prioritizing improvement projects. If your property has experienced two or more wet-weather backups in the last five years, you may qualify for SD1's Backup Assistance Program. Learn more by visiting www.sd1.org/seweremergency or calling 859-578-7450 and asking for the program coordinator.

You also should begin cleanup and call your homeowners insurance provider as soon as possible to report damage.

Can I purchase insurance for sewer backups?

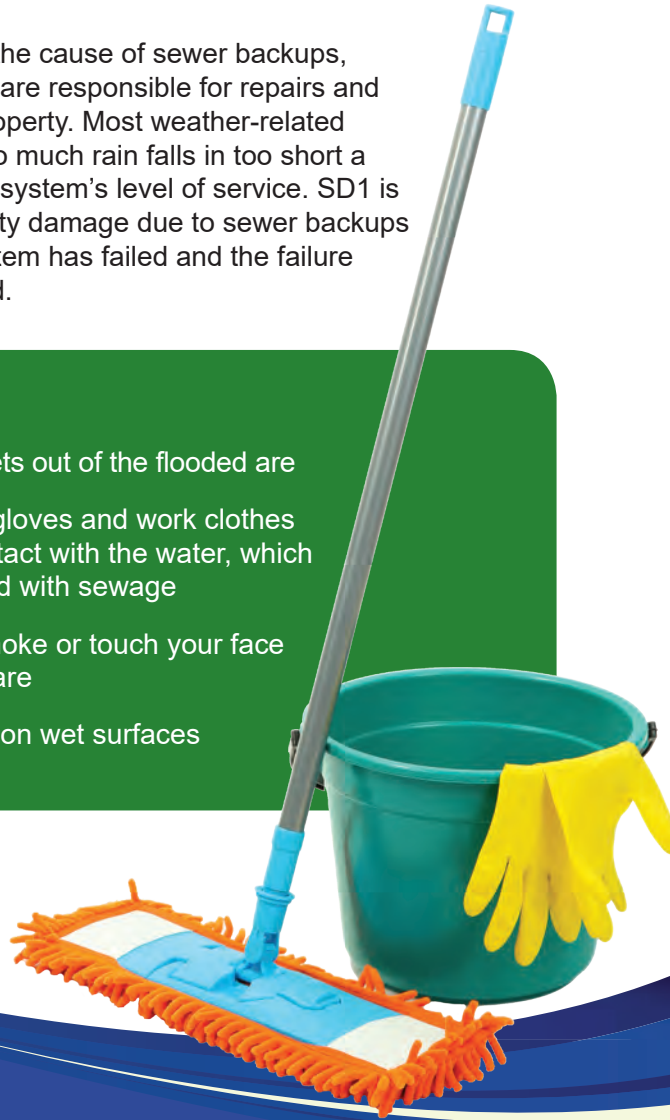
Insurance for damage caused by sewer backups is available and relatively inexpensive, but this may be a separate policy from your homeowners insurance. If you pursue such a policy or a rider to your existing policy, check to see if it covers both repair and cleanup costs that can result from flooding and sewer backups. You may also wish to pursue insurance for your private sewer lateral to recoup repair costs should it collapse or otherwise become damaged.

Who is responsible for cleanup and repair after sewer backups?

When extreme weather is the cause of sewer backups, individual property owners are responsible for repairs and cleanup on their private property. Most weather-related backups occur because too much rain falls in too short a time, exceeding the sewer system's level of service. SD1 is only responsible for property damage due to sewer backups when the public sewer system has failed and the failure could have been prevented.

Cleanup Tips

- Keep children and pets out of the flooded are
- Wear rubber boots, gloves and work clothes to minimize skin contact with the water, which may be contaminated with sewage
- Do not eat, drink, smoke or touch your face while in the flooded are
- Take care not to slip on wet surfaces



Backup Assistance Program

SD1
Managing Northern Kentucky's Wastewater and Storm Water

Guide for Property Owners and Plumbers

What is SD1's Backup Assistance Program?

SD1's Backup Assistance Program is designed to provide financial relief to property owners dealing with repeated wet weather sewer backups in their homes or businesses. It provides up to $5,000 in assistance per approved property for installing a "backup solution" – a mechanical device that can prevent wet-weather backups. This maximum amount represents the typical cost to install a backup solution.

Who is eligible to participate in the Backup Assistance Program?

You may be eligible to participate if you meet all of the following conditions:

- The property is located in SD1's service area.
- The property has experienced two "qualified backups" within fiv years.
- Your private sewer lateral and indoor plumbing is in proper working condition and you have no illegal connections.
- Your SD1 accounts may not be delinquent.

How do I participate in SD1's Backup Assistance Program?

- ☐ **Investigate the backup.** If you experience a sewer backup, call SD1 as soon as possible at 859-578-7450 (choose option 1) to report the issue. SD1 will send an employee to investigate. If SD1 cannot determine the cause, you may be required to hire a plumber to investigate further. In this case, be sure to have your plumber fill out the Plumbe 's Checklist attached at the end of this guide and return it to SD1. SD1 will review the results to determine if the backups qualify for the Backup Assistance Program.

- ☐ **Review, sign and submit a Backup Assistance Agreement.** If SD1 confirms you are eligible for assistance, you will receive a Backup Assistance Agreement. Return your signed Agreement to SD1. SD1 will send a formal letter of acceptance with next steps if you are accepted into the program.

- ☐ **Authorize installation work to begin.** Once you receive an acceptance letter, you are responsible for overseeing the installation of the backup solution. Your plumber may require you to provide a copy of your program acceptance letter before beginning work. Your plumber is responsible for obtaining all necessary permits and inspections.

- ☐ **Sign and submit an Application for Financial Assistance.** Once you are satisfied with your plumbe 's work and installation is complete, fill out the Application for Financial Assistance and sign the Release of Claims. You should have received these documents with your acceptance letter. The Release of Claims must also be notarized. Return the Application for Financial Assistance and Release of Claims to SD1 along with an itemized final invoice from your qualified plumb .

  SD1 will contact you to schedule an inspection of the installed backup solution before releasing financial assistance. Finall , SD1 will send a check along with a letter approving eligible expenses and explaining that your signed Backup Assistance Agreement and Release of Claims have been filed with your county clerk.

Where do I submit my paperwork for the Backup Assistance Program?

You may drop off or mail your signed Backup Assistance Agreement, Release of Claims, Application for Financial Assistance, invoicing and any other necessary paperwork to SD1's main offic

SD1 - Backup Assistance Program
c/o Debbie Rizzo
1045 Eaton Drive
Ft. Wright, KY 41017

If you need help notarizing your Release of Claims, you may call SD1 to arrange for a notary public when you drop off your documents. Cal 859-578-7450 and ask for the Backup Assistance Program coordinator to schedule a drop-off

Questions?

If you have questions about SD1's Backup Assistance Program, please call SD1 at 859-578-7450 and ask for the Backup Assistance Program coordinator.

Backup Assistance Program

SD1
Managing Northern Kentucky's Wastewater and Storm Water

How do I know if I've hired a "qualified plumber"?

You must hire a "qualified plumber" to recommend and install a backup solution. SD1 considers a plumber "qualified" if h or she is licensed by the state of Kentucky. You may wish for your plumber to also be a certified tappe . Find SD1's list of certified tappers on our website at **www.sd1.org/seweremergency.**

What counts as a "qualified backup"?

A sewer backup can qualify for SD1's Backup Assistance Program if it is caused by wet weather and other issues are not the primary cause of the problem. If your private lateral is damaged, you have illegal connections or your property's plumbing is otherwise not working properly, your sewer backup may not qualify for the program.

What qualifies as an eligible expense?

Eligible expenses include any labor or materials directly related to installing a backflow solution, including the device itself and the digging required to install it. Ineligible expenses include work to upgrade internal plumbing or electricity to current standards, repair defective private laterals or remove illegal connections.

What is a backup solution?

A backup solution is a mechanical device that isolates a home or business from the public sewer pipe and the water that flows th ough it. Backflow valves, sewage ejector pumps and grinder pumps ar backup solutions you may wish to consider installing if your property experiences backups related to wet weather.

Remember, not all backups are caused solely by wet weather. Faulty indoor plumbing or a damaged private lateral can cause or contribute to backups. If this is the case in your situation, a backup solution alone may not eliminate backups in your home or business. Hire a qualified plumber to help you assess your property and recommen a comprehensive backup solution.

What types of backup solutions can I choose from?

There are two types of backup solutions that most residential or small business properties choose: backflow valves and sewage ejector umps. Each type has unique benefits as well as challenges. See the fo lowing pages for detailed explanations of these two backup solutions.



Maintaining a backflow valve can be as simple as pulling it out of the access pipe and hosing it down to remove debris. Make maintenance of your new backup solution device a routine to ensure it works when it is needed most.

What else should I consider when choosing a backup solution?

Carefully consider each backup solution with the help of a qualified plumbe . To ensure you get the best advice at the best price, seek out evaluations and quotes from multiple qualified lumbers before you choose a backup solution. Be sure to also consider the following factors when choosing a backup solution:

- Whether your plumbing and electrical systems are up-to-date or will need upgraded.
- The ease and expense of addressing future maintenance needs.
- Whether you have storm water connections that will need rerouted.
- The cost-benefit of installing and maintaining each backup solu ion. Are the backups on your property severe and frequent enough to justify the cost of a more costly pump backup solution?

Backup Assistance Program

SD1
Managing Northern Kentucky's Wastewater and Storm Water

Backflow valve

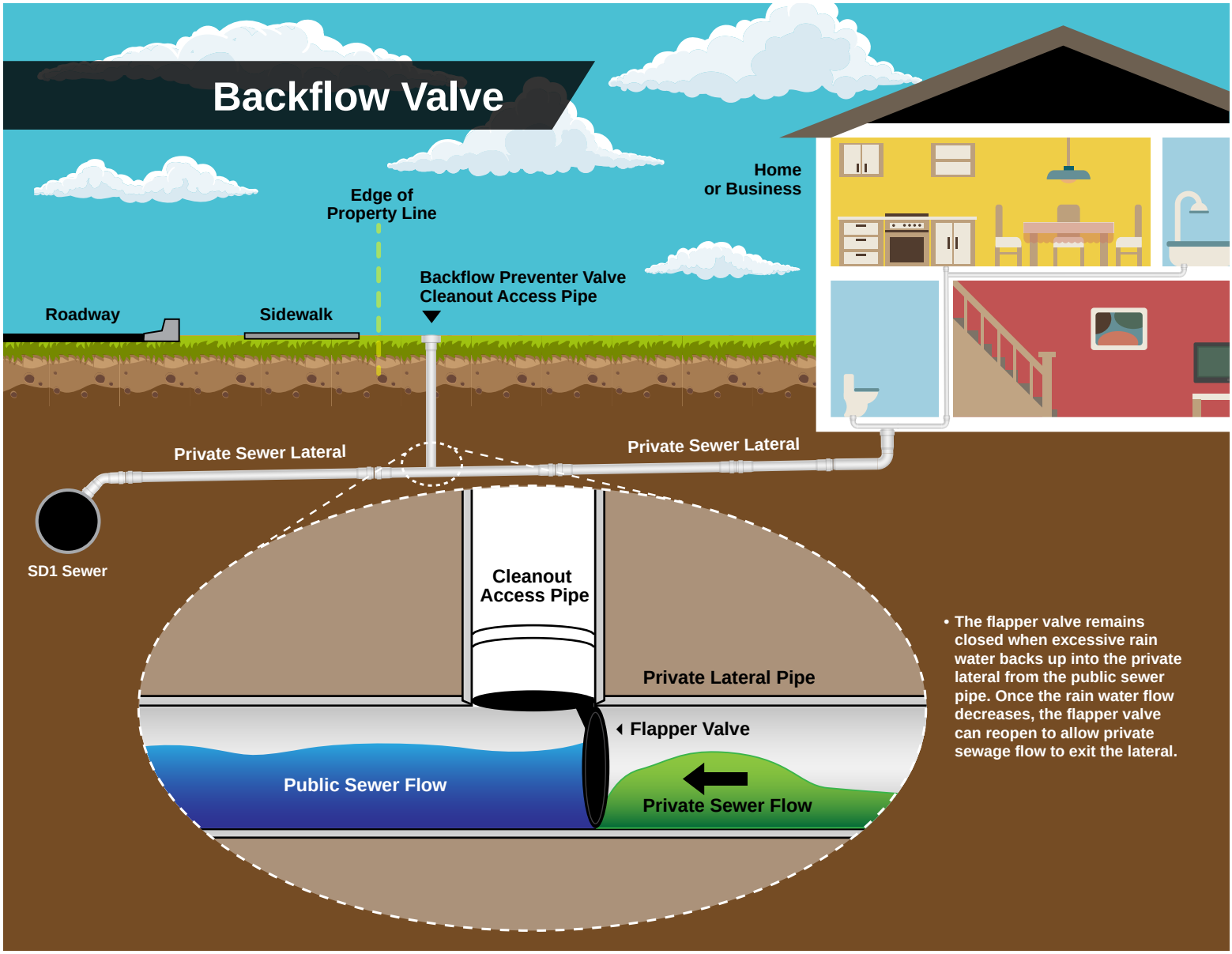
Backflow valves only permit water to flow in one direction -- f m a home or business to the public sewer. This device is installed along a private sanitary sewer lateral and, ideally, outside near the property line.

PROS

- ✓ No power requirements.
- ✓ Lower cost to buy and install.
- ✓ Lower cost to operate and maintain.
- ✓ If installed indoors, does not require installation of a plumbing vent. Many older homes do not have an existing plumbing vent.

CONS

- ✖ Any storm water connections to your plumbing or sewer lateral must be removed.
- ✖ You may need to limit use of your indoor plumbing during a rain event. An engaged backflow valve will sto wastewater from flowing in either direction



Backup Assistance Program

SD1
Managing Northern Kentucky's Wastewater and Storm Water

Sewage ejector pump

Sewage ejector pumps lift sewage up and out of a property before discharging it back into the sanitary sewer lateral. All flo from the lowest levels of the home would be routed into the lateral through the pump. The pump could be installed inside or outside the home. Install an alarm on the pump to ensure you are notified if the pump fails

PROS

✓ Can handle both storm water and wastewater.

✓ Can use indoor plumbing during a rain event.

CONS

✖ Will not work during power outages.

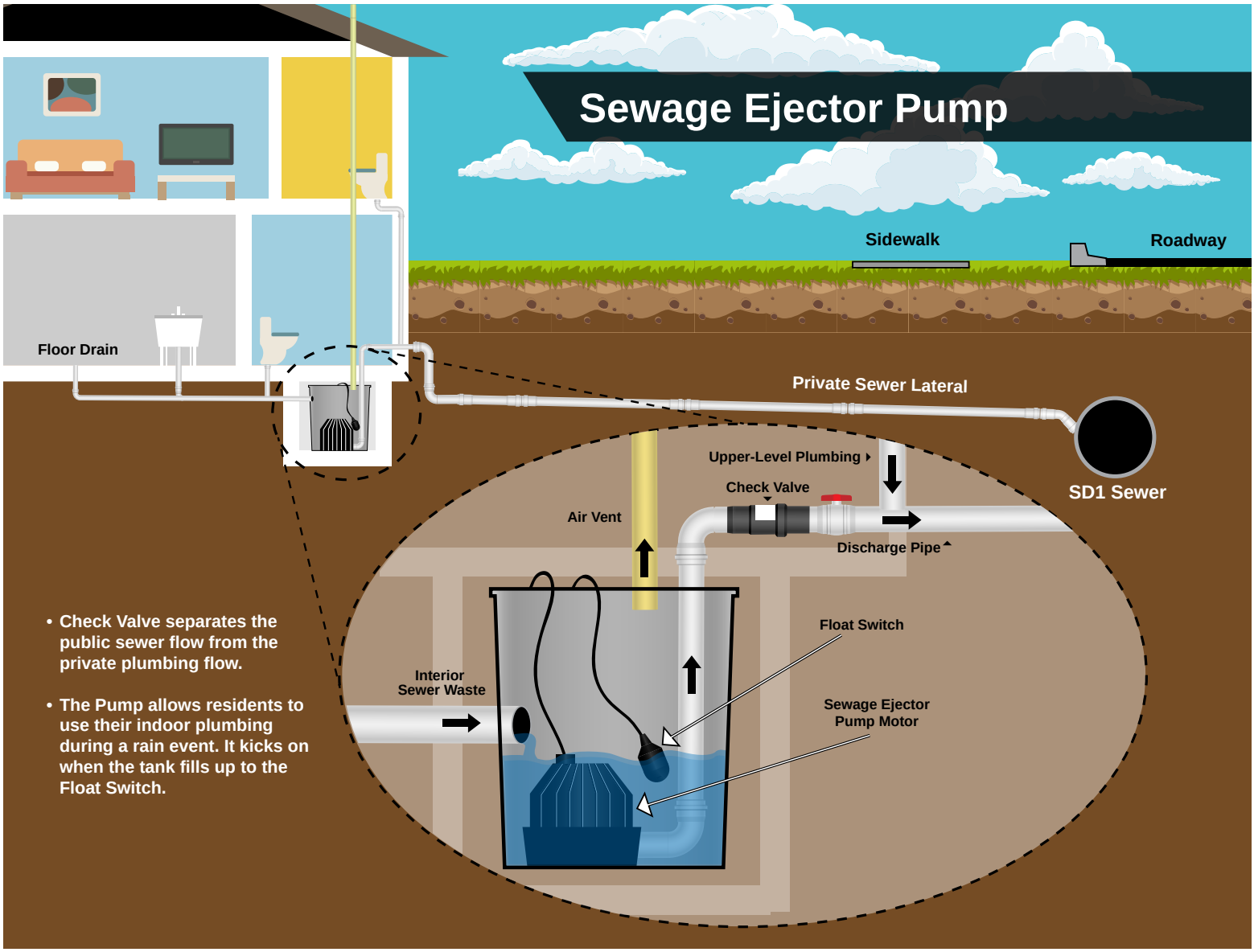
✖ Requires a dedicated electrical circuit.

✖ May require an air vent, which many older homes do not already have.

✖ Higher operating (electricity) and maintenance (pump replacement) costs.

✖ Can be a source of odors.

✖ Toys, rags, wipes and other hygiene products can clog the pumps. Customers should never flush these items as they can damage the public se er system.



SD1
Managing Northern Kentucky's Wastewater and Storm Water

Plumber's Checklist
for Private Lateral Inspections

Attention Property Owner: Provide this form to your plumber whenever they inspect your private sewer lateral to determine its condition. The checklist will help SD1 determine your eligibility for our Backup Assistance Program or Private Lateral Repair Program. Once your plumber has completed the form, return it to *SD1 Attn: Debbie Rizzo, 1045 Eaton Drive, Ft. Wright, KY 41017*. Property owners also should keep a record of the completed form.

Address: _____ **Date televised:** _____
Street address, City - please print

Attention Plumber: If you televise the private lateral, please note the footage (in feet) of the video where issues appear. Customers must submit video footage showing the condition of their lateral if they wish to participate in SD1's Private Lateral Repair Program. Video footage is optional for the Backup Assistance Program.

Lateral Televising: Was this inspection method used? ☐Yes ☐No
To the mainline? ☐Yes ☐No
Total Linear Feet Televised _____

Lateral Condition: (Check "Yes" or "No" and, when pipe televised, provide video footage)

Yes	No	Lateral Condition	Video Footage in Feet (If pipe was televised.)
☐	☐	Completely structurally collapsed and blocking flow (camera may have gone under water)	
☐	☐	Partially collapsed, broken or cracked with restricted flow	
☐	☐	Displaced joints causing infiltration or blockage	
☐	☐	Roots infiltrating pipe causing 50% or more blockage	
☐	☐	Sags in pipe, ponding water or settling debris	

Company Name: _____

Technician: _____ _____ _____
Signature *Print name* *Date*

Comments: _____

_____

By signing, the property owner confirms the lateral condition assessment by the plumber.

Property Owner: _____ _____ _____
Signature *Print name* *Date*

SAMPLE INVOICE - This sample shows the detail needed to apply for financial assistance through SD1's Backup Assistance Program. Plumbers are not required to use this form unless their existing invoicing practices do not provide adequate detail.

BACKUP ASSISTANCE PROGRAM - PLUMBER ITEMIZED COSTS

Labor Costs	Total Hours	Cost	SD1 ELIGIBLE EXPENSE	SD1 APPROVED EXPENSE
Foreman				
Labor				
Operator				
Driver				

Equipment Costs	Type / Size	Hours/days	Cost	SD1 ELIGIBLE EXPENSE
Backhoe				
Skid Steer				
Dump Truck				

Materials	Description	Unit/ Measure	Amount	Cost	SD1 ELIGIBLE EXPENSE
Pipe		LF			
Pipe		LF			
Pipe		LF			
Fitting		EA			
Fitting		EA			
Fitting		EA			
Concrete/ sakrete		CY / Bags			
Concrete/ sakrete		CY / Bags			
Gravel/rock		CY			
Gravel/rock		CY			
Backflow device		EA			
Ejection Pump		EA			
		TOTAL	**$**		**$**

Description-pipe type/diameter; fitting type/size; concrete mix type; gravel type; pump brand/size
Amount- length of pipe; number of items(each) yards of material

APPENDIX H:

FY 2017 Safety Training Calendar

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Outline of Scheduled Classes

Courses
Exposures

FY 2017 Revised

June 16, 2016

Month	Class	Length	Date	Class	Length	Date
July 2016	Flagger Traffic Control	2	5th - 8th	Lockout/Tagout	1	19th-21st
		2		Electrical Safety	2	19th-21st
August 2016	Lab Safety	2	10th & 23rd	Swift Water Awareness	8	26th
September 2016	HAZWOPER Clean-up Brownfield Sites	4	6th - 9th	Flagger Traffic Control	4	19th-23rd
October 2016	Fire Extinguisher Emergency Action Plan	2	3rd - 7th	Fire Extinguisher Emergency Action Plan	2	18th-19th
November 2016	Lockout/Tagout	1	8th-10th	Excavation & Trench Operations Rescue	4	15th -17th
	Electrical Safety	2	8th-10th			
December	(no training scheduled in December)					
January 2017	CPR/AED/First Aid/BBP	8	9th-13th	Accident Prevention and Hazard Recognition		24th-26th
February 2017	HAZWOPER Response Fixed Facilities	4	6th - 9th	Workplace Violence/Active Shooter	2	20th-24th
March 2017	CPR/AED/First Aid/BBP	8	6th-10th	Accident Prevention and Hazard Recognition	2	21st-23rd
April 2017	Cranes, Hoist, and Rigging	4	3rd - 7th	Lift Truck (Forklift) Safety	4	17th-20th
May 2017	Confined Space Entry and Rescue	4	9th-11th	Excavation and Trench Safety	4	23rd-24th
June 2017	Confined Space Entry and Rescue	4	6th - 8th	Excavation and Trench Safety	4	21st-22nd

Note: Occupational Safety/Health courses are <u>mandatory</u> for all employees based upon compliance and potential exposure to injury, illness, and death. Refer to the Process Hazard Analysis and course description. If you have any questions regarding whether you are required to take the classes contact your Supervisor, Safety Committee Representative and/or the Safety Department.

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APPENDIX I:

FY 2017 SORP Training Presentation Slides

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SORP TRAINING

Refresher 2017/18





Introduction

- SD1 is required to provide a standard operating procedure for providing consistent and effective response and clean-up of unpermitted overflows.
- Consistent application of these procedures ensures adequate protection of public health and mitigation of the impact to the environment.
- In addition, it provides structure and guidance for SD1's staff in the selection and application of appropriate measures to meet the needs of each situation.

Volume of Overflow Estimate

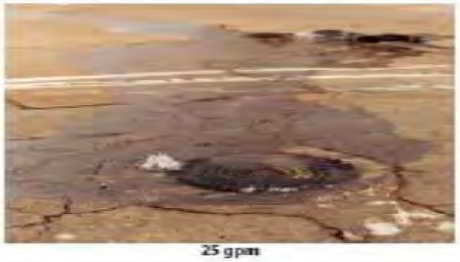
City of San Diego
Metropolitan Wastewater Department

Reference Sheet for Estimating Sewer Spills from Overflowing Sewer Manholes

All estimates are calculated in gallons per minute (gpm)

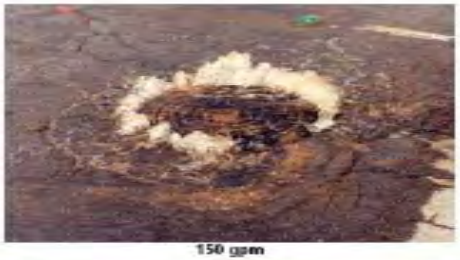
Wastewater Collection Division
(619) 654-4160


5 gpm


25 gpm

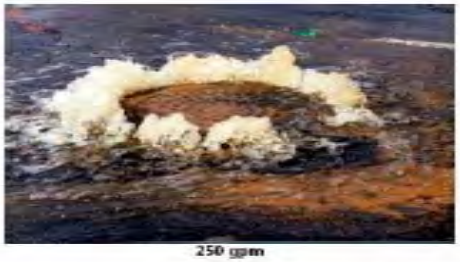

50 gpm


100 gpm


150 gpm


200 gpm


225 gpm


250 gpm


275 gpm

All photos were taken during a demonstration using metered water from a hydrant in cooperation with the City of San Diego's Water Department.

rev. 4/99

Observing Safety Procedures

- Safety should always be the principal concern of the field crew.
- It is essential in all operations that personal protective equipment (PPE) is used and all safety procedures are followed.

Sewer Overflow Response Procedures for First Responders



Purpose

- Regardless of how an unpermitted overflow is detected all response personnel must follow the same response procedures to ensure adequate protection of public health and mitigation of the impact to the environment.

Procedures

- Confirm/Report the Overflow
- Collect Information for Documenting the Overflow
- Assess the Impact and Notify the Public
- Correct, Contain and Cleanup
- Document

Procedures

- Each overflow event is unique and requires SD1 personnel to employ their best professional judgment in evaluating each event to determine the most appropriate actions.
- The employee who initially discovers an overflow must call it in as soon as all the necessary data is collected for a proper response, this is so system release email can be sent out asap.

Confirm the Overflow

- Provide the on-duty Dry Creek Operator the following information:
  - The location of the overflow, including street address and city
  - The structure number, if known
  - A description of the overflow and cause, if known
  - The response personnel making the overflow report
  - The time it was found
- If chemical or hazardous materials are suspected or detected in an overflow dial 911

Fish Kill

- Fish Kill- If fish kill is observed the EPA as well as the Department of Fish and Wildlife are notified.





Assess the Impact and Notify the Public

- Visually identify the areas that have been affected due to the discharge.
  - When necessary, notify the Public
- By phone, review your assessment and planned response measures with a SORP coordinator.

SORP Coordinators

- Craig Massie:640-4496
- Phil Stanken: (Pump Stations) 240-6668
- Cap Kiser:250-5416
- Jeremy Spada:512-8916

Correct, Contain and Cleanup

- Once the appropriate personnel and equipment are onsite, take measures to correct the cause
- Where appropriate, implement containment procedures to prevent public contact and further dispersion of the overflow until repair and clean-up efforts can be completed.

Types of Containment

- Natural Depression-This is a low lying area with a dam in place like a curb around a grassy area.



Types of Containment

- ByPass pumping: Used when an immediate solution to the overflow is unable to occur.



Types of Containment

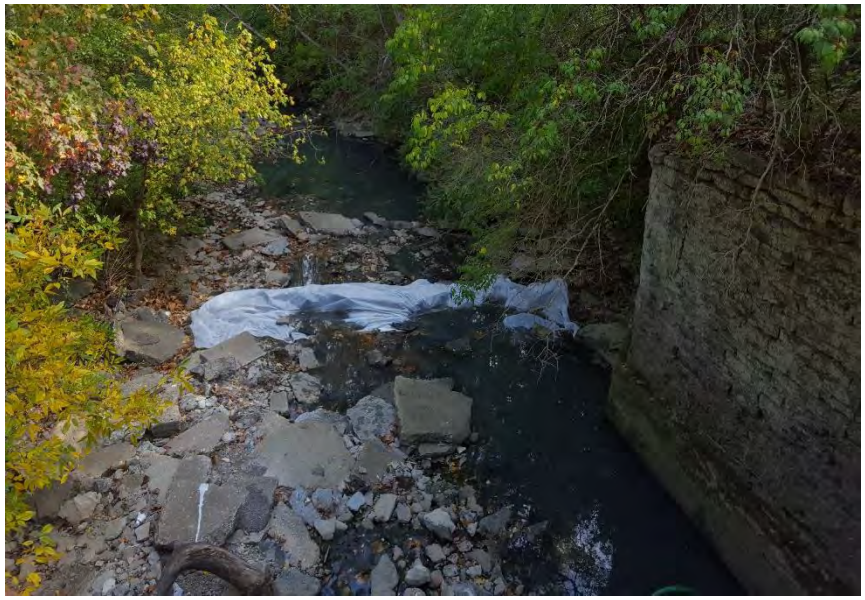
- Sandbag Dam-Sandbags used to contain or redirect the flow.





Types of Containment

- Earthen Dam-May be piles of dirt or sand used to contain or direct flow.





Types of Containment

- Blocked Storm Drain-A plugged storm inlet to prevent flow from entering the storm system.



Types of Containment

- Stream Barriers-Natural items that block a stream such as logs or rocks.



Types of Cleanup

- Flush and Pump-Flush sewage to a specific area then pump back into system.





Flush and Pump





Flush and Vac









Types of Cleanup

- Pump-Pump sewage back into sanitary system.
- Vac-Sewage is vacuumed but no flushing is used.
- On some occasions flushing with clean water is used if no method of capture is available. KDOW is notified on these situations.

Types of Cleanup

- Rake, Sweep, and Pick Up-Hand tools such as rakes, shovels, and brooms used to remove sewage and debris from release.



Types of Cleanup

- Soil removal and restoration





Soil Remediation









Soil Remediation





Types of Cleanup

- Replace Net Bags





Possible Reasons

- Blockages
  - Roots
  - Grease
  - Debris
  - Vandalism







Grease

- If grease is the reason a representative of SD1's FOG program is notified to assess the area and try to determine origin.



Vandalism

- If vandalism is the reason a police report is made in the corresponding city. All documents are then linked to the overflow module.



DRAFT KYIBRS REPORT

COMMONWEALTH OF KENTUCKY

ADMINISTRATIVE

AGENCY ORI/NAME: 0591900 INDEPENDENCE POLICE DEPARTMENT					INCIDENT NUMBER: KY 16-10618	
INCIDENT DATE/TIME	EXACT / ESTIMATE	REPORT DATE	RECEIVED	DISPATCHED	ARRIVED	CLEARED
1/1/2017 07:00 TO 6/19/2017 11:30	ESTIMATE	6/20/2017	11:06	11:10	11:20	11:38
REPORTED BY: KISER, EUGENE L. III					HOW REPORTED: IN PERSON	
LICENSE/ID STATE: KY	LICENSE/ID NUMBER: K95246092					
ADDRESS: 2942 RICH RD						
CITY: MORNING VIEW	STATE: KY	ZIP CODE: 41063	PHONE NUMBER: 859-578-7450			
EXACT LOCATION OF OFFENSE: WOODS TO THE SOUTH OF REMKE					SECTOR NO:	
ADDRESS: 3960 TURKEYFOOT RD						
CITY: INDEPENDENCE				STATE: KY	ZIP CODE: 41051	
COUNTY: KENTON	LATITUDE: 38 DEG	58.607 MIN	LONGITUDE: 84 DEG	35.569 MIN		

OFFENSE DATA

SEQUENCE #: 1 OF 1	LOCATION TYPE: FIELD, WOODS				TYPE WEAPON/FORCE INVOLVED	CRIMINAL ACTIVITY/GANG IFO
OFFENSE DESCRIPTION: CRIMINAL MISCHIEF, 1ST DEGREE						
OFFENSE CODE: 01401	ASCF CODE: 0	KRS CODE: 512.020	CLASS: D	DEGREE: F	COUNTS: 1	
BIAS MOTIVATION: NONE (NO BIAS)	METHOD ENTRY:	NUMBER PREMISES: 0				
SCHOOL NAME:	SCHOOL TYPE:	CAMPUS?				
OFFENDER SUSPECTED OF USING: NOT APPLICABLE	COURT ORDER TYPE:					
SEQUENCE # OF	LOCATION TYPE:				TYPE WEAPON/FORCE INVOLVED	CRIMINAL ACTIVITY/GANG IFO
OFFENSE DESCRIPTION:						
OFFENSE CODE:	ASCF CODE:	KRS CODE:	CLASS:	DEGREE:	COUNTS:	
BIAS MOTIVATION:	METHOD ENTRY:	NUMBER PREMISES:				
SCHOOL NAME:	SCHOOL TYPE:	CAMPUS?				
OFFENDER SUSPECTED OF USING:	COURT ORDER TYPE:					
SEQUENCE # OF	LOCATION TYPE:				TYPE WEAPON/FORCE INVOLVED	CRIMINAL ACTIVITY/GANG IFO
OFFENSE DESCRIPTION:						
OFFENSE CODE:	ASCF CODE:	KRS CODE:	CLASS:	DEGREE:	COUNTS:	
BIAS MOTIVATION:	METHOD ENTRY:	NUMBER PREMISES:				
SCHOOL NAME:	SCHOOL TYPE:	CAMPUS?				
OFFENDER SUSPECTED OF USING:	COURT ORDER TYPE:					

PROPERTY DATA

SEQ #	PROPERTY DESCRIPTION	TYPE OF LOSS	VALUE	RECVRD VALUE	REC. COND.	DT RECOVERED
1	SEWER GRATE, UTILITY POLE, Etc. (Utility Owned)	DESTROYED/DAMAGED/VANDALIZED	$10,000.00			

GENERAL

PROPERTY DESCRIPTION: SANITATION DISTRICT MANHOLE

OWNER APPLD NUMBER	SERIAL NUMBER		
2060061			
MAKE	MODEL	OWNER	
		Victim 1	

SEQ #	PROPERTY DESCRIPTION	TYPE OF LOSS	VALUE	RECVRD VALUE	REC. COND.	DT RECOVERED

GENERAL

PROPERTY DESCRIPTION:

OWNER APPLD NUMBER	SERIAL NUMBER		
MAKE	MODEL	OWNER	

TOTAL STOLEN VALUE:	TOTAL RECOVERED VALUE:		TOTAL VEHICLES STOLEN:		TOTAL VEHICLES RECOVERED:	

STATUS

INCIDENT STATUS	CLOSED DATE	CLEARANCE TYPE	CLEARED EXCEPTIONALLY	EX. CLEARANCE DATE	UCR REPORTING FOR OTHER AGENCY
INACTIVE	6/20/2017				☐ YES

ORIGINATING OFFICER	ASSIGNED TO	UNIT/BADGE #	REVIEWED BY	SUPPLEMENTED BY
Bennett, Todd	Bennett, Todd	18	Sgt [illegible]	

Possible Causes

- Condition of pipe
  - Collapsed Pipe
  - Line Break
- Construction
  - Outside Contractor
  - In-house Construction Crew
- Equipment Malfunction
  - Electrical Failure
  - Mechanical Failure

Possible Causes

- Force Main Failure
  - Line Break
  - Corrosion
- High Flow
  - Lack of Capacity
  - High River Level
- Power Failure
  - Area-Wide
  - Localized





Document and Report

- Once the event has been corrected report a close-out notification to the Dry Creek Control Room.





Document and Report (cont)

- Provide the on-duty Dry Creek Operator the following information:
  - The response personnel making the close-out report
  - The time the overflow ended
  - The structure numbers of the problem pipe (upstream and downstream manholes) if not already done
  - The environmental impact
  - The initial waterway affected
  - The secondary waterway affected
  - The final overflow destination

Sewer Overflow Response Procedures for SORP Coordinators





Purpose

- SORP coordinators provide oversight and assistance to responding personnel in each overflow event. This position performs the following duties:
  - Investigates the environmental impact of an event in a holistic manner
  - Ensures that crews are consistently following procedures
  - Assist with response training
  - Reviews the overall efficiency of the program
  - Listen to and consider any suggestions for cleanup operations

Scope

- The on-duty SORP coordinator is the primary personnel for keeping SD1's management team informed of the response efforts.
- If necessary, the SORP coordinator will respond to the location of the overflow event.
- Once the overflow has been corrected, the SORP coordinator documents information about the event in Lucity.

Procedure for the On-Duty SORP Coordinator

- Contact the First Responder
- Respond to the Internal System Release Email Notification
- Make Emergency Notifications, if required
- Document Investigation and Cleanup Efforts in Lucity

What is documented in Lucity

- Reason for overflow
- Info about release, if any
- Instructions from KDOW
- Clean up efforts
- If soil clean up was done or if soil was saturated
- Any notifications made

Documenting Release into a MS4



What is an MS4?

- Municipal separate storm sewer system (MS4). By definition an MS4 is a system of conveyances that include catch basins, curbs, gutters, ditches, man-made channels, pipes, tunnels, or storm drains that discharges into waters of the United States.

Dry Creek Operators - Sewer Overflow Reporting and Notification Procedures



Purpose

- The purpose of SD1's SSO Reporting & Notification Program is to ensure that unpermitted discharges from SD1's sewer collection systems are properly documented, stored in a data management system, and properly reported to appropriate regulatory authorities, drinking water purveyors, city and county officials, and affected publics.

Scope

- Response personnel must provide plant operators with all of the information needed to document the event
- Once the event has been mitigated, the response personnel again notify plant operators and provide more detailed information about the close of the event.

Responsibility

- Plant Operators are responsible for the proper documentation and reporting of all overflows.
- Control room dispatcher responsible for initial Documentation and to send the internal System Release email notification.
- One staff member is dedicated to quality control and verifies each overflow record in Lucity to ensure that the event is properly documented.

Internal System Release Email Notification

- This email notifies all of the SORP coordinators and other personnel of the release. It is important to send this out immediately after initial call to get the coordinators involved and the clean up process underway.

Sewer Overflow Response Procedures for Locations Not Owned By SD1



Purpose

- SD1 has entered into agreements to operate and maintain pump stations and small package treatment plants that are owned by various organizations and businesses.
- SD1 has an obligation to establish procedures on how its personnel, assigned to these locations, should respond to ensure adequate protection of public health and mitigation of the impact to the environment.

Locations not owned by SD1

- The owners of these locations do not have qualified personnel to report sewer overflows and backups that occur in their system. Therefore, SD1 will report any witnessed overflows to KDOW, and conduct correction, containment and cleanup measures, if necessary.

Summary

- Both Solids and Liquids need to be recovered.
- Containment needs to be done as quickly as possible.
- The System Release Email should be sent out immediately.



Summary Cont

- System Release called in to Dry Creek ASAP
- SORP Coordinator contacted with initial cleanup and mitigation actions



Questions??



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APPENDIX J:

Pump Station Backup Power Plan Completed Schedule

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Pump Station Backup Power Plan

CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 1 Projects (4 total projects)						
Alex Licking	East	Permanent Generator	n/a	2008	2008	Complete
American Sign	West	Permanent Generator	n/a	2008	2008	Complete
Riley Road	East	Permanent Generator	n/a	2009	2009	Complete
Sunset	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2010	2010	Complete
			PS Elimination	2013	2013	Complete
CIP Title	**Basin**	**Original Proposed Solution**	**Updated Solution**	**Scheduled Completion Date**	**Actual Completion Date**	**Final Status as of October 2015**
Category 2 Projects (21 total projects)						
Kahns	East	PS Elimination	n/a	2007	2007	Complete
Meadow Hill	Central	PS Elimination Study	PS Elimination	Study - 2008	2008	Complete
				2012 - 2015	2010	
Riley Road No. 1	East	PS Elimination	n/a	2009	2009	Complete
Riley Road No. 2						
Riverwatch PS	North	PS Elimination Study	PS Elimination	Study - 2008	2008	Complete
				2012 - 2015	2008	Complete
South Park Industrial	North	PS Elimination Study	Backup Dry Prime Pump with a Diesel	Study - 2008	2008	Complete
				2012 - 2015	2010	Complete
Wedgewood Dr	Central	PS Elimination Study	Electrical hook up for portable generator	Study - 2008	2008	Complete
				2015	2015	Complete
Willow Bend No. 2	West	PS Elimination Study	PS Elimination	Study - 2008	2008	Complete
				2013	2013	Complete
Army Reserve	East	PS Elimination Study	Electrical hook up for portable generator	Study - 2008	2008	Complete
				2013-2014	2014	Complete
Eagles Landing	West	PS Elimination Study	Electrical hook up for portable generator	Study - 2008	2008	Complete
				2013-2014	2014	Complete
Evergreen	Central	PS Elimination Study	Electrical hook up for portable generator	Study - 2008	2008	Complete
				2014	2014	Complete
Lamphill	East	PS Elimination Study	Electrical hook up for portable generator	Study - 2008	2008	Complete
				2011	2011	Complete
Mill House Crossing	Central	PS Elimination Study	Backup Dry Prime Pump with a Diesel	Study - 2008	2008	Complete
				2012	2012	Complete
Ridgefield	North	PS Elimination Study	Backup Dry Prime Pump with a Diesel	Study - 2008	2008	Complete
				2014	2014	Complete
War Admiral	West	PS Elimination Study	PS Elimination	Study - 2008	2008	Complete
				2012 - 2015	2011	Complete
Blackstone	West	PS Elimination Study	Electrical hook up for portable generator	Study - 2008	2008	Complete
				2015	2015	Complete
Dublin Green No. 1	West	PS Elimination Study	PS Elimination	Study - 2008	2008	Complete
				2015	2012	Complete
Fowler Creek	West	PS Elimination	These stations were eliminated after the Western Regional collection system became operational.	2013	2011	Complete
Gammon Calmet	West	PS Elimination		2013	2012	Complete
Gunpowder	West	PS Elimination		2013	2012	Complete
Union	West	PS Elimination		2013	2012	Complete

Updated: October 30, 2017

Pump Station Backup Power Plan

CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 3 Projects (24 total projects)						
Airport Exchange Ind Park	North	Permanent Generator	n/a	2009	2009	Complete
Barrs Branch	East	Permanent Generator	Portable Generator	2009	2009	Complete
Cedar Point	East	Permanent Generator	n/a	2009	2009	Complete
Bullitsville	North	Permanent Generator	n/a	2008	2008	Complete
Catalpa	Central	Permanent Generator	n/a	2009	2009	Complete
Centerplex	East	Permanent Generator	n/a	2008	2008	Complete
Hempsteade	West	Permanent Generator	Permanent Generator	2009	2009	Complete
			PS Elimination	2011	2011	Complete
Highland Heights	East	Portable Generator	n/a	2009	2009	Complete
Dublin Green No. 2	West	Permanent Generator	n/a	2009	2009	Complete
Brookwood	East	Permanent Generator	n/a	2009	2009	Complete
Ky Aire	West	Permanent Generator	Permanent Generator	2008	2007	Complete
			PS Elimination	2014	2014	Complete
Levi	West	Permanent Generator	n/a	2008	2007	Complete
Maple Ave	Central	Permanent Generator	n/a	2009	2009	Complete
Sand Run	North	Permanent Generator	n/a	2008	2008	Complete
Saturn	West	Permanent Generator	n/a	2009	2009	Complete
Second Street	Central	Permanent Generator	n/a	2009	2009	Complete
Skyport	North	Permanent Generator	n/a	2008	2008	Complete
South Hampton	West	Permanent Generator	Permanent Generator	2008	2007	Complete
			PS Elimination	2012	2012	Complete
Thornwilde	North	Permanent Generator	n/a	2008	2008	Complete
Bunning Lane	East	PS Elimination Study	Electrical hook up for portable generator	2015	2015	Complete
Kees	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2011	2011	Complete
Overlook	East	Permanent Generator	Electrical hook up for portable generator	2015	2015	Complete
Riverview Farms	North	Permanent Generator	Electrical hook up for portable generator	2015	2015	Complete
Stillwater	East	Permanent Generator	Electrical hook up for portable generator	2015	2015	Complete

Pump Station Backup Power Plan

CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 4 Projects (50 total projects)						
Banklick	Central	Permanent Generator	n/a	2009-2014	2009	Complete
Cedar	Central	Permanent Generator	n/a	2009-2014	2009	Complete
Fowler Ridge	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2010	Complete
Lassing Green	West	Permanent Generator	n/a	2009-2014	2009	Complete
Leathers Rd	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2010	Complete
Marshall Rd	Central	Permanent Generator	n/a	2009-2014	2010	Complete
Mineola Pike	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2010	Complete
Newport Steel Mill	East	Permanent Generator	n/a	2009-2014	2009	Complete
Paul Rd	East	Permanent Generator	Portable Generator	2009-2014	2010	Complete
Rosewood Lane	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2010	Complete
Shadow Lake	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2009	Complete
Wolf Rd	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2009	Complete
Air Park West	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2011	Complete
Arbortech	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012	2012	Complete
Arborwood	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
Brandtly Ridge	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012	2012	Complete
Brentwood	North	Permanent Generator	Electrical hook up for portable generator	2015	2014	Complete
Brushup Lane	West	Permanent Generator	PS Elimination	2012	2012	Complete
Carlisle Ave	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
Cinnamon Ridge	West	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012	2012	Complete
Cold Spring Crossing	East	Permanent Generator	Permanent Generator	2014	2014	Complete
Cold Spring Plaza	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012	2012	Complete
Darma Ct	East	Permanent Generator	Electrical hook up for portable generator	2013-2014	2014	Complete
Deer Creek No. 1	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2011	Complete
Deer Creek No. 2	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2011	Complete
Eighth Street	Central	Connect to Grid Power	Permanent Generator	2015	2015	Complete
Gerrard Ave	East	Permanent Generator	Portable Generator	2009-2014	2011	Complete
Golf Course	Central	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete
Hampton Ridge	West	Permanent Generator	Electrical hook up for portable generator	2015	2015	Complete
Harrison Harbor	East	Permanent Generator	Portable Generator	2009-2014	2011	Complete

Pump Station Backup Power Plan

CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 4 Projects (continued)						
Harvest Hill	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
ICH	Central	Permanent Generator	Electrical hook up for portable generator	2011	2011	Complete
IDI	North	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete
Independence Station Rd	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2011	Complete
Jefferson Ave	East	Permanent Generator	Portable Generator	2009-2014	2011	Complete
Jericho Rd	Central	Permanent Generator	Electrical hook up for portable generator	2011	2011	Complete
Jonathan	West	Permanent Generator	Electrical hook up for portable generator	2015	2015	Complete
Litton	North	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete
Ohio Ave	East	Permanent Generator	Portable Generator	2009-2014	2011	Complete
Orchard Estates	West	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
Parkside No. 2	East	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete
Patton Street	Central	Dual Utility Power Feed	Permanent Generator	2015	2014	Complete
Ria Vista	North	Permanent Generator	Electrical hook up for portable generator	2011	2011	Complete
Silver Grove	East	Permanent Generator	Permanent Generator	2015	2015	Complete
St Annes	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
Sycamore	West	Permanent Generator	PS Elimination	2015	2012	Complete
Taylor Mill Rd	Central	Permanent Generator	Electrical hook up for portable generator	2011	2011	Complete
Wilder	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
Wyndemere	North	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete
Youell Rd	West	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete

Pump Station Backup Power Plan

CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 5 Projects (6 total projects)						
Keavy	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2010-2015	2010	Complete
Meadow Lane	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2010-2015	2009	Complete
Cardinal Cove	North	Permanent Generator	Permanent Generator	2015	2013	Complete
Crestview	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2015	2015	Complete
Ripple Creek	East	PS Elimination Study	PS Elimination	2010-2015	2010	Complete
Winters Lane No. 2	East	Permanent Generator	Electrical hook up for portable generator	2014	2014	Complete
CIP Title	**Basin**	**Original Proposed Solution**	**Updated Solution**	**Scheduled Completion Date**	**Actual Completion Date**	**Final Status as of October 2015**
Category 6 Projects (5 total projects)						
Enzweiller	East	Permanent Generator	n/a	2012-2015	2009	Complete
Mafred	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012-2015	2009	Complete
Ridgeway	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012-2015	2009	Complete
Richwood	West	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012	2012	Complete
Twin Lakes	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete

Progress Summary	Number
2007 Complete Projects	4
2008 Complete Projects	8
2009 Complete Projects	24
2010 Complete Projects	11
2011 Complete Projects	16
2012 Complete Projects	18
2013 Complete Projects	2
2014 Complete Projects	16
2015 Complete Projects	11
Total Complete	**110**

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APPENDIX K:

SD1 Strategic Business Plan Summary Document

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STRATEGIC BUSINESS PLAN

Customer-Centered and Community-Focused

The staff of SD1 has worked with stakeholders throughout the community and across the organization to develop a new strategic business plan. The plan will help SD1 to become a utility that is more customer-centered and community-focused. This summary provides an outline of our long-term goals and the strategies we will implement over time to achieve the expected outcomes.

MISSION: Why we exist

To reliably provide the Northern Kentucky region with wastewater and storm water services to protect public health, property and the environment and to support the economic vitality of the community.

VISION: Our focus for the future

To be a customer-centered and community-focused utility by understanding and meeting the needs of our customers and addressing issues that are of strategic importance to the entire community.

VALUES: Principles guiding our actions

- Accountability
- Collaboration
- Customer Focus
- Environmental Stewardship
- Integrity
- Safety

GOALS

CUSTOMER SATISFACTION

Create a culture of exceptional service by focusing on understanding and meeting the needs of both internal and external customers.

OPERATIONAL EFFICIENCY AND RESILIENCY

Ensure operational efficiency through effective performance improvements while managing and minimizing business risks.

FINANCIAL VIABILITY

Effectively manage and generate the financia resources required to meet current and future operating, debt service and capital needs.

WORKFORCE DEDICATION

Develop a high-performance, collaborative workforce that is engaged, motivated and dedicated.

ENVIRONMENTAL STEWARDSHIP

Ensure adequate and reliable quality of Northern Kentucky's waterways for the benefit of those who live, visit and work in th community.

STAKEHOLDER SUPPORT

Effectively communicate and collaborate with our stakeholders to create a shared understanding of SD1's Mission and Vision.

OPTIMAL INFRASTRUCTURE MANAGEMENT

Optimize asset functionality, condition and operations to ensure we have adequate and reliable facilities and infrastructure needed to convey, manage and clean wastewater and storm water.

STRATEGIES: Actions to achieve our goals

CUSTOMER SATISFACTION

1. Conduct an assessment of existing customer service practices and response standards, and take necessary actions based upon an understanding of the needs of different types of customers.
2. Develop and implement customer service training plans for each department, based on SD1's Mission, Vision and Values.
3. Identify and expand interactive customer technology to improve the customers' experience.

EXPECTED OUTCOMES

- Improved external customer satisfaction of specific an overall service experiences
- Improved employee satisfaction of specific and overal internal service experiences

OPERATIONAL EFFICIENCY AND RESILIENCY

1. Optimize the use of technology and data to support and improve decision-making.
2. Implement resource optimization initiatives and best business practices to reduce operating costs.
3. Ensure business continuity and operational reliability during both routine operations and emergency conditions.
4. Create a culture of continuous improvement and innovation.

EXPECTED OUTCOMES

- Improved efficiency in using resource
- Improved operational performance levels
- Increased operational reliability
- Comprehensive emergency preparedness

FINANCIAL VIABILITY

1. Invest in projects and technology intended to reduce operating costs.
2. Seek project partnership opportunities with municipalities, as well as with state and/or federal agencies, to expand financial resources
3. Develop and adopt comprehensive financial managemen policies.
4. Develop a multi-year comprehensive financial plan
5. Establish financial performance metrics

EXPECTED OUTCOMES

- Optimized operations costs
- Achievement of capital and fixed asset expenditure plan
- Recovery of costs for providing services through rates and fees
- Maintained bond ratings (AA stable – S&P and Aa2 – Moody's)

WORKFORCE DEDICATION

1. Recognize employee achievements.
2. Regularly communicate with employees about current and relevant topics.
3. Create a learning environment that fosters professional growth and the retention of institutional and technical knowledge.
4. Explore new wellness programs that offer improvement in preventative care.
5. Encourage the use of collaborative teams to address issues of strategic importance and facilitate employee development.
6. Promote employee development by providing effective training and quality educational opportunities.
7. Provide employees with the tools, resources and technology necessary to perform their jobs.

EXPECTED OUTCOMES

- Improved employee satisfaction
- Increased employee awareness and participation in Wellness Program
- Increased number of interdepartmental work teams
- Eighty percent of employees fully meeting their personal development and performance plans

ENVIRONMENTAL STEWARDSHIP

1. Actively participate in matters relating to local, state and national water quality-related regulations.
2. Utilize local data to optimize the use of models, tools and other technologies.
3. Advocate appropriate environmental regulations.
4. Implement cost-effective integrated storm water management practices to control runoff.
5. Explore opportunities to improve stream conditions that are supported by scientific principles and data

EXPECTED OUTCOMES

- Reduced volume and number of sewer overflow
- Sustained or improved stream conditions
- Compliance with all water quality-related permit conditions and limits
- Influenced environmental policies and regulation

STAKEHOLDER SUPPORT

1. Expand involvement in and collaborations with local community groups.
2. Build and improve relationships with key non-residential accounts.
3. Identify and implement new communication strategies to reach stakeholders.
4. Regularly inform community leaders about SD1 through various strategies.

EXPECTED OUTCOMES

- Improved stakeholder support
- Increased number of stakeholder collaborations

OPTIMAL INFRASTRUCTURE MANAGEMENT

1. Conduct on-going infrastructure risk assessments, and target resources accordingly.
2. Regularly communicate to SD1's Board and the public about infrastructure issues through standardized reporting and data.
3. Evaluate industry trends and utilize emerging technologies to reduce costs and improve the longevity, reliability and performance of infrastructure.
4. Develop and adopt a sustainable asset repair and replacement program.
5. Maximize the use of information technology systems to collect and share the asset-specific knowledge required t optimize the maintenance, refurbishment and replacement of assets at the right times.

EXPECTED OUTCOMES

- Maintained asset renewal rate to optimize system performance
- Achievement of regulatory requirements
- System assessments of pipes conducted on a 10-year cycle
- Optimized asset life-cycle costs
- Achievement of operational performance metrics



APPENDIX L:

SD1 Lean Improvement Program

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SD1 Main Departmental Business Functions	Department Core Business Purpose Statement	Departmental Core Business Processes							
		Core Business Process #1	Core Business Process #2	Core Business Process #3	Core Business Process #4	Core Business Process #5	Core Business Process #6	Core Business Process #7	Core Business Process #8
IWM	Provide the scientific basis to assessing and protecting the quality of NKY's water resources, as well as maintaining compliance with NKY's regional storm water permit and enforcing storm water rules and regulations.	NKY Water Quality Assessment and Reporting	Storm Water Quality Management Plan Implementation	NKY Storm Water Rules and Regulations Administration	Water Quality Regulatory Reviews				
DCM	Plan, design, construct, and inspect cost effective capital improvement program solutions that meet desired performance objectives. Provide engineering support to other departments and external customers.	Capital Preliminary Design Planning	Capital Design Management	Capital Construction Management	Project Inspection and Quality Control of CIP and Development Projects	Engineering Support to other Divisions	Standards & Specifications Management and Support	Utility Location Services, Grease Trap Inspections, and Other Short Duration Inspections	
ICP	Advance Future SD1 Infrastructure, Assess and Develop New Infrastructure Assets, Monitor and Report Infrastructure Performance and Projects	Master Planning: New Development and Wastewater Needs	Master Planning: Storm Water Needs	External Stakeholder/Community Program Coordination: 50/50 Program, Cost Share, Tappers Program, Etc.	Regulatory Compliance: Complete and submit consent decree compliance documents	Management of System: Measure and document system flows and rainfall	Wastewater Plan Review and Permitting		
Asset Management	Manage and direct SD1 asset management enterprise program and activities to optimize asset health, establish risk levels and maximize asset life using available funding and resources.	Condition Assessment Program Development and Monitoring	Asset Prioritization	Asset Replacement / Renewal Plan	Interdepartmental Coordination of Asset Management and Renewal Activities				
Fleet	SD1's fleet management is to provide safe and reliable vehicles and equipment to employees in which help serve the customers' of SD1. Fleet management is dedicated to providing fleet services in a cost-effective and efficient manner.	Condition Assessment Implementation	Asset Maintenance Management	Customer Support and Response	Operations Management and Execution	Repair & Replacement Program Execution	Inventory Control & Purchasing		
Facilities	The purpose and function of the facilities department is to ensure that all building and grounds are properly maintained guaranteeing a safe and comfortable environment for both employees and customers to work and conduct business.	Condition Assessment Implementation	Asset Maintenance Management	Customer Support and Response	Operations Management and Execution	Repair & Replacement Program Execution	Inventory Control & Purchasing		
Treatment	Utilize best business practices and lean management tools to operate and manage the treatment of SD1's wastewater flow in a safe, effective, and efficient manner utilizing a network of regional treatemnt facilities.	Condition Assessment Implementation	Asset Maintenance Management	Customer Support and Response	Operations Management and Execution	Repair & Replacement Program Execution	Inventory Control & Purchasing	Industrial Monitoring	Lab Analysis
Pump Stations	Utilize best business practices and lean management tools to operate, manage, the conveyance of SD1's non-gravity wastewater flow to a permitted location in a safe, effective, and efficient manner utilizing a network of pump stations.	Condition Assessment Implementation	Asset Maintenance Management	Customer Support and Response	Operations Management and Execution	Repair & Replacement Program Execution	Inventory Control & Purchasing		
Collection Systems	Utilize best business practices and lean management tools to operate, manage, the conveyance of SD1's gravity wastewater flow to a permitted location in a safe, effective, and efficient manner utilizing a series of storm and wastewater piping and associated assets.	Condition Assessment Implementation	Asset Maintenance Management	Customer Support and Response -Includes Program Management	Repair & Replacement Program Execution	Inventory Control & Purchasing			
Purchasing	Promote fair and open competition and procure high quality products and services that meet the needs of our customers while maintaining public trust	Process Requisitons and issue purchase orders (P. O.'s)	Develop and Issue Bid Documents	Procure Goods and Services for SD1 Departments					
Finance Accounting	Maintain and ensure the accuracy and integrity of SD1's General Ledger, expertly conduct all accounting functions, provide timely and accurate financial infomration, and to ensure compliance with applicable accounitng laws and procedures	Budgeting, forecasting projecting, reporting and tracking	Capital Funding Analysis including Alternative Funding Solutions	General Ledger & Fixed Assets	Accounts Payable	Accounts Receivable	Payroll		
Billing	Accurately and fairly bill and collect from all SD1 Customers Sanitary Sewer and/or Storm Water Rates and Fees	Sanitary Sewer Billing Process	Strom Water Billng Process	Deliquency & Collections for Utility Billing Accounts					
Human Resources	Provide exceptional services to attract, develop, engage, and retain a diverse workforce by providing a supportive work envionment for departments and employees	Performance Management and Compensation	Benefit Management	Employee and Organizational Development	Employee Engagement and Support	Recruitment and Retention			

	Safety	Direct and manage enterprise occupational safety-health, worker compensation, department of transportation and environmental risk management practices and procedures associated with all applicable federal regulations and state laws. Proactively identify, plan areas for occupational safety and health hazards and mitigate employee and environmental risk associated with daily operational working procedures and establish effective corrective actions.	Enterprise Occupational Safety and Health, Environmental, Workers Compensation, and DOT Risk Compliance, Education and Training	General Occupational Safety and Health, Environmental, and Hazard Assessment, Mitigation and Enforcement	Occupational Health and Environmental Safety Compliance Audits	Emergency Preparedness and Response Efforts				
	Customer Contact Center	To operate and manage incoming phone and electronic communications from SD1 customers to ensure consistent messaging, clear communications, and reliable problem resolution associated with enterprise operations is achieved on behalf of our internal team leaders and members.	Inbound Customer Contact Management and Resolution	Complaint Resolution Reporting and Distribution	Enterprise Communication Advisory and Coordination					
	Communications	Strategize, plan, manage and direct the implementation of consistent, customer-friendly and stakeholder-appropriate communication by SD1 staff and third-party vendors. We inform and collaborate with the community about SD1's services, progress and challenges to ensure the utility is transparent, accessible and fully integrated into our service area.	Media Relations	Public Relations	Crisis Communication	Communication Strategy - Manage and Support	Key Stakeholder Engagement			
	IT	Support the SD1 strategic business plan, by delivering reliable, secure and efficient technology solutions; providing accurate, consistent and accessible data, comprehensive analysis and application development to enhancing operations and decision making.	Technology Support	Risk Mitigation	Business Intelligence / Data Analytics	GIS Mapping				
	Legal/Risk	1. General Counsel; 2. Contract Management/Procurement; 3. Insurance/Risk Management; 4. Litigation; 5. Governmental Affairsand community Engagement; and 6. Records Management	Promptly provide good legal advice upon request from Board Members, Executive Director and other SD1 staff (example: Storm Water Working Group).	Review all Contracts for sufficiency of legal form and compliance with procurement policy and laws and administer the recently developed guidelines for easement documentation and recording.	Review and negotiate insurance coverage each year and review internal policies and guidelines for risk assessment and management.	Manage all claims and litigation.	Represent SD1 in community and be available to aid local governmental partners.	Manage and Retain Official Records in accordance with legal requirements and for efficient internal usage. Respond to Open Records Requests in accordance with legal requirements.		

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APPENDIX L:

Department: Asset Management

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1																	
	2																	
	3																	
	4																	
Customer Relations	5																	
	6																	
	7																	
	8																	
	9																	
Business Planning & Management	10																	
	11																	
	12																	
Wastewater Operations	13	CS PM Maintenance (hours) %	S	75	85	%												S
	14	CS CM Maintenance (hours) %	S	25	15	%												S
	15	CS Maint Cost / RAV %	S	TBD	3	%												S
	16	CS Renewal Rate	S	0.67	1	%												S
	17	Logic Related CS Failures	D	TBD	TBD													
	18	Plant / PS PM Maintenance (hours) %	S	75	85	%												
	19	Plant / PS CM Maintenance (hours) %	S	25	15	%												
	20	Plant / PS Maint Cost / RAV %	S		3	%												
	21	Reduce the amount of annual logic related failures																S
Storm Water Operations	22	Storm PM Maintenance (hours) %	S	75	85	%												S
	23	Storm CM Maintenance (hours) %	S	25	15	%												S
	24	Storm Maint Cost / RAV %	S	TBD	3	%												S
	25	Storm Renewal Rate	S	0.85	1	%												S
	26	Logic Related SS Failures	D	TBD	TBD													
	27	Reduce the amount of annual logic related failures																
	28																	

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APPENDIX L:

Department: Collections Systems

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1	WW Collections System (collecions & Pump Stations) - percentage of staffing to total staffing levels	B	26.90%	31.30% (Benchmark)	%	I				■				■			O
	2																	
	3																	
	4																	
Customer Relations	5	Respond to Customer Trouble Calls in under 2 hours	D	120	120	Mins	O	■						■			■	R
	6	Customer Service Complaints - Technical/Customer Service - Complaints per 1000 Accounts	B	8.18	7.4	Complaints/1, 000 Accounts	Ou	■						■			■	R
	7																	
	8	H,M,L Priority																
	9																	
Business Planning & Management	10																	
	11	Sanitary System Renewal/Replacement Rate	D	0.67	0.67	% of System	O	■						■			■	O
	12	Maintain Employee Utilization Rates	D	75%	75.35%	Utilization %	Ou		■						■			E
	13	No. of FTE's per 100 Miles of Sanitary Sewer	D	4.56	4.5	No. of Employees/100 Miles of Sewer	O		■						■			E
	14	Preventative O&M $'s /100 Miles of Sewer	D	$101,000	$125,000	$/ 100 miles of sewer	O		■						■			O
	15	O&M Cost/Corrective WO		$7,800	10,000	$/ WO			■						■			O
	16																	
Wastewater Operations	17	Planned Maintenance (% of total maintenance time)	B	70%	60%	% of total maintenance time			■					■			■	O
	18	Planned Maintenance to Collection System	B	1,150	3,745	Hr/ 100 miles of pipe			■					■			■	O
	19	Corrective Maintenance to Collection System	B	475	2,040	Hr/ 100 miles of pipe			■					■			■	O
	20	Sanitary Collection Systems Integrity	B	3	2.6	Failures/100 Miles of Pipe	Ou	■						■			■	O
	21	Reduce the amount of annual operations related failures	D	50	55	Failures/Year	Ou							■			■	O
	22																	
	23																	
	24																	
Storm Water Operations	25	Reduce the amount of annual operations related failures	D	15	20	Failures/Year	Ou	■	■									
	26	Storm System Renewal/Replacement Rate	D	0.85	0.85	% of System	O							■			■	O,R
	27																	
	28																	
	29																	
	30																	
	31																	

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APPENDIX L:

Department:
Customer Call Center

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
Customer Relations	7	Service Level Conformance: Phone **KPI	S	80 in 240	80 in 60	% ans in secs												O
		Average Speed of Answer	S	180	120	seconds												O
		Maximum Time in Queue		<10:00	<5:00													
		Abandonment Rate	S	12.5	7	%												O
		Agent Calls per Hour	S	7	7	calls per hour	O											O
		Average Handle Time (includes only ACD and ACW)	B	0:05:30	0:06:00	hh:mm:ss												O
		Occupancy Rate (includes only ACD and ACW)	S	60%	70%	%												O
		Schedule Adherance	S	Avaya	95	%												
		IVR Penetration Rate	S	Avaya	35	%												O
	8	Service Level Conformance: e-mail **KPI	B	95 in 14*	95 in 3	% ans in days												O
	9	First Call Resolution **KPI	S	Avaya	85	%												O
		Process Adherance (thru call and screen monitoring)	D	Avaya 2	90	%												
		Agent Training Success Rate	D	80	90	%	Ou											
	11	Customer Satisfaction (Bi-Annual Survey) **KPI	B	72	80	%	Ou											S
		CSR Courtesy (Bi-An)	B	89	80	%												O
		CSR Efficiency (Bi-An)	B	84	80	%												O
		CSR Knowledge (Bi-An)	B	82	80	%												O
		Interaction Quality (thru call and screen monitoring)	D	Avaya 2	90	%												O
	12	Cost per Call **KPI	S	$10.00	$7.17	cost per call												O
Business Planning & Management	15																	
	16																	
	17																	
	18																	
	19																	
	20																	
	21																	
Wastewater Operations	22																	
	23																	
Storm Water Operations	24																	
	25																	

*9 - Previously 1 day until agent assigned to e-mail left and not replaced

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APPENDIX L:

Department:
Design and Construction Management

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1	Utility Locations are marked within 48 hours	S	85	95	%	P		■					■	■			O
	2	Design Cost vs Total Construction Cost (Will Vary Based on Size & Complexity of Project, Small projects $100K to $250K can be as high as 15-25%, $1M to 5M Under 10%, $5M+ under 5% Use 11% until better data can be collected)	S	11	10	%	P		■						■			P
	3	Total Cost of all change orders/Total Cost of Construction	S	10	8	%	P		■						■			P
	4	Total Days of rework (reinstallation due to contractor poor installation)/total days of construction	S	5	1	%	O		■					■			■	P
	5	Lineal Feet of Pipe Inspected/Pipe Installed	S	>10%	>50%	%	O							■			■	O
Customer Relations	6	Customer Concerns are Responded to within 24 hours during Construction	S	80	100	%	P	■							■			O
	7	Customers are Notified in Advance of Project Activities (Surveying, geotechnical activities, construction start, etc.)	R	80	100	%	P	■									■	P
	8	Engineering Support to Operating Divisions completed within mutually agreed budget, schedule, and deliverable	B	100	100	%	Ou	■									■	P
	9	Customer issues during construction that could have been prevented by DCM staff	B	<20	<20	%	Ou	■									■	E
	10																	
Business Planning & Management	11	Actual Project Cost/Fully Planned Budget (Planned budget is assumed to be based on preliminary design, 30% design, or conceptual design estimates on completed projects with no substantial changes in scope)	S	Within +/-30%	Within +/- 20%	%	P		■	■							■	P
	12	Total Spent on DCM projects/Total Forecasted (Quarterly Measurement and metric based on projects not delayed by others outside of DCM)	S	Within +/- 30%	Within +/- 20%	%	P		■	■							■	P
	13	Specifications and Standards Reviewed (4 per year)	S	4	4	each	O			■				■			■	R
	13	Constructed Projects Address Initial Planning Objectives	S	90	100	%	O			■				■			■	P
	14									■				■			■	
Wastewater Operations	15																	
	16																	
	17																	
	18																	
	19																	
Storm Water Operations	20																	
	21																	
	22																	
	23																	
	24																	
	25																	
	26																	

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APPENDIX L:

Department: Facility Management

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1	Workforce Productivity	S	Developing	>60%	%	I											O
	2	Employee Training Hours	S															O
	3																	
	4																	
Customer Relations	5	Minimize Customer Request	S	Avg. 9/Week	Avg. 6/Week	%	P											O
	6	Customer Satisfaction	S	Developing	>95%	%	P											
	7																	
	8																	
	9																	
Business Planning & Management	10	Condition Assessments	S	Developing	Assess 50% of assets	%	p											O
	11	PM to CM Ratio	S	Developing	85/15	%	p											O
	12	Facility Utility Cost - Electric	S			$/ft												
	13	Facility Utility Cost - Gas	S			$/ft												O
	14	Facility Utility Cost - Water	S			$/ft												O
	15	Building Maintenance & Repair Cost per sq/ft	S	$2.13	$1.63 annually	$/ft	I											O
	16	Facility Utility Cost per sq/ft (Electric,Gas,Water)	S	$1.42	$2.15 annually	$/ft	I											O
	17	Operating Budget Execution	S	$108,000.00	$108,000.00	$/account	I											O
	18	PM Schedule Completion Rate	S	Developing	>95%	%	I											O
Wastewater Operations	19																	
	20																	
	21																	
	22																	
	23																	
Storm Water Operations	24																	
	25																	
	26																	
	27																	
	28																	
	29																	
	30																	

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APPENDIX L:

Department: Finance and Accounting

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
Customer Relations	7																	
	8																	
	9																	
	10																	
	11																	
	12																	
	13																	
Business Planning & Management		Finance																
	14	Debt Service Coverage:																
		- Senior Debt Service >=125% Trust Indenture Requirme	B, Bo, & R	Intended to Meet or Exceed 150% for All Debt		$ / Ratios	Ou											O
		- All Debt >= 150%																
	15	Liquidity																
		- 200 Days of Operarting Cash Minimum, Net of O&M Maintenance Fund balances for both Wastewater Funds and Storm Water Funds	S	Meet or Exceed Targets		$ / Ratios, Min. Balances. Etc.	Ou											O
	16	Maximum Debt as a Percentage of the Total Revenue Budget																O
		- Wastewater Utility: <=40.0%	S	Meet or Exceed Targets		$ / Ratios	Ou											O
		- Storm Water Utility: 0.0%																
	17	Maintain or Improve SD1 Bond Ratings of Aa3 from Moody's and AA/Stable from Standard & Poor's	B, D, S, & Bo.	Aa3 - Moody's and AA/Stable - S&P		Periodic Ratings	O											O
		Accounting																
	18	Month end financial close cycle time	D	10		Days	P											O
	19	Year end financial close cycle time	D	3		Months	P											O
	20	Financial Reporting																O
		- Board Report	D	7		Days Prior to Board Meeting	P											O
		- Department Reports	D	7		Days Prior to Board Meeting	P											O
		- Cash Flow Reports	D	2		Days After Board Meeting												O
		- Comprehensive Annual Financial Report (CAFR)	R	6		Months from end of Fiscal Year	P											
	21	Maintain Accounting Systems in conformance with Generally Accepted Accounting Principles (GAAP)	S, Bo. & R	Auditor issued "Unqualified Opinion"		Annual Financial Audit	O											O

	22	**Meet or Exceed requirements established in the Trust & Supplemental Trust Indentures**	Bo. & R	Auditor issued "Unqualified Opinion"		Annual Financial Audit	O												O
	23	**Monthly Activity**																	O
		- Bank Reconciliations	S, R	11		Accounts	P												O
		- Bond & Invesment Account Reconciliations	S, R	24		Accounts	P												O
	24	**Account Payable**																	
		- Attain all Early Pay Discounts	S	100%		% of All Invoices that qualify	P												O
		- Pay all invoices on time to avoid late fees and penalties	S	100%		% of All Invoices that qualify	P												O
	25	**Accounts Payable**																	
		- Bill timely for all SD1 Services	S	100%		% of all Billable services	P												O
	26	**Payroll Processing**	S	Bi-Weekly		Periodic Review	P												O
Wastewater Operations	27																		
	28																		
Storm Water Operations	29																		
	30																		

APPENDIX L:

Department: Fleet

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
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Organization Development	1	Workforce Productivity	S	Developing	>60%	%	I											O
	2	Employee Training Hours	S			hrs	I											
	3																	
	4																	
Customer Relations	5	Minimize Customer Request	S	15/85	85/15	%	I											O
	6	Customer Satisfaction	S	Developing	>95%	%	I											
	7																	
	8																	
	9																	
Business Planning & Management	10	Fleet Utilization (Average Hours of Operation for each Tier)	D	See Tier level Descriptions	See Tiers	%	P											O
	11	Annual Miles Driven	S	1,164,151	Reduce by 5%	%	p											O
	12	Annual Fuel Usage (Gas)	S	63,715 Gallons	Reduce by 5%	%	p											O
	13	Annual Fuel Usage (Diesel)	S	79,635 Gallons	Reduce by 5%	%	p											O
	14	Condition Assessments	S	Developing	Assess 50% of vehicles	%	p											O
	15	PM Schedule Completion Rate	S	Developing	>95%	%	I											O
	16	PM to CM Ratio	S	Developing	85/15	%	p											O
	17	Annual Maintenance Cost	S	$534,269	Reduce by 5%	%	p											O
	18																	
Wastewater Operations	19																	
	20																	
	21																	
	22																	
	23																	
	24																	
Storm Water Operations	25																	
	26																	
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APPENDIX L:

Department: Human Resources

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS						SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Report Frequency	Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development		BENEFITS AND SALARY			*current state*	*desired state*													
	1	100% performance evaluations completed within 30 days of due date	Quarterly Reports	S		100%	%												
	2	Average position compensation 50% of public sector market	Annual Evaluation	Bo		100%	%												
	3	Health Plan and Emp Benefit budget to total O&M expense	Quarterly Reports	S			%												
		TRAINING																	
	4	100% of supervisor complete annual leadership training	Annually	D		100%	%												
	5	Total non-safety related training hours per employee, per year	Quarterly Reports	B		11.8 (Benchmark, AWWA 2016)	hours												
	6	Total Safety Training Hours per employee, per year	Quarterly Reports	B			hours												
		TURNOVER																	
	7	Treatment Plant & Pump Stations Employee Turnover Rate	Quarterly Reports	B	8% overall, 3.2% CY17	7.3% (Benchmark, AWWA 2016)	%												
	8	Collection Systems Employee Turnover Rate	Quarterly Reports	B	8% overall, 1.2% CY17	7.3% (Benchmark, AWWA 2016)	%												
	9	Administration Employee Turnover Rate	Quarterly Reports	B	8% overall, 2.0% CY17	7.3% (Benchmark, AWWA 2016)	%												
	10	Operations Employee Turnover Rate	Quarterly Reports	B		7.3% (Benchmark, AWWA 2016)	%												
	11	Engineering Employee Turnover Rate	Quarterly Reports	B	8% overall, 1.6% CY17	7.3% (Benchmark, AWWA 2016)	%												
	12	IWM Employee Turnover Rate	Quarterly Reports	B		7.3% (Benchmark, AWWA 2016)	%												
		Time to Fill Open Positions from Approved Posting	Open Position Report	D															
		RETIREMENT																	
	13	Treatment Plant Retirement Eligibility- within 5 years/FTE	Quarterly Reports	B		19.2% (Benchmark, AWWA 2016)	%												
	14	Collection Systems Employee Retirement Eligibility	Quarterly Reports	B		19.2% (Benchmark, AWWA 2016)	%												
	15	Administration Employee Retirement Eligibility	Quarterly Reports	B		19.2% (Benchmark, AWWA 2016)	%												
	16	Operations Employee Retirement Eligibility	Quarterly Reports	B		19.2% (Benchmark, AWWA 2016)	%												
	17	Engineering Employee Retirement Eligibility	Quarterly Reports	B		19.2% (Benchmark, AWWA 2016)	%												
	18	IWM Employee Retirement Eligibility	Quarterly Reports	B		19.2% (Benchmark, AWWA 2016)	%												
		STAFFING																	

	19	**Treatment Process (Dry Creek, Eastern, Western)- percentage of staffing to total staffing levels**	Annual Evaluation	B	23.02% (FY18 budget)	27.80% (Benchmark, AWWA 2016)	%															
	20	**Collection Systems- percentage of staffing to total staffing levels**	Annual Evaluation	B		29.6% (Benchmark, AWWA 2016)	%															
	21	**Administration- percentage of staffing to total staffing levels**	Annual Evaluation	B			%															
	22	**Operations- percentage of staffing to total staffing levels**	Annual Evaluation	B			%															
	23	**Engineering- percentage of staffing to total staffing levels**	Annual Evaluation	B		5.4% (Benchmark, AWWA 2016)	%															
	24	**IWM- percentage of staffing to total staffing levels**	Annual Evaluation	B			%															
	25	**Open positions filled internally/Total Positions Available**	Annual Evaluation	D		75%	%															
		Average Evaluation Score for 1 - 3 year employees	Halogen Annual	D																		
		Average Evaluation Score for 4 - 10 year employees	Halogen Annual	D																		
		Average Evaluation Score for 11 - 20 year employees	Halogen Annual	D																		
		Average Evaluation Score for 21+ year employees	Halogen Annual	D																		
		Average # Sick days/Year for New - 3 year employees	Paycor Annual	D																		
		Average # Sick days/year for 4 - 10 year employees	Paycor Annual	D																		
		Average # Sick days/year for 11 - 20 year employees	Paycor Annual	D																		
		Average # Sick days/year for 21 + year employees	Paycor Annual	D																		
Customer Relations	12																					
	13																					
	14																					
	15																					
	16																					
	17																					
	18																					
Business Planning & Management	19																					
	20																					
	21																					
	22																					
	23																					
	24																					
	25																					
Wastewater Operations	26																					
	27																					
Storm Water Operations	28																					
	29																					

APPENDIX L:

Department:
Infrastructure Capital Planning

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1																	
	2																	
	3																	
	4																	
Customer Relations	5	Customer assistance for new construction procedures	S	M-F/8-5	M-F/8-5	Time	O											O
	6																	
	7																	
	8																	
	9																	
Business Planning & Management	10	PM project status/financial review	D	Monthly	Monthly	Time	O											P
	11	Project status and financial report	D	Monthly	Monthly	Time	O											P
	12	Board CIP report	Bo	Monthly	Monthly	Time	O											S
	13																	
	14																	
	15	Consent decree compliance report	R	Quarterly	Quarterly	Time	O											S
	16	NMC, CMOM, SORP, PSOEP reports	R	Annual	Annual	Time	O											S
	17	Install/maintain 70 flow meters	D	Number	Number	Count	O											O
	18	Install/maintain 25 rain gauges	D	Number	Number	Count	O											O
	19	Flow/rain data evaluate, document, and report to end user	D	Number	Number	Count	O											O
	20	Inspect structures post wet-weather	D	Number	Number	Count	O											O
	21																	
Wastewater Operations	22	Development plan review (including grease)	D	4 weeks	4 weeks	Time	O											O
	23	Connection requests	Bo	10 days	10 days	Time	O											O
	24	Capacity assessment	D	1 week	1 week	Time	O											O
	25	Reservation of capacity	Bo	Monthly	Monthly	Time	O											O
	26	Locate requests entered	R	48 hours	48 hours	Time	O											O
	27	Plants/PS needs review and implement	D	Quarterly	Quarterly	Time	O											P
	28	Collections needs review and implement	D	Monthly	Monthly	Time	O											P
	29	Assess and plan increased capacity				Time	O											P
	30	Implement watershed plan				Time	O											P
	31	Coordination of long-term plans				Time	O											P
	32																	
Storm Water Operations	33	50-50 cost share projects	Bo	$800k-$1M/yea	$800k-$1M/year	$	O											P
	34	City/County SW tech assistance	D	Number	Number	$	O											O
	35	Storm water master plans	D	2 per year	2 per year	Count	O											O
	36	SW problem areas	Bo	$1.5M/year	$1.5M/year	$	O											P
	37	Strategic storm water offloading	D	Number	Number	Count	O											P
	38																	
	39																	
		Tapper program - tap permit and invoicing																
		Project effectiveness																
		model calibration and develoment																
		watershed plan update																

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APPENDIX L:

Department:
Integrated Watershed Management

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1																	
	2																	
	3																	
	4																	
Customer Relations	5																	
	6																	
	7																	
	8																	
	9																	
Business Planning & Management	10																	
	11																	
	12																	
Wastewater Operations	13	Water Quality Data Collection	D	Completion of scheduled surveys	Completion of scheduled surveys	Individual surveys associated with Monitoring Programs	Pr											P
	14																	
	15																	
	16																	
	17																	
Storm Water Operations	18	Water Quality Data Collection	D	Completion of scheduled surveys	Completion of scheduled surveys	Individual surveys associated with Monitoring Programs	Pr											P
	19	KPDES MS4 Permit Compliance	R	Compliance with the Storm Water Quality Management Plan	Compliance with the Storm Water Quality Management Plan	Individual tasks associated with the Storm Water Quality Management Plan	Pr											P
	20	Project Submittal Review	S	2	2	Weeks	P											P
	21																	
	23																	
	25																	
	27																	
	29																	
	31																	

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APPENDIX L:

Department: Information Technology

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1	Server Uptime	S	99.00%	99.90%	% available	OU											O
	2	Security Incidents	S	TBD		count	I											R
	3	Data Recovery Target Time	S	1 day recovery up to 2 weeks of data		time per event	O											R
	4	Full DR Platform Recovery	S	1 h / 1 d / 1w		time per event	O											R
	5	Equipment Lifecycle	S	Matrix based on equipment		time	P											O
	6	Reports Created	D	TBD		count	O											O
	7	Interfaces Created	D	TBD		count	O											O
	8	Time to create a report / Interface	S	1w / 1m / 2m		time per event	O											O
	9	Staff hours reduced	D	TBD		Overall Time	OU											S
	10	GIS Mapping Requests	D	TBD		count	I											O
	11	Time to complete Mapping request	S	1w / 1m / 2m		time per event	O											O
Customer Relations	12	Trouble Tickets Resolved	D	TBD		Count	O											O
	13	Time till first customer contact after ticket submitted	S	1 h / 1d / 1 w		time per event	O											E
	14	Time to close trouble ticket	S	1d / 1w / 1m		time per event	O											O
	15	Number of escalation requests	S	TBD		Count	I											O
	16	Devices support per tech staff member	S	1 for 75	1 for 50	Ratio	O											O
	17	Number of Tickets per department	D	TBD		Count	I											E
	18	Number of tickets per software package	D	TBD		Count	I											E
Business Planning & Management																		
Wastewater Operations																		
Storm Water Operations																		
				Metrics are based on different priority levels of requests high / medium / low														

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APPENDIX L:

Department: Lab and Pretreatment

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS						SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Report Frequency	Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1	Lab Services /compliance - percentage of staffing to total staffing levels	Annually (Board Report)	B	1.98% (FY18 budget)	3% (Benchmark, AWWA 2016)	%	i											O
	2	Pretreatment - percentage of staffing to total staffing levels	Annually (Board Report)	B	1.59% (FY18 budget)	1.8% (Benchmark, AWWA 2016)	%	i											O
	3	Licensed Lab Analyst to total lab staff	Quarterly (Manager Report)	D	50.00%	50%	%	i											E
	4	Licensed Pretreatment to total pretreatment staff	Quarterly (Manager Report)	D	50%	50%	%	i											E
	5	Lab & pretreatment employee turnover rate	Quarterly (Manager Report)	B	25% [FY17]	7.3% (Benchmark, AWWA 2016)	%	i											E
	6	Lab & Pretreatment Employee Training Hours	Quarterly (Manager Report)	B		11.8 (Benchmark, AWWA 2016)	hours/yr	i											E
	7	Lab & Pretreatment Employee Retirment Eligibility	Quarterly (Manager Report)	B	12.50%	19.2% (Benchmark, AWWA 2016)	%	i											E
	8	Analysis completed per lab analyst	Quarterly (Manager Report)	D	15,941	14,958	#/yr	i											O
Customer Relations	9	Communincate plant discharge permit exceedances to operations for corrective action within 8 hrs of obtaining results.	Quarterly (Manager Report)	S	100%	100%	%	P											O
	10	Comlpete all required KDOW/NELAC method-specific quality control criteria	Quarterly (Manager Report)	R	100%	100%	%	P											O
	11	Respond to all industrial and food service establishment customer inquiries within 24 hours	Quarterly (Manager Report)	D	TBD	24 hrs	hrs	P											O
	12	Follow up on all grease blockages causing an overflow in the collection system within two (2) days, evaluate cause and corrective action	Quarterly (Manager Report)	D	TBD	2 days	days	P											O
Business Planning & Management	13	Maintain compliance with all federal regulations and Kentucky KPDES permit requirements	Monthly (Board Report)	R	100.00%	100.00%	%	P											O
	14	Maintain below 6% total unscheduled OT hours	Monthly (Board Report)	S	0.72% [FY17]	6% (Best Practice)	%	I											O
	15	Complete all KDOW Industrial Pretreatment Program annual inspections with No Violations	Annually (Board Report)	R	100% (FY17)	100%	%	P											O
Wastewater Operations	16	Wastewater treatment O&M Cost / Total O&M Cost	Quarterly (Board Report)	B	43.50%	44.4% (Benchmark, AWWA 2016)	%	P											O
	17	Cost of Industrial Pretreatment Program per significant industrial user (Tier 1 SIU)	Annually (Manager Report)	D	$3,312	$4,761	$	P											O
	18	Cost of FOG Pretreatment Program per food service establishment	Annually (Manager Report)	D	$274	$348	$	P											O
Storm Water Operations	19																		
	20																		
	21																		
	22																		
	23																		
	24																		
	25																		

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APPENDIX L:

Department: Pump Stations

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS						SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Report Frequency	Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1											■				■			O
	2	WW Collections System (Collections & Pump Stations) - percentage of staffing to total staffing levels	Quarterly (Manager Report)	B	36.9% (FY18 budget)	29.6% (Benchmark, AWWA 2016)	%	I				■				■			O
	3	Licensed operator to total operations staff	Quarterly (Manager Report)	D	47.70%	50% of operators	%	I				■				■			E
	4	Pump Stations Employee Turnover Rate	Quarterly (Manager Report)	B	9.8% (CY17)	7.3% (Benchmark, AWWA 2016)	%	I				■						■	E
	5	Pump Stations Employee Training Hours	Quarterly (Manager Report)	B	49 hours	11.8 (Benchmark, AWWA 2016)	hours/yr	I				■						■	E
	6	Pump Stations Employee Retirment Eligibility	Quarterly (Manager Report)	B	9.8% (CY17)	19.2% (Benchmark, AWWA 2016)	%	I				■						■	E
Customer Relations	7								■	■							■		O
	8								■	■							■		O
	9								■	■							■		O
	10	No more than 3 DWO's annually due to PS equipment failure	Annually (Board Report)	D	3	3	No. of Overflows	Ou		■								■	R
	11	No more than six (6) customer complaints associated to noise, invasive lighting or cleanliness and aesthetics per year	Quarterly (Board Report)	D	0 (CY17)	6	No. of Complaints	Ou	■	■								■	O
Business Planning & Management	12	Maintain Compliance with all federal regulations and Kentucky KPDES permit requiriments	Monthly (Board Report)	R	100% (FY17)	99.7% (Benchmark, AWWA 2016)	%	P		■								■	O
	13	Maintain below 6% total unscheduled OT hours	Monthly (Board Report)	S	4.1% (FY17)	6% (Best Practice)	OT hours/Total Hours	I				■					■		O
	14	Complete all KDOW Treatment Plant Inspections with No Violations	Monthly (Board Report)	R	100%	100%	%	P		■								■	O
Wastewater Operations	15	Wastewater treatment O&M Cost/Total O&M Cost	Quarterly (Board Report)	B	43.51% (FY18 budget)	44.4% (Benchmark, AWWA 2016)	%	P		■						■			
	16									■						■			O
	17									■						■			O
	18									■						■			O
	19	Energy Efficiency - Energy Consumption/MG treated	Quarterly (Board Report)	B	6,722 (CY17)	9,903 (Benchmark, AWWA 2016)	kBtu/yr./MG	P		■						■			O
	20	Chemical Cost/MG Pumped	Quarterly (Board Report)	D	Developing	Benchmark	$/MG	P		■						■			O
	21	Planned maintenance / MG pumped	Monthly (Manager Report)	B	0.54 hour/MG (Apr-Jun CY17)	2.4 hour / MG (Benchmark, AWWA 2016)	hrs/MG	O		■						■			O
	22	Energy Efficiency - Energy Consumption/MG Pumped	TBD	D	Developing	??	kBtu/yr./MG	P		■						■			O
	23									■							■		O
	24									■							■		O
	25									■							■		O
	26	Pump Station PM Maintenance (hours) / Total Maintenance (hours)	Monthly (Board Report)	S	41.1% (Apr-Jun CY17)	85% (Best Practice)	%	P		■					■			■	O
	27	Pump Station CM Maintenance (hours) / Total Maintenance (hours)	Monthly (Board Report)	S	58.6% (Apr-Jun CY17)	15% (Best Practice)	%	P		■					■			■	O
	28	Pump Station Maint Cost / Replacement Asset Value	TBD	S	Developing	3% (Best Practice)	%	P		■					■			■	O
	29																		
	30																		

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APPENDIX L:

Department: Purchasing

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
Customer Relations	7	PO processing time	D	8	16	Hours	O											O
	8	Response time to review bid documents	D	10	14	Days	P											O
	9	Inventory pricing and vendor management	D	1	3	Days	P											O
	10	SD1 website procurement information management	D	1	1	Days	Ou											O
	11																	
	12																	
	13																	
Business Planning & Management	14	Processing time to reconcile AMEX Statement	D	8	16	Hours	P											O
	15	Processing time to reconcile Duke & Owen utility bills	D	8	16	Hours	P											O
	16	Processing time to reallocate Lykins fuel expenses	D	8	16	Hours	P											O
	17	Processing time to analyze Superfleet fuel usage	D	8	16	Hours	P											O
	18	Contract renewal and expiration management	D	60	60	Days	P											O
	19																	
	20																	
Wastewater Operations	21																	
	22																	
Storm Water Operations	23																	
	24																	

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APPENDIX L:

Department: Safety

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS					SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1	Complete safety audits and inspections of physical work environments through all departments	D	150					X		X	X					X	O
	2	Complete safety audits of crew activities through all deprtaments	D	200					X		X			X	X			R
	3	Percent of all safety audits with no defiencies identified	D	98%					X			X		X				
	4	Provide Safety training on all required OSH topics	D	100%														
	5	Total hours of required safety training available for an FTE	D						X		X		X	X				
	6	Percent of FTE's completing required training - Collection Systems	D	100%					X									
	7	Percent of FTE's completing required training - All Treatment Facilities	D	100%					X		X			X	X			R
	8	Percent of FTE's completing required training - Field Technical Servicess	D	100%					X		X			X	X			R
	9	Percent of FTE's completing required training -Administration	D	100%					X		X			X	X			R
	10	Percent of FTE's completing required training -IWM	D	100%					X		X			X	X			R
	11	OSHA recordable incidents	D	13					X		X			X	X			P
	12	Lost time due to accidents per 100,000 hours worked							X									
	13	Incident investigation completion time	D	3 days					X						X			E
	14	Vehicular accident rate per 100,000 miles driven	D	2%					X			X	X	X			X	E
	15																	
	16																	
	17																	
	18																X	E
Customer Relations																		
Business Planning & Management																		
Storm Water Operations																		

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APPENDIX L:

Department:
Treatment and Pump Stations

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SD1 Core Business Systems (These do not change and apply to entire enterprise)		Ex. Of Existing SD1 Performance Indicators (Number of performance indicators will vary per department for each Core Business System/Insert comment to further clarify metric description)	Key Performance Indicator Vitals and LOS						SD1's Strategic Goals (Choose a minimum of 1 for each KPI, max of 2)							Types of Family Measures (Choose 1 Per Each KPI)			Metric Type
			Report Frequency	Established Benchmark (B), Internal Data (D), or Industry Standard/Best Practice (S), Board Established (Bo), Regulatory (R)	Intended or Current KPI Target or Level of Service Value (Owner determines)	Accepted KPI Standard Value - Future State (Based on Benchmark, Data, Best Practice, Board)	Unit of Measurement ($/ft, ratio,%, $/account, $/FTE)	KPI Measurement Type (Input (I), Process (P), Output (O), Outcome (Ou), Project (Pr))	Customer Satisfaction	Operational Efficiency and Resiliency	Financial Viability	Workforce Dedication	Environmental Stewardship	Stakeholder Support	Optimal Infrastructure Management	EFFICIENCY	QUALITY	EFFECTIVENESS	Strategic (S), Operational (O), Project (P), Risk (R), Employee (E)
Organization Development	1	Treatment Process (Dry Creek, Eastern, Western)- percentage of staffing to total staffing levels	Annually (Board Report)	B	23.02% (FY18 budget)	27.80% (Benchmark, AWWA 2016)	%	I				■				■			O
	2	WW Collections System (Collections & Pump Stations) - percentage of staffing to total staffing levels	Quarterly (Manager Report)	B	36.9% (FY18 budget)	29.6% (Benchmark, AWWA 2016)	%	I				■				■			O
	3	Licensed operator to total operations staff	Quarterly (Manager Report)	D	47.70%	50% of operators	%	I				■				■			E
	4	Treatment Plant & Pump Stations Employee Turnover Rate	Quarterly (Manager Report)	B	9.8% (CY17)	7.3% (Benchmark, AWWA 2016)	%	I				■						■	E
	5	Treatment Plant & Pump Stations Employee Training Hours	Quarterly (Manager Report)	B	49 hours	11.8 (Benchmark, AWWA 2016)	hours/yr	I				■						■	E
	6	Treatment Plant & Pump Stations Employee Retirment Eligibility	Quarterly (Manager Report)	B	9.8% (CY17)	19.2% (Benchmark, AWWA 2016)	%	I				■						■	E
Customer Relations	7	Eastern/Western and Pump Stations - No odor complaints with a nuisance detecton level equal to or greater than D/T ratio of 7 as measured by the Nasal Ranger Olfactometer	Monthly (Board Report)	R	0	0	No. of Complaints	Ou	■	■							■		O
	8	Eastern/Western and Pump Stations - No more than 10 odor complaints with a nuisance detaction level greater than D/T ratio of 4. Maintain odors within the fence line.	Monthly (Board Report)	D	0	10	No. of Complaints	Ou	■	■							■		O
	9	Dry Creek- No more than 10 odor complaints with a nuisance detection level greater than D/T ratio of 4 within a 1 mile radius.	Monthly (Board Report)	D	4	10	No. of Complaints	Ou	■	■							■		O
	10	No more than 3 DWO's annually due to PS equipment failure	Annually (Board Report)	D	3	3	No. of Overflows	Ou		■								■	R
	11	No more than six (6) customer complaints associated to noise, invasive lighting or cleanliness and aesthetics per year	Quarterly (Board Report)	D	0 (CY17)	6	No. of Complaints	Ou	■	■								■	O
Business Planning & Management	12	Maintain Compliance with all federal regulations and Kentucky KPDES permit requiriments	Monthly (Board Report)	R	100% (FY17)	99.7% (Benchmark, AWWA 2016)	%	P		■								■	O
	13	Maintain below 6% total unscheduled OT hours	Monthly (Board Report)	S	4.1% (FY17)	6% (Best Practice)	OT hours/Total Hours	I				■					■		O
	14	Complete all KDOW Treatment Plant Inspections with No Violations	Monthly (Board Report)	R	100%	100%	%	P		■								■	O
Wastewater Operations	15	Wastewater treatment O&M Cost/Total O&M Cost	Quarterly (Board Report)	B	43.51% (FY18 budget)	44.4% (Benchmark, AWWA 2016)	%	P		■						■			
	16	Dry Creek Treatment O&M Cost/MG treated	Quarterly (Board Report)	B	$910 (FY14,15,16)	$2,504 (Benchmark, AWWA 2016)	$/MG	P		■						■			O
	17	Eastern Regional Treatment O&M Cost/MG treated	Quarterly (Board Report)	B	$2,160 (FY14,15,16)	$2,504 (Benchmark, AWWA 2016)	$/MG	P		■						■			O
	18	Western Regional Treatment O&M Cost/MG treated	Quarterly (Board Report)	B	$1,130 (FY14,15,16)	$2,504 (Benchmark, AWWA 2016)	$/MG	P		■						■			O
	19	Energy Efficiency - Energy Consumption/MG treated	Quarterly (Board Report)	B	6,722 (CY17)	9,903 (Benchmark, AWWA 2016)	kBtu/yr./MG	P		■						■			O
	20	Chemical Cost/MG treated	Quarterly (Board Report)	D	Developing	Benchmark	$/MG	P		■						■			O
	21	Planned maintenance / MG treated	Monthly (Manager Report)	B	0.54 hour/MG (Apr-Jun CY17)	2.4 hour / MG (Benchmark, AWWA 2016)	hrs/MG	O		■						■			O
	22	Energy Efficiency - Energy Consumption/MG Pumped	TBD	D	Developing	??	kBtu/yr./MG	P		■						■			O
	23	Biosolids Quality - Dry Creek biosolids equal to or greater than 30% solids concentration	Monthly (Board Report)	S	30.94%	30% (Best Practice)	%	P		■							■		O
	24	Biosolids Quality - Eastern Regional biosolids equal to or greater than 15% solids concentration	Monthly (Board Report)	S	15.50%	15% (Best Practice)	%	P		■							■		O

		25	**Biosolids Quality - Western Regional biosolids equal to or greater than 15% solids concentration**	Monthly (Board Report)	S	15.26%	15% (Best Practice)	%	P														O
		26	**Treatment Plant & Pump Station PM Maintenance (hours) / Total Maintenance (hours)**	Monthly (Board Report)	S	41.1% (Apr-Jun CY17)	85% (Best Practice)	%	P														O
		27	**Treatment Plant & Pump Station CM Maintenance (hours) / Total Maintenance (hours)**	Monthly (Board Report)	S	58.6% (Apr-Jun CY17)	15% (Best Practice)	%	P														O
		28	**Treatment Plant & Pump Station Maint Cost / Replacement Asset Value**	TBD	S	Developing	3% (Best Practice)	%	P														O
	Storm Water Operations	29																					
		30																					
		31																					
		32																					
		33																					
		34																					
		35																					