

**TCEQ SSO INITIATIVE  
ON-GOING INFILTRATION/INFLOW  
REDUCTION PROGRAM**

**Sewer Line SSES Phase 4  
Basins 19,21,23,23A,26,33 and 35**

**Technical Proposal**



**CITY OF KILLEEN, TEXAS**



**Pipeline Analysis, LLC  
1115 Main Street  
Garland, Texas 75040**

**November 24, 2015**

## CITY OF KILLEEN

# TCEQ SSO INITIATIVE ON-GOING INFILTRATION/INFLOW REDUCTION PROGRAM – SEWER LINE SSES PHASE 4 OF BASINS 19,21,23,23A,26,33 and 35

### Project Background

The Project Approach to the Killeen Sewer System Evaluation is organized around the objectives for this project:

- Regulatory compliance
- Attainment of long-term I/I solutions
- Customer satisfaction
- Cost control

The goal of the City and TCEQ is to develop long-term solutions to infiltration/inflow (I/I) and sanitary sewer overflows (SSO's). The first step in achieving this goal is to establish the magnitude and location of the problem. City-wide temporary flow monitoring was completed in March 2009. This flow analysis established dry and wet weather flows at key locations across the city. In addition, flow meters isolated the areas of the collection system that contribute to excessive rainfall dependent infiltration/inflow (RDII) that enters through poor fitting manhole castings, vented manhole covers in ponding areas, holes in pipes, open or defective cleanouts, yard drains, storm sewer cross connections, etc. The results of this field testing provided a ranking of basins by priority. This scope of work builds on the previous flow monitoring and master plan efforts and is the next phase of field testing to locate defects, establish least cost repair cost estimates and prepare a collection system rehabilitation report.

The Killeen collection system consists of approximately 530 miles of mainline gravity sewer and 334 miles of private service laterals. These assets have a replacement value of approximately \$280 million. Stretched end to end, the collection system would connect Killeen with Atlanta, Georgia. The purpose of this project is to initiate field testing to locate defects in high priority areas of the city. With a design life of 75 to 100 years, some of the Killeen system has reached its design life. Infiltration/inflow is a symptom of aging collection systems. We must identify specifically where the deterioration is occurring and develop a plan to locate and repair these City assets. The City of Killeen (like all municipalities) cannot afford to wait for system failure and replace the collection system. The least cost strategy will be to locate system defects early while trenchless repair methods can be used.

The City of Killeen was invited to join the TCEQ SSO Initiative and the City responded with an acceptance letter to voluntarily participate in the program. TCEQ has officially notified the City of its acceptance into the program and the City is currently implementing the approved comprehensive plan and schedule. This project is identified in the TCEQ SSO Initiative.

This project will use smoke testing to locate wastewater collection system defects that allow rainfall to enter on both public and private sewers. Smoke testing data will be collected to identify sources of wet weather inflow that enters the collection system and prepare remedial measures and estimated repair costs for defects identified on public mains and private laterals. Crews will perform inspections and testing of all sanitary sewer pipes within the study areas shown in Figure 1 and identified as Basins 19, 21, 23, 23A, 26, 33 and 35.

**Figure 1**  
Study Area Map  
Sewer Line SSES Phase 4  
Basins 19,21,23,23A,26,33 and 35



## **TASK 100 MOBILIZATION**

Mobilize project team and coordinate startup. Establish personnel assignments and responsibilities. Inventory equipment needs and order expendable supplies. Pipeline Analysis, LLC (PA) will review all relevant existing materials developed for or by the City of Killeen concerning this project, including, but not limited to, the following:

1. Previous studies for the service areas to be investigated
2. Prepare study area field inspection maps

### *Deliverable:*

1. Delivery of equipment and personnel
2. Work maps with delineated boundaries
3. Status report on collection and review of materials supplied

### *To Be Provided by City:*

- Access for placement of equipment and personnel
- Copies of all applicable reports, maps and historical data for the study area at no cost to ENGINEER
- As-built drawings, sewer key maps, street plans, electronic aerial photographs if available and if requested at no cost to ENGINEER

### *Deliverables:*

1. Inclusion in final report of findings from this work task

### *Measurement of Payment:*

Mobilization will be charged as a lump sum.

## **TASK 200 SMOKE TESTING OF STUDY AREA**

Smoke testing will provide detailed information on wet weather inflow sources for the study area. In order to identify defects in the lines, a non-toxic smoke will be forced into the sewer by high capacity blowers. Data documentation includes measurements from two permanent points and will be sufficient to establish the location of each defect and determine the best repair method and priority. In addition, sub-meter GPS coordinates are obtained for smoke defects. Color digital photographs will be taken to document each defect during the smoke test.

Forty-eight (48) hours prior to testing, door hangers will be used to notify residents. A local telephone number will be provided for those individuals with questions or for anyone requiring special assistance. Each day the fire department will be notified of the crew location since smoke may enter homes through defective plumbing. Pipeline Analysis will be responsible for public awareness, distribution of smoke notices, field questions from residents, coordinating with City staff for residents requiring special assistance and mapping associated with this phase of field testing.

*To Be Provided by City:*

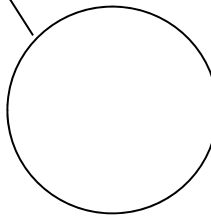
- Review and approval of Notice to Residents
- Letter of introduction to be carried by field crews (Example to be supplied by Pipeline Analysis)

*Deliverables:*

- Defects listing and spreadsheets
- Defect location sketches
- Digital photographs
- Smoke Notification Flyers and Notification of Residents

*Measurement of Payment:*

Payment for this work task shall be a unit price for each linear foot of mainline sewer smoke tested. A summary listing of the database for line segments smoke tested will serve as the basis for the periodic partial payment requests.



***Draft Copy***

## SMOKE TESTING NOTICE TO RESIDENT

For the next few days, inspection crews will conduct a physical survey of the wastewater collection system. Pipeline Analysis will perform this study, which involves opening manholes in the streets and backyard utility easements. Information gained from this study will be used to repair and improve the wastewater collection system.

One important task of the survey will be **smoke testing** of sewer lines to locate breaks and defects in the system. During this testing, white smoke will exit through vent pipes on the roofs of homes and through sewer line breaks. **The smoke is non-toxic, leaves no residue, and creates no fire hazard.** The smoke should not enter your home unless defective plumbing exists or drain traps are dry.

If you have seldom-used drains, please pour a gallon of water in the drain to fill the drain trap. This procedure will help prevent the possibility of smoke entering your living areas through those drains.

Field crews will perform testing of all sewers in the area. **At no time will field crews have to enter your business or residence.**

Your cooperation is appreciated. Should you have any additional questions concerning this study or if you desire special assistance, please phone:

**800-637-0164**



### **TASK 300     DYE FLOODING**

Dye water testing can be anticipated to assist in the location and quantifying of specific defects during the evaluation. Non-toxic dye will be introduced as a powder or liquid. Cross-connections, roof drains and area drains that are suspected of being connected to the sanitary sewer will be positively identified using the dye tracer procedure. Field documentation and photographs will be used to record all findings. Internal inspection will determine the exact source of the 'cross-connection' and establish the best repair option (i.e., point repair, direct connection, etc.).

*To Be Provided by City:*

- Water for dye flooding at no cost to ENGINEER

*Measurement of Payment:*

Payment for this work task shall be a unit price for each dye flood test site. Dye test records that document the dye test location and results will serve as the basis for the periodic partial payment requests.

### **TASK 400     PREPARATORY CLEANING** **TASK 500     CLOSED CIRCUIT TV INSPECTION (CCTV)** **TASK 501     ZOOM CAMERA CCTV**

Preparatory cleaning shall consist of hydraulic jet cleaning to facilitate the internal CCTV inspection. The City of Killeen will have the option to perform this phase of the work in close coordination with the CCTV operator. Debris will be removed from the line and transported for disposal. CCTV investigation is critical in establishing best practical repair methods. Knowing the conditions, locations of services, degree of pipe deterioration, etc. is paramount in developing the least cost alternatives for subsequent repairs. Where right of way will not permit placement of cleaning and/or CCTV equipment, the Engineer may utilize a portable zoom camera (Task 501) to inspect mainline sewers recommended for CCTV. The portable self-contained zoom camera will record digital video to obtain as much information as possible on the condition of the pipeline being inspected. Recorded data will be reviewed and recommendations on the rehabilitation method(s) will be determined where possible. The following information will be provided:

1. Field forms, equipment, supplies and oversight QA/QC
2. Document findings. Data to include:
  - a. Date inspected
  - b. Line segment being inspected
  - c. Project name
  - d. Location (Address)
  - e. Footage location from manhole
  - f. Defect code and/or type and severity rating using the national Pipeline Assessment Certification Program (PACP) codes
  - g. Pipeline surface cover
3. Review video and logs
4. Provide reports on disk (CD, DVD or hard drive) of segments televised

5. Summary of line segments cleaned and CCTV'd
6. Results of TV inspection provided on printed logs
7. Prepare prioritized mainline rehabilitation plan

*To Be Provided by City:*

- Hydraulic jet cleaning (at City of Killeen option) of line segments designated by Pipeline Analysis in preparation of internal closed circuit television inspection
- Access to site of work for placement of equipment and personnel
- Disposal of any debris removed from the sewer system
- Water for cleaning and dye testing at the nearest hydrant at no charge to ENGINEER
- Water meter (if required) for recording volume of water used at no charge to ENGINEER
- City will provide at no cost to ENGINEER removal and site restoration of any camera or cleaning equipment that becomes lodged in the sewer, provided it can be determined that ENGINEER has exercised reasonable caution.

*Measurement of Payment:*

The City may elect to perform preparatory cleaning ahead of the CCTV inspection. Should the City elect not to perform the preparatory cleaning, then Pipeline Analysis will invoice for the actual linear feet of sewer cleaned per the unit price specified in Exhibit C. In the case of CCTV, should the camera not be able to pass the entire length of the segment (due to protruding taps, roots, dropped joints, etc.), then an attempt will be made from the opposite direction (if possible). Where a reverse setup was attempted, then the entire segment length will be billed at the unit price specified. If a reverse setup cannot be performed, then the actual segment footage CCTV'd will be billed. Where access will not allow placement of cleaning or CCTV equipment, Engineer may utilize a zoom portable camera to inspect the sewer. Payment for use of the zoom camera will be on a per set up basis. Summary listings of the database with field logs will serve as the basis for the periodic partial payment requests.

## **TASK 600 ADMINISTRATION AND PROJECT MANAGEMENT**

This task includes internal project administration and oversight including scheduling, budget, quality assurance and control meetings and reporting. The project schedule will be reviewed and milestones for the completion of each task will be assigned. The project schedule will be reviewed and updated monthly to ensure that all tasks are completed in a timely and organized fashion.

Management work items include:

1. Field crew supervision and project planning
2. Obtain initial maps for field use and verification
3. Prepare monthly billings
4. Schedule equipment and order supplies
5. Monthly meetings and progress reports

Major system deficiencies that are identified during the field inspections that, if corrected, would result in significant reduction in I/I or is deemed to be of a safety concern will be recorded and forwarded as soon as



possible to City's designated project manager. Likewise, should City undertake a major repair within the study area, they will immediately notify ENGINEER to determine the impact on data analysis.

*Deliverables:*

1. Monthly invoice
2. Status reports
3. Project schedule and updates
4. Project meetings and presentations

*To Be Provided by City:*

- All reports or materials deemed necessary by ENGINEER and identified during the course of the project that is not specifically stated above will be provided at no additional cost to the ENGINEER

*Measurement of Payment:*

Payment for this work task shall be a lump sum and billed based on the percentage completion of the work task.

## **TASK 700      DEFECT ANALYSIS/ REHABILITATION**

This project will generate a considerable amount of data that will require proper entry and quality control. Pipeline Analysis has developed a system to enter smoke test data using a pen-based computer system that has the computing power to perform quality control checks in the field while data is being entered. Data collection will include the following:

1. Defect data will be presented graphically (data visualization) within the City GIS system.
2. Using industry standard descriptions of source defects, Pipeline Analysis staff will prioritize defects and recommend rehabilitation
3. Evaluate the various rehabilitation options (including trenchless methods) based on the soils, line cover, pipe depth, easement restrictions, pipe material and defects identified.
4. Since private sector defects can contribute to excessive inflow, proper documentation for subsequent repair is important. Property owner address, photograph and sufficient information to document the defect will be recorded. Private sector defects will be prioritized and repair methods/costs established.
5. Rehabilitation recommendations will consider the best repair for the particular asset being rehabilitated.
6. Estimated cost to make both public and private sector repairs.

*To Be Provided by City:*

- Complaint records for past 12 months and SSO database for past 12 months.
- Review and comments on rehabilitation methods, cost estimates, and alternatives
- Pipeline Analysis will provide electronic files of the City corrected GIS maps in ArcGIS. The City will have the final authority to accept the changes and update their master GIS map files.

*Measurement of Payment:*

Payment for this work task shall be a lump sum and billed based on the percentage completion of the work task.

## **TASK 800 FINAL REHABILITATION PLAN REPORT**

Prepare and submit five (5) Final Rehabilitation Plan Reports that includes the following:

- Executive Summary
- Description of all tasks
- Pipeline defect summary and preliminary rehabilitations
- Data visualization rehabilitation maps
- Service lateral defect summary
- Smoke defect photos (jpg format)
- Smoke defect sketches (pdf format)
- Recommendations and Cost Estimates for Private and Public sector repairs
- Provide Geodatabase ArcMap version 10.0 with the following feature classes: Main (to include PA pipe ID & City of Killeen unique ID), manhole, and cleanout feature classes. These feature classes will contain updated attribution, smoke test data plus the following columns:
  1. USMH
  2. DSMH
  3. PAPipeID
  4. Location
  5. Type of Defect
  6. Inflow Potential
  7. Surface Cover
  8. Address
  9. Defect GPS Latitude (where possible)
  10. Defect GPS Longitude (where possible)
  11. Defect Photo file name

*To Be Provided by City:*

- None

*Measurement of Payment:*

Payment for this work task shall be a lump sum and billed based on the percentage completion of the work task.

*To Be Provided by City of Killeen:*

Task 100 Mobilization

- Access for placement of equipment and personnel
- Copies of all applicable reports, maps and historical data for the study area at no cost to ENGINEER
- As-built drawings, sewer key maps, street plans, electronic aerial photographs if available and if requested at no cost to ENGINEER

Task 200 Smoke Testing

- Current collection system map in electronic format
- Access (if requested) to manholes that are buried or could not be opened.
- Assistance in locating assets (if requested)
- Coordination with Fire Department
- GIS Coordination

Task 300 Administration/Project Management

- Provide contact person for coordination of database deliverable
- Review format for data delivery

Task 400 Defect Analysis and Rehabilitation

- Review and comments on rehabilitation methods, cost estimates, and alternatives

Task 500 Final Report

- Review comments on Draft Final Report

PROJECT SCHEDULE

Task	Task Description	Month								
		1	2	3	4	5	6	7	8	9
100	Mobilization									
200	Smoke Testing									
300	Dye Water Flooding									
400	Preparatory Cleaning 15%									
500	Closed Circuit TV Insp. 15%									
501	Zoom Camera Inspection									
600	Admin. Project Mgmt.									
700	Defect Analysis/ Rehab. Est.									
800	Final Report.									

COMPENSATION SUMMARY (TOTAL NOT TO EXCEED)

Task	Task Description	Contract Quantity	Unit Price	Contract Amount
100	Mobilization	Lump Sum	Lump Sum	\$3,880.00
200	Smoke Testing	533639	\$0.41	\$218,791.99
300	Dye Water Flooding	20	\$215.00	\$4,300.00
400	Preparatory Cleaning 15% **	80,046	\$1.95	\$0.00
500	Closed Circuit TV Insp. 15%	80,046	\$1.25	\$100,057.31
501	Zoom Camera Inspection	0	\$150.00	\$0.00
600	Admin./ Project Mgmt.	Lump Sum	Lump Sum	\$3,915.00
700	Defect Analysis/ Rehab. Est.	Lump Sum	Lump Sum	\$9,645.00
800	Final Report.	Lump Sum	Lump Sum	\$28,800.00
<b>TOTAL</b>				<b>\$369,389.30</b>

\*\* City to Perform line cleaning