Ongoing Sewer Assessment and Rehabilitation Program

DeKalb County Department of Watershed Management (DWM)

December 18, 2013
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ACRONYMS

ASCE American Society of Civil Engineers
AWTF Advanced Wastewater Treatment Facility
CCTV Closed Circuit Television
CERP Contingency and Emergency Response Plan
CIPP Cured in Place Pipe Lining
C&M DeKalb County Department of Watershed Management Construction and Maintenance Division
CMMS Computerized Maintenance Management System
CMOM Capacity, Management, Operations, and Maintenance
DWM DeKalb County Department of Watershed Management
FOG Fats, Oil, and Grease
FSE Food Service Establishment
EPA U.S. Environmental Protection Agency
EPD Georgia Environmental Protection Division
GAWP Georgia Association of Water Professionals
GIS Geographical Information System
GWEF Georgia Water Environment Federation
I/I Infiltration/Inflow
KPI Key Performance Indicators
MACP Manhole Assessment and Certification Program
NPDES National Pollutant Discharge Elimination System
NACWA National Association of Clean Water Agencies
NASSCO National Association of Sewer Service Companies
O&M Operation and Maintenance
OSARP Ongoing Sewer Assessment and Rehabilitation Program
PACP Pipeline Assessment and Certification Program
PASARP Priority Areas Sewer Assessment and Rehabilitation Program
RDI/I Rainfall Dependent Infiltration/Inflow
<table>
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<tr>
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1 INTRODUCTION

11 Overview

This Ongoing Sewer Assessment and Rehabilitation Program (OSARP) has been prepared in accordance with the requirements of Section VI.B(x).38 of the Consent Decree - DeKalb County, Civil Action File No. 1:10-CV-4039-WSD. Section VI.B(x).38 of the Consent Decree requires the County to submit the OSARP to the U.S. Environmental Protection Agency (EPA) and the Georgia Environmental Protection Division (EPD), for review and comment, within two (2) years of the Date of Entry of the Consent Decree. The Consent Decree was entered on December 20, 2011.

The main purpose of the OSARP is to ensure continuous assessment and rehabilitation of the County’s Wastewater Collection and Transmission System (WCTS). The OSARP will govern assessment and rehabilitation of those areas outside the Priority Areas while the Consent Decree is in effect, and will continue to exist after the Consent Decree expires. It will enable the County to continuously and proactively identify, delineate, and prioritize areas or sewer segments within the WCTS for condition assessment and rehabilitation, as appropriate, starting with areas not being addressed under the Priority Areas Assessment and Rehabilitation Program (PASARP). The implementation of the OSARP will take into consideration data obtained through other ongoing County programs and operations including the Capacity, Management, Operations, and Maintenance (CMOM) programs, information obtained from customers and the general public, the assessment and rehabilitation work performed under the PASARP, knowledge and experience of County personnel knowledgeable of the County’s WCTS, and professional judgment.

This document contains the following key elements in compliance with the requirements of Section VI.B(x).38 of the Consent Decree:

- Summary of the County’s sewer assessment and rehabilitation efforts over the last five (5) years.
- Summary of the County’s Priority Areas Sewer Assessment and Rehabilitation Program (PASARP) and its relationship to the OSARP.
- Procedures for identifying, delineating, and prioritizing areas or sewer segments within the WCTS for assessment and/ or rehabilitation.
- Specifications and guidelines for various evaluative WCTS condition assessment tools and programs.
- Procedures and specifications for establishing the types of rehabilitation methods the County uses following condition assessment.
• Procedures for identifying, prioritizing, and implementing rehabilitation projects under the OSARP to address excessive infiltration and inflow (I/I) and other conditions causing, or are likely to cause, sanitary sewer overflows (SSOs).

• Process for inventorying all completed WCTS rehabilitation projects under the OSARP.

• Procedures for tracking and inventorying completed rehabilitation measures completed under the OSARP, including rehabilitation techniques.

• Procedures for coordinating rehabilitation work performed under the OSARP into the Management Maintenance System (MMS) Program.

• Key performance indicators for measuring the effectiveness of completed rehabilitation measures to reduce SSOs and address capacity limitations within the WCTS

1.2 Description of the DeKalb County WCTS

The DeKalb County WCTS (defined to include all pipes, lift stations, force mains, gravity sewer lines, manholes and other appurtenances) consists of an estimated 2,600 miles of sewers, 66 lift stations, and an estimated 61,500 manholes. The County is divided into three (3) sewer basins (Intergovernmental, Snapfinger, and Pole Bridge) containing a total of thirty-five (35) sewersheds, two (2) of which do not currently contain any sewers. The following are summary descriptions of the three (3) sewer basins:

• Inter-Governmental Basin: The Intergovernmental Basin is divided into the following nine (9) sewersheds: Ball Mill Creek, Camp Creek, Lucky Shoals Creek, Marsh Creek, Northeast Creek, Nancy Creek, North Fork Creek, South Fork Creek, and Peavine Creek. This basin contains an estimated 1,136 miles of sanitary sewers and an estimated 25,800 manholes.

The approximately thirty-six (36) million gallons per day (MGD) of wastewater generated within the Intergovernmental Basin is collected, transmitted, and treated at the City of Atlanta R. M. Clayton Water Reclamation Facility under an intergovernmental agreement with the City of Atlanta. Sewers located within the City of Atlanta, through which wastewater from the Intergovernmental Basin flows, are owned and maintained by the City of Atlanta under the above-mentioned intergovernmental agreement with the City of Atlanta.

• Snapfinger Basin: This basin is divided into the following fifteen (15) sewersheds: Barbashela Creek, Blue Creek, Cobb Fowler Creek, Conley Creek, Constitution Area, Corn Creek, Doolittle Creek, Indian Creek, Intrenchment Creek, Lower Snapfinger Creek, Shoal Creek, South River, Sugar Creek, Upper Snapfinger Creek, and Upper Stone Mountain. This basin contains an estimated 1,098 miles of sanitary sewers and an estimated 25,100 manholes.
There are two (2) areas served by septic tanks only in the Snapfinger Basin. These areas include approximately one-third (⅓) of the Cobb Fowler Creek sewershed and the entire Upper Stone Mountain sewershed.

- **Pole Bridge Basin**: The Pole Bridge Basin is divided into the following eleven (11) sewersheds: Crooked Creek, Honey Creek, Johnson Creek, Lower Crooked Creek, Lower Stone Mountain, Pine Mountain Creek, Plunket Creek, Polebridge Creek, Swift Creek, Upper Crooked Creek, and Yellow River. This basin includes an estimated 398 miles of sanitary sewers and an estimated 10,600 manholes.

It should be noted that the length of sewers and the number of manholes in each basin, sewershed, and the County’s WCTS as a whole, changes continuously due to the addition of new sewers within new developments, realignment of existing sewers to advance efficiency or to accommodate construction and repair of other infrastructure, and the abandonment of sewers within abandoned developments.

### 1.3 Summary of the County’s Sewer Assessment and Rehabilitation Efforts over the Last Five Years Outside the Priority Areas

As part of the County’s daily operations, the County identifies areas and sewer segments for assessment and rehabilitation to improve WCTS performance, increase collection and conveyance capacity, and eliminate excessive I/I. The work associated with the County’s sewer assessment and rehabilitation efforts is performed either by in-house personnel or contracted out to various contractors engaged by the County on an annual basis. See Appendix 1 for a listing of previous, ongoing, and scheduled assessment and rehabilitation projects both inside and outside of the Priority Areas.

The selection of areas and sewer segments for assessment and/or rehabilitation has previously been based on several factors including the following:

- Results of engineering studies periodically commissioned to assess the performance of selected areas or sewer segments.
- Data obtained from the County’s System-Wide Flow and Rainfall Monitoring Program.
- Locations, frequencies, volumes, and causes of SSOs.
- Customer complaints.
- Data obtained from the County’s Fats, Oils, and Grease (FOG) program.
- Data obtained from the County’s Lift Stations Inspections and Maintenance Program.
- Data obtained from personnel involved in routine maintenance of the WCTS.
The projects identified in Appendix 1 are not exhaustive. The list is provided to illustrate examples of projects the County has implemented or is in the process of implementing.

1.4 Summary of the County’s PASARP and its Relationship to the OSARP

1.4.1 Summary of the PASARP

On March 26, 2013, EPA approved the County’s PASARP. The PASARP was prepared by the County pursuant to the requirements of Section VI.B(x).35 of the Consent Decree. The PASARP focuses on a subset of the WCTS potentially needing more urgent attention, hence the term “Priority Areas”.

The Priority Areas identified in the PASARP consist of Initial Priority Areas and Additional Priority Areas. The Initial Priority Areas were included in Appendix B of the Consent Decree. They consist of areas determined by the County, at the time the Consent Decree was negotiated, as meeting the following criteria: (1) having sewers that are estimated to be older than fifty (50) years; (2) with calculated “R-Values” greater than three percent; and (3) areas and/or sewer segments determined by the County, through its ongoing sewer system maintenance program, as needing additional assessment and/or prioritized rehabilitation. The Additional Priority Areas were identified, delineated, and prioritized based on the criteria listed in Subparagraph 35(d) of Section VI.(x) of the Consent Decree as described in the PASARP approved by the EPA. The locations of both the Initial and the Additional Priority Areas (collectively; “Priority Areas”) are shown in Appendix C of the PASARP and are also included in Appendix 2 of this document for ease of reference. The process used to identify, delineate, and prioritize the Additional Priority Areas is described in a report titled: “DeKalb County Department of Watershed Management Wastewater Collection and Transmission System (WCTS) Additional Priority Areas Identification, Delineation, and Prioritization Process”. This report is included in Appendix B of the PASARP.

1.4.2 Relationship between the PASARP and the OSARP

As indicated in Section 1.4.1 above, the PASARP focuses on a subset of the WCTS potentially needing more urgent attention, hence the term, “Priority Areas”. Consistent with the requirements of Section VI.B(x).38 of the Consent Decree, this document consolidates and formalizes key aspects of the County’s ongoing sewer assessment and rehabilitation practices into a formal OSARP to establish a formalized continuous assessment and rehabilitation process for the County’s WCTS. During the Consent Decree period, the OSARP will focus on areas outside the Priority Areas. Following the implementation of the PASARP, and after the Consent Decree period, the areas currently designated as Initial and Additional Priority Areas will eventually be considered for assessment and rehabilitation, as appropriate, under the OSARP. The OSARP is intended to be a permanent program that the County will continuously implement.
2 IDENTIFICATION, DELINEATION, AND PRIORITIZATION OF AREAS AND SEWER SEGMENTS FOR ASSESSMENT AND, WHERE NEEDED, REHABILITATION

2.1 Background Information

The experience gained by WCTS assessment and rehabilitation experts, over the last several decades, has shown that the process of identifying, delineating, and prioritizing areas and sewer segments for assessment and rehabilitation is a relatively complex one. It requires the availability of tremendous amounts of data (e.g., age, location, size, construction materials, condition, and performance of various WCTS components), expertise in the application of WCTS data analytical tools, and professional judgment. However, various sewer utilities throughout the world have consistently been developing best and effective WCTS assessment and rehabilitation practices as technology evolves, as experience is gained, and as more effective assessment and rehabilitation tools are developed. Over the last several years, the County has advanced significantly in its knowledge of its WCTS and in its approach to sewer assessment and rehabilitation.

As indicated in Section 1 above, the purpose of the OSARP is to ensure continuous assessment and rehabilitation of the County’s WCTS (during and after the expiration of the Consent Decree) by proactively identifying, delineating, and prioritizing areas or sewer segments within the WCTS for condition assessment and/or rehabilitation.

Section 2.2 below presents summaries of the programs, data sources, and information sources on which the County will rely to identify, delineate, and prioritize areas and sewer segments for assessment and rehabilitation under the OSARP. It should be noted that some of the programs, data sources, and information sources are still being developed under the various CMOM Programs required by the Consent Decree. The County will use its best efforts to incorporate data and information from various CMOM programs as the CMOM Programs are developed and fully implemented. It should be noted further that the programs, data sources, and information sources are not exhaustive. Other programs, data sources, and information sources may be identified and incorporated into the process as various CMOM Programs are fully developed and implemented, as new information and data become available, as existing technologies evolve, and as new technologies are developed. Section 2.3 below provides procedures for identifying, delineating and prioritizing areas and sewer segments for assessment and, as appropriate, rehabilitation.
2.2 Programs, Data Sources, and Information Sources that will be used in Identification, Delineation, and Prioritization of Areas

The following is a list of the programs, data sources, and information sources on which the County will rely and will initially incorporate into the process of identifying, delineating, and prioritizing areas and sewer segments for assessment and rehabilitation under the OSARP:

- Nature and Extent of Service Requests (service requests includes multiple request for corrective actions and actual customer complaints).
- Flow and Rainfall Monitoring Data.
- Hydraulic Modeling Data.
- Location, Cause, Frequency, and Volume of SSOs.
- Rehabilitation Measures Ongoing Pursuant to the CERP.
- Data Obtained from the FOG Management Program.
- Data Obtained from the MMS Program.
- Results from Lift Station Inspections.
- Preliminary Sewer Assessment Data.
- Results from Engineering Studies.
- Data obtained from Personnel Knowledgeable of the County’s WCTS Including Field Crew Work Orders.
- Professional Judgment and Experience.

The following sections provide summary descriptions of each of these programs, data source, and information sources and their usefulness to the process of identifying, delineating, and prioritizing areas and sewer segments for assessment and, as appropriate, rehabilitation under the OSARP.
2.2.1 Nature and Extent of Customer Issues

Customer calls related to sewer problems, such as backups, spills, and pipe breaks are among the most important sources of information regarding problems in the WCTS. These calls are directed to the DWM dispatch center where a service request is created. Field crews are then dispatched to perform an assessment of the problem associated with the customer issue. The information obtained through customer related service requests and associated assessments will assist in the decisions regarding the identification, delineation, and prioritization of areas and sewer segments for assessment and rehabilitation.

2.2.2 Flow and Rainfall Monitoring Data

The County maintains rain gauges and permanent and temporary flow monitors at strategically selected locations throughout the WCTS. The data obtained from rain gauges and flow monitors are used as follows:

i. to estimate the presence and volume of rainfall dependent and groundwater induced I/I;

ii. to determine the volume of wastewater flowing at various locations throughout the WCTS;

iii. to identify wastewater flow anomalies at various locations throughout the WCTS;

iv. to assess the adequacy of the collection and transmission systems at various locations throughout the WCTS;

v. to develop, calibrate, and maintain the hydraulic model;

vi. to evaluate the presence and correlations of rainfall and flow monitoring data with other CMOM programs, such as the FOG Program; and

vii. to guide the County in its proactive WCTS maintenance program.

The rainfall and flow monitoring data will help guide the County in identifying areas and sewer segments that may be experiencing capacity limitations, to make projections regarding when a sewer segment may run out of capacity, and to estimate the presence and volume of rainfall dependent I/I. This information will be used in identifying areas and sewer segments for assessment under the OSARP.

2.2.3 Hydraulic Modeling Data

The County is in the process of developing three hydraulic models (the Models) for the County’s three (3) sewer basins (Intergovernmental, Snapfinger, and Pole Bridge). The three sewer basins contain a total of thirty-five (35) sewersheds, two (2) of which do not currently contain any sewers. The three sewer basin models are being developed as separate models
representing each of the thirty-three sewersheds constituting the County’s WCTS. Once the basin Models are fully developed, the County will use them to obtain information regarding the hydraulic conditions of various components of the WCTS including - hydraulic profiles for various sewer segments, wet and dry weather flow conditions, peaking factors, and pressure and volumes of flow in force mains.

The data obtained from the Models will, among other uses:

- Enhance the County’s Capacity Assurance Program including monitoring wastewater flow volumes, velocities, and profiles at any point throughout the WCTS; identifying sewer segments, sewer appurtenances, lift stations, and treatment facilities needing expansion to accommodate prevailing and projected future flows; and determining whether the section that would convey a new connection would be adequate to convey prevailing and anticipated additional flows to the associated treatment facility.

- Aid in the identification of areas, sewer segments, and lift stations needing proactive maintenance to minimize or completely eliminate the likelihood of a SSO.

- Aid in the identification and prioritization of areas and sewer segments for additional assessment to address capacity limitations.

- Estimate the used and available capacities of various sewer segments within various sewersheds in the WCTS.

- Determine the presence and estimating the volume of rainfall dependent and groundwater induced I/I.

- Establish the hydraulic response of individual sewer segments, sewersheds, or basins to the introduction of additional flows, such as flows from new development and I/I.

- Aid in the selection of the most effective WCTS condition assessment tools for various areas or sewer segments.

- Aid in the identification and prioritization of rehabilitation measures.

- Facilitate the determination of the effectiveness of implemented rehabilitation measures.

Data obtained from the Hydraulic Models will be used in the process for identifying, delineating, and prioritizing areas and sewer segments for assessment and, as appropriate, rehabilitation under the OSARP.
2.2.4 Location, Cause, Frequency, and Volume of SSO’s

Wastewater collection and transmission systems are designed to provide adequate capacity to collect and convey wastewater to wastewater treatment facilities. The occurrence of a SSO may indicate the presence of one or more conditions that increases the amount of wastewater flowing in an area or sewer segment. Such conditions may include: defective sewers allowing the entry of groundwater and/or rainwater into the pipes, manholes, or other WCTS components; and the introduction of stormwater into the sanitary sewer through illicit connections. The presence of an obstruction in one or more sewer segments, such as accumulation of FOG and/or sediments, root intrusion, or foreign materials introduced into the sewer through vandalism, equipment malfunction; and the presence of sewers that do not have sufficient capacity to collect or convey wastewater from the areas they are designed to serve.

The County maintains electronic and hard copy data on the locations, causes, and volumes of SSOs occurring throughout the WCTS. The County uses and will continue to use SSO data in identifying, delineating, and prioritizing areas and sewer segments for assessment and rehabilitation, with areas experiencing relatively high numbers and volumes of SSOs at relatively high frequencies receiving higher priorities.

2.2.5 Rehabilitation Measures Ongoing Pursuant to the CERP

As indicated in the CERP approved by the EPA on January 10, 2013, the County responds expeditiously to SSOs occurring within the County’s WCTS. Following the initial response, the County dispatches personnel to perform an inspection of the right-of-ways and manholes within a reasonable distance upgradient and downgradient of the location of the SSO (minimum one-eighth mile) to determine the extent of the problem. The County has also instituted methods and procedures for assessing and mitigating, where feasible, the potential likelihood of the cause of a SSO occurring elsewhere within the County’s WCTS.

Some of the conditions causing SSOs are repaired immediately following their discovery and others are scheduled for repair at a later date. To fully optimize assessments and repairs triggered under the CERP, that data will be taken into account to help guide the County in identifying and delineating areas and sewer segments for assessment or, as appropriate, rehabilitation under the OSARP. Areas and sewer segments determined to be susceptible to SSOs will receive relatively higher priority.

2.2.6 Data Obtained from the FOG Management Program

The majority of SSOs in the County are related to the accumulation of FOG in sewers with diameters of eight- (8) inch to twelve- (12) inch. Eight- (8) inch to twelve- (12) inch sewers make up approximately eighty- (80) percent of the wastewater collection system in the County. The FOG Management Program involves identifying unpermitted new and existing FSEs, performing FOG interceptor pre- and post-installation inspections, issuing FOG Permits to qualifying FSEs, and performing periodic inspections of FSEs to ensure compliance with the FOG Management Program. In addition, the FOG Management
Program includes a public education component which focuses on educating residential customers on the importance of keeping FOG out of the WCTS. In the past, residential customers were encouraged (via flyers) to place all cooking oils and grease into containers, and dispose with the trash (solid waste) – for collection and disposal at the County landfill twice a week. The County currently uses a multi-media approach (personal, print, email, radio/TV media, etc.) to educate the public regarding the consequences of disposing of FOG in the WCTS and about alternative FOG disposal methods.

Under the FOG Program, the County tracks the occurrence of SSOs by location, cause(s), volume, and receiving waters. Once each month, the County reviews SSO records to determine, among other purposes, whether or not, there exist correlations between SSO caused by FOG blockages and the locations and densities of multi-family residential complexes upstream of the SSOs. As a first step, the County has coordinated with selected Apartment Owners Associations for a multi-location pilot program aimed at assessing the existence of direct collections between FOG from apartment complexes and SSOs caused by FOG blockages. This is a public/private partnership, based on the following parameters:

- Voluntary program – not mandated or required.
- No additional fees (cost) to our customers.
- Direct recycling of residential grease.
- Tracking of the location and quantities of grease collected.

Other information that may be obtained or observed by FOG Management Program personnel may include code violations, missing or broken cleanout covers, areas susceptible to relatively high occurrences of FOG-related SSOs, and exposed defective sewers or sewer appurtenances. When identifying, delineating, and prioritizing areas or sewer segments for assessment and/or rehabilitation under the OSARP, observations made and information obtained by FOG Management Program personnel will be used appropriately.

2.2.7 Data Obtained from the MMS Program

The County’s MMS Program is designed to facilitate effective management, operations, and maintenance of the County’s WCTS. It consists of computer software systems at various levels of development; computerized electronic data at various levels of integration and user interfaces; computerized, wireless telephone, and analog telephone communication systems; electronic and written WCTS inspection and testing procedures; electronic and written WCTS operations, practices, and procedures; electronic and written technical specifications for each lift station; electronic and written preventive and corrective maintenance schedules, practices, and procedures, including procedures for generating and tracking service requests and work orders; descriptions of the County resources dedicated to the operations, maintenance, and management of the WCTS; an inventory management system; and key performance indicators (KPI’s) for tracking and measuring the performance of the WCTS.

The MMS Program provides the County with the most comprehensive WCTS data that is relatively easy to retrieve for sharing, analysis, interpretation, and querying. WCTS location, condition, and performance data coupled with human intelligence will be instrumental in
identifying, delineating, and prioritizing areas and sewer segments for assessment and/or rehabilitation.

### 2.2.8 Results from Lift Station Inspections

Lift station inspections are performed under the County’s Lift Station Operations and Maintenance Program. The purpose of the Lift Station Operations and Maintenance Program is to provide for continuous, uninterrupted transmission of wastewater to the County’s wastewater treatment plants with a goal of achieving zero SSOs and reducing reactive and emergency operations and maintenance through the use of planned and predictive operations and maintenance.

Lift station inspections are performed daily, weekly, monthly, or at other predetermined time intervals based on the size of the lift station and the type of equipment. Although the inspections performed at lift stations are directed toward ensuring that the components of a lift station are in good working order, lift station performance data and observations made during inspections do, in certain instances, provide information about the condition or performance of the collection system upgradient of a lift station and the force main leaving the lift station. The following are examples of performance data items and observations that may provide information about the collection system upgradient of a lift station and/or the force main downgradient of a lift station:

- **Accumulation of large amounts of debris in the wet well**: Accumulation of large amounts of debris may be an indication of vandalism or openings/breaks of the collection system upgradient of the lift station. Breaks at stream crossings, for example, can allow large amounts of debris to enter the collection system.

- **Accumulation of FOG in the wet well**: Accumulation of large amounts of FOG in the wet well may be an indication of the presence of unpermitted FSEs, residential multifamily dwellings that do not capture or collect kitchen oil and grease, or the illegal introduction of FOG at a manhole upgradient of a lift station.

- **Wet well level and pump run times**: Relatively high wet well levels and long pump times may be an indication of restrictions within the force main leaving the lift station (such as those caused by corrosion) or increases in wastewater flows that may be caused by growth in development, illicit connections, and/or excessive I/I.

The County will review and analyze lift station performance data and observations made during lift station inspections to determine the need for assessing the collection system upgradient of the lift station or the force main leaving the station. Lift station performance data and observations made during inspections will also be considered in the identification, delineation, and prioritization of areas and sewer segments for assessment and, where appropriate, rehabilitation.

### 2.2.9 Preliminary Sewer Assessment Data

In addition to the WCTS assessment work performed by County personnel on a continuous basis, the County maintains annual contracts with companies specializing in sewer assessment work including flow and rainfall monitoring, smoke testing, dyed-water testing,
closed circuit television inspections, manhole condition assessments, etc. The County maintains the WCTS assessment data. Of all the data available for use in determining the need to perform additional assessment and/or rehabilitation, preliminary assessment data provides the most accurate current condition of the components of the WCTS assessed and also provides some of the most valuable data regarding the condition of the components immediately upgradient and, to an extent, immediately downgradient of the components assessed.

In determining the need for additional assessment and/or rehabilitation of WCTS components already assessed as well as the need to assess and/or rehabilitate components upgradient and downgradient of the components assessed, the County will review and perform some level of analysis of available preliminary sewer assessment data. The results of the County’s review and analysis will be used as a guide during the identification, delineation, and prioritization of areas or sewer segments under the OSARP.

2.2.10 Results from Engineering Studies

The County maintains annual contracts with outside consultants to provide planning, research, design, and program management and construction management services on a task order basis. Based on data obtained from the various County CMOM Programs, the County occasionally determines that an engineering study is needed to gather additional information on an area or sewer segment. The results of commissioned engineering studies are documented in a report. Some of the engineering studies have triggered the need for additional assessment, design, and repair/ replacement/ rehabilitation of sections or components of the area covered by the engineering study. The County plans to continue performing engineering studies in its efforts to improve the performance of its WCTS. Results of engineering studies will undoubtedly be used to guide the County in the identification, delineation, and prioritization of areas and sewer segments for assessment and/ or rehabilitation under the OSARP.

2.2.11 Data obtained from Personnel Knowledgeable of the County’s WCTS Including Field Crew Work Orders

The County’s WCTS field maintenance crews respond to service requests and work orders created as a result of customer complaints and other sources of information. While fulfilling their daily duties of maintaining, repairing, replacing, and rehabilitating components of the County’s WCTS, the field maintenance crews gather tremendous amounts of information on the conditions of the WCTS. Other personnel with knowledge of the WCTS include professionals involved in managing the field crews, sewer mapping professionals, and personnel involved in designing and construction of sewer system infrastructure. The County will incorporate the input of personnel knowledgeable of the County’s WCTS in the identification, delineation, and prioritization of areas and sewer segments for assessment and/ or rehabilitation under the OSARP.
2.2.12 Standard Industry Practices as Documented in Industry Manuals, Engineering Textbooks, EPA Publications, and Lessons Learned

As indicated in the PASARP, the sewer system assessment and rehabilitation processes have advanced tremendously over the last twenty (20) years. Numerous sewer assessment and rehabilitation programs have been implemented throughout the world with various degrees of success. In addition to the readily available information regarding sewer systems assessment and rehabilitation programs, various entities, including the EPA, have published several documents regarding effective sewer system assessment and rehabilitation techniques. Data and information documented in industry manuals, engineering textbooks, EPA publications, and lessons learned from other successful sewer assessment and rehabilitation programs will be used by the County as a guide during the identification, delineation, and prioritization of areas and sewer segments for assessment and/ or rehabilitation under the OSARP.

2.2.13 Professional Judgment and Experience

Professional judgment can be defined as: The process of forming an opinion by discerning and comparing various alternatives. Sound professional judgment is characterized by, and conforms to, established technical, industry, and ethical standards and requires specialized knowledge and experience in the relevant professional field. During the identification, delineation, and prioritization of areas and sewer segments for assessment and/ or rehabilitation under the OSARP, the County will apply individual and collective sound professional judgment.

2.3 Procedures for Identifying, Delineating, and Prioritizing Areas and Sewer Segments for Assessment and/or Rehabilitation

During the development of the PASARP approved by the EPA on March 26, 2013, the County divided its WCTS into 171 Ranking Areas for evaluation, ranking, and prioritization. The 171 Ranking Areas were selected because they were deemed to be of appropriate size, had readily identifiable boundaries in the County’s GIS, and available relevant data could reasonably be associated with specific Ranking Areas for analysis. Following the identification and delineation of the 171 Ranking Areas, the County ranked the Ranking Areas within each of the three sewer basins that constitute the County’s WCTS, as described in Section 2.2.2 of the PASARP. As described in the PASARP, a Knee of the Curve analysis was performed to aid the County in identifying the Additional Priority Areas for assessment and/ or rehabilitation. The Initial Priority Areas identified in the Consent Decree and the Additional Priority Areas identified as described in the PASARP are collectively termed “Priority Areas”.

Since the ranks for various Ranking Areas (both within and outside the Priority Areas) have already been established based on the criteria established in the Consent Decree and
the data available during the development of the PASARP, the County will consider the rankings for the Ranking Areas outside the Priority Areas as baseline rankings and use them as a guide during the identification, delineation, and prioritization of areas and sewer segments for assessment and/or rehabilitation under the OSARP. The County will also reassess the Ranking Areas outside the priority areas as appropriate, based on system evaluations and conditions to confirm the ranking status of each non-priority area. The County recognizes that Ranked Areas addressed under the PASARP will be re-ranked as part of the re-ranking process. The expectation is that once an area is addressed under the PASARP, it will be re-ranked as appropriate under the OSARP. The County will then update the ranks for the Ranking Areas using data obtained from the programs, data sources, and information sources summarized above.

As indicated previously in this document, the main purpose of the OSARP is to ensure continuous assessment and rehabilitation of the County’s WCTS (during and after the expiration of the Consent Decree) by proactively identifying, delineating, and prioritizing areas or sewer segments within the WCTS for condition assessment and/or rehabilitation. The implementation of the OSARP will, therefore, continue in perpetuity. The County recognizes that in order for the OSARP to be successful in meeting its intended purpose, it must be incorporated into the County’s overall capital improvement program (CIP) planning process. The following paragraph describes how the OSARP will be incorporated into the County’s CIP planning process.

During the development of the CIP, the County will review the rankings established during the development of the PASARP, or most current updates, and then identify the number of top ranked Ranking Areas (and hence the length of sewers and number of manholes), outside the Priority Areas, that would reasonably be assessed and/or rehabilitated, cost effectively, during each CIP year, and the CIP duration as a whole. The County will then enter the estimated annual and total costs for assessing and/or rehabilitating the identified Ranking Areas into the rate model as part of the process for determining the water and sewer rates. The determination of the Ranking Areas (length of sewers and number of manholes) to be assessed and/or rehabilitated, during a specific year or during the entire duration of the CIP, may follow an iterative process until the County determines that the water and sewer rates for a specified period are fair, reasonable, equitable, and affordable. The CIP may identify specific Ranking Areas, portions of Ranking Areas, and/or sewer segments for assessment and/or rehabilitation during each CIP year. As is customary during the implementation of a water and wastewater CIP, the areas and/or sewer segments identified in the CIP, for assessment and/or rehabilitation under the OSARP, may be modified from time to time based on several factors including the data obtained from other ongoing programs. In addition, the process used to update the rankings for various Ranking Areas may be modified or changed as new information and data becomes available, as existing technologies evolve, and as new technologies are developed. Figure 1 shows the Ranking Areas Review Process.
Figure 1 - Ranking Areas Review Process

1. **PASARP Ranking Areas**
2. **Refine Ranking Areas and Ranking Criteria As Appropriate**
3. **Assemble Current and Relevant WCTS Condition and Performance Data**
4. **Analyze Data for Ranking**
5. **Prioritize Areas and Sewer Segments for Assessment and/or Rehabilitation Under the OSARP**
6. **Identify Projects for Assessment and/or Rehabilitation During CIP Period**
7. **Identify Funding Sources During Annual Budget Cycle**
8. **Begin New or Continue Work Annually Under OSARP**
9. **Collect WCTS Condition and Performance Data from CMOM and Other Programs**
3 SPECIFICATIONS AND GUIDELINES FOR VARIOUS EVALUATIVE WCTS CONDITION ASSESSMENT TOOLS AND PROGRAMS

Condition assessment of the County’s WCTS utilizes the same set of evaluative tools whether performed under the PASARP or the OSARP. Summaries of the evaluative tools are included in Section 3 of the PASARP. The specifications, guidelines, and procedures for the evaluative tools the County utilizes are included in Appendices D through K of the PASARP. The same summary descriptions as well as the specifications, guidelines, and procedures for the evaluative tools the County uses are included in this document for ease of reference. The following is a list of the evaluative tools:

- Dyed Water Flooding Specifications, Guidelines, and Procedures (Appendix 3B).
- Corrosion Defect Identifications Specifications, Guidelines, and Procedures (Appendix 3C).
- Manhole Condition Assessment Specifications, Guidelines, and Procedures (Appendix 3D).
- Smoke Testing Specifications, Guidelines, and Procedures (Appendix 3H).

3.1 Overview of WCTS Evaluative Tools and Programs and their Applicability to the OSARP

As indicated in the PASARP, the WCTS infrastructure degrades with time based on several factors including age, pipe material, soundness of original construction, concentrations of wastewater constituents, type and duration of external loading, and types of surrounding soils. WCTS degradation can affect the structural integrity and/or hydraulic performance...
of the infrastructure. The level of degradation is determined by using several of the above-listed evaluative tools to determine the current condition compared with the design or expected level or performance. The assessment of the WCTS under the OSARP will be performed in a manner so as to provide the information needed to identify and to prioritize rehabilitation measures based on consequence and likelihood of failure (risk) and cost effectiveness. The following are summary descriptions of the evaluative tools and programs that will be used to assess areas and sewer segments under the OSARP.

- **Private Lateral Investigations:** Private laterals can be inspected using a combination of technologies, the selection of which depends on site conditions and access. Access onto private property to confirm or gather defect data is a voluntary program and requires the property owner’s permission in DeKalb County.

- **Dyed Water Flooding:** Dyed water testing is used in conjunction with smoke testing and CCTV to determine whether or not a smoke exit point is directly or indirectly connected to the sewer system. Dyed water testing is also used to investigate building sewer system connectivity.

- **Corrosion Defect Identification:** For gravity sewers, the simplest method to identify corrosion is by direct visual observation or CCTV inspection. For force mains, direct and indirect technologies may or may not be easy to apply depending on the force main's access. Combinations or tiered (levels of equipment and/or access to force mains) technologies are usually employed.

- **Manhole Condition Assessment:** Manhole condition assessment technologies are primarily by visual or camera imaging and can be performed from the surface or by physical entry depending on the desired level of precision of the collected data.

- **Flow Monitoring:** Flow monitoring is used to measure hydraulic performance. It helps identify areas of the system with excessive I/I. It is also used to determine the effectiveness of rehabilitation measures.

- **CCTV:** CCTV is used to provide a visual assessment of the interior of a manhole or pipe asset. The visual assessment is converted to a condition score. The asset is sometimes cleaned in advance of the inspection to provide a clearer structural image.

- **Gravity Sewer Line & Force Main Defect Analysis:** Gravity sewer and force main sewer (as well as other infrastructure assets) defects are given a code and score that, when aggregated, produce an asset condition score. When sewer line and force main defect data is properly linked to software and hardware applications, the analysis can enable subsequent selection and prioritization of rehabilitation measures.

- **Smoke Testing:** Smoke testing is used to identify potential locations of defects allowing the entry of I/I and, therefore, to prioritize CCTV Inspection and other assessment activities. Smoke testing is effective on both public and private property
(lateral) and can locate cross connections or other illicit connections such as roof
drains and yard drains.

Some combination of these evaluative tools and programs may be utilized simultaneously
based on the specific circumstances in the field. The most efficient progression and
combination of evaluative tools and programs will be used to assess areas and sewer
segments under the OSARP. Detailed specifications, guidelines, and procedures for these
assessment tools and programs are included in Appendices 3A through 3H. It should be
noted that the specifications, guidelines, and procedures included in Appendices 3 and 4 are
subject to change based on advancement in technology, effectiveness, and site specific
conditions. Figure 2 shows the Specifications Update Process where the Specification
Review Committee, made up of County personnel and contractors as appropriate, meet to
decide if a requested revision will be processed. Whenever revisions are made to the
specifications, guidelines, and procedures, the revision date will be identified on the
electronic and hard copy versions. Previous versions will also be maintained in a separate
file.
Figure 2 - Specifications Update Process

MASTER SPECIFICATION UPDATE PROCESS

County Personnel Update Request

Specification Review Committee

Review Request

Accept Request for Preprocessing

Update Affected Sections

Replace Affected Sections with New Version

Establish Hierarchy

Distribute Document to Authorized Users

Update Current Master Specifications Under Document Control
4 PROCEDURES FOR IDENTIFYING, PRIORITIZING, AND IMPLEMENTING REHABILITATION PROJECTS

This section describes the procedures the County will use to identify, prioritize, and implement rehabilitation projects under the OSARP to address excessive I/I and other conditions causing, or likely to cause SSOs. Some of these procedures are currently being utilized effectively under the PASARP.

Conditions associated with the occurrence of SSOs can generally be grouped into three (3) major categories: (1) capacity limitations, (2) structural defects, and (3) maintenance problems. The criteria presented in this section will be used to identify and prioritize rehabilitation measures to address capacity limitations and structural defects that are determined to cause, or are determined to have the potential of causing, SSOs within the areas and sewer segments rehabilitated under the OSARP. Although some of the rehabilitation measures may address maintenance problems that are causing or have the potential to cause SSOs, the County believes that CMOM programs, such as the FOG Management Program and the sewer cleaning program will more effectively address maintenance problems that are causing or have the potential to cause SSOs. In general, the County will identify and prioritize rehabilitation measures under the OSARP based on the following criteria:

- Locations, types, number, and magnitudes of defects.
- Likelihood and consequence of affected WCTS component failure (risk).
- Constructability assessment.
- Hydraulic Modeling analysis.
- Cost effectiveness and documented performance.
- The frequencies and volumes of SSOs with specific emphasis on those caused by capacity limitations and structural defects.
- Professional judgment of County personnel knowledgeable of the performance and maintenance requirements of the WCTS.
- SSO potential to impact human health and the environment.
4.1 Identification and Prioritization of Rehabilitation Projects

The process of identifying rehabilitation measures for a specific area or sewer segment will be initiated following the completion of the condition assessment within that area or sewer segment or portions thereof. As indicated in the guidelines for the various condition assessment techniques, the data obtained during sewer system condition assessment will be documented and archived in formats compatible with the County’s mapping and work order systems. This approach will promote intelligent interface of various condition assessment data and the sewer system locational data (GIS). The condition assessment data will effectively become an attribute of the sewer system assets for which rehabilitation measures will be identified and prioritized. This will ensure reasonable data accuracy by eliminating multiple data entries, facilitate data analysis, and reduce duplication of effort; and therefore, advance cost effectiveness in data analysis, identification and prioritization of rehabilitation measures, and rehabilitation measures design and construction processes.

The Gravity Line and Force Main Defect Analysis Guidelines included in Appendix 3G of this document summarizes the process the County will use to analyze the defects identified during the sewer system condition assessment. Consistent with the Priority Areas approach to prioritizing rehabilitation measures, certain defects will be scheduled for rehabilitation immediately upon their discovery during the sewer system condition assessment. Such defects will include those that pose immediate or foreseeable danger to human health and welfare and those determined to be contributing to the occurrence or reoccurrence of SSOs, based on their severity. The determination as to whether a defect should be scheduled for rehabilitation will be made based on professional judgment and experience.

The defect analysis process will include estimating the volume of infiltration and/or inflow associated with defects not immediately scheduled for rehabilitation and the total for observed defects within specific manhole to manhole sections and the targeted area or sewer segment as a whole for selected rainfall and groundwater conditions. The total estimated volume of extraneous flows within specific manhole to manhole sections will be used as a means of distributing and proportioning the extraneous I/I through the collection and transmission system within the targeted area or sewer segment and then all the way to the wastewater treatment plant using the County’s hydraulic model. The hydraulic model will of course account for flows originating from areas outside the targeted area or sewer segment (these other flows will be obtained from flow monitoring data). The hydraulic model will provide the hydraulic profiles within the targeted area or sewer segment and the sewers through which flows originating and upgradient of the targeted area or sewer segment are transmitted to the wastewater treatment plant. Locations of sewer segments with capacity limitations, manhole surcharges, and SSOs, if any, within the entire WCTS, will become evident once the hydraulic model is fully developed.

After the hydraulic model for a targeted area or sewer segment is developed, the County will then integrate inspection data and identify combinations of rehabilitation measures that can be implemented to remove selected percentages of the extraneous flows within the
targeted area or sewer segment (including the zero percent removal option). The County will then estimate the cost of implementing the various combinations of rehabilitation measures analyzed. The County will also estimate the cost of transmitting the extraneous flows not removed by the various combinations of rehabilitation measures analyzed. The most cost effective set of rehabilitation measures will then be selected for implementation.
5 PROCEDURES AND SPECIFICATIONS FOR ESTABLISHING THE TYPES OF REHABILITATION TECHNIQUES

This section describes the procedures and specifications the County will use to establish the types of rehabilitation methods that will be performed under the OSARP. One or more of the types of rehabilitation measures listed below will be utilized by the County. The listed rehabilitation measures have been tested and implemented extensively and effectively throughout the world and their applicability, effectiveness, and durability are well documented.

- Cured-in-place pipe liner.
- Pipe bursting.
- Manhole lining.
- Manhole replacement.
- Manhole height adjustment.
- Manhole ring and cover replacement.
- Manhole frame sealing.
- Open cut pipe replacement method.
- Point repairs.
- Manhole raising.
- Manhole ring and cover replacement.
- Service lateral rehabilitation.

The following paragraphs summarize each of the rehabilitation measures listed above and their applicability. Installation procedures and specifications for the rehabilitation measures are included in Appendix 4.

5.1 Cured-In-Place Pipe Liner

Cured-in-place liner pipe is formed by inserting a resin-impregnated felt tube into a defective sewer pipe and curing it by recirculating any medium. After the liner pipe is installed and cured, a remote-controlled cutting device is used with a closed circuit TV camera to reopen service connections. The cured-in-place liner pipe method is best suited
for sewer segments with multiple defects along the pipe segment such as pipe breaks, offset joints, sags, root intrusion, and cracked pipes; but where the structural integrity of the pipe and pipe alignment are not significantly compromised as to prohibit sufficient correction or enhancement by the installation of a cured in place liner. The cured-in-place liner pipe method is probably one of the oldest and most effective methods for wastewater collection system rehabilitation. It has been used successfully throughout the world for many years. Some of the advantages of the cured-in-place liner pipe method include the following:

- No excavation is needed to accomplish the installation of a cured-in-place liner pipe. The resin-impregnated felt tube is inserted through existing manholes and service connections are reinstated remotely.

- The cured-in-place liner pipe method can be used to correct almost all sewer line defects. The flexibility of the resin-impregnated felt tube allows it to navigated through defective sewers realigning offset joints, filling missing sewer sections, and re-sealing cracked sewer pipes.

- The cured-in-place liner pipe realizes high reductions of I/I due to its ability to hold tightly to the host pipe and to form a good seal at pipe joints.

- Unlike deform/reform and fold and formed liner pipes, the cured-in-place liner pipe bonds well with manhole rehabilitation products and hence reduces significant amounts of I/I at manhole connections.

- Can be done when open cut rehabilitation is not practicable.

Some of the disadvantages of cured-in-place liner pipe method include the following:

- For the same diameter pipe, the cured-in-place liner pipe method is more expensive than other sanitary sewer collection system rehabilitation methods, (except pipe bursting).

- Curing the resin-impregnated felt tube can be difficult for relatively long sewer segments, sewers with relatively large diameters, and when there exists an underground spring adjacent to the sewer pipe segment being rehabilitated.

- Correcting defective installations of a cured-in-place liner pipe can be very time consuming and cost prohibitive. Sometimes the sewer segment has to be excavated and replaced.

### 5.2 Pipe Bursting

The pipe bursting method involves breaking a pipe and inserting another pipe of equal or greater diameter. During installation, a cone-shaped tool is pushed or pulled through the inside of the pipe to be replaced. In the process, the cone-shaped tool breaks the existing
pipe and forces the broken fragments into the surrounding ground. The cone-shaped tool
tows the new pipe behind it, simultaneously installing it in place as it bursts the old pipe.
The bursting tool has a slightly larger outside diameter than the new pipe and it has a
diameter greater than the inside diameter of the old pipe. Service connections are reinstated
through excavation and reconnection using a variety of methods including mechanical
saddles and "Tees". The pipe bursting method is best suited for areas where the size of an
existing sewer pipe is too small to handle current or anticipated wastewater flows. The pipe
bursting method has been used successfully throughout the world for many years.

Some of the advantages of the pipe bursting method include the following:

- The pipe bursting method can be used to install a pipe with a larger diameter than
  an existing pipe resulting in an increase in capacity to handle increases in
  wastewater flow.
- The pipe bursting method can be used to install sewer pipes of different construction
  materials including polyethylene and ductile iron.
- Can cure some alignment and pipe deformation problems.

The disadvantages of the pipe bursting method include the following:

- It requires the excavation of entry and exit pits.
- For the same diameter pipe, the pipe bursting method is more expensive than cured-
in-place liner pipe.
- Service connections are reinstated by excavation and reconnection.

5.3 Manhole Lining

Several techniques are used to rehabilitate defective manholes. Some of the most common
techniques include spraying the inside surface of a defective manhole using urethane resin,
epoxy, or cementitious materials; installing a cured-in-place epoxy resin liner; and installing
a fiber grass insert. The following are summary descriptions of some of the most common
manhole rehabilitation techniques:

5.3.1 Cured-in-Place Manhole Liners

Cured-in-place manhole liners work best in locations where there is a potential for
infiltration that cannot be addressed in an effective amount of time. It is also a good option
when increasing the structural integrity of the manhole is important. Cured-in-place liners
provide a good monolithic surface that prevents water from entering the structure.
Cementitious Coatings

Cementitious coatings are typically used in manholes with varying degrees of concrete deterioration (0.5-inch to 2-inches). They can be spray applied, pumped and troweled, or spin cast. They are appropriate for rehabilitating manholes where bypass pumping or flow control is limited and in manholes with damp surfaces. They typically require minimal surface preparation beyond high pressure and/or detergent cleaning. Additives, such as calcium aluminate can provide pH buffering properties and reduce the rate of concrete degradation in the presence of sewer gases. In addition, some additives, such as fiberglass flakes help protect against corrosion and increase structural integrity. Cementitious coatings with close to 100% calcium aluminate have resulted in superior performance due to their pH buffering properties.

Mechanical Seals, Inserts, and Liners

Mechanical seals, inserts, and liners are typically made of PVC, fiberglass, or HDPE. They are typically grouted in place after installation by applying mortar to ½ inch thickness and physically pushing the liner onto the surface. The mortar moves into the existing annular space and acts as the mechanism to lock the liner into place, providing the desired level of adhesion. They are a good option for larger diameter manholes. They provide a physical barrier against corrosion, and do provide long-term manhole structural integrity and I/I control.

Polymer Modified Coatings

Polymer Modified Coatings can be spray applied, trowel applied or spin cast. They are a good option for odd shaped structures and in manholes where the atmosphere can be controlled. A benefit to using 100% solids polymer modified coatings is that they do not require a super-smooth surface for good adhesion. Some polymer modified coatings can be applied up to 250 mils, reducing the concern about pinholes in the coating, due to voids in the concrete, which can occur with thinner film coatings. These coatings can get into nooks and crannies, especially when spray applied. Spray application allows for better coverage, as the gun can be set to account for the different types of angles that may exist in the manhole.

Polymer modified coatings require environmental controls and stringent surface preparation. Full-time inspection is also recommended. Most coatings of this type are moisture and temperature sensitive and can pinhole on concrete if the environment is not properly controlled.
5.4 Manhole Replacement

This rehabilitation method involves either a full or partial replacement of manholes with severe structural defects, manholes requiring improvements in flow configurations, and manholes whose diameters need to be increased to handle large diameter pipes.

5.5 Manhole Height Adjustment

Manhole height adjustment involves lowering or raising the top of manholes so that the manhole covers are flush with the surrounding ground surface or pavement. Manholes protruding above the surrounding ground surface or pavement not only pose a safety hazard but are susceptible to damage from objects moving above the manhole (especially vehicles). However, if the manhole is in a wooded area away from public access, the manhole height is determined based on the standards. In all situations, the minimum height is controlled by the hydraulic gradient line. When manhole covers are below the surrounding ground surface or pavement, surface water drainage (especially stormwater runoff) concentrates above the manhole cover and flows into the manhole relatively easily through perforated manhole covers and around the edge of the cover to the sewer (inflow). They also pose a safety hazard to the public.

Manhole lowering involves excavating the area around the manhole and lowering the top of the manhole by either removing some of the bricks from the cone and setting the remaining part of the cone with brick and mortar or by cutting a section of the riser and reattaching the cone section with mortar. Manhole raising involves excavating the area around the manhole and adding a sufficient height of brick (typically a maximum of 12 inches) with mortar or removing the cone, adding a section of the riser, and reattaching the cone with mortar.

5.6 Manhole Frame and Cover Replacement

Defective manhole frames and covers and missing covers can contribute significant amounts of inflow into the sewer depending on their location, elevation relative to the ground surface, and the amount of surface water runoff and/or drainage in the surrounding area. In manhole rehabilitation practices, manhole frames and covers are typically replaced if they are damaged, or missing in the case of covers; when they are discovered to be above or below the street grade; and/or when it is discovered that they are allowing significant amounts of stormwater runoff and/or drainage to enter the sewer system. Some entities have been able to achieve significant inflow reductions through “Find and Fix” contracts where outside contractors are retained to investigate and replace manhole frames and covers that are found defective, or missing in the case of manholes; or observed to be allowing significant amounts of inflow into the sewer system.

Manhole frame and cover replacement involves excavating a small pit around the manhole, replacing the frame and cover, and then backfilling the excavated pit to grade. If a manhole cover is missing, excessively loose or tight in the frame, rocks, wobbles, or otherwise moves in its frame, the frame and cover is removed and replaced.
5.7 Manhole Frame Sealing

Manhole seals are designed to prevent leakage of water into the manhole through the frame joint area and the area above the manhole cone including all extensions to the chimney area. Extensions include lifting rings, brick, and/or block material that may have been used to achieve grade.

Manhole frame seals may be internal or external and are installed to cover the entire chimney area. The frame seal are typically installed in accordance with the manufacturer’s instructions and may consist of a flexible rubber sleeve, interlocking extensions, stainless steel expansion bands, or flexible urethane resins.

Manhole inserts are also available that seal manholes from I/I.

5.8 Open Cut Pipe Replacement Method

The open cut pipe replacement method is used to replace sewers with severe structural defects especially when other rehabilitation methods are determined to be significantly less cost effective and where disruption of the general public affairs is deemed nonexistent or insignificant. This method is also used to replace smaller pipes with larger pipe to handle anticipated flows.

An advantage is the opportunity to relocate or re-route the line.

5.9 Point Repairs

Point repairs involve the replacement or repair of relatively short lengths of pipe, typically up to fifteen (15) feet, of pipe sections where isolated line failure has occurred due to settlement, corrosion, crushing, or separation of joints. Point repairs may be performed anywhere along a manhole to manhole pipe segment, at manhole connections including manhole replacements, and on service laterals. The attached specifications distinguishes between internal and external point repairs.

5.10 Service Lateral Rehabilitation

Because of their sheer numbers, variety of potential construction, age, potential for illicit connections, and the relative inability of government agencies to provide routine maintenance due to ownership issues, service laterals can contribute significant amounts of I/I into a WCTS. In most cases, government agencies have only been able to assess and/or rehabilitate the publically-owned section of service laterals and to enforce observed/reported plumbing code violations.

In the recent past, the wastewater industry has developed evaluative tools to aid in the assessment and identification of the locations of conditions, within service laterals, contributing, or having the potential to contribute, to the entry of I/I into the WCTS. As service lateral assessment tools have continued to evolve, the wastewater industry has made service lateral assessment a part of broader WCTS assessment programs.
Over the past 20 years, various service lateral rehabilitation methods have been implemented with varying degrees of success. These methods include cured in place liners, sealing/repair of the service lateral-sewer main connection, installation of cleanouts, disconnection of illicit connections, and replacement of service laterals using the open-trench method.
6 PROCEDURES FOR INVENTORYING COMPLETED REHABILITATION PROJECTS INCLUDING, REHABILITATION TECHNIQUES

The County intends to incorporate the inventory and tracking of all its WCTS installation, maintenance, and rehabilitation work in its asset management program. Until the asset management program is fully developed and implemented, the County will utilize several methods to inventory and track work completed under the OSARP.

Initially, the County will inventory and track work performed under the OSARP using Microsoft Excel Spreadsheets; however, for sewer segments where GIS mapping is completed before rehabilitation work, work completed under the OSARP will also be recorded in the County’s GIS. The following asset rehabilitation projects will be tracked under the OSARP:

- Sewer gravity pipe rehabilitation (to be tracked in linear feet, geographical location and/or address, pipe diameter, and type of rehabilitation measure).
- Force mains and air release valves rehabilitation (to be tracked in linear feet, geographical location and/or address, force main diameter, and type of rehabilitation measure).
- Manhole rehabilitation [to be tracked by manhole identification number (ID), date started/dates completed, type of manhole rehabilitation, and location].
- Lift station replacement and rehabilitation projects (to be tracked by the asset, type, and geographical location of the lift station, and type of rehabilitation measure).

Service requests and work orders will be tracked in the Oracle Utilities Work and Asset Management (WAM) system. Data from the work order system that is related to or considered a rehabilitation project will be summarized and submitted to the County’s Engineering and Technical Services personnel for recording in the Microsoft Excel Spreadsheets and for input into the ESRI ArcGIS database, where feasible.

When rehabilitation projects completed by outside contractors are inspected and approved by the County, data associated with specific projects will be provided by the County project manager to the County’s Engineering and Technical Services personnel for recording in the Microsoft Excel Spreadsheets and for input into the ESRI ArcGIS database, where feasible. The approach summarized above will allow for the tracking and inventorying of completed rehabilitation measures under the OSARP for the purpose of updating work on system
assets and establishing a graphical representation of completed rehabilitation measures before the County’s asset management program is fully developed and implemented. Once the County’s asset management program is fully developed and implemented, the County will inventory and track all work completed under the OSARP and other County programs through the asset management program.
7 PROCEDURES FOR COORDINATING REHABILITATION WORK PERFORMED INTO THE MANAGEMENT MAINTENANCE SYSTEM (MMS) PROGRAM

The MMS will play a critical role for tracking and coordinating the County’s WCTS management, operation, and maintenance programs. By its nature and function, the MMS program is dynamic in that it requires continuous updates and improvements as WCTS data changes and new and improved management, operations, and maintenance procedures evolve. As the MMS becomes fully functional, it will contain the WCTS location, condition, management, operations, maintenance, and performance data; purchase order processing and documentation data; and the relevant personnel data. With the OSARP providing a means for continuously assessing and rehabilitating the WCTS assets during and after the completion of the work under the PASARP, it is critical that the assessment and rehabilitation work performed under the OSARP be coordinated with the work performed under the other Consent Decree programs, including the PASARP and other County water and wastewater management, operations, and maintenance programs.

As described in Section 6.0 of this document, the County will continue to utilize various databases including Microsoft Excel Spreadsheets to inventory and track all rehabilitation work performed on assets where GIS mapping is not completed. Various databases including Microsoft Excel Spreadsheets and the ESRI ArcGIS database are used for sewer assets that are already mapped in the County’s GIS. In addition, the County will continue to utilize the Oracle Utilities Work and Asset Management (WAM) system to manage and track work completed by County personnel through service requests and work orders. The County plans to fully integrate the Oracle Utilities Work and Asset Management (WAM) system and the ESRI ArcGIS to facilitate seamless data entry and data retrieval from both systems. During the systems integration process, the County will establish data modification hierarchies to ensure data accuracy and integrity. The combination of inventory and tracking methods described in Section 6.0, coupled with the Oracle WAM and ESRI ArcGIS systems integration, will promote the establishment of a comprehensive approach for not only inventorying and tracking asset management work throughout the County but also providing the County a means to coordinate work performed under the County’s various programs.

As discussed in the preceding sections of this document, the County will utilize various sources of data and professional judgment to select areas and sewer segments for assessment and/or rehabilitation under the OSARP. In addition to the sewer system assessment and rehabilitation work performed under the OSARP, the County will also be
performing assessment, inspections, maintenance, and rehabilitation of its WCTS under the other programs developed by the County and approved by the EPA under the Consent Decree. The County will be performing assessment, inspection, and maintenance/rehabilitation of manholes and sewer segments under the PASARP. It is essential that the work performed under the various Consent Decree programs be sufficiently coordinated to avoid duplication of efforts; to promote orderly tracking and inventorying of assessment and rehabilitation work; to optimize the effectiveness of the County’s capacity, management, operations, and maintenance (CMOM) programs; to advance the establishment and maintenance of an effective asset management program; and to optimize the utilization of rate payer resources while providing a superior level of customer service.

As part of the County’s asset management program, the MMS will provide a tool for coordinating the WCTS assessment, inspection, and maintenance/rehabilitation efforts under the various Consent Decree Programs including the OSARP. This section presents how the County will use the MMS, as a tool within the County’s asset management program, to coordinate the work performed under the OSARP as well as how the work performed under the OSARP will be coordinated with the work performed under other County other programs.

To the extent feasible and reasonably practical, the County will electronically track, coordinate, and inventory the assessment and rehabilitation of its WCTS under the various programs as well as acquisitions and additions to the WCTS. Whenever it is not feasible or reasonably practical to electronically accomplish this effort, the County will maintain hard copy data and maps of the work under various programs within its document control program in a reasonably retrievable form and enter it into its electronic databases when feasible and reasonably practical. The following paragraphs presents the procedures and processes the County will use to track, coordinate, and inventory the assessment and rehabilitation work performed under the OSARP into the MMS. Paper documents will be kept for backup and for details such as laterals etc.

### 7.1 Assessment Data Gathering, Management, and Coordination

During WCTS assessment data gathering, the County will document specific WCTS assessment data (CCTV, manhole condition assessment, dyed-water testing, smoke testing, corrosion defects identification, etc.) in a National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) and Manhole Assessment and Certification Program (MACP)-certified comprehensive data collection and management software (such as GRANITE XP) with an ESRI GIS Module that allows the import of ESRI asset data and the export of sewer assessment data in formats compatible with other County software. Documenting WCTS assessment data in a NASSCO-certified software will standardize data gathering efforts; enable the County to retrieve the data with relative ease for evaluation and analysis; aid in the selection of rehabilitation measures; aid in the planning and implementation of proactive and predictive maintenance activities; aid
in the establishment of management, operations, and maintenance budgets and resource allocation; avoid duplication of efforts in data analysis; and facilitate the coordination of various programs within sewersheds, basins, and the entire WCTS within the MMS.

Once the WCTS assessment data is gathered and documented in NASSCO-certified software, it will then be integrated as appropriate into the County’s Oracle WAM, ESRI ArcGIS systems, and hydraulic models to allow electronic data retrieval, viewing, and analysis. The WCTS assessment data will essentially become an attribute of the associated WCTS asset whereby the locations of the various WCTS defects and observed conditions will be readily retrievable from the County’s GIS and/or hydraulic model and mapped as needed to facilitate evaluation and analysis. Electronic interface of WCTS assessment data and the County’s Oracle WAM and ESRI ArcGIS will facilitate coordination between the observed condition and the performance of the associated WCTS asset. For example, the County will be able to co-relate observed SSOs, under the CERP, with the types and locations of defects located in the immediate vicinities of the SSOs and be able to determine the potential for comparable SSOs in other locations within the WCTS where similar defects/conditions are observed. Similarly, the County will be able to co-relate the observed wastewater flow conditions within various sewer segments, as observed from flow and rainfall monitoring data and the hydraulic model, with the types of defects/conditions in the immediate vicinities of various sewer segments. More importantly, electronic WCTS assessment data will eliminate duplication of effort in data entry, retrieval, observation, and analysis; support the implementation of the County’s CMOM programs; enable the County to efficiently retrieve historical maintenance data for specific WCTS assets; enable the County to map the locations of defects, service connections, and/or sewer system appurtenances electronically in GIS; view the condition of defects and service connections by clicking to specific defects/service connections within a video stream; and facilitate the selection of rehabilitation measures to correct specific defects, multiple defects, and/or conditions.

### 7.2 WCTS Maintenance and Rehabilitation Data

In instances where the assets are already mapped, the County will utilize both Microsoft Excel Spreadsheets and the ESRI ArcGIS database to inventory and track all rehabilitation work performed. In those areas where mapping is not yet complete, the County will track rehabilitation work using Microsoft Excel Spreadsheets. In addition, the County will utilize the Oracle WAM system to manage and track work completed by County personnel through service requests and work orders. Some of the historical WCTS rehabilitation data has already been entered into the ESRI ArcGIS database. For WCTS assets where available historical rehabilitation and other attribute data is available and has been entered into ESRI ArcGIS, the County is able to retrieve and to create maps showing the locations of various WCTS assets and the historical data associated with those assets (date of construction, material of construction, size of asset, date rehabilitated, method of rehabilitation, etc.) As GPS mapping is completed within various sewersheds (under the Sewer Mapping Program), the County will enter completed rehabilitation data and available attribute data into the ESRI ArcGIS database. When GPS mapping and entry of available WCTS attribute data is completed for all sewersheds within the County’s WCTS, the County will be able to
retrieve WCTS locational and attribute data in GIS for the entire County, including assessment and rehabilitation data for evaluation and analysis.

As indicated previously in this section, The County plans to fully integrate the Oracle Utilities Work and Asset Management (WAM) system, the ESRI ArcGIS, and the hydraulic models to facilitate seamless data entry and data retrieval from both systems. During the systems integration process, the County will establish data modification hierarchies to ensure data accuracy and integrity. The integration of the Oracle WAM system and ArcGIS will facilitate intelligent asset management including the ability to efficiently transition from reactive to predictive maintenance management. In addition, the County will significantly improve the level of customer service and more accurately establish WCTS capital improvement programs as well as management, operation, and maintenance budgets.
8 KEY PERFORMANCE INDICATORS (KPIs)

Table 8-1 presents the KPIs selected by the County to assess the effectiveness of rehabilitation projects completed under the OSARP. Data associated with these KPIs will be gathered before, during, and after rehabilitation measures are completed. It should be noted that other factors will undoubtedly affect the parameters used to establish the KPIs. In its assessment of the effectiveness of various rehabilitation measures, the County will make reasonable efforts to identify associations between the parameters identified and the rehabilitation measures implemented within a selected period of time and area.

Table 8-1 Key Performance Indicators

<table>
<thead>
<tr>
<th>KPI</th>
<th>Formula</th>
<th>Desired Result</th>
<th>Data Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSO per 100 miles of sewers</td>
<td>(#SSOs / total miles of sewers) x 100</td>
<td>Monitor for progress</td>
<td>Annual</td>
</tr>
<tr>
<td>SSO per 100 miles of sewers per year per inch of rain</td>
<td>(#SSOs / total sewer miles / estimated total rainfall in inches) x 100</td>
<td>Monitor (not expected to change significantly)</td>
<td>Annual</td>
</tr>
<tr>
<td>Total volume of spills per 100 miles of sewers</td>
<td>(Estimated total volume of spills / total miles rehabilitated) x 100</td>
<td>Monitor for progress</td>
<td>Annual</td>
</tr>
<tr>
<td>Total volume of spills per 100 mile per inch of rain within areas and sewer segments</td>
<td>(Estimated total volume of spills / total miles/ estimated total rainfall in inches) x 100</td>
<td>Monitor (not expected to change significantly)</td>
<td>Annual</td>
</tr>
<tr>
<td># of dry weather SSOs</td>
<td>Total # of dry weather SSOs</td>
<td>Monitor for progress</td>
<td>Annual</td>
</tr>
<tr>
<td>Annual average Treatment Plant Flow per inch of rain per year</td>
<td>Flow (MG)/ inches of rain</td>
<td>Monitor (not expected to change significantly)</td>
<td>Annual</td>
</tr>
</tbody>
</table>
APPENDIX 1

COMPLETED, ONGOING, AND SCHEDULED ASSESSMENTS AND REHABILITATION MEASURES
<table>
<thead>
<tr>
<th>Consent Degree Priority Area</th>
<th>New Priority Area Number</th>
<th>Project Name</th>
<th>Project Description</th>
<th>Total Quantity</th>
<th>Quantity Inside Priority Area</th>
<th>Quantity Outside Priority Area</th>
<th>Date Started</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I-G1</td>
<td>Dunwoody Lane Petition Sewer</td>
<td>Gravity Sewer Installation</td>
<td>1,300 LF</td>
<td>1,300 LF</td>
<td>0</td>
<td>1/5/2013</td>
<td>8/5/2013</td>
</tr>
<tr>
<td>3</td>
<td>I-G2</td>
<td>Winters Chapel</td>
<td>Sewer Cleaning, CCTV, Cured-in-Place Liner Rehabilitation</td>
<td>3583 LF</td>
<td>2,000 LF</td>
<td>1,583 LF</td>
<td>8/1/2010</td>
<td>10/28/2010</td>
</tr>
<tr>
<td>5</td>
<td>I-G5</td>
<td>Oakcliff-Pleasantdale Road</td>
<td>Sewer Cleaning &amp; CCTV</td>
<td>3,262.8 LF</td>
<td>300 LF</td>
<td>2,962.8 LF</td>
<td>2/20/2012</td>
<td>4/17/2012</td>
</tr>
<tr>
<td>6</td>
<td>I-G6</td>
<td>Munday Drive - Busk Drive</td>
<td>Sewer Cleaning &amp; CCTV</td>
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<td>10,673 LF</td>
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<td>2/21/2012</td>
<td>2/29/2012</td>
</tr>
<tr>
<td>7</td>
<td>I-G10</td>
<td>Buford Highway</td>
<td>Sewer Cleaning, CCTV, Cured-in-Place Liner Rehabilitation</td>
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<td>15,137 LF</td>
<td>981 LF</td>
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<td>3/17/2009</td>
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<tr>
<td>8</td>
<td>I-G5, I-SF3</td>
<td>I-IG17</td>
<td>Manhole Assessment</td>
<td>335 MHs</td>
<td>335 MHs</td>
<td>0</td>
<td>2013</td>
<td>2013</td>
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<tr>
<td>9</td>
<td>I-G12</td>
<td>Southfork Peachtree Creek Basin Improvements</td>
<td>Engineering Study</td>
<td>1,543,180 LF</td>
<td>422,704 LF</td>
<td>1,120,476 LF</td>
<td>10/1/2012</td>
<td>9/1/2013</td>
</tr>
<tr>
<td>10</td>
<td>I-G17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>I-G19</td>
<td>Northern Avenue</td>
<td>Sewer Cleaning &amp; CCTV</td>
<td>8,565.3 LF</td>
<td>3,300 LF</td>
<td>5,265.3 LF</td>
<td>12/2/2008</td>
<td>1/9/2009</td>
</tr>
<tr>
<td>12</td>
<td>I-G17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>I-SF1</td>
<td>Indian Creek Manhole Rehabilitation</td>
<td>Manhole Rehabilitation</td>
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<td>10,460.4 LF</td>
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<td>5/6/2013</td>
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<tr>
<td>14</td>
<td>I-SF2</td>
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<td>3,275 MHs</td>
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<td>2012</td>
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<td>15</td>
<td>I-SF3</td>
<td>Farnham Court - Richard Road</td>
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<td>5/23/2012</td>
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<tr>
<td>16</td>
<td>I-SF4</td>
<td>Farnham Court - Westam Drive</td>
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<td>3,567.3 LF</td>
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<tr>
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<td>I-SF5</td>
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<td>Sewer Cleaning &amp; CCTV</td>
<td>45,059.9 LF</td>
<td>45,059.9 LF</td>
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<td>8/30/2011</td>
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<tr>
<td>19</td>
<td>I-G9</td>
<td>Embry Circle</td>
<td>Sewer Cleaning, CCTV, Cured-in-Place Liner Rehabilitation</td>
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<td>13,359 LF</td>
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<td>7/30/2012</td>
<td>1/3/2013</td>
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<td>Miriam Lane</td>
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<td>21</td>
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<tr>
<td>23</td>
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<td>NA</td>
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<td>Presidential Parkway</td>
<td>Pipe Bursting Rehabilitation</td>
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<td>1,001 LF</td>
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<td>Aztec Rd. Phase II</td>
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<td>984 LF</td>
<td>0</td>
<td>5/5/2008</td>
<td>9/15/2008</td>
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</tbody>
</table>

**COMPLETED, ONGOING, AND SCHEDULED ASSESSMENTS AND REHABILITATION MEASURES CATEGORIZED BY THE INITIAL AND ADDITIONAL PRIORITY AREAS**
**COMPLETED, ONGOING, AND SCHEDULED ASSESSMENTS AND REHABILITATION MEASURES CATEGORIZED BY THE INITIAL AND ADDITIONAL PRIORITY AREAS**

<table>
<thead>
<tr>
<th>Consent Decree Number</th>
<th>New Priority Area Number</th>
<th>Project Name</th>
<th>Project Description</th>
<th>Total Quantity</th>
<th>Quantity Inside Priority Area</th>
<th>Quantity Outside Priority Area</th>
<th>Date Started</th>
<th>Completion Date</th>
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<tbody>
<tr>
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<td>1 Point Repair</td>
<td>1 Point Repair</td>
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<td>NA</td>
<td>Chelsea Circle (Dyson Dr. Point Repair 2)</td>
<td>Sewer Point Repair</td>
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<td>NA</td>
<td>NA</td>
<td>W. Nancy Creek Dr. &amp; Dunwoody Rd</td>
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<tr>
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<td>NA</td>
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<td>75 LF</td>
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<td>9/3/2009</td>
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<tr>
<td>NA</td>
<td>NA</td>
<td>Gresham Avenue</td>
<td>Sewer Cleaning, CCTV, Cured-in-Place Liner Rehabilitation</td>
<td>1,613 LF</td>
<td>1,613 LF</td>
<td>1,613 LF</td>
<td>7/22/2009</td>
<td>10/16/2009</td>
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<tr>
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<td>NA</td>
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<td>1,262 LF</td>
<td>1,262 LF</td>
<td>6/15/2009</td>
<td>6/15/2009</td>
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<tr>
<td>NA</td>
<td>NA</td>
<td>Gresham Avenue (Emergency Repair)</td>
<td>Sewer Point Repair</td>
<td>1 Point Repair</td>
<td>1 Point Repair</td>
<td>1 Point Repair</td>
<td>8/20/2009</td>
<td>8/20/2009</td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>Gresham Avenue</td>
<td>Sewer Cleaning &amp; CCTV</td>
<td>41,342.8 LF</td>
<td>41,342.8 LF</td>
<td>41,342.8 LF</td>
<td>6/22/2009</td>
<td>7/3/2009</td>
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<tr>
<td>NA</td>
<td>NA</td>
<td>Scott Boulevard (Phase II)</td>
<td>Gravity Sewer Installation</td>
<td>1,906.2 LF</td>
<td>1,906.2 LF</td>
<td>1,906.2 LF</td>
<td>10/8/2008</td>
<td>11/8/2008</td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>Scott Boulevard</td>
<td>Sewer Cleaning &amp; CCTV</td>
<td>15,615.8 LF</td>
<td>15,615.8 LF</td>
<td>15,615.8 LF</td>
<td>7/7/2008</td>
<td>8/6/2008</td>
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<tr>
<td>NA</td>
<td>NA</td>
<td>Archwood Dr. (Emergency Repair)</td>
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<td>1 Point Repair</td>
<td>1 Point Repair</td>
<td>8/17/2009</td>
<td>9/11/2009</td>
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<tr>
<td>NA</td>
<td>NA</td>
<td>John Carroll Dr. Easement</td>
<td>Sewer Cleaning, CCTV, Cured-in-Place Liner Rehabilitation</td>
<td>1,977 LF</td>
<td>1,977 LF</td>
<td>1,977 LF</td>
<td>4/21/2008</td>
<td>7/30/2008</td>
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<tr>
<td>NA</td>
<td>NA</td>
<td>Riverview Lane</td>
<td>Sewer Cleaning, CCTV, Cured-in-Place Liner Rehabilitation</td>
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<td>3,716 LF</td>
<td>3,716 LF</td>
<td>6/30/2008</td>
<td>10/3/2008</td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>Com Creek</td>
<td>Sewer Cleaning &amp; CCTV</td>
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<td>8,767.7 LF</td>
<td>8,767.7 LF</td>
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<td>6/30/2008</td>
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<td>NA</td>
<td>NA</td>
<td>W. Nancy Creek Dr.</td>
<td>Sewer Cleaning &amp; CCTV</td>
<td>78,342.81 LF</td>
<td>78,342.81 LF</td>
<td>78,342.81 LF</td>
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<td>10/14/2008</td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>Park Circle</td>
<td>Pipe Bursting Rehabilitation</td>
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<td>1,302 LF</td>
<td>1,302 LF</td>
<td>7/24/2008</td>
<td>9/17/2008</td>
</tr>
</tbody>
</table>

NA = Not Applicable

**LF** = Linear Feet

**MH** = Manhole

Refer to Priority Areas Sewer Assessment and Rehabilitation Program (PASARP)

*This station is being eliminated and connected to gravity system.*
<table>
<thead>
<tr>
<th>Project Description</th>
<th>TOTAL</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014 and Beyond</th>
<th>TOTAL</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014 and Beyond</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewer Cleaning &amp; CCTV</td>
<td>923,936.1 LF</td>
<td>339,912.0 LF</td>
<td>78,418.3 LF</td>
<td>35,492.4 LF</td>
<td>35,492.4 LF</td>
<td>231.1 LF</td>
<td>TBD</td>
<td>TBD</td>
<td>581,527.4 LF</td>
<td>179,255.6 LF</td>
<td>223,858.2 LF</td>
<td>16,534 LF</td>
<td>182,979 LF</td>
<td>84,139.2 LF</td>
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<tr>
<td>Cured-In-Place Liner Rehabilitation</td>
<td>20,162 LF</td>
<td>5,966 LF</td>
<td>214 LF</td>
<td>-</td>
<td>5,288 LF</td>
<td>273 LF</td>
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<td>7,886 LF</td>
<td>5,962 LF</td>
<td>731.1 LF</td>
<td>TBD</td>
<td>7,886 LF</td>
<td>91,492.3 LF</td>
<td>35,492.4 LF</td>
<td>731.1 LF</td>
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<tr>
<td>Pipe Bursting Rehabilitation</td>
<td>8,773.5 LF</td>
<td>4,798.1 LF</td>
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<td>-</td>
<td>2,770.4 LF</td>
<td>-</td>
<td>1,262 LF</td>
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<td>7,886 LF</td>
<td>1,262 LF</td>
<td>531.1 LF</td>
<td>TBD</td>
<td>7,886 LF</td>
<td>91,492.3 LF</td>
<td>35,492.4 LF</td>
<td>731.1 LF</td>
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<tr>
<td>Gravity sewer Installation</td>
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<td>-</td>
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<td>-</td>
<td>3,868.8 LF</td>
<td>1,300.0 LF</td>
<td>731.1 LF</td>
<td>TBD</td>
<td>3,868.8 LF</td>
<td>91,492.3 LF</td>
<td>35,492.4 LF</td>
<td>731.1 LF</td>
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<tr>
<td>Frame main installation</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>TBD</td>
<td>0 LF</td>
<td>91,492.3 LF</td>
<td>35,492.4 LF</td>
<td>731.1 LF</td>
</tr>
<tr>
<td>sewer Point Repair</td>
<td>17 Point Repair</td>
<td>9 PR</td>
<td>1 PR</td>
<td>1 PR</td>
<td>-</td>
<td>4 PR</td>
<td>3 PR</td>
<td>TBD</td>
<td>17 Point Repair</td>
<td>3 PR</td>
<td>5 PR</td>
<td>-</td>
<td>6 PR</td>
<td>3 PR</td>
<td>TBD</td>
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<td>Creek Crossing Rehabilitation</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>170 LF &amp; 1-MH</td>
<td>140 LF &amp; 1-MH</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>170 LF &amp; 1-MH</td>
<td>140 LF &amp; 1-MH</td>
<td>-</td>
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<tr>
<td>Sewer Extension</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>170 LF &amp; 1-MH</td>
<td>TBD</td>
<td>180 LF &amp; 1-MH</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>180 LF &amp; 1-MH</td>
<td>1,121,676 LF</td>
<td>1,200 LF</td>
<td>TBD</td>
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<tr>
<td>Manhole Assessment</td>
<td>13,526 Manhole</td>
<td>6,378 LF</td>
<td>1,695 LF</td>
<td>2,417 LF</td>
<td>707 HF</td>
<td>23 LF</td>
<td>2,343 LF</td>
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<td>16,059 Manhole</td>
<td>4,818 LF</td>
<td>2,026 LF</td>
<td>1,827 HF</td>
<td>1,058 LF</td>
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<td>Manhole Rehabilitation</td>
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<td>3 LF</td>
<td>4 LF</td>
<td>6 LF</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>TBD</td>
</tr>
<tr>
<td>Lift Station Project</td>
<td>3 lift station</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 lift station</td>
<td>-</td>
<td>1 lift station</td>
<td>TBD</td>
<td>3 lift station</td>
<td>-</td>
<td>1 lift station</td>
<td>-</td>
<td>2 lift station</td>
<td>-</td>
<td>3 lift station</td>
<td>TBD</td>
</tr>
<tr>
<td>Pump Station and Pipeline Improvements</td>
<td>5,005 LF &amp; 1 pump station</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6,600 LF</td>
<td>1 Pump station</td>
<td>TBD</td>
<td>2,200 LF</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2,200 LF</td>
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<td>TBD</td>
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<tr>
<td>Engineering study</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,121,676 LF</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,121,676 LF</td>
<td>1,200 LF</td>
<td>TBD</td>
<td></td>
</tr>
</tbody>
</table>

LF = Linear Feet  
MH = Manhole  
PR = Point Repair  
TBD = To be determined
APPENDIX 2

INITIAL AND ADDITIONAL PRIORITY AREAS MAP
APPENDIX 3

ASSESSMENT SPECIFICATIONS, GUIDELINES, AND PROCEDURES

A. Private Lateral Investigations Specifications, Guidelines, and Procedures
B. Dyed Water Flooding Specifications, Guidelines, and Procedures
C. Corrosion Defect Identifications Specifications, Guidelines, and Procedures
D. Manhole Condition Assessment Specifications, Guidelines, and Procedures
E. Flow Monitoring Specifications, Guidelines, and Procedures
F. Closed Circuit Television ("CCTV") Inspection Specifications, Guidelines, and Procedures
G. Gravity Sewer Line and Force Main Defect Analysis Specifications, Guidelines, and Procedures
H. Smoke Testing Specifications, Guidelines, and Procedures
PRIVATE LATERAL INVESTIGATIONS SPECIFICATIONS, GUIDELINES, AND PROCEDURES

The Department of Watershed Management (DWM) Private Lateral Investigation Program is designed to identify sources of Infiltration/Inflow (I/I) originating from private property and conveyed to the Wastewater Collection and Transmission System (WCTS). Private lateral I/I is often a significant contributor to increased wastewater flow and sanitary sewer overflows (SSOs) in mainlines and wastewater backups in private properties. Note, however, that the County is legally limited with respect to any activity it conducts on private property. For instance, the County is prohibited from using Public Funds for private purpose. These and other legal limitations will be taken into account during implementation. This guideline and procedure presented below will be evaluated and revised as needed as the program is implemented.

Private laterals are typically connected to the public sewer mainlines in public rights of way or sewer lines in easements on private property. Figure 1 depicts potential sources of I/I on private laterals. Private laterals have unique features compared to public sewer mainlines including:

- Relatively smaller pipe diameters (4 and 6 inches), which makes them relatively more vulnerable to increased frequency of clogging by items disposed of by homeowner such as excess paper, grease, toys, kitty litter, etc.
- Relatively shallow burial depths, which makes them susceptible to damage and easier to connect to.
- Relatively mild slopes and, therefore, relatively slower wastewater flow velocities.
- Some contain multiple bends with multiple fittings for cleanouts due to lack of uniform design and construction standards. This results in relatively greater head losses and tortuous flow regimes.
- Defects in joint connections at the building and to the mainline pipe including misaligned or open pipe joints which provide I/I entry points.
- Limited access to lateral pipes which creates maintenance challenges.
- Tree root impacts which causes lateral misalignment and damage.
Determination as to where private lateral assessment will be performed will be made based on a review of flow monitoring data, cost effectiveness, professional judgment, and previous experience of personnel knowledgeable of field conditions. Smoke testing will be the primary assessment method utilized in private lateral assessment. Smoke testing will be supplemented with other assessment methods, as needed to confirm specific I/I sources. Table 1 below lists common tiered or progressive inspection techniques used to provide comprehensive inspections as described in Steps 1 and 2 below.

**Table 1 – Optional Testing Methods for Private Lateral Investigation**

<table>
<thead>
<tr>
<th>Type of Defect</th>
<th>Testing Methods</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Smoke</td>
</tr>
<tr>
<td>Uncapped Cleanout</td>
<td></td>
</tr>
<tr>
<td>Downspout</td>
<td></td>
</tr>
<tr>
<td>Area Drain</td>
<td></td>
</tr>
<tr>
<td>Sump Pump</td>
<td></td>
</tr>
<tr>
<td>Foundation Drain</td>
<td></td>
</tr>
<tr>
<td>Stair Well Drain</td>
<td></td>
</tr>
<tr>
<td>Service Lateral Connection</td>
<td></td>
</tr>
<tr>
<td>Private Lateral</td>
<td></td>
</tr>
</tbody>
</table>
Step 1 - Smoke Testing

Service lateral investigation (Step 1) will involve the use of smoke testing to determine if there are I/I sources or illegal connections on private properties within the area being tested. Non-toxic smoke will be blown into the public sewer at pressures above atmospheric pressure. Observation of smoke exiting the ground and/ or other surfaces or inside the buildings, residences, or structures will be evidence of potential sources of I/I.

Common private property sources revealed by the smoke detection process include connected downspouts, open cleanouts, area drains, and defective laterals. If a building’s plumbing system is structurally tight and operating properly, smoke should not enter a building and should only be visible from a building’s plumbing vent.

Smoke testing guidelines and procedures are provided in Appendix K of the PASARP. Should results of smoke testing indicate no visible evidence of potential I/I sources or illegal connections, then the private lateral investigation will be deemed complete. Should results of smoke testing indicate visible evidence that there is an I/I source or illegal connection then Step 2 activities will be considered for further investigation, otherwise repairs of I/I sources will be recommended (repairs will either be performed by the property owner or the County based on ownership of the lateral). Repairs may include downspout disconnection from the sewer system or repair of a broken cleanout. In some cases, a repair may be required to bring the home owner’s private lateral up to County code standards to meet public health requirements.

The following is a list of actions that may be performed based on the results of smoke testing:

- **A** - Plumbing vent only – no further action, indicates the connections are in working order.
- **B** - Garden and around trees – indicates cracked line – note whether smoke is emanating from public or private property or both; conduct additional testing as needed (Step 2 below).
- **C** - Downspout – conduct exterior building inspection as needed (Step 3 below).
- **D** - Near foundation – conduct additional testing as needed (Step 2 below).
- **E** - Requirements of a back water valve to meet code requirement, if applicable to prevent spills or backups for those buildings located at a lower topography of the sewer main.

Step 2 - Dye Testing and CCTV Inspections

Step 2 of service lateral assessment will include dye testing, and/ or closed-circuit television (CCTV) activities to identify the specific source of I/I in the private lateral. Dye-water testing can be introduced above private laterals or at foundation drains by using a jetting device. Crews will then inspect down-gradient sanitary sewer manholes for the presence of the dye.

CCTV inspection may be used to directly view the private lateral to determine whether there are pipe defects and/ or other potential sources of I/I. Prior to CCTV inspection, laterals will be cleaned to remove debris and other obstructions (fats, oil, and grease, FOG) that may be blocking defects from view of the camera. The County will only clean the County maintained
portion of the lateral. The private property lateral will not be accessed, cleaned, or maintained. The private lateral may be comprised of fragile clay pipe and its structural integrity will not withstand jet cleaning pressure.

Dye-water testing and CCTV inspection guidelines and procedures are included in Appendix E and I of the PASARP respectively.

**Step 3 - Building Inspections**

Step 3 of service lateral assessment includes exterior building inspections to determine if downspouts, area drains, and/or stairway drains are connected to the sanitary sewer, or if there are open cleanouts on the property. Dye may be introduced above private laterals or at foundation drains by using a jetting device. Crews will then inspect down-gradient sanitary sewer manholes for the presence of the dye.

Building inspections can be performed to identify State plumbing code or municipal sewer-use ordinance violations. Building inspections may involve a physical inspection of the interior basement or crawl space and the outside perimeter of the building.

An interior inspection of a building will be conducted only if all other inspection techniques have been exhausted to determine if the building is a significant source of I/I to the County system. For instance, if the building is suspected to have an illegal foundation drain or sump pump connected to the sanitary sewer, this would need to be verified through an interior inspection, only if approved in the County ordinance and by the County Legal Department.

As part of the interior inspection, dye-water testing will involve introducing dye directly into suspect sump pumps or drains. This will allow crews to determine if the fixture is connected to the sanitary sewer system by the visible presence of dye in manholes down-gradient of the building fixture. The existence of a Palmer Valve (a one way check valve connecting basement floor drains to the sanitary sewer system installed between the years of 1920 to 1950) or other connections to the sewer system is proof of foundation drains connections to the sanitary sewer.
PRIVATE LATERAL ASSESSMENT PROCEDURE

Date of Revision: December 17, 2012

ACTIVITY DESCRIPTION
Private lateral assessment will be performed to identify sources of Infiltration/Inflow (I/I) and illegal sewer connections from private properties.

ACTIVITY GOALS AND OBJECTIVES
The objective of private lateral assessment is to identify sources if I/I such as downspouts; stairwell, yard, driveway, patio, and area drains; foundation drains; broken or un-capped clean-outs; pipe defects; and illegal connections. The goal of the private lateral assessment will be to identify repair, rehabilitation, and replacement projects that can be performed cost effectively to eliminate I/I sources from private properties.

SAFETY ANALYSIS - Specific to job site conditions

<table>
<thead>
<tr>
<th>Safety</th>
<th>Potential Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Program</td>
<td>Infectious Diseases</td>
</tr>
<tr>
<td>Protective Clothing and Equipment (Personal Protection Equipment)</td>
<td>Slip, Trip, and Fall</td>
</tr>
<tr>
<td>Gases and other Hazardous Atmospheres Analysis (Confined Space Entry)</td>
<td>Lifting</td>
</tr>
<tr>
<td>Overhead Power Lines (Electrical Safety)</td>
<td>Poisonous Snakes, Pests</td>
</tr>
<tr>
<td>Traffic Safety Requirements (Traffic Safety)</td>
<td>Confined Spaces (Confined Space Entry)</td>
</tr>
<tr>
<td></td>
<td>Traffic</td>
</tr>
<tr>
<td></td>
<td>Vehicle Operation</td>
</tr>
<tr>
<td></td>
<td>Mechanical Tools</td>
</tr>
<tr>
<td></td>
<td>Electrical Hazards (Electrical Safety)</td>
</tr>
<tr>
<td></td>
<td>Flooding and Inundation (Confined Space Entry)</td>
</tr>
</tbody>
</table>

PRIVATE LATERAL INVESTIGATION CHECKLIST - Specific to job site conditions

SAFETY
- Traffic Cones
- Yellow Vests (for each crew member)
- Flashing Beam (mounted on the vehicle)
- Fire Extinguisher
- Traffic Signs
- Arrow Bar/Board (for heavy traffic areas, only)
- First-Aid Kit (fully stocked) and Safety Manual
- Cellular Telephone/2-way Radio
- Drinking Water and Disposable Cups
- Hand Cleaner (Alcohol, waterless, towel-less cleaner, paper towels)

CLERICAL
- Step 1: Smoke Testing Clerical Supplies
- Step 2: Dye Water and CCTV Clerical Supplies
- Digital camera

WORKING
Step 1 – Smoke Testing Checklist Items
Step 2 – Dye Water and CCTV Working Checklist item
Step 3 – Building Inspection Items: Stock of booties to cover work shoes when entering a building
## SERVICE LATERAL INSPECTION PROCEDURE STEP 1

### ACTIVITY/SUBTASK

**SMOKE TESTING**

Refer to Smoke Testing Procedures in Appendix K of the PASARP. Smoke testing is most effective in sewers with diameters equal to or less than 18 inches. Smoke testing shall be performed during dry weather, no wind, and low soil moisture level conditions. Written documentation and photographs of smoke testing results will be maintained. Smoke testing procedures include public notification using direct mail, door hangers, verbal communications with property owners or building managers, notice placed in DeKalb County newspapers, and notice on the DeKalb County Government channel.

### DOCUMENTATION

1. **Record Results:** Crews shall record Step 1 results based on smoke testing procedures protocol.

## SERVICE LATERAL INSPECTION PROCEDURE STEP 2 and 3

### ACTIVITY/SUBTASK

**PRE-WORK ACTIVITIES**

Building Owner Notification and Appointment: Contacts with building owner or manager to schedule the building inspection, as needed, will follow the following steps:

**Note:** County permission is required to perform work outside of designated business hours.

- **a.** Prior to beginning Step 2 of the Service Lateral Inspection Procedure, a “general notification for private lateral investigation” letter will be mailed to each owner or building manager (Attachment A). The letter will identify a date and time of the building inspection. If the owner or building manager cannot be at building at the scheduled time, the letter will provide information as to how to re-schedule the appointment. In general, appointments will be scheduled on non-holiday weekdays and Saturdays based on the convenience of the owner or building manager.

- **b.** If the owner or building manager does not respond within the requested time period, an attempt will be made to contact them by telephone. If the resident refuses entry for an inspection, the inspector or scheduler will politely disengage and refer the matter to DWM Supervisor or for further action as presented in Step e below.

- **c.** If the owner or building manager cannot be contacted by telephone, a “request for access to building” letter will be mailed by the DWM (Attachment B) requesting the owner or building manager to contact DWM.
and refer the matter to the DWM or its designee for further action.

d. If after five (5) days, no contact has been made, a “Request for access to building” letter will be sent certified mail (Attachment B). The owner or building manager will be notified to contact DWM or its designee within seven (7) days. If the building is determined to be vacant, the county records will be researched by the DWM to locate the owner. After the owner is determined, a “Request for access to building” letter shall be mailed by the DWM or its designee to the owner. If there is no response within the allotted time, the “Request for access to building” letter (Attachment B) will be sent by certified mail. After the certified mail receipt is returned, the owner will be contacted by telephone. If occupant “refuses” or is a “no-contact” then the matter will be referred to the County Law Department.

e. For “refusals” and “no-contact” buildings the matter will be referred to the County Law Department.

BUILDING, DYE WATER AND CCTV INSPECTION

1. Approach to House/Building:

   a. Inspectors will be neat in appearance and wearing a uniform. They will carry photo ID and a copy of the “general notification” letter. They will approach the front door using the driveway and sidewalks (inspectors must avoid walking in home/building owner’s yard when approaching the structure).

2. Introduction and Identification:

   a. Inspector will present identification (photo ID) to owner/building manager for examination. In general, each 2 - 3 person inspection crew will perform the inspection.

   b. Consent to an inspection must be provided by someone 18 years or older (owner, building manager, or their designee).

   c. Introduction Speech: Hello, my name is __________. I am an inspector with the DeKalb County Department of Watershed Management [or I am working on behalf of the DeKalb County Department of Watershed Management (designated contractor). We are in the process of performing building inspections to locate possible sources of groundwater or stormwater entry into the sanitary sewer system. We would like
## SERVICE LATERAL INSPECTION PROCEDURE STEP 2 and 3

### ACTIVITY/SUBTASK

<table>
<thead>
<tr>
<th>Activity/Subtask</th>
</tr>
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<tbody>
<tr>
<td>• Πηοτογραπησ ωιλλ βε τακεν οφ αλλ οβσερϖεδ δεφεχτσ.</td>
</tr>
<tr>
<td>χ. Δψεδ−ωατερ τεστινγ προχεδυρεσ φορ συσπετ τ σουρχεσ: Δψεδ−ωατερ τεστινγ προχεδυρεσ σηουλδ βε εξπλαινεδ το οωνερ/βυιλδινγ µαναγερ: εξπλαν πυρποσε οφ τεστ ανδ ασσυρε οωνερ/βυιλδινγ µαναγερ τηατ δψε ισ νον−τοξιχ ανδ βιοδεγραδαβλε.</td>
</tr>
<tr>
<td>δ. Εξπλανατιον οφ Λατεραλ ΧΧΤς προχεδυρεσ:</td>
</tr>
<tr>
<td>• Removal/replacement of cleanout cap.</td>
</tr>
<tr>
<td>• Cleanup/housekeeping. Note – crews will wear disposable booties to prevent tracking into house.</td>
</tr>
<tr>
<td>• Possible need, and permission, to CCTV from main if the occupant has consented to a building inspection, but CCTV from the house cannot physically be accomplished. (Refer to Attachment D)</td>
</tr>
</tbody>
</table>


### 5. Conduct CCTV Inspection as Needed: Inspection procedures shall be followed in accordance with the CCTV Inspection Guidelines and Procedures (Appendix I of the PASARP).

### 6. Follow-up with Owner/Building Manager: Thank the owner/building manager for their cooperation;

   - replace any sump covers and draining grates disturbed during testing. Clean-up any dye residue and leave the property in the same or better condition than you found it. Inform the occupant that no further action will be needed on their part at this time and that based on the results of the testing, they may receive a call or letter from DWM or contractor.

### 7. Completing the Building Inspection Form: The Building Inspection form and accompanying procedures for completing the form are included as Attachment E.

### 8. Documentation: Complete the Private Lateral Building Inspection Form: This form and accompanying procedures for completing the form are included as Attachment E.

## RISK MANAGEMENT PLAN

### 11. Damage to private property must be avoided at all times. Great care should be exercised to avoid damage to yard, trees, bushes, flowers, etc.

### 12. Care must be exercised when dye testing suspect inflow sources to prevent dye from staining gutters, downspouts, siding, trim, or any sidewalk or paved surfaces both in and around the property.

### 13. Care must be taken during CCTV inspections to make sure no damage to the lateral is incurred.

### 14. Care must also be taken if pets are encountered during inside or outside inspections. If you feel that there is a possibility of being bitten or that the yard or house can't be entered safely, request that the homeowner/tenant restrain the pet during inspection and testing.
SERVICE LATERAL INSPECTION PROCEDURE STEP 2 and 3

ACTIVITY/SUBTASK

15. Correction of any damage to private property resulting from negligence on behalf of the DWM inspection crew(s) or contractor will be DWM's or contractor's responsibility and will be corrected immediately.

16. If care is taken and unavoidable damage occurs, then the following procedure will be followed:

   a. If damage to the building plumbing occurs (not related to service laterals), a plumber will be contacted to make repairs. The plumber will invoice DWM or contractor (and the contractor will apply for reimbursement from DWM).

   b. If a service lateral needs to be repaired, DWM staff or contractor will evaluate the repair site.

   c. DWM crews or contractor will provide the following information to DWM Supervisor:
      • Address.
      • Location (front/back).
      • Pipe Diameter.
      • Pipe Material.
      • Estimated Length of Repair.
      • Estimated Depth.
      • Pertinent Surface Features (Driveway, Trees, etc.)

   d. The DWM will dispatch a crew to evaluate the repair site. This work may also be performed in coordination with a designated contractor. The contractor will perform the repair and coordinate with DWM on reimbursement for repair costs and the contractor will provide documentation, including photos, of any repair work completed.

   e. In all cases, the first concern will be to restore the customer’s service (the contractor will work with DWM on adjustments to costs).

17. Homeowners will be asked to be present during inspection activities. The homeowner will be informed by the inspection crew if the house lateral is blocked or in need of repair.

18. For any issue with the customer’s lateral that cannot be repaired by the DWM or contractor, a report form will be completed that describes the issue and the action to be taken.

19. If a homeowner contacts the DWM or contractor with a potential claim during or after the inspection, the DWM will investigate the potential claim based on data provided by the homeowner. If appropriate, the issue will be resolved “under the project” and a release obtained. If not, the issue will proceed through DWM’s claim process, and the DWM will advise the homeowner how to file a claim.
Letter
(on DWM Letterhead)

Date

Mr./Mrs. ______________
Street
City, State, ZIP

Re: Upcoming Sanitary Sewer Assessment in Your Neighborhood

Dear DeKalb County Resident

The DeKalb County Department of Watershed Management (DWM) is performing a sanitary sewer assessment in your area that will lead to improvements of the sanitary sewer system. The purpose of the assessment is to determine whether there are sanitary sewer defects and/or unauthorized stormwater/other connections that are allowing the entry of ground water and/or rain water into the sanitary sewer and to repair those defects and disconnect the unauthorized connections. The entry of groundwater and stormwater into sanitary sewers can cause the sanitary sewer’s capacity to be exceeded resulting in sanitary sewer overflows and spills into rivers and lakes. It can also cause basement flooding or backups of sewage into your home or building creating a health hazard. The ultimate goal is to repair the sewers in order to prevent the entry of groundwater and stormwater, to eliminate sanitary sewer overflows and spills into rivers and lakes, and to eliminate sewage backups and basement flooding in homes / buildings.

Over the next several months, teams of engineers, inspectors, and surveyors representing the DWM will be working in your area. They will inspect external building sewer connections, televise building service and main sewer lines, and inspect manholes. They will carry a signed copy of this letter as well as photo identification during the course of these inspections. Part of the program involves inspection of sewer connections outside of your residence or business to allow DWM to verify connections to the sewer system. This program may include a televised inspection of your building service line which you will have the opportunity to view while the inspection is being conducted.

To schedule an inspection of your residence or business at a time convenient for you, please call DWM or Contractor at __________ for an appointment. You may also schedule an inspection via email at __________. Since the inspection program must be completed promptly, please call or email us within five (5) days of receipt of this letter. Your cooperation is necessary in order for this program to be successful.

In addition to building and service line inspections, a related evaluation procedure, known as “smoke testing,” will be performed in your area. This involves pumping a non-toxic smoke into the sewer lines to detect leaks in the system. During smoke testing, you may observe smoke seeping from the ground around your house and possibly escaping from plumbing vents. You will be notified in advance when smoke testing will take place in your neighborhood, and you will be provided a more detailed explanation of what to expect at that time. We will do our best to keep you informed as this program progresses.

Sincerely,

XXX (Name); XXX (Title)
Mr./Mrs. ___________ __
Street
City, State, ZIP

Re: Request for Building Access - Sanitary Sewer Assessment in Your Neighborhood

Dear DeKalb County Resident,

The DeKalb County Department of Watershed Management (DWM) or ___ Designated Contractor___ sent you a letter dated _____ ______ requesting you to make an appointment for an inspection of your building; as of the date of the writing of this letter, no response has been received. We subsequently attempted to obtain your telephone number so we could call you to set up an appointment, but were unable to do so. The cooperation of all DeKalb County residents is required so that the assessment of the sanitary sewer system, including connections on private property, can be performed successfully.

A physical inspection of each building is required to provide accurate information on sewer capacity requirements, as well as information on any past flooding or back-up problems you may have experienced. The inspection consists of an inside and outside survey performed by DWM or ____ Designated Contractor____.

To schedule an appointment for a building inspection, you may contact us at ____________, during regular business hours (8:00 a.m. - 5:00 p.m. Weekdays).

Your cooperation is requested to ensure the success of this beneficial project currently underway in DeKalb County.

If you have any questions regarding this inspection, please contact DWM or ____ Designated Contractor____ at the number listed above.

Cordially,

DWM Representative

cc: ______________________________
_______________ ______________
DeKalb County DWM

ATTENTION

DeKalb County Wastewater is investigating the sanitary sewer system in your area and need to gather information on and/or in reference to your property. Specifically, we need to schedule an appointment with you to inspect your property for the presence of sources of surface runoff or groundwater entering the sanitary sewer. This is called Infiltration and Inflow (I/I). We have been unable to reach you by letter or telephone.

Please call within five (5) days to schedule an appointment for an inspection, at:

XXXX

Your cooperation is greatly appreciated.

Field Technician

DeKalb County DWM

ATTENTION

DeKalb County Wastewater is investigating the sanitary sewer system in your area and need to gather information on and/or in reference to your property. Specifically, we need to schedule an appointment with you to inspect your property for the presence of sources of surface runoff or groundwater entering the sanitary sewer. This is called Infiltration and Inflow (I/I). We have been unable to reach you by letter or telephone.

Please call within five (5) days to schedule an appointment for an inspection, at:

XXXX

Your cooperation is greatly appreciated.

Field Technician
DEKALB COUNTY DEPARTMENT OF WATERSHED MANAGEMENT (DWM)
Permission to Televise Lateral from Main

Name: ________________________________________________________________

Status: Owner___ Tenant___ Building Manager___ (Must be 18 or older to provide consent)

Site Address: ____________________________________________________________

Date: ___________________ __________

Permission Granted to CCTV Lateral from Main:     Yes ______  No ____ _

Occupant Signature: _____________________________________________________

☐ Check here if occupant declines to provide signature.

Inspector Signature: _____________________________________________________
Note: A building interior inspection will be conducted only if necessary and meets the County Ordinances and codes.
<table>
<thead>
<tr>
<th>Defect #</th>
<th>Defect Type</th>
<th>Length (in)</th>
<th>Width (in)</th>
<th>Comments</th>
<th>RECOMMENDED Test Type</th>
<th>Defect Photo</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td></td>
<td>Dye</td>
<td>JPG</td>
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<td>2</td>
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<td></td>
<td>CCTV</td>
<td>JPG</td>
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<td>JPG</td>
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</tbody>
</table>

Comments:

Diagram:

Address: __________________
B. Dyed Water Flooding Specifications, Guidelines, and Procedures.
DYED WATER FLOODING SPECIFICATIONS, GUIDELINES, AND PROCEDURES

Dye-water testing is used to identify specific points of entry of inflow and infiltration (I/I) into the sanitary sewer, cross connections between the sanitary sewer and storm sewer, and to identify the path of pipes (mains and laterals). Dye-water testing is also used to determine if a pipe has been abandoned.

The procedure consists of injecting non-toxic fluorescent dye into defects that are identified during smoke testing and manhole inspection, or directly inserted into suspected inflow sources without the aid of smoke testing. The path of the dye is then documented, and leaks in the sewer lines or interconnections with storm sewers or service laterals may be located.

When dye-water testing is used to confirm rain or groundwater entry points into the sanitary sewer, the dye is introduced to roof drain leaders, driveway drains, or area drains. The downstream manhole or cleanout is checked for the presence of dyed water. Dye-water testing may also include flooding ground surfaces via “Top Side” drenching, wherein ground surfaces such as depressions are flooded with water sufficient to verify sources of infiltration.

When verifying whether a service connection to the main line is active or out of service, the dye is added to the service connections and the flow is visually observed. If required, dye may be observed using Closed Circuit Television (CCTV) inspection. Moreover, if a flow path in a sewer system is not known, the dye can be used to determine the direction of flow.

In order to promote safety, minimize risk, and mitigate potential environmental impact, man-entry into manholes is prohibited without an entry permit. The DWM’s preferred method of performing dye water testing is a Top Side procedure at ground level.
DYE - WATER TESTING OF SEWERS
Date of Revision:   December 17, 2012

ACTIVITY DESCRIPTION
Dye-water testing is used to study the flow of water from one area to another. Dye-water testing is useful in verifying discharge locations of storm sewer lines, checking for illicit connections between storm and sanitary sewers, and verifying the integrity of sewer lines. The dye is brightly colored, and may cause concern to the public when it becomes visible downstream. Therefore, public notification 72 hours before dye-water testing and interaction during and after the process is critical.

ACTIVITY GOALS AND OBJECTIVES
Goals and objectives for this activity include identifying cross connections between sanitary sewers and storm sewers, documenting I/I entry points into the sanitary sewer system, and confirming the path of laterals and mains. Testing is also used to determine if a main or lateral has been abandoned.

SAFETY ANALYSIS – Specific to job site conditions

<table>
<thead>
<tr>
<th>Safety</th>
<th>Potential Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Site Analysis for Potential Hazards</td>
<td>Infectious Diseases</td>
</tr>
<tr>
<td>Safety Program</td>
<td>Slip, Trip, and Fall</td>
</tr>
<tr>
<td>Protective Clothing and Equipment (Personal Protection Equipment)</td>
<td>Poisonous Snakes, Pests</td>
</tr>
<tr>
<td>Gases and other Hazardous Atmospheres</td>
<td>Confined Spaces (Confined Space Entry)</td>
</tr>
<tr>
<td>Analysis (Confined Space Entry)</td>
<td>Traffic</td>
</tr>
<tr>
<td>Underground Services Utilities Locations</td>
<td>Vehicle Operation</td>
</tr>
<tr>
<td>(If required)</td>
<td>Mechanical Tools</td>
</tr>
<tr>
<td>Traffic Safety Requirements (Traffic Safety)</td>
<td>Flooding and Inundation (Confined Space Entry)</td>
</tr>
<tr>
<td></td>
<td>Lifting</td>
</tr>
</tbody>
</table>

MANHOLE INSPECTION CHECKLIST

SAFETY – Specific to job site conditions

- Traffic cones
- Yellow vests (for each crew member)
- Hard hats, steel toed boots and gloves (for each crewmember)
- Face shield or goggles
- MSDS for dye
- Flashing beam (mounted on the vehicle)
- Fire extinguisher
- Traffic signs
- Arrow bar/board (for heavy traffic areas, only)
- First-aid kit (fully stocked) and safety manual
- Directions and telephone number to the nearest hospital or medical care facility
- Cellular telephone/2-way radio
- Drinking water and disposable cups
- Hand cleaner – alcohol, waterless, towel-less cleaner, paper towels

CLERICAL

- Work Order
- Maps – street and sanitary sewer
- Confined Space Entry Permit (if required)
### DYE - WATER TESTING OF SEWERS

**Date of Revision: December 17, 2012**

- Small note pads (for each crew member)
- Pencils and pens (for each crew member)
- County ID or Vendor/Contractor Name badges (for each crew member)
- Small white board and markers

#### WORKING
- Calibrated gas & air quality monitor
- Ventilation blower(s) (if required)
- Extra spark plugs for gas powered ventilation blower(s) (if required)
- Florescent dye
- Digital camera
- Digital Closed Circuit Televised (CCTV) Inspection rig
- Lateral inspection camera
- Portable or fixed water source for flooding
- Properly sized pipe plugs, air hose & fittings
- Appropriately sized air compressor
- 15'-20' ropes
- Extra rope
- 50' or 100' measuring tape
- Manhole-hook
- Pick
- Shovels
- Sledge hammers
- Locator/probe
- Flashlights
- Measuring wheel
- Marking paint
- Manhole marking flags (for use off-road)
- Tool box with necessary tools for routine equipment maintenance
**SPECIFICATIONS FOR DYE-WATER TESTING**

**Date of Revision:** December 17, 2012

<table>
<thead>
<tr>
<th>ACTIVITY/SUBTASK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRE-WORK ACTIVITIES</strong></td>
</tr>
<tr>
<td>1. <strong>Permits for Right of Ways:</strong> The supervisor will obtain work permits for all work to be performed in State and/or County Right-of-Ways. The supervisor will also plan for traffic control measures and other terms and conditions of the permits in advance.</td>
</tr>
<tr>
<td>2. <strong>Weather, Ground, and Ground Water Condition Requirements:</strong> Dye-water testing will not be conducted when weather conditions inhibit the introduction of dye into the sewer system or where typical system flow cannot be observed. Dye-water testing will be suspended if weather conditions make Dye-water testing unsafe and/or inefficient/ineffective.</td>
</tr>
<tr>
<td>3. <strong>Manhole Surcharge and Flow Control:</strong> Dye-water testing may not be performed during a manhole or line segment surcharge condition. The sewer will be relieved before testing can be undertaken.</td>
</tr>
<tr>
<td>4. <strong>Public Notification:</strong> The public in affected areas will be notified about the testing utilizing the local paper, web site, letters, and/or door hangers. Notification will be done 72 hours before dye-water testing and will include dates and times of dye-water testing, brief description of activities, and contact number for any questions or concerns.</td>
</tr>
</tbody>
</table>

**SITE PREPARATION**

1. **Review Work Order:**
   a. The supervisor will review the work order with the dye-water testing crew(s).
   b. The supervisor will review all safety procedures with the crew.
   c. The supervisor will ensure that all necessary material and equipment are on hand and available at the site.
   d. The supervisor will ensure that each critical equipment unit is in proper working order and that a backup unit is on site.
3. Site Security: Secure the work site by placing traffic control signs and safety devices at the work site.
   
   a. Follow traffic safety procedures.
   
   b. Wear all required safety equipment, such as safety vests, hardhats, safety glasses, and steel toe boots.
   
   c. Isolate one or more lanes of traffic with flags, cones, traffic control signs, etc. where work takes place in or immediately adjacent to roads.
   
   d. Alert the closest fire department/Emergency Medical Services (EMS) as to the location of the day’s work and ask them to stand by for potential emergencies and inquiries.

4. General Procedures:
   
   a. Determine the location of the manhole on the Geographic Information System (GIS) map. Mobilize to testing site.
   
   b. Once on site, secure the site with safety devices such as directional boards, cones, barricades, flags, and signs.
   
   c. Use metal detection if manhole is not visible. If the manhole is buried, report its location to Emergency Dispatch immediately and coordinate with other DWM crews for excavation. If the manhole is covered by 18 inches or less of sod or soil, inspection crews may uncover it by hand.
   
   d. Lift the manhole cover using the hook. Drag the cover with the hook; avoid bending over and using hands whenever possible.
   
   e. For heavier manholes, use a truck-mounted winch.
   
   f. Follow confined space procedures if man entry is required. Only trained and certified personnel are allowed to enter a confined space after receiving an entry permit.
   
   g. Follow OSHA personal protective equipment (PPE) program.
   
   h. DO NOT place your face near the manhole opening. Let the manhole ‘breathe” for 10 minutes before looking in.

   i. DO NOT SMOKE near manholes regardless of whether the cover is on or off.
   
   j. DO NOT STAND on a removed manhole cover.
   
   k. USE IMPERVIOUS GLOVES when working with an open manhole.
   
   l. USE DISPOSABLE TYVEK COVERALLS to keep sewage off of your uniform.
## SPECIFICATIONS FOR DYE-WATER TESTING

**Date of Revision:** December 17, 2012

### ACTIVITY/SUBTASK

| m. Ensure proper operation of blower. |

5. **Confined Space Entry:** Crews will minimize the physical entry of personnel into the sewer facilities. If required, manhole entry will be performed in accordance with Federal, State, local, and any other regulations for confined space entry. Only trained crews and staff may conduct confined space entry after obtaining an entry permit. Staff must use safety required equipment for manhole entry operations, including harnesses, ventilation equipment, etc.

6. **Safe Work Area:** The work area will be protected at all times by an adequate number of cones, barricades, flags, flaggers, and other measures necessary to meet the Manual for Uniform Traffic Control Devices (MUTCD) standards and to properly and safely protect both vehicular and pedestrian traffic. Flag men will work to secure all affected streets. Further requirements for traffic control may be imposed by the specific agency having jurisdiction. All traffic control measures will comply with the requirements of MUTCD, Part 6 – Temporary Traffic Control, Latest Edition as published by US DOT / FHWA.

7. **Unsafe Conditions:** Any condition deemed to be an unsafe condition will be immediately reported to the supervisor. Unsafe conditions will require all work to be stopped immediately and an inspection will be performed by the safety officer of the entity performing the work.

8. **Scheduling Time:** Crews will begin inspections after 8:00 am and terminate testing no later than 5:00 pm each day. Any scheduling outside of these designated times will require crews to obtain approval from the County. Work should be performed in timeframes that will allow compliance with the County’s noise ordinance.

9. **Storm or Sanitary Sewer Testing Procedure:**
   
   - **a.** Remove manhole cover and move it away from traffic flow without impacting the work area. Broken or missing manhole covers will be replaced immediately upon discovery.
   
   - **b.** The supervisor will instruct the crew to apply water to storm drain inlet, manhole, or other access point by use of a water pressure machine or from a pre-approved fixed source.
   
   - **c.** Dye will be applied directly into the existing flow of the upstream storm drain inlet, manhole, or other access point. Allow 20-30 minutes for the dye to disperse and travel, (in accordance with dye manufacturer’s recommendations).
   
   - **d.** The crew will observe the downstream manhole or other observation location to determine if dye is present.
   
   - **e.** If the dye is detected at the downstream manhole or observation location, CCTV inspection will be performed to precisely identify the location of the defect.
   
   - **f.** The supervisor will position the camera in proximity to the assumed cross connection or defect spot and the dye-water testing procedure will be performed again.
   
   - **g.** The supervisor will leave the camera at the defect location for dye to be applied then
### SPECIFICATIONS FOR DYE-WATER TESTING

**Date of Revision:** December 17, 2012

<table>
<thead>
<tr>
<th>ACTIVITY/SUBTASK</th>
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<tbody>
<tr>
<td>observe the defect location for signs of dye.</td>
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<tr>
<td>h. When the dye is detected, a mark on the ground or pavement will be made with marking paint or a flag indicating the location of the defect above ground.</td>
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<tr>
<td>i. The work order map will be marked with the location, type, and severity of the defect.</td>
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<tr>
<td>j. CCTV video recording of the defect will be coded in compliance with NASSCO’s Pipe Assessment Certification Program (PACP) and turned over to appropriate DWM authorities for rehabilitation.</td>
</tr>
</tbody>
</table>

10. Infiltration Detection in Creek Main (Dry Weather Only):

- a. The supervisor’s job assignment will include maintaining a map and address for the inspection.
- b. The supervisor will assess the information, gather the equipment and tools needed for the job, and mobilizes to the job site.
- c. Once on site, the crew will secure the site with safety devices such as directional boards, cones, barricades, flags, and signs.
- d. The crew will initiate plugging of the main downstream of flow. If manhole entry is required, confined space entry procedures will be followed using only trained and certified personnel with an entry permit.
- e. The crew will apply dye to the flow line from the upstream manhole.
- f. The crew will allow 20-30 minutes for travel and proper dilution of dye.
- g. The crew will inspect the line between the two manholes for signs of dye in the creek.
- h. The crew will monitor flow line back-ups by inspecting laterals and upstream manholes from the plugged manhole.
- i. When the dye is detected in the sewer, a mark will be made on the ground with marking paint or flag indicating the location of the defect above ground.
- j. As appropriate, the supervisor will perform a CCTV inspection as prescribed in the CCTV Procedures, Guidelines, and Specifications Appendix I.
- k. If no dye is detected, the supervisor will exercise best professional judgment as to whether other evaluative tools should be applied.

11. Lateral Service Testing *(For additional information on private laterals, refer to Private Lateral Assessment Guidelines in Appendix D of the PASARP)*:
SPECIFICATIONS FOR DYE-WATER TESTING

Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>a.</td>
<td>The supervisor will assess the information, gather the equipment, and tools needed for the job and mobilize to the site.</td>
</tr>
<tr>
<td>b.</td>
<td>Once on site, the crew will secure the site with safety devices such as directional boards, cones, barricades, flags, and signs.</td>
</tr>
<tr>
<td>c.</td>
<td>The supervisor will speak with the resident of the property and ask for permission to enter and perform a dye-water test. If the location is an abandoned lot and a cleanout is present, it will be located and used for applying the dye.</td>
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<td>d.</td>
<td>The crew will add dye to a toilet. (For proper detection in the sewer system, allow 20-30 minutes for dilution and flow travel).</td>
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<tr>
<td>e.</td>
<td>The crew will observe the manhole directly downstream of the tested lateral.</td>
</tr>
<tr>
<td>f.</td>
<td>When dye is detected at the downstream line segment, the path between the sanitary sewer and the private property will have been established. This information will be used to determine if service is still being provided.</td>
</tr>
<tr>
<td>g.</td>
<td>If the dye is not detected, a lateral camera may be inserted in the cleanout and pushed to review the lateral service line. The dye-water testing procedure will be performed again to verify a possible cross connection between two properties or an abandoned lateral.</td>
</tr>
<tr>
<td>h.</td>
<td>If no cleanout exists, laterals may be inspected from inside the sewer main.</td>
</tr>
<tr>
<td>i.</td>
<td>If a problem is detected on private property, the resident will be notified. It is the resident’s responsibility to correct any deficiencies identified.</td>
</tr>
<tr>
<td>j.</td>
<td>If CCTV is required, the CCTV video recording of the defect will be coded in accordance with NASSCO's Pipe Assessment Certification Program (PACP).</td>
</tr>
</tbody>
</table>

12. Sewer Main Testing: (Determine Live/Abandoned Status)

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>The supervisor’s job assignment for sewer main testing will include specifying precise locations, including a map and address for the inspection.</td>
</tr>
<tr>
<td>b.</td>
<td>The supervisor will assess the information, gather the equipment and tools needed for the site and mobilize to the job site.</td>
</tr>
<tr>
<td>c.</td>
<td>Once on site, the crew will secure the site with safety devices such as directional boards, cones, barricades, flags, and signs.</td>
</tr>
<tr>
<td>d.</td>
<td>The crew will apply dye directly into flow of upstream manhole or other access location of the suspected abandoned line. (Allow manhole time to ventilate prior to applying dye).</td>
</tr>
<tr>
<td>e.</td>
<td>The crew will allow 20-30 minutes for travel and proper dilution of dye.</td>
</tr>
</tbody>
</table>
SPECIFICATIONS FOR DYE-WATER TESTING

Date of Revision:   December 17, 2012

ACTIVITY/SUBTASK

f. The crew will observe the downstream manhole or access location flow for signs of dye.

g. If dye is detected, the flow line will have been established and the main will be considered live.

h. If no dye is detected, CCTV will be performed on the main.

i. Dye-water testing will then be performed and monitored using CCTV.

j. If no dye is detected and no lateral services are located, the line segment will be considered abandoned.

13. Equipment Removal and Breakdown:

a. Upon completion of the dye-water testing, tools, plugs, loose dirt, stones, and other foreign material will be removed from the mating surface of the rim before replacing the manhole cover. When replacing the manhole cover, the supervisor will ensure that the cover is seated properly. The cover will also be adjusted if necessary. If the cover cannot be seated correctly, a notation will be made on the manhole log and Emergency Dispatch will also be notified.

b. Traffic control devices will be secured before the crew proceeds to the next test site.

14. Data Evaluation:

NASSCO PACP/LACP ASSESSMENT

a. Consistency is necessary in all aspects of the investigation. All defects should be reviewed closely and observations should be well documented. NASSCO’s Manhole Assessment and Certification Program (MACP), Pipe Assessment and Certification Program (PACP), and Lateral Assessment and Certification Program (LACP) are valuable tools in the sewer system assessment process. These programs allow for consistency of documentation and a repeatable process for evaluation.

b. The goals of MACP, PACP, and LACP coding are: define attributes and features of the structure, document and explain defects, develop ratings for each applicable component of a pipe segment or service lateral (structural rating, O&M rating, and I/I rating), and record dimensional data that can be used for selecting rehabilitation methods. This standardized methods for reporting the results of condition assessment ensures consistency, promotes cost efficiency, and avoids unnecessary rehabilitation work.

c. Following the completion of the field data gathering, the data will be reviewed by qualified technicians to record the defects. Priority grades will be assigned to all defects using the appropriate NASSCO assessment certification and grading system.
DOCUMENTATION

As indicated in the preceding paragraphs, defect inspection documentation will be carried out in accordance with NASSCO's MACP, PACP, and LACP by trained personnel. Data will be recorded on a paper form and entered into a database, using the required file format in Microsoft ACCESS® Version 2003 or higher. The dye-water test database will include the following information at a minimum, and a sample paper form is included. The supervisor will ensure that, at a minimum, the following information is recorded.

1. Date, time, and weather condition.
2. Names of testing personnel
3. Location, including reference to the relevant manhole segment (upstream and downstream manholes ID numbers) and the nearest street address.
4. Description of the dye-water test results.
5. Status of structure tested (private or public).
6. Source type.
7. Ponding of affected area (length and width in feet).
8. Percent of area that is paved (run-off).
9. CCTV utilization.
10. Digital color photographs of the results of each test with precise description of photo content and location (refer to photographic documentation procedures).
11. A schematic layout of the manholes and sewer mains being tested noting the location of sandbags and/or plugs, address and location, manhole ID numbers, photo number and direction taken, dimensional ties and offsets to the documented inflow, and area and type of surface drained. (Note geographical orientation relative to north.)

PHOTOGRAPHIC DOCUMENTATION PROCEDURES

Each dye-water test will be photographed using high-resolution digital photography. Digital photographs will be provided in jpeg (jpg) format. The resolution of the photographs will be a minimum of 72 x 72 dpi and minimum dimension of 640 x 480 pixels. The photographs will be referenced in the database by filename along with the location of the dye-water test.
<table>
<thead>
<tr>
<th>ACTIVITY/SUBTASK</th>
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<tbody>
<tr>
<td>referencing will support QA/QC to ensure that dye-water tests, and their associated data, can be confirmed by a person other than the original testing crew.</td>
</tr>
</tbody>
</table>

Digital photographs will be orientated so that the long side of the photograph is horizontal and that 4”x 6” printed copies can be incorporated in the hard copy of the dye-water testing report.

The digital photographs will incorporate references including the date the photograph was taken. Each picture will have clearly annotated text using the following naming convention: [UPSTREAMMANHOLEID#]D[PHOTOID#].JPG.
Attachment A – SAMPLE DYE TEST FORM

DYE TEST FORM

1. DYE CREW: __________________________________________ DYE DATE: ________ / ______ / ______

2. UPSTREAM MANHOLE: __________________________ DOWNSTREAM MANHOLE: ___________________ __

3. WEATHER CONDITIONS: __________________________ __________________________ ___________________

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<th>OBS #</th>
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<th>RESULT</th>
<th>STATUS</th>
<th>TYPE</th>
<th>AREA</th>
<th>RUN-OFF</th>
<th>TV</th>
<th>TIME</th>
<th>ROLL/PHOTO#</th>
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</table>

RESULT CODES
POSITIVE
NEGATIVE
CANNOT TEST

STATUS CODES
PRIVATE
PUBLIC

SOURCE TYPE CODES
SERVICE LATERALS
TRANSITION JOINT
DRIVEWAY DRAIN
WINDOW WELL DRAIN
STAIRWELL DRAIN
AREA DRAIN
DOWNSPOUT
DOWNSPOUT CONNECT
FOUNDATION DRAIN
BUILDING INSIDE
CATCH BASIN
STORM DITCH
STORM MANHOLE
MAIN SEWER
UPSTREAM MANHOLE
CLEANOUT
OTHER

RUNOFF CODES
0% PAVED
25% PAVED
50% PAVED
75% PAVED
100% PAVED

COMMENTS __________________________________________ __________________________ __________________________
DeKalb County Department of Watershed Management

Notice to Residents
Dye-Water Testing of Sewer Collection System

In the next few days the DeKalb County Department of Watershed Management will be conducting dye-water tests within your neighborhood as part of an ongoing program to detect leaks within the sewer collection system. Dye that you may see is non-toxic and will not harm children, pets, or plants.

Please help us notify shut-ins in your area that may not receive this notice.

If dye enters your house, you should report it to the crews conducting the test so that they can help you locate the source while the test is still in progress. Repairs to your internal plumbing are your responsibility. We are only testing for problems on the sewer mains outside.

Please accept our apologies for any inconvenience this may cause. If you should have any questions regarding these tests, please call DeKalb County, Department of Watershed Management Customer Service at 770-621-7226 or the Contractor conducting the testing at xxx-xxx-xxxx. Thank you for your assistance with this project.
Attachment B – Sample Letter

Date
TO WHOM IT MAY CONCERN

This letter is to notify you that the DeKalb County Department of Watershed Management and its contractors will be working on the sanitary sewer system in your area. DeKalb County is in the process of investigating sewers and manholes in order to identify repairs that are needed to improve the performance of the sewers and to eliminate sanitary sewer overflows. In the next several months, some residents will notice that fluorescent dye is injected into drains and sanitary sewers or is noticeable in nearby streams. This is part of the testing program to find leaks in the system. The dye is non-toxic, and will not harm people, pets, or plants.

The dye-water testing program and necessary repairs of sewer pipes are part of the County’s multi-million dollar planned investment over the next seven (7) years to repair sewer pipes and to make improvements to the overall sewer system. This investment is in addition to regular operations; maintenance, and routine capital projects and is the beginning of a major investment in the aging infrastructure. This investment by ratepayers is not funded by taxes but rather is funded by the rates paid for sewer service on the utility bill.

Work will begin in your area in the next few weeks. Dye-water testing teams typically have one (1) to four (4) people. Their trucks will have the DeKalb County logo or DeKalb County’s contractor logo displayed on the door panels for easy identification. In addition, each inspector will be wearing an identification badge. Their work will occur during the day from 8:00 A.M. – 5:00 P.M. Monday through Friday.

- During the process of dye-water testing, it is normal for dye to be injected into drains and sewers.
- The dye is not harmful, and should not enter buildings.

If you have questions or concerns, please contact us at:

DeKalb County, Department of Watershed Management
Phone Number 7:00 am to 5:30 pm weekdays
Phone Number after hours
www.dekalbcounty.gov

Sincerely,

Name,
Collection System Supervisor

END OF GUIDELINES
C. Corrosion Defect Identifications
Specifications, Guidelines, and Procedures.
CORROSION DEFECT IDENTIFICATIONS, AND GUIDELINES

The Department of Watershed Management (DWM) Corrosion Defect Identification Program is designed to provide a mechanism for identifying and inspecting segments/components of the wastewater collection and transmission system (WCTS) within the Initial and Additional Priority Areas that are already corroded or are at risk of corrosion and then prioritizing identified corrosion defects for repairs. This document provides an overview of the causes of corrosion and a three step process for identifying, inspecting, and repairing sewer infrastructure that is corroded.

Background

One of the products of wastewater degradation is Hydrogen Sulfide (H$_2$S) gas. H$_2$S causes odor and can lead to corrosion in gravity sewers, manholes, force mains, and components of lift stations that are vulnerable to corrosion. H$_2$S is heavier than air and can be detected by the human sense of smell at very low concentrations (average threshold of 0.02 parts per million) and is hazardous and lethal in higher concentrations. H$_2$S generation involves a biological process that occurs in the submerged portion of the sanitary sewer and is dependent on the growth of a slime layer and affected by organic food source concentration, temperature, pH, and the velocity of wastewater flow. Figure 1 below depicts the biological and chemical interaction in the development of H$_2$S gas in a sewer pipe [Water Environment Research Foundation (WERF) Minimization of Odor and Corrosion in Collection Systems – Phase I, 2007].

Figure 1 – Hydrogen Sulfide Gas Generation
Segments/components of sewer infrastructure with relatively high potential for \( \text{H}_2\text{S} \) accumulation include the following:

- Flat, low velocity/long retention time gravity sewers areas where solids can accumulate.
- Lift stations.
- Turbulent areas, drop manholes, force mains, and force main discharge points.
- Inverted siphon discharge points.
- Areas with odor complaints.
- Exposed pipes in creeks.
- Lines that cross major petroleum or gas transmission pipelines (risk of stray current).
- Industrial areas where corrosive chemical discharges may be occurring.

Vitrified clay, fiberglass, high density polyethylene, and PVC pipes are very resistant to \( \text{H}_2\text{S} \) corrosion, while concrete, steel, composite, and iron pipes are susceptible to \( \text{H}_2\text{S} \) corrosion.

**Corrosion Defects Identification Guideline**

**Step 1: Data and Information Review Process to Identify Infrastructure Corroded or at Risk of Corrosion**

Activities to be considered for the identification of sewer infrastructure that is already corroded or at risk of corrosion within the Initial and Additional Priority Areas will include the following:

- Use of Geographic Information System (GIS), asset databases, as-built drawings, and information obtained from DWM personnel knowledgeable of the condition of the sewer system to identify potential locations of the following where feasible:
  - Metallic and concrete sewers.
  - Force mains/force main discharge points (additional detail provided below under Force Mains).
  - Inverted siphon discharge points.
  - Exposed metallic or concrete pipes in creeks.
  - Pipes that cross major petroleum or gas transmission pipelines.
  - Lift stations.
  - Drop manholes.
  - Manholes with structural defects susceptible to corrosion.
- Review and documentation of locations of odor complaints and identify the areas around odor complaints for further assessment/review.
- Identification of industrial areas where corrosive chemical discharges may be occurring.
• Interviewing Construction and Maintenance (C&M) supervisors and field crews to identify areas where odor is prevalent and areas where corrosion has been visually identified.

• Review of flow monitoring data to identify areas of low velocity/relatively long retention times.

• Review of the hydraulic model or components thereof to identify areas of low velocities/long retention times (once the hydraulic model is completed).

Once assets are screened and listed for each identified Initial and Additional Priority Area, proceed to Step 2.

**Step 2: Inspection of Infrastructure at Risk of Corrosion Manholes**

Manhole condition assessments for those assets identified in Step 1 will be completed using inspection technologies such as visual and/ or pole camera inspections. For manholes that have already been inspected, inspection data will be reviewed for corrosion defects. The procedure for manhole inspections is provided in Appendix G of the PASARP, Manhole Condition Assessment Guidelines. The Manhole Condition Assessment Guidelines include a form to be completed in the field that includes defect codes for corrosion using the National Assessment of Sewer Service Companies (NASSCO) Manhole Assessment and Certification Program (MACP) guidelines.

During routine sewer system maintenance activities, field crews from the DWM regularly make note of areas suspected to the accumulation of H$_2$S. The presence of a “rotten egg” sulfur odor is a reliable indicator of the presence of H$_2$S gas. Crews from the DWM are equipped with portable gas detectors that alert them of the potential presence of H$_2$S gas above preset concentration levels. The presence or absence of H$_2$S will be recorded on the form provided in the Manhole Condition Assessment Guidelines in Appendix G of the PASARP.

Manholes which have severely compromised structural integrity and that pose a hazard to personnel or the general public will immediately be scheduled for replacement or rehabilitation. Manhole corrective actions will be documented in the DWM work order system.

**Gravity Sewers**

After a list of pipe segments (manhole to manhole segments) or components have been identified in Step 1, these segments and/or components of gravity sewers will be inspected by Closed Circuit Television (CCTV). DWM’s Closed Circuit Television (CCTV) Inspection Guideline (Appendix I of the PASARP) provides forms and instructions that include corrosion defect identification using NASSCO Pipeline Assessment and Certification Program (PACP) guidelines.

CCTV for segments and components identified as being at risk of corrosion will be completed where CCTV has not already been performed as part of the sewer system condition assessment within the Initial and Additional Priority Areas. Previous CCTV results will be reviewed to identify corrosion defects.

Should CCTV inspection results not provide sufficient information regarding the extent of corrosion defects, other inspection tools will be used as appropriate for the type of pipe to be inspected. Lasers and sonar are also used in gravity and surcharge sewers, respectively, and can provide useful information particularly when there is measureable wall thickness loss. Should
additional assessment be required, contractors and vendors who specialize in sewer system corrosion will be engaged to perform appropriate sewer system assessment. Soil corrosivity analysis, where applicable and determined effective and necessary, will be used to quantify corrosion risk. Soil corrosivity analysis will be performed in accordance with ASTM G187 standard procedure or other appropriate method. The results obtained from soil corrosivity analysis will be recorded on the form provided in Attachment A and then archived in the DWM GIS to facilitate further analysis and future maintenance efforts.

Also refer to Appendix J of the PASARP, Gravity Sewer Line and Force Main Defect Analysis Guideline.

**Force Mains and Force Main Discharge Locations**

Prior to engaging in Step 2 activities, additional data and information topics will be reviewed in preparation for inspection of force main routes, air release valves, and force main discharge locations. These preliminary inspection data and information reviews are more relevant for metal pipe materials but can be applied to other pipe materials because of their metal appurtenances. The data and information review will include topics such as:

- Historical maintenance records (leak, repair, and excavation records).
- Available construction and as-built drawings.
- Pipe material and characteristics (wall thicknesses, pressure rating, flow rates, and air release valve points, operational status, coatings, and linings).
- GIS records to confirm the force main route.
- Above ground crossing location.
- High point locations.
- Air valve locations.
- Soil sample conditions (corrosivity, pH, moisture, and resistivity, see soil analysis below).
- Backfill and bedding material.
- Force main discharge locations (outfall).

After data and information review is completed, the overall force main length will be subdivided into shorter segments, if necessary, to best represent groupings of common factors that would differentiate individual segments from adjoining segments and therefore be represented by different condition scores. The establishment of segment boundaries will be based on factors such as locations of valves and locations of piping intersection locations.

Once the force main segments are established, external visual inspections of pipes will be performed at points exposed or easily exposed. Force main routes will also be walked to identify readily apparent visual indications of pipe breaks or dips in the ground. Visual inspections will be performed to identify defects particularly around air release valves and connections to open air discharge points from the force main to the manhole. A Force Main
Inspection Form (Attachment B) will be used to document results and attributes of each particular pipe segment. This form will not be used to generate condition scores. Condition scores will be developed for each force main segment (and gravity sewer segment) as discussed in Step 3.

Progressive non-destructive and destructive inspection tests will be performed when the physical integrity and internal condition of the force main is determined to require further assessment based on preliminary results obtained from visual inspections and records review. Various non-destructive and destructive assessment methods are available and may include, but are not limited to, acoustics, ultrasonics, electromagnetic current, and/or pit-depth measurement. The selection of the most effective technology or combination of technologies to use will be on a case-by-case basis.

Also refer to Appendix J of the PASARP, Gravity Sewer Line and Force Main Defect Analysis Guideline.

**Lift Stations**

Lift Station assessment will be completed using visual inspection process first. Upon completion of visual inspections, the presence or potential presence of H\(_2\)S will be confirmed using portable gas detectors. The presence or absence of H\(_2\)S will be recorded on the form provided in the Lift Station Inspection procedure below. Wet wells will be visually inspected and the general appearance noted prior to cleaning. Wet well retention times will also be noted to determine if retention times are too long (zoom camera inspection can be undertaken to obtain visual results within the pipe or force main interface with the lift station without entering the structure). Inspection results will be recorded on the Lift Station Inspection Form provided below. Results of lift station inspections will be assessed in Step 3, to prioritize repair/rehabilitation corrective actions for lift stations. Best professional judgment will be used in the scoring process to catalog the severity of defects.

**Step 3: Corrosion Defect Analysis and Prioritization**

Corrosion defects will be analyzed to determine if the source of the corrosion is readily apparent: e.g. H\(_2\)S related, corrosive wastewater influent, or operations or maintenance related activities. This determination will be based on the categories of deficiencies or defects identified such as:

- Presence of H\(_2\)S during inspections of manholes, gravity pipes, force mains, and lift stations
- Corrosion defects that are identified in areas with no presence of H\(_2\)S will be investigated further to determine the source of the corrosion. This process will include identification of upstream industrial dischargers and review of Industrial Pretreatment waste sampling reports. Reports will be reviewed for low pH and the presence of potentially corrosive chemicals.
- Retention times of wastewater in wet wells may be a major component of H\(_2\)S and slime build up that causes the generation of H\(_2\)S gas. Operations and maintenance changes to reduce the impact of H\(_2\)S gas on infrastructure will be evaluated.
Prioritization of repair of corrosion defects will be an inclusive process that will be a part of the PASARP process.
ACTIVITY DESCRIPTION
Corrosion inspection procedures are designed to provide for a mechanism for identifying and inspecting sewer infrastructure that is corroded or at risk of corrosion. The corrosion inspection procedures presented below include inspection procedures and forms, as applicable, for external visual inspection of force mains and lift station inspection.

- Inspection of manholes procedure for corrosion is provided in Appendix G of the PASARP, Manhole Condition Assessment Guidelines.
- Gravity pipe CCTV inspection procedure for corrosion is provided in Appendix I of the PASARP, CCTV Inspection Guideline.
- Force Main Corrosion Inspection Procedures and Form are included in this document.
- Soil corrosivity analysis for gravity sewers and force mains shall be performed in accordance with ASTM G187 standard procedure or other appropriate method. Soil corrosivity results for gravity sewers and force mains shall be recorded on the form provided in Attachment A below.

ACTIVITY GOALS AND OBJECTIVES
The objective of the Corrosion Inspection Procedures is to provide a mechanism for identifying and inspecting infrastructure that is corroded or at risk of corrosion. The goal of Corrosion Inspection Procedures is to identify corrosion related sewer defects.

SAFETY ANALYSIS - Specific to job site conditions

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<th>Potential Hazards</th>
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<td>Safety Program</td>
<td>Infectious Diseases</td>
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<tr>
<td>Protective Clothing and Equipment (Personal Protection Equipment)</td>
<td>Slip, Trip, and Fall</td>
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<tr>
<td>Gases and other Hazardous Atmospheres Analysis (Confined Space Entry)</td>
<td>Poisonous Snakes, Pests</td>
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<td>Overhead Power Lines (Electrical Safety)</td>
<td>Confined Spaces (Confined Space Entry)</td>
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<td>Flooding and Inundation (Confined Space Entry)</td>
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<td>Lifting</td>
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</table>

CORROSION INSPECTION TESTING CHECKLIST - Specific to job site conditions

SAFETY
- Hydrogen Sulfide Gas Detector
- Traffic Cones
- Yellow Vests (for each crew member)
- Flashing Beam (mounted on the vehicle)
- Fire Extinguisher
- Traffic Signs
- Arrow Bar/Board (for heavy traffic areas, only)
- First-Aid Kit (fully stocked) and Safety Manual
- Cellular Telephone/2-way Radio
- Drinking Water and Disposable Cups
- Hand Cleaner – Alcohol, waterless, towel-less cleaner, paper towels
CORROSION INSPECTION PROCEDURES AND SPECIFICATIONS
Date of Revision: December 12, 2012

CLERICAL
• Supply of Inspection Forms
• Supply of Field Photo Forms
• Clipboards
• Scotch Tape
• Maps – Street and Sanitary Sewer
• Small Note Pads (for each crew member)
• Pencils and Pens (for each crew member)
• Contractor ID and Vendor/Contractor Name Badges (for each crew member)
• Carpenter’s Aprons (for each crew member)
• Small white board and markers

WORKING
• Camera and supplies
• Locator/probe
• Flashlights
• Hydrogen sulfide detection badges
• Soil corrosivity equipment as required by ASTM G187 standard procedure
• Lift Station Wet Well Cleaning Equipment (vacuum truck, bypass pumping equipment, hoses, etc.)

EXTERNAL INSPECTION OF FORCE MAINS

1. Force main routes, air release valves, and force main discharge points will be walked and visually inspected for evidence of corrosion or corrosion induced leaks where applicable.

2. The visual inspections will be performed after a review of the record drawings to confirm the force main’s route, high points or special crossings, air valve locations, and point of discharge.

3. The soil corrosivity will be performed as needed on a case by case basis. Results shall be documented on the Form included as Attachment A to this document.

4. Permits for Right of Ways: The Supervisor shall obtain work permits for all work to be performed in State and/or County Right-of-Ways. All other insurances, traffic control measures, and other terms of the permit shall be obtained and planned for in advance.

5. Photographic Documentation:
   a. Crews shall document each corrosion defect using a digital camera supplied by the supervisor.
   b. A close up picture shall be taken to show a detailed view of the defect.
   c. The digital photographs shall incorporate references including the date the photograph was taken.
**LIFT STATION INSPECTION**

1. Lift stations shall be visually inspected for evidence of corrosion. Wet well retention times and condition shall be documented prior to cleaning. Review plans and field measurements to determine wet well retention times and condition as part of the determination for the release of H2S from solution to atmosphere prior to cleaning or as part of the assessment process.

2. Wet well inspections will be coordinated with wet well cleaning.
   a. Influent shut-off valve and/or upstream manholes shall be checked for suitable plug locations. Use of flow diversion pumping equipment, if needed, will be coordinated with all parties involved.
   b. To the extent feasible, wet wells shall be cleaned at the same time as the lift station is being dewatered.
   c. If heavy grease deposits are present, a degreaser solution shall be used.
   d. To facilitate a thorough inspection, shut-off valves shall be closed or a plug shall be installed in the upstream manhole.
   e. Upstream flow shall be monitored continuously. If flows approach depths that would cause a sanitary sewer overflow, the manhole plug shall be released or the shut-off valve shall be opened to allow the flows into the lift station for pumping.
   f. The bottom of wet well shall be vacuumed with extension tubes to remove debris and sediment.
   g. If dewatering of truck is necessary, the manhole plug shall be opened or the shut-off valve shall be opened. The back of the truck shall then be dewatered back into wet well (liquid only) and the process shall be repeated until sludge & debris is removed from the truck.
   h. Remove plug or open shut-off valve to restore flow to the wet well.
   i. Repeat “f.” if necessary.
   j. Dewater truck at next station and dispose of grit, grease and debris at an approved facility in accordance with all applicable local, state and federal regulations.

3. Once wet well is cleaned and in a dewatered state visual and zoom camera inspections of wet well shall be performed.
4. Observations made on the wet well shall be recorded on the Lift Station Inspection Form (Attachment C).
Attachment A – Soil Corrosivity Form

Soil Corrosivity Form

Location: ________________________________

Pipe Segment (Manhole to Manhole ID for gravity sewers, lift station for force mains):

Date: ___________ By: ______________

Pipe Information
Pipe Diameter: _____ inch
Installation Date: _____

Pipe Type
☐ Galvanized ☐ Copper
☐ Cast Iron ☐ Steel
☐ Ductile Iron ☐ CCP
☐ Other: _____

External Coating: _____

Soil Condition
Dept of Cover: _____ feet

Principal Soil Type
☐ Clay ☐ Gravel ☐ Mixed
☐ Loam ☐ Rocky
☐ Sand ☐ Glacial Till

Groundwater at _____ feet

Soil Resistivity _____ ohm-cm

☐ Soil Box ☐ Single Probe ☐ Wenner 4-pin

Depth of Test Measurement _____ feet

Notes:
# Attachment B – External Force Main Inspection Form

## Force Main Pipeline Inspection Report

<table>
<thead>
<tr>
<th>Inspector name:</th>
<th>Date:</th>
<th>Address of pipeline inspection:</th>
<th>Leak?</th>
<th>Yes</th>
<th>No</th>
<th>File Number:</th>
</tr>
</thead>
</table>

1. **Type of Pipe:**
   - [ ] Cast iron
   - [ ] Ductile iron
   - [ ] Carbon steel
   - [ ] Copper
   - [ ] Non-metallic
   - [ ] Concrete
   - [ ] Other:

2. **Diameter of pipe**
   - [ ] in.
   - **Pipeline Name:**
   - **Service Type:**
     - [ ] Water
     - [ ] Wastewater
   - **Estimated date of pipe installation:**
   - **Depth of pipe**
   - [ ] ft.

3. **Type of Pipe:**
   - [ ] Distribution
   - [ ] Transmission
   - [ ] Service
   - [ ] Hydrant
   - [ ] Mechanical joint
   - [ ] Fasteners
   - [ ] Other
   - [ ] Unknown

4. **Type of Coating:**
   - [ ] Polyethylene encased
   - [ ] Shop applied coating
   - [ ] No coating
   - [ ] Tape wrap
   - [ ] Unable to determine

5. **External Pipe Condition:**
   - [ ] Very Good
   - [ ] Good
   - [ ] Poor
   - **Comments:**

6. **Ultrasonic Thickness Measurements and comment (if applicable):**
   - **Internal lining present?**
     - [ ] Yes
     - [ ] No
   - **Comments:**

7. **Is corrosion pitting evident?**
   - [ ] Yes
   - [ ] No
   - **Number of pits:**
   - **Typical size of pits:**
   - **Quantity of pits:**

8. **Is graphitization evident (longitudinal or circumferential breaks)?**
   - [ ] Yes
   - [ ] No

9. **The pipe is installed in (check appropriate items):**
   - [ ] Industrial area
   - [ ] Residential area
   - [ ] Rural area
   - [ ] Near street or road
   - [ ] Near creek or waterway
   - [ ] In reclaimed land
   - [ ] Near oil or gas pipelines
   - [ ] Near high-voltage lines

10. **Describe soil conditions where inspection occurred:**
    - [ ] Wet
    - [ ] Dry
    - [ ] Clay soil
    - [ ] Rocky soil
    - [ ] Cinders
    - [ ] Other

11. **Were soil samples obtained, sealed, and analyzed for chlorides, moisture content, pH, sulfides, and resistivity?**
    - [ ] Yes
    - [ ] No
    - **If yes, results were:**

12. **Were previous repairs made on the pipeline (leak clamps, etc.)?**
    - [ ] Yes
    - [ ] No
    - **Was new pipe installed?**
      - [ ] Yes
      - [ ] No

13. **Was a repair clamp installed on the pipe during inspection?**
    - [ ] Yes
    - [ ] No

14. **Was a galvanic anode installed as part of the inspection process?**
    - [ ] Yes
    - [ ] No
    - **If yes size and quantity:**

15. **Please relay additional comments:**

16. **Plan of Action:**

17. **Insert Digital Photo below:**
# Lift Station Inspection Form For Corrosion

**Location:**

---

**Station No.**

---

**Date:**

---

**By:**

---

## Station Information

<table>
<thead>
<tr>
<th>Wet Well Depth:</th>
<th>Lift Station Capacity:</th>
</tr>
</thead>
<tbody>
<tr>
<td>____</td>
<td>____</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wet Well Capacity:</th>
<th>Hydrogen Sulfide Reading (atmosphere):</th>
</tr>
</thead>
<tbody>
<tr>
<td>____</td>
<td>____</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hydraulic Detention Time:</th>
<th>Hydrogen Sulfide Reading (solution)</th>
</tr>
</thead>
<tbody>
<tr>
<td>____</td>
<td>____</td>
</tr>
</tbody>
</table>

Note turbulence of wastewater coming into the wet well: ____

## Condition Ratings

(for Lift Station Corrosion Table below)

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Like New</td>
</tr>
<tr>
<td>2</td>
<td>Minor Corrosion</td>
</tr>
<tr>
<td>3</td>
<td>Pitting and Some Metal Loss</td>
</tr>
<tr>
<td>4</td>
<td>Significant Metal Loss</td>
</tr>
<tr>
<td>5</td>
<td>Severe Pitting</td>
</tr>
</tbody>
</table>

## Lift Station – Evidence of Corrosion: Use Condition Ratings above (1 through 5)

<table>
<thead>
<tr>
<th>Lift Station Element</th>
<th>Condition Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition of wet well:</td>
<td></td>
</tr>
<tr>
<td>Condition of pump/motor:</td>
<td></td>
</tr>
<tr>
<td>Condition of electrical /HVAC equipment:</td>
<td></td>
</tr>
<tr>
<td>Condition of pipe:</td>
<td></td>
</tr>
<tr>
<td>Condition of motor control center:</td>
<td></td>
</tr>
<tr>
<td>Condition of building</td>
<td></td>
</tr>
</tbody>
</table>

Record condition with photographs
## Attachment D – Gravity Sewer and Force Main Scoring Criteria

<table>
<thead>
<tr>
<th>Wastewater Condition: Gravity &amp; Force Main</th>
<th>Condition Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Gravity</strong></td>
<td></td>
</tr>
<tr>
<td>Excellent (NASSCO Pipe Rating Index 1 or SCREAM 1-25 inspection scores). New or nearly new. Ten or less years old. Ferrous pipe that has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths &gt; 10 feet. No to minor offset or open joints; no or few minor cracks; good service lateral connections; and no root intrusions.</td>
<td></td>
</tr>
<tr>
<td>Good (NASSCO Pipe Rating Index 2 or SCREAM 26-50 inspection scores). Ten to twenty five years old. Ferrous pipe has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths &gt; 10 feet. No to minor offset or open joints; no or few minor to moderate cracks; generally good service lateral connections; and no to some root intrusions.</td>
<td></td>
</tr>
<tr>
<td>Fair (NASSCO Pipe Rating Index 3 or SCREAM 51-75 inspection scores). Twenty five to fifty years old. Ferrous pipe may not have internal or external corrosion protection. Cast iron, concrete, vitrified clay, or PVC pipe material. Pipe segment lengths less than 10 feet. No to minor offset or open joints; no or few minor to moderate cracks; generally good service lateral connections; and no to some root intrusions.</td>
<td></td>
</tr>
<tr>
<td>Poor (NASSCO Pipe Rating Index 1 or SCREAM 76-90 inspection scores). Fifty to seventy five years old. Ferrous, clay, or cementous pipe material. Corrosion protection deteriorated. Within 600 ft of force main discharge. Pipe segment lengths less than 10 feet. Other than rubber gasketed joints or welded joints. Significant infiltration/inflow and causing capacity problems. Interior wall surface shows uniform corrosion or material etching. Areas of aggregate and wall thickness loss in cementous pipes. Generally good pipe alignment but some sections not aligned; several minor to moderate offset or open joints but a few severe; few to several severe cracks or broken pieces of pipe but several more severe or even to the point of collapse; broken pieces or pipe or bricks missing with soil or bedding visible; generally good service lateral connections but several hammer taps and some to frequent root intrusions.</td>
<td></td>
</tr>
<tr>
<td>Very poor (NASSCO Pipe Rating Index 5 or SCREAM 90-100 inspection scores). Greater than seventy five years old. Ferrous, cementous, or brick pipe material. Corrosion protection deteriorated. Within 100 ft of force main discharge. Pipe segment lengths less than 10 feet. Other than rubber gasketed or welded joints. Severe infiltration/inflow and causing regular capacity problems. Interior wall surface shows uniform corrosion or material etching. One or more major severity defects. Areas of significant aggregate and wall thickness loss in cementous pipes. Generally good pipe alignment but some sections not aligned; several minor to modest offset or open joints but a few severe and may impede inspection; few to several moderate cracks or broken pieces of pipe but several more severe or even to the point of collapse; broken pieces of pipe or bricks missing with soil or bedding visible; generally good service lateral connections but several hammer taps and poor connections; and some to frequent root intrusions.</td>
<td></td>
</tr>
<tr>
<td><strong>Force Main</strong></td>
<td></td>
</tr>
<tr>
<td>Excellent (NASSCO Pipe Rating Index 1 or SCREAM 1-25 inspection scores). New or nearly new. Ten or less years old. Ferrous pipe that has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths &gt; 10 feet. No evidence of exterior wall pitting or corrosion. No pipe wall thickness loss. Air valves operational and generally in good condition.</td>
<td></td>
</tr>
<tr>
<td>Good (NASSCO Pipe Rating Index 2 or SCREAM 26-50 inspection scores). Ten to twenty five years old. Ferrous pipe has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths &gt; 10 feet. No to some evidence of exterior wall pitting or corrosion. No to some pipe wall thickness loss. Design pressure (including surge) factor of safety above 2. Air valves operational and generally in good condition.</td>
<td></td>
</tr>
<tr>
<td>Fair (NASSCO Pipe Rating Index 3 or SCREAM 51-75 inspection scores). Twenty five to fifty years old. Few moderate severity defects or lots of minor severity defects. Ferrous or cementous pipe may not have internal or external corrosion protection. Pipe segment lengths less than 10 feet. Evidence of some exterior wall pitting or corrosion. Some areas of pipe wall thickness loss. Design pressure (including surge) factor of safety above but close to 2. Air valves generally in fair condition.</td>
<td></td>
</tr>
<tr>
<td>Poor (NASSCO Pipe Rating Index 1 or SCREAM 76-90 inspection scores). Fifty to seventy five years old. Several moderate to severe defects. Ferrous or cementous pipe material. Corrosion protection deteriorated. Within 600 ft of force main discharge. Pipe segment lengths less than 10 feet. Other than rubber gasketed or welded joints. Severe infiltration/inflow and causing capacity problems. Interior wall surface shows uniform corrosion or material etching. Areas of aggregate and wall thickness loss in cementous pipes. Generally good pipe alignment but some sections not aligned; several minor to moderate offset or open joints but a few severe; few to several moderate cracks or broken pieces of pipe but several more severe; generally good service lateral connections but several hammer taps; and some to frequent root intrusions.</td>
<td></td>
</tr>
<tr>
<td>Very poor (NASSCO Pipe Rating Index 5 or SCREAM 90-100 inspection scores). Greater than seventy five years old. One or more major severity defects. Ferrous or cementous pipe material. Corrosion protection deteriorated or non existant. Pipe segment lengths less than 10 feet. Other than rubber gasketed or welded joints. Evidence of aggressive exterior wall pitting or corrosion. Areas of significant pipe wall thickness loss. Design pressure (including surge) factor of safety below 1. Air valves generally poor condition.</td>
<td></td>
</tr>
</tbody>
</table>
## Attachment E – Likelihood of Failure for Gravity Sewer

### Likelihood of Failure: Wastewater Gravity

<table>
<thead>
<tr>
<th>Category</th>
<th>Wt</th>
<th>Negligible = 1</th>
<th>Unlikely = 2</th>
<th>Possible = 4</th>
<th>Likely = 7</th>
<th>Very Likely = 10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good (Condition Grade 2). Minor defects. Ten to twenty five years old. Ferrous pipe has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths &gt; 10 feet. Little to no infiltration/inflow.</td>
<td>Fair (Condition Grade 3). Twenty five to fifty years old. Few moderate severity defects or lots of minor severity defects. Ferrous pipe may not have internal or external corrosion protection. Pipe segment lengths less than 10 feet. Noticeable infiltration/inflow but has not caused known problems.</td>
<td>Poor (Condition Grade 4). Fifty to seventy five years old. Several moderate severity defects. Ferrous or cementous pipe material. Corrosion protection deteriorated. Pipe segment lengths less than 10 feet. Other than rubber gasketed joints or welded joints. Significant infiltration/inflow and causing capacity problems.</td>
<td>Very poor (Condition Grade 5). Greater than seventy five years old. One or more major severity defects. Ferrous, cementous, or brick pipe material. Corrosion protection deteriorated. Pipe segment lengths less than 10 feet. Other than rubber gasketed or welded joints. Severe infiltration/inflow and causing regular capacity problems.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operational Factors</strong></td>
<td></td>
<td>Sufficient capacity to meet peak wet weather flow requirements. No leaks or breaks in past five years. Have maintenance SOPs and structured training. Good work order system. Perform scheduled inspections and expediently, prioritized subsequent maintenance and rehab. Maps updated. No to very few odor complaints.</td>
<td>Sufficient capacity to meet peak wet weather flow requirements. Avg less than one leak or break per 1000 feet in past five years. Have maintenance SOPs and structured training. Good work order system. Perform scheduled inspections and reasonably quick but prioritized subsequent maintenance and rehab. Maps updated. No to very few odor complaints.</td>
<td>Just enough capacity to meet peak wet weather flow requirements. Avg less than one leak or break per 1000 feet in past five years. May or may not have maintenance SOPs and informal, more on-job-training. May or may not have functional work order system. Perform mostly scheduled inspections, others to resolve questions. Subsequent maintenance and rehab performed but no formal prioritization. Maps infrequently updated. A few odor complaints.</td>
<td>At or slight exceed capacity to meet peak wet weather flow requirements. Leaks or breaks in past five years avg about 1 or slightly more per 1000 feet. No or outdated maintenance SOPs and training. Perform reactive inspections and subsequent maintenance. Map accuracy is poor and not updated. Periodic to regular odor complaints.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Environmental Factors</strong></td>
<td></td>
<td>Does not traverse or not exposed to landfills, peat bogs, road de-icing, salt water or cinders. Granular backfill. Normal low moisture and below water table, medium pH soil, and high resistivity soils.</td>
<td>Does not traverse or not exposed to landfills, peat bogs, road de-icing, salt water or cinders. Granular or clay backfill. Normal low moisture and below water table, medium pH soil, and high resistivity soils.</td>
<td>May traverse or be exposed to landfills, peat bogs, road de-icing, salt water or cinders. Sand/silt backfill. Seasonal moisture or at water table, medium pH soil, and medium to low resistivity soils.</td>
<td>Traverses or exposed to landfills, peat bogs, road de-icing, salt water or cinders. Mostly organic and moist backfill. Normally below water table, medium pH soil, and medium to low resistivity soils.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical Factors</strong></td>
<td></td>
<td>No vibration from surface activity. Accessible by walking and vehicle/equipment. Cover depth of generally between 4 and 12 feet. Line locating service required. Rarely third party damage.</td>
<td>No or minor vibration from surface activity. Accessible by walking and vehicle/equipment. Cover depth generally between 0 and 12 feet. Line locating service required. Rarely third party damage.</td>
<td>Some vibration from surface activity. Accessible by walking and vehicle/equipment but some obstacles or traffic congestion. Can have trench depths of up to 20 feet. Line locating service required. Rarely third party damage.</td>
<td>Subject to vibration from surface activity. Mostly accessible by walking only and only very limited to vehicle/equipment. Can have trench depths of up to 30 feet. Line locating service not required or loosely enforced. Some third party damage.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

DeKalb County Department of Watershed Management
## Likelihood of Failure: Wastewater Force Main

<table>
<thead>
<tr>
<th>Category</th>
<th>WT</th>
<th>Negligible ≠ 1</th>
<th>Unlikely ≠ 2</th>
<th>Possible ≠ 4</th>
<th>Likely ≠ 7</th>
<th>Very Likely ≠ 10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical Factors</strong></td>
<td>Very good (Condition Grade 1). New or nearly new. All diameter ranges. Ten or less years old. Ferrous pipe that has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths &gt; 10 feet.</td>
<td>Good (Condition Grade 2). All diameter ranges. Ten to twenty five years old. Ferrous pipe has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths &gt; 10 feet.</td>
<td>Fair (Condition Grade 3). All diameter ranges. Twenty five to fifty years old. Ferrous pipe may not have internal or external corrosion protection. Pipe segment lengths may be less than 10 feet.</td>
<td>Poor (Condition Grade 4). Fifty to seventy five years old. All diameter ranges. Ferrous or cementous pipe material with no, worn, or ineffective corrosion protection. Pipe segment lengths less than 10 feet. Other than rubber gasketed or welded joints.</td>
<td>Very poor (Condition Grade 5). Greater than seventy five years old. Ferrous, cementous, or brick pipe material. No or deteriorated corrosion protection. Pipe segment lengths less than 10 feet. Other than rubber gasketed or welded joints.</td>
<td></td>
</tr>
<tr>
<td><strong>Operational Factors</strong></td>
<td>No leaks or breaks in past five years. Have maintenance SOPs and structured training. Exercise isolation valves. Have air release/vac valves and inspection program. Planned and regular systemwide flow and pressure measurement. Good work order system. Expediately perform maintenance or rehab. Maps accurate and updated. No on/off surging or high system pressures.</td>
<td>Avg less than one leak or break per 1000 feet in past five years. Have maintenance SOPs and structured training. Usually exercise isolation valves. Have air release/vac valves and inspection program. Regularly measure flows and pressures. Good work order system. Perform scheduled inspections and reasonably quick but prioritized subsequent maintenance and rehab. Maps accurate and updated. No on/off surging or high system pressures.</td>
<td>Avg less than one leak or break per 1000 feet in past five years. May or may not have maintenance SOPs and informal, more on-job training. Sporadically exercise isolation valves. May or may not have air release/vac valves and inspection program. Measure flows and pressures sporadically or not at all. May or may not have functional work order system. Perform mostly scheduled inspections, others to resolve questions. Subsequent maintenance and rehab performed but no formal prioritization. Maps not always accurate and are infrequently updated. Some on/off surging or high system pressures.</td>
<td>Leaks or breaks in past five years avg about 1 or slightly more per 1000 feet. No or outdated maintenance SOPs and training. Do not regularly exercise isolation valves. May or may not have air release/vac valves and inspection program. Generally do not measure flows and pressures. Perform reactive inspections and subsequent maintenance. Map accuracy is poor and not updated. Regular on/off surging or high pressures.</td>
<td>Leaks or breaks in past five years &gt; 1 per 1000 feet. No maintenance SOPs and training. Do not exercise isolation valves. No air release/vac valve inspection and maintenance program. No measurement of flows and pressures. Perform reactive inspections and subsequent maintenance. Map accuracy is poor and not updated. Regular on/off surging or high pressures.</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental Factors</strong></td>
<td>Does not traverse or not exposed to landfills, peat bogs, road de-icing, salt water or cinders. Granular backfill. Normal low moisture and below water table, medium pH soil, and high resistivity soils.</td>
<td>Does not traverse or not exposed to landfills, peat bogs, road de-icing, salt water or cinders. Granular or clay backfill. Normal low moisture and below water table, medium pH soil, and high resistivity soils.</td>
<td>May traverse or be exposed to landfills, peat bogs, road de-icing, salt water or cinders. Sand/silt backfill. Seasonal moisture or at water table, medium pH soil, and medium to low resistivity soils.</td>
<td>May traverse or be exposed to landfills, peat bogs, road de-icing, salt water or cinders. Mostly organic and moist backfill. Normally below water table, medium pH soil, and medium to low resistivity soils.</td>
<td>Traverses or exposed to landfills, peat bogs, road de-icing, salt water or cinders. Organic backfill. Normal high moisture, low pH soil, and low resistivity soils.</td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical Factors</strong></td>
<td>No vibration from surface activity. Accessible by walking and vehicle/equipment. Cover depth of generally less than 12 feet. Line locating service required. Rarely experienced third party damage.</td>
<td>No or minor vibration from surface activity. Accessible by walking and vehicle/equipment. Cover depth generally less than 12 feet. Line locating service required. Rarely experienced third party damage.</td>
<td>Some vibration from surface activity. Accessible by walking and vehicle/equipment but some obstacles or traffic congestion. Can have trench depths greater than 12 feet. Line locating service required. Experienced some third party damage.</td>
<td>Subject to vibration from surface activity. Mostly accessible by walking only and only very limited to vehicle/equipment. Can have segments with trench depths of up to 20 feet. Line locating service not required or loosely enforced. Experienced some third party damage.</td>
<td>Subject to frequent or substantial surface vibration. Not accessible by walking or vehicle/equipment without significant effort. Can have segments with trench depths greater than 20 foot depth. No line location required. Experience regular third party damage.</td>
<td></td>
</tr>
</tbody>
</table>
## Attachment G – Consequence of Failure

**Consequence of Failure: WASTEWATER Gravity and Force Main Sewers**

<table>
<thead>
<tr>
<th>Category</th>
<th>Wt.</th>
<th>Negligible = 1</th>
<th>Low = 4</th>
<th>Moderate = 7</th>
<th>Severe = 10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financial Viability and Impact</strong></td>
<td></td>
<td>Corrective action costs could be absorbed in O&amp;M budget. A low percentage of unplanned $ versus planned $ improvements.</td>
<td>Corrective action costs could be absorbed in O&amp;M budget or may require budget transfers from other accounts. May have to postpone other projects. A low to moderate percentage of unplanned $ versus planned $ improvements.</td>
<td>Corrective action costs could not be absorbed in O&amp;M budget or would not be covered by acceptable budget transfers from other accounts. Would require Board/Council approval. A moderate to high percentage of unplanned $ versus planned $ improvements.</td>
<td>Corrective action costs would require Board/Council approval, possibly new borrowing, delay in other capital improvements, or cause rates to increase. A major percentage of unplanned $ versus planned $ improvements.</td>
</tr>
<tr>
<td><strong>Customer Satisfaction</strong></td>
<td></td>
<td>No to minimal loss of service or impact on other services. Only local and temporary traffic interruption. Easily accessibility. Less than five structure or basement backups.</td>
<td>Minimal to some loss of service or impact on other services for several hours. Moderate accessibility. Generally local and temporary traffic interruption. Less than five structure or basement backups.</td>
<td>Some loss of service or impact on other services several hours but less than a day. Difficult accessibility. Generally local but possibly major traffic interruption for days or weeks. Greater than five structure or basement backups.</td>
<td>Will cause loss of service or impact on other services for several hours or more than a day. Difficult accessibility. Generally local but major extended traffic interruption for weeks or months. Greater than five structure or basement backups.</td>
</tr>
<tr>
<td><strong>Compliance/Health</strong></td>
<td></td>
<td>No state permit violations. No potential adverse health effects. Any overflows can be contained without reaching U.S. waters.</td>
<td>Technical violation. Possible notice of violation but enforcement action is unlikely. No to minor potential health effects. Any SSO &lt; 1,000 gals.</td>
<td>Probable enforcement action but fines unlikely. Any SSO ≥ 1,000 gals and &lt; 30,000 gals.</td>
<td>Enforcement action with fines likely. Likely to cause &quot;boil water&quot; notice. Any SSO &gt; 30,000 gals.</td>
</tr>
<tr>
<td><strong>Public Service and Image</strong></td>
<td></td>
<td>Would not trigger complaints or media coverage. Isolated incident for area; e.g. first in 10 years. Affects less than 50 customers and no major customers.</td>
<td>Might trigger wide spread complaints or media coverage. Isolated incident for area; e.g. one or two in 5 years. Affects 50 to 250 customers or one or two major customers.</td>
<td>Likely to trigger wide spread complaints or media coverage. Fairly regular incident for area; e.g. one or two in 3 years. Affects 250 to 1,000 customers or several major customers.</td>
<td>Most certain to trigger wide spread complaints or media coverage. Regular incidence for area; e.g. about one per year. Affects &gt; 1,000 customers or multiple major customers.</td>
</tr>
</tbody>
</table>

## Attachment H – Risk Calculation

DeKalb County Department of Watershed Management Page 17
<table>
<thead>
<tr>
<th>ASSETS (Hierarchy Levels or Pipe Segments)</th>
<th>CONSEQUENCE</th>
<th>LIKERHOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Financial Viability and Impact</td>
<td>Customer Satisfaction</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
D. Manhole Condition Assessment
Specifications, Guidelines, and Procedures.
MANHOLE CONDITION ASSESSMENT SPECIFICATIONS, GUIDELINES, AND PROCEDURES

The Department of Watershed Management (DWM) Manhole Condition Assessment Program includes locating manholes, documenting all incoming and outgoing sewer pipes, and determining physical dimensions, materials, structural condition, maintenance concerns, and sources of inflow and infiltration (I/I).

In order to promote safety, minimize risk, and mitigate potential environmental impact, man-entry is prohibited without an entry permit. The DWM's method of performing manhole inspection is a “Top Side” ground level procedure utilizing a “down-hole” pan & tilt camera with zoom capability. Man-entry may be required for manholes that are twenty (20) feet deep and greater or with offset manholes overflow weirs, or other unique features precluding effective ground level assessment. Man-entry inspections require manual inspection using high-level illumination and documentation of defects using high-resolution digital photographs.

This guideline includes the requirements and procedures for assessing manholes through manhole inspections and televising via zoom technology using a wide-angle, truck mounted or secure-pole telescoping boom camera. The high-resolution camera is used to record the condition of the manhole features: the frame, chimney, cone, walls, bench, invert, and steps. The camera pans as it is lowered to the bottom to allow for a clear inspection of the following parts of the manhole:

- Walls
- Joints
- Pipe Inlets & Outlets
- Lateral Service Breeches
- Benches
- Channels & Inverts

Data collection software is used to capture and record information pertaining to the inspected manhole. The data fields and formats used are consistent with the National Association of Sewer Service Companies’ (NASSCO) Manhole Assessment and Certification Program (MACP) specification. Manholes with structural defects are ranked from least to most defects utilizing the MACP rating system or other nationally recognized scoring system that can convert MACP defect codes. Manhole condition scores are recorded in InfoWorks™ and the InfoNET™ databases. As manholes are located they are assigned a permanent, unique Manhole Facility identification (ID) number. This unique ID number is referenced in data systems containing information on manholes, including the CMMS, InfoWorks™, InfoNET™, and the GIS.
Manhole Condition Assessment Forms are included at the back of this guideline. Data gathered in the field will be captured within the MACP compliant software. Hard copies of individual manhole inspections and summary spreadsheets will be generated for the County’s files.
MANHOLE CONDITION ASSESSMENT PROCEDURES
Date of Revision: December 17, 2012

ACTIVITY DESCRIPTION
Sewer manhole condition assessment is performed to document the physical condition of manholes, including the structural condition, locations of defects causing the entry of I/I, and improper grades. The data gathered during manhole condition assessments are used to establish priorities for sewer system improvement programs.

ACTIVITY GOALS AND OBJECTIVES
The objectives of manhole condition assessment are to locate and document sources of I/I and structural defects such as cracks; missing brick/mortar; root intrusion; misaligned rings and covers; negative grade rims; aggregate loss in walls, benches and inverts; loss of sealing materials in proximity to pipe inlets; and manhole step conditions.

SAFETY ANALYSIS - Specific to job site conditions

<table>
<thead>
<tr>
<th>Safety</th>
<th>Potential Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Job Site Analysis for Potential Hazards</td>
<td>• Infectious Diseases</td>
</tr>
<tr>
<td>• Safety Program</td>
<td>• Slip, Trip, and Fall</td>
</tr>
<tr>
<td>• Protective Clothing and Equipment (Personal Protection Equipment)</td>
<td>• Poisonous Snakes, Pests</td>
</tr>
<tr>
<td>• Gases and other Hazardous Atmospheres Analysis (Confined Space Entry)</td>
<td>• Confined Spaces (Confined Space Entry)</td>
</tr>
<tr>
<td>• Overhead Power Lines (Electrical Safety)</td>
<td>• Traffic</td>
</tr>
<tr>
<td>• Traffic Safety Requirements (Traffic Safety)</td>
<td>• Vehicle Operation</td>
</tr>
<tr>
<td></td>
<td>• Mechanical Tools</td>
</tr>
<tr>
<td></td>
<td>• Electrical Hazards (Electrical Safety)</td>
</tr>
<tr>
<td></td>
<td>• Flooding and Inundation (Confined Space Entry)</td>
</tr>
<tr>
<td></td>
<td>• Lifting</td>
</tr>
<tr>
<td></td>
<td>• Pressurized Plug Malfunction</td>
</tr>
</tbody>
</table>

MANHOLE INSPECTION CHECKLIST - Specific to job site conditions

SAFETY
• Traffic cones
• Yellow vests (for each crew member)
• Hard hats (for each crew member)
• Gloves
• Steel toed boots (each crew member)
• Flashing beam (mounted on the vehicle)
• Fire extinguisher
• Traffic signs
• Arrow bar/board (for heavy traffic areas only)
• First-Aid Kit (fully stocked) and Safety Manual
• Directions and telephone number to the nearest hospital or medical care facility
• Cellular telephone/2-way radio
• Drinking water and disposable cups
• Hand Cleaner – Alcohol, waterless, towel-less cleaner, paper towels
## MANHOLE CONDITION ASSESSMENT PROCEDURES

**Date of Revision:** December 17, 2012

### CLERICAL
- Work Order
- Confined Space Entry Permit
- Maps – street and sanitary sewer
- Small note pads (for each crew member)
- Pencils and pens (for each crew member)
- County ID and Vendor/Contractor Name badges (for each crew member)
- Small white board and markers
- Digital camera

### WORKING
- Calibrated gas & air quality monitor
- Ventilation blower(s)
- Extra spark plugs for ventilation blower(s)
- High resolution truck or secure-pole mounted camera, coaxial leads, backup light-head and all appurtenances
- Sand bags (4-5 per vehicle) with 15’- 20’ ropes
- Extra rope
- Properly sized pipe plug with fittings and pressure hose
- Extra pressure hose and fittings
- Air compressor (suitably sized for appropriate pipe plug)
- 50’ or 100’ measuring tape
- Manhole-Hook
- Pick
- Shovels
- Sledge hammers
- Metal locator/probe
- Flashlights
- Measuring wheel
- Marking paint
- Manhole marking flags (for use off-road)
- Tool box with necessary tools for routine equipment maintenance
## MANHOLE CONDITION ASSESSMENT SPECIFICATIONS

**Date of Revision:** December 17, 2012

### ACTIVITY/SUBTASK

#### PRE-WORK ACTIVITIES

1. **Permits for Right of Ways:** The supervisor shall obtain work permits for all work to be performed in State and/or County Right-of-Ways. The supervisor shall also plan for all other insurances, traffic control measures, and other terms of the permit in advance.

2. **Weather, Ground, and Ground Water Condition Requirements:** Manhole inspection shall not be performed when weather conditions preclude the acquisition of high resolution video and digital recording in a safe and efficient manner.

3. **Manhole Surcharge and Flow Control:** Manhole inspection will normally be accomplished without the need for bypass pumping. Crews shall set up temporary plugs or flow barriers as required to allow for a complete viewing of manhole inverts, benches, walls, cones, and chimneys. Crews shall coordinate with other DWM field staff if a line is to be plugged as part of the inspection. Crews shall monitor the resulting surcharged sewer at the manhole up-gradient of the manhole being assessed, or at another location, if so directed by the supervisor, and prevent overflow conditions from occurring by diverting flows to a down-gradient manhole in a timely manner.

#### SITE PREPARATION

1. **Review Work Order:**
   
   a. The supervisor shall review work orders with manhole inspection crews.
   
   b. The supervisor shall review all safety procedures with crews.
   
   c. The supervisor shall ensure that all necessary material and equipment is on hand and available at the site.
   
   d. The supervisor shall ensure that each critical equipment unit is in proper working order and that a backup unit is on site.
### MANHOLE CONDITION ASSESSMENT SPECIFICATIONS

**Date of Revision:** December 17, 2012

#### ACTIVITY/SUBTASK

<table>
<thead>
<tr>
<th>ACTIVITY/SUBTASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Follow all applicable state and local traffic safety procedures.</td>
</tr>
<tr>
<td>b. Wear all required safety equipment, such as safety vests, hardhats, safety glasses, and steel toe boots.</td>
</tr>
<tr>
<td>c. Isolate one or more lanes of traffic with flags, cones, traffic control signs, etc. where work takes place in or immediately adjacent to roads.</td>
</tr>
<tr>
<td>d. Look for overhead power lines that may hit the truck or equipment. If lines are above the work area, contact the power utility to de-energize or shield the lines. Equipment must be kept at least 20 feet from the overhead lines.</td>
</tr>
<tr>
<td>e. Alert closest fire department/ Emergency Medical Services (EMS) as to the location of the day’s work and to stand by for emergencies and inquiries.</td>
</tr>
<tr>
<td><strong>4. General Procedures:</strong></td>
</tr>
<tr>
<td>a. Determine the location of the manhole on the Geographic Information System (GIS) map. Use metal detection if manhole is not visible.</td>
</tr>
<tr>
<td>b. If the manhole is buried, report its location immediately and coordinate with other DWM crews for excavation. If the manhole is covered by 18 inches or less of sod or soil inspection crews may uncover it by hand.</td>
</tr>
<tr>
<td>c. Lift the manhole cover using the hook. Drag the cover with the hook; avoid bending over and using hands whenever possible.</td>
</tr>
<tr>
<td>d. For heavier manholes, use a truck-mounted winch.</td>
</tr>
<tr>
<td>e. Follow confined space entry procedures if man-entry is required. Only trained and certified personnel may enter a manhole after obtaining an entry permit.</td>
</tr>
<tr>
<td>f. Follow personal protective equipment (PPE) protocol.</td>
</tr>
<tr>
<td>g. DO NOT place your face near the manhole opening. Let the manhole “breathe” for 10 minutes before looking in.</td>
</tr>
<tr>
<td>h. DO NOT SMOKE near manholes regardless of whether the cover is on or off.</td>
</tr>
<tr>
<td>i. DO NOT STAND on the removed manhole cover.</td>
</tr>
<tr>
<td>j. USE IMPERVIOUS GLOVES when working with an open manhole.</td>
</tr>
<tr>
<td>k. USE DISPOSABLE TYVEK COVERALLS to keep sewage off of your uniform.</td>
</tr>
<tr>
<td>l. Ensure proper operation of blower.</td>
</tr>
</tbody>
</table>
m. Isolate sections if necessary with sandbags, baffles, or other approved method to allow for inspection of walls, benches, inverts chimneys, cones, rings and covers.

5. Confined Space Entry: Crews shall minimize the physical entry into the manhole. If required, manhole entry shall be performed in accordance with Federal, State local, and any other regulations for confined space entry. Only trained crews and staff may perform confined space entry after obtaining an entry permit. Staff must use safety required equipment, including harnesses, ventilation equipment, etc.

6. Safe Work Area: The work area shall be protected at all times with an adequate number of cones, barricades, flags, flaggers, and other measures necessary to meet the Manual for Uniform Traffic Control Devices (MUTCD) standards and to properly and safely protect both vehicular and pedestrian traffic. Flagmen shall work to secure that all affected streets. Further requirements for traffic control may be imposed by the specific agency having jurisdiction. All traffic control measures shall comply with the requirements of MUTCD, Part 6 – Temporary Traffic Control, Latest Edition as published by US DOT / FHWA.

7. Unsafe Conditions: Any condition deemed to be an unsafe condition shall immediately be reported to the Supervisor. Unsafe conditions shall require all work to be stopped immediately and an inspection will be performed by the Safety Officer of the entity performing the work.

8. Scheduling Time: Crews shall begin inspections after 8:00 am and terminate inspections no later than 5:00 pm each day. County authorization should be obtained if work is to be performed outside of the designated hours. Work should be performed in timeframes that will allow compliance with the County’s noise ordinance.

9. Start the Inspection Procedure:

   a. Remove manhole cover and move it away from traffic flow without impacting the work area. If cover is defective, take a photograph that clearly shows the defect. Broken or missing covers will be scheduled for replacement immediately.

   b. Position the inspection vehicle so the camera is directly above the manhole for optimal camera movement for inspection.

   c. Lower a surveyor’s elevation rod into the manhole. Place the elevation rod in front of the outgoing pipe but as far from the camera as possible. The rod shall be used for rotation and depth reference during inspection so it should be touching the bottom of the channel for accuracy.

   d. The camera head shall pan until it is facing in the direction of the downward pipe. Reset rotation reader to 0.0. No video recording should occur during this procedure.

   e. Lower the telescopic boom so that the camera head is approximately 1 foot above frame and ground surface. No video recording shall occur during this procedure.

   f. Power on the camera mounted light-head.
### MANHOLE CONDITION ASSESSMENT SPECIFICATIONS

**Date of Revision:** December 17, 2012

**ACTIVITY/SUBTASK**

<table>
<thead>
<tr>
<th>g.</th>
<th>Tilt camera head down to 90 degree angle (flush with the manhole) to document the entire manhole as a top down view. Begin video recording of the manhole once the camera has been positioned and shows a clear top down view. Lower the telescopic boom if necessary to obtain a clear picture of the entire manhole and pipe configuration.</th>
</tr>
</thead>
<tbody>
<tr>
<td>h.</td>
<td>Wait until the manhole identification Q-card has been recorded (first 6 seconds).</td>
</tr>
<tr>
<td>i.</td>
<td>The top down view shall have a minimum duration of five (5) seconds. Continue recording.</td>
</tr>
<tr>
<td>j.</td>
<td>If a defect is found at any point in the inspection the camera shall be held over the defect for a minimum of 10 seconds. In all cases, the camera pan will be stopped and zoom capability used to inspect any defect or abnormality observed.</td>
</tr>
</tbody>
</table>

#### 10. Cover, Frame, and Chimney Inspection:

| k. | Position the telescopic boom so that the camera head is approximately 1 foot above the frame and ground surface. Adjust the camera head angle to 30 to 45 degrees below horizontal and perform a 360 degree inspection of the manhole showing the cover and pavement surrounding the manhole frame. |
| l. | The camera shall be positioned and adjusted to 0-15 degrees to closely view the frame/chimney joint area. Care shall be taken to adjust the camera angle to assure a detailed view of the entire joint area. |
| m. | Once a 360 degree inspection is completed, the camera shall remain at a 0 to 15 degree angle as the camera is lowered to the next inspection point within the chimney area. Do not pan camera as it is lowered. Rod measurements shall be visible onscreen as the camera is lowered. It may be necessary to offset the rod to the side of the picture to reduce glare and improve clarity. |
| n. | Lower the camera in one (1) foot intervals according to the rod while in the chimney area. A 360 degree rotation is achieved when the camera starts panning at the rod and ends at the point it began. |

#### 11. Cone and Wall Inspection:

| a. | Once the camera is lowered into the cone area, the angle can be adjusted to 25-30 degrees to obtain a detailed view of the cone area. |
| b. | For manholes with concrete walls, every joint shall require a 360 degree inspection. Ideally, the camera shall be positioned so that any joint is in the center of the viewed area. |
| c. | For brick manholes, the manhole shall be inspected 360 degrees once every 2 feet - refer to the measuring rod to determine 2 foot intervals. |
MANHOLE CONDITION ASSESSMENT SPECIFICATIONS

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d. Care shall be taken to ensure that the entire surface of the manhole is visible in the images. A slight overlap of area between vertical adjustments needed to provide full camera coverage.

a. For manholes with slab type cones, the camera shall be lowered past the slab with the camera tilted upward to allow the inspection of the underside of the slab. The camera shall be lowered sufficiently so that it doesn’t cast a shadow on the slab.

12. Bench and Channel Inspection:

a. At the bottom of the manhole (2 feet indicated on the rod), the camera shall be positioned to inspect pipe connections, inverts, and bench using a 30 to 45 degree angle which is maintained until the camera is facing the outlet manhole.

b. The camera shall be paused at each pipe connection with the entire visible area of the pipe connection photographed.

c. If additional lighting is required for the inspection of this area, additional spot lights can be powered on to allow inspection of the channel in one final pan.

d. Care shall be taken to assure that glare from the light does not obscure the video. The inspection will be finalized with the camera facing the outlet of the manhole. Recording can then be stopped.

13. Equipment Removal and Breakdown:

a. After the recording has stopped, all connecting pipeline diameters shall be verified with the measuring rod and the zoom camera.

b. Upon completion of the manhole inspection, carefully raise telescopic boom to remove camera from the manhole then turn off lights.

c. Remove loose dirt, stones, and other foreign material from the mating surface of the rim before replacing the manhole cover. When replacing the manhole cover, be sure the cover is seated properly. Adjust if necessary. If cover cannot be seated correctly, make a notation on manhole log and inform DWM of location.

d. If a critical service (blockage) or structural (cracked/broken cover, collapsing wall) condition is found, notify DWM immediately of condition and location.

e. Secure camera and boom, pick up traffic control devices, and proceed to next manhole.

14. Data Evaluation:

NASSCO MACP ASSESSMENT

a. Consistency is necessary in all aspects of manhole condition assessment. The inspector
MANHOLE CONDITION ASSESSMENT SPECIFICATIONS

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shall closely review all defects and document their visual observations. NASSCO’s Manhole Assessment Certification Program (MACP) is a valuable tool in the assessment process. This program allows for consistency of documentation and a repeatable process for evaluation.

b. The goals of the MACP coding are: define attributes and features of the structure, document and explain defects, develop ratings for each applicable component of a manhole – structural rating, O&M rating, I/I rating – and record dimensional data that can be used for selecting rehabilitation methods. This standardized method for reporting the results of condition assessments allows for consistency, promotes cost efficiency and avoids unnecessary rehabilitation work.

c. Following the completion of the field data gathering, the videos shall be reviewed by qualified technicians to record the defects. Priority grades shall be assigned to all defects using the NASSCO MACP manhole condition assessment and grading system.

**DOCUMENTATION**

For contractors, defect inspection documentation shall be accomplished in compliance with NASSCO’s Manhole Assessment Certification Program by trained certified personnel. As such, paper logs are not necessary. The MACP operator shall ensure that AT A MINIMUM, the following information fields are recorded in electronic form.

1. Manhole Facility ID number
2. Clock reference of each main (outgoing main at 6:00 o’clock)
3. Date of condition assessment and weather
4. Status of the manhole as inspected, buried, or un-located manhole
5. Type of manhole lid, frame, and chimney
6. Number and size of holes, if any, in manhole cover
7. Deficiencies in the ring and cover
8. Whether or not the manhole is subject to ponding and the size of the runoff/ponding area.
9. Location of manhole (street address, cross streets, etc.)
10. Depth to manhole invert from rim (nearest 0.1 foot)
11. Manhole construction materials and conditions of the walls, steps, benches, troughs
12. Clock reference of each manhole defect (outgoing main at 6:00 o’clock)
<table>
<thead>
<tr>
<th>ACTIVITY/SUBTASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Size, material, condition, and depth of each main</td>
</tr>
<tr>
<td>14. Location and nature of visible defects and obstructions, i.e., indication of structural conditions or special problems in the main/manhole</td>
</tr>
<tr>
<td>15. Root growth and type in manhole wall/base, if any</td>
</tr>
<tr>
<td>16. Evidence of leaks and locations, along with measured or estimated sources of extraneous flows, i.e., identification and quantification of visible I/I source</td>
</tr>
<tr>
<td>17. Special problems and conditions, such as overflows</td>
</tr>
<tr>
<td>18. Plan and profile drawings of the manhole. Include the invert showing direction of flow of the incoming and outgoing main(s), defects, etc.</td>
</tr>
<tr>
<td>19. Presence of any water flushing valves</td>
</tr>
<tr>
<td>20. Type and depth of debris and deposition in the manhole</td>
</tr>
<tr>
<td>21. Evidence of surcharge and the level of the surcharge</td>
</tr>
<tr>
<td>22. Manhole environment (abnormal features, detected gases, etc.)</td>
</tr>
<tr>
<td>23. Surface type (asphalt, grass, etc.)</td>
</tr>
<tr>
<td>24. Shape, dimension, material, and type of cover</td>
</tr>
<tr>
<td>25. Rim height or depression from roadway surface measured by placing a straight edge over manhole frame</td>
</tr>
<tr>
<td>26. Material, depth, and diameter of riser, extension rings</td>
</tr>
<tr>
<td>27. Material and diameter of manhole barrel</td>
</tr>
<tr>
<td>28. Material of bench, invert or floor</td>
</tr>
<tr>
<td>29. Deficiencies observed on the ground surface, cover, frame, chimney, cone, walls, bench, invert and steps</td>
</tr>
<tr>
<td>30. Additional connections to the manhole other than those indicated on the plan</td>
</tr>
<tr>
<td>31. Look for the presence of lining and record type, if applicable</td>
</tr>
<tr>
<td>32. Validate function and sub-function of main sewer line</td>
</tr>
<tr>
<td>33. Depth of flow</td>
</tr>
</tbody>
</table>
## Attachment A – Sample Manhole Condition Assessment Forms

<table>
<thead>
<tr>
<th>1. INSPECTION CREW</th>
<th>2. DATE:</th>
<th>2. TIME:</th>
<th>4. MANHOLE ID:</th>
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<tbody>
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<table>
<thead>
<tr>
<th>5. GENERAL LOCATION</th>
<th>6. LAND LOT</th>
<th>7. NEAREST STREET ADDRESS</th>
<th>8. SUB-BASIN NAME:</th>
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<th>OBSERVATION</th>
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<th>9. INSPECTION TYPE</th>
<th>10. STRUCTURE TYPE</th>
<th>11. LOCATION</th>
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<tr>
<th>12. SURFACE TYPE</th>
<th>13. MANHOLE NEED TO CLEAN</th>
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<tr>
<th>14. TYPE</th>
<th>15. FIT</th>
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<tr>
<th>17. PLUMBING DEPTH (IN)</th>
<th>18. PLUMBING TYPE</th>
<th>19. TANSECT +/- (IN)</th>
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<tr>
<th>20. SIZ</th>
<th>21. INFLOW DISCH</th>
<th>22. EYEFIT (IN)</th>
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<table>
<thead>
<tr>
<th>FRAME</th>
<th>23. ASSET HEIGHT (IN)</th>
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</table>

<table>
<thead>
<tr>
<th>23A. REINFORCING FRAME WITH NO COVER (MEXICAN HAT)</th>
</tr>
</thead>
<tbody>
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<table>
<thead>
<tr>
<th>GRADE ABJ.</th>
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<table>
<thead>
<tr>
<th>25. DEPTH (IN)</th>
<th>26. MIN.D. (IN)</th>
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<table>
<thead>
<tr>
<th>CONE/TOP</th>
<th>27. TYPE</th>
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<table>
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<tr>
<th>WALL</th>
<th>28. NATURE</th>
<th>29. LINING TYPE</th>
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<thead>
<tr>
<th>30. BENCH TYPE</th>
<th>31. TRAPWAY TYPE</th>
<th>32. PIPE SEAL TYPE</th>
<th>33. STEPS</th>
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<table>
<thead>
<tr>
<th>34. CONDITIONS</th>
<th>35. MANHOLE DEPTH (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VIEWED FROM WALL TO INVERT OF OUTLINING PIPE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>36. 1ST気づくOF SUPERHANG (FT)</th>
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<table>
<thead>
<tr>
<th>DEFECTS</th>
<th>DIS</th>
<th>BROKEN</th>
<th>CORROSION/</th>
<th>ROOTS</th>
<th>FLOW</th>
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<tr>
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<td>DESCRIPTION</td>
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<table>
<thead>
<tr>
<th>37. COVER</th>
<th>38. FRAME</th>
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<table>
<thead>
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<th>39. FRAME SEAL</th>
<th>40. GRATE ADJ.</th>
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<table>
<thead>
<tr>
<th>41. CONE</th>
<th>42. WALL</th>
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<thead>
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<th>43. BENCH</th>
<th>44. THROUGH/CHANNEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>45. CROWN CROSSING</th>
<th>46. MANHOLE COMMENTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DeKalb County Department of Watershed Management Page 13
### Pipe Data Form

<table>
<thead>
<tr>
<th>Pipe #</th>
<th>Footage</th>
<th>Loc.</th>
<th>Def.</th>
<th>Rating</th>
<th>Location</th>
<th>Defects (Code)</th>
<th>Defects (Description)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

#### Manual Sketch

[Diagram of a pipe with defects marked]

---

**Full Camera Inspection was performed on site: Yes/No by:**

**Picture Description**

**Photo/Video Numbers**

---

**Overall Review**

<table>
<thead>
<tr>
<th>Defect</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>
The Department of Watershed Management (DWM) has developed a System-Wide Flow and Rainfall Monitoring Program as required under Section IV B (vi) of the Consent Decree. The System-Wide Flow and Rainfall Monitoring Program is a continuous monitoring program. Data from rain gauges and the permanent and temporary flow meters have been recorded and analyzed since the year 2007. The flow and rainfall monitoring data includes both dry weather and wet weather periods, and is used to characterize base flows, to estimate I/I rates, and to identify potential sources of relatively high I/I. The flow monitoring guidelines presented in this document will be used in conjunction with the System-Wide Flow and Rainfall Monitoring Program to characterize base flows and I/I rates within the Initial and Additional Priority Areas, to aid in the identification of sewer segments susceptible to I/I within the Initial and Additional Priority Areas, to support the assessment of the Initial and Additional Priority Areas, to support the evaluation and analysis of the data gathered during the assessment of the Initial and Additional Priority Areas, to aid in the prioritization of sewer cleaning and other ongoing maintenance programs within the Initial and Additional Priority Areas, to aid in the identification and prioritization of rehabilitation measures, and to aid in the assessment of the effectiveness of rehabilitation measures implemented as a part of the Priority Areas Assessment and Rehabilitation Program (PASARP).

The System-Wide Flow and Rainfall Monitoring Program includes a description of the County’s current flow and rainfall monitoring program and proposed enhancements to the program. DWM’s network of flow meters and rain gauges includes the following:

- One hundred and six (106) permanent flow meters.
- Sixteen (16) inter-jurisdictional billing flow meters.
- Forty-nine (49) temporary flow meters.
- Twenty-one (21) rain gauges.

In addition, the County has access to:

- Thirty-five (35) Weather Bug stations to provide rainfall data.
- Fifteen (15) USGS rain gauges.
The DWM’s enhancements to its current flow monitoring program as described in the System-Wide Flow and Rainfall Monitoring Program includes the procedures that will be used to identify locations of additional permanent and temporary flow meters and additional temporary rain gauges as needed to support the development and calibration of the hydraulic model, to characterize flows within the entire wastewater collection and transmission system (WCTS), to aid in the prioritization of DWM’s proactive maintenance activities (especially sewer system cleaning), and to support the prioritization of DWM’s ongoing sewer assessment and rehabilitation program.

As indicated in the Criteria for Identifying and Prioritizing Rehabilitation Measures within the Initial and Additional Priority Areas, rehabilitation measures will be identified and prioritized based on a variety of factors including (1) cost effectiveness analysis and (2) likelihood and consequence of failure (risk). Some of the data gathered through the System-Wide Flow and Rainfall Monitoring Program will undoubtedly be used in the cost benefit analysis and in the assessment of likelihood and consequence of failure of assets within the Initial and Additional Priority Areas. However, the cost effectiveness analysis and the assessment of the likelihood and consequence of failure for some of the Initial and Additional Priority Areas will require the gathering of flow and rainfall monitoring data that is more specific to the Initial and Additional Priority Areas. The gathering of data specific to various Initial and/or Additional Priority Areas may require the installation of flow monitors and probably rain gauges (permanent and/or temporary) in strategic locations to meet the intended purpose. The determination regarding the need and location of additional flow meters and/or rain gauges beyond those available through the System-Wide Flow and Rainfall Monitoring Program will be accomplished on a case by case basis.
FLOW MONITORING SPECIFICATIONS
Date of Revision: December 17, 2012

ACTIVITY DESCRIPTION
Flow monitoring will be used to characterize dry and wet weather flows within the Initial and Additional Priority Areas, to identify potential sources of I/I, to prioritize the smoke and dyed-water testing programs, to prioritize the closed circuit television inspection (CCTV) program, to aid in the distribution and proportioning of I/I through the collection and transmission system within the Initial and Additional Priority Areas and then all the way to the wastewater treatment plant using the DWM hydraulic model, to prioritize the sewer cleaning program, and to identify and prioritize the sewer system rehabilitation measures.

ACTIVITY GOALS AND OBJECTIVES
Goals and objectives for this activity include identifying and characterizing flows within the Initial and Additional Priority Areas and to identify potential locations of I/I.

SAFETY ANALYSIS – Specific to Job Site Conditions

<table>
<thead>
<tr>
<th>Safety</th>
<th>Potential Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Program</td>
<td>Infectious Diseases</td>
</tr>
<tr>
<td>Protective Clothing and Equipment (Personal Protection Equipment)</td>
<td>Slip, Trip, and Fall</td>
</tr>
<tr>
<td>Gases and other Hazardous Atmospheres Analysis (Confined Space Entry)</td>
<td>Poisonous Snakes, Pests</td>
</tr>
<tr>
<td>Traffic Safety Requirements (Traffic Safety)</td>
<td>Confined Spaces (Confined Space Entry)</td>
</tr>
<tr>
<td></td>
<td>Traffic</td>
</tr>
<tr>
<td></td>
<td>Vehicle Operation</td>
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<tr>
<td></td>
<td>Mechanical Tools</td>
</tr>
<tr>
<td></td>
<td>Flooding and Inundation (Confined Space Entry)</td>
</tr>
<tr>
<td></td>
<td>Lifting</td>
</tr>
</tbody>
</table>

FLOW MONITORING CHECKLIST – Specific to Job Site Conditions

SAFETY
- Traffic cones
- Yellow vests (for each crew member)
- Hard hats, steel toed boots and gloves (for each crewmember)
- Face shield or goggles
- MSDS for dye
- Flashing beam (mounted on the vehicle)
- Fire extinguisher
- Traffic signs
- Arrow bar/board (for heavy traffic areas, only)
- First-aid kit (fully stocked) and safety manual
- Directions and telephone number to the nearest hospital or medical care facility
- Cellular telephone/2-way radio
- Drinking water and disposable cups
- Hand cleaner – alcohol, waterless, towel-less cleaner, paper towels

CLERICAL
- Maps – street and sanitary sewer
- Small white board and markers
- Confined Space Entry Permit (if required)
<table>
<thead>
<tr>
<th>FLOW MONITORING SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Revision: December 17, 2012</td>
</tr>
</tbody>
</table>

- Small note pads (for each crew member)
- Pencils and pens (for each crew member)
- County ID or Vendor/Contractor Name badges (for each crew member)
- Small white board and markers

**WORKING**

- Calibrated gas & air quality monitor
- Ventilation blower(s)
- Extra spark plugs
- Digital camera
- Flow meters and rain gauges
- Properly sized pipe plugs, air hose & fittings
- Appropriately sized air compressor
- 15’ - 20’ ropes
- Extra rope
- 50’ or 100’ measuring tape
- Manhole-hook
- Pick
- Shovels
- Sledge hammers
- Locator/probe
- Flashlights
- Measuring wheel
- Marking paint
- Manhole marking flags (for use off-road)
- Tool box with necessary tools for routine equipment maintenance
FLOW MONITORING SPECIFICATIONS
Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

1. MONITORING EQUIPMENT
   a. The sanitary sewer flow meter shall be manufactured by ISCO, or equal. The flow monitor installed on the pipe lines shall be equipped with pressure, velocity, and temperature sensors. The instruments shall be self-contained and record qualitative data. The sensors shall be utilized to measure the velocity and depth above the pipe invert and determine the flow using the continuity equation. Accuracy shall be +/- 5 percent of actual flow or better. Each meter shall be field calibrated prior to installation.
   
   b. For flow monitoring sites with flumes, ultrasonic depth sensors shall be used to measure the depth for flow. Accuracy of depth shall be +/- 0.029 feet or better. Each meter shall be field calibrated prior to installation.
   
   c. Rainfall data shall be recorded using a tipping-bucket rain gauge. Rain gauges shall be manufactured by ISCO, or equal. The rain gauge shall provide real time data synchronized to computer type memory bank, and shall be of the solid-state type. The instruments shall be self-contained and record qualitative data. Whenever 0.01 inches of rain is collected, the tipping-bucket shall empty, triggering an electronic counter. The intensity, duration, and time of day of rainfall shall be recorded synchronously.
   
   d. Groundwater level data shall be recorded digitally and continuously utilizing groundwater piezometers. Each piezometer shall be fitted with a recording pressure transducer or other type of sensor that will automatically sense the height of water above the sensor. Each sensor shall be calibrated and the relationship of the sensor elevation to the invert of the sewer main being monitored shall be established.
   
   e. All monitoring equipment installed within sewer manholes shall be capable of withstanding the conditions associated with sewer systems. These conditions include turbulent flows, sewer gases, and surcharging.
   
   f. The data shall be reported on the same daily time clock that shall begin at 00:00 military time (12:00 midnight). Time shall be recorded in military time.

2  MONITORING INTERVALS
   a. The permanent and temporary flow monitors shall be maintained and monitored for the length of time needed to accomplish the intended purpose.
   
   b. Each flow monitor shall record data at an interval of five (5) minutes when close to a downstream or upstream lift station. All other flow meters shall record data at intervals of fifteen (15) minutes unless data needs dictate otherwise.
   
   c. Each rain gauge shall record data at an interval of fifteen (15) minutes.

3  DATA RETRIEVAL INTERVAL
FLOW MONITORING SPECIFICATIONS

Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

a. Data from the monitoring sites without real-time access shall be retrieved at least once per week.

b. Data from the monitoring sites with real-time access shall be reviewed at least once per day to ensure the data uptime and quality.

4 FLOW MONITOR PLACEMENT

a. Flow Meter
   1. The optimal number and placement of flow meters will vary from Priority Area to Priority Area and will be dependent on several factors including the adequacy of the System-Wide Flow and Rainfall Monitoring Program, the physical layout of the sewer system, and the condition of manholes within the area most suitable for the placement of flow meters.
   2. A potential flow monitor location must have the proper hydraulic conditions to ensure that accurate data is obtained. The location must be suitable for either capturing flows outside the priority area or a targeted part or capturing partial or total flows leaving the Priority Area or a targeted part. Only experienced and trained personnel shall determine hydraulic suitability for accurate flow measurement.
   3. The flow meter shall be installed in accordance with the manufacturer’s recommendations to ensure data accuracy.
   4. The location of each flow meter shall be surveyed and mapped in accordance with the Sewer Mapping Program.

b. Rain Gauge
   1. Rain gauge locations must be proper for accurate rain measurements that can be correlated with flow monitoring. The rain gauge shall be placed in open spaces to minimize the effects of trees and buildings. Windshields shall be installed if wind interference is suspected to minimize the effect of the wind.
   2. The locations of rain gauges shall be surveyed and mapped in accordance with the Sewer Mapping Program.

c. Groundwater Piezometer
   1. The optimal placement of groundwater piezometers will vary and will be dependent on the physical layout of the sewer system, soil classifications, and locations of flow monitors and rain gauges.
   2. A potential groundwater piezometer site must have the proper conditions to ensure accurate monitoring of the groundwater level. Only experienced and trained personnel shall determine suitability of a site for groundwater monitoring. Each piezometer shall be properly installed to obtain accurate data and to avoid damage.
   3. The locations of piezometers shall be surveyed and mapped in accordance with the Sewer Mapping Program.

5 TRAINED FIELD CREWS

a. Flow meter field crews shall be adequately trained and capable of determining the proper flow monitoring techniques required for each location under various flow conditions.
FLOW MONITORING SPECIFICATIONS
Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

b. The sensors shall be installed securely in the sewer lines by appropriate mounting devices to continuously record velocity of flow.

6 SEWER FLOW METER SENSOR CALIBRATION

a. The manufacturer’s calibration procedures shall be followed to ensure that the depth of flow is measured and recorded at accuracies of ±0.25 inch (or better) for area-velocity sensors placed in the pipe line and ±0.029 ft (or better) for the flume site.

b. The area-velocity sensors shall also undergo comprehensive testing prior to use in the sewer pipe. The meter sensors shall be securely installed according to the manufacturer’s instructions to ensure accuracy.

7 CALIBRATION OF SEWER FLOW METERS

a. All flow meters shall be calibrated based on the manufacturer’s procedures.

b. The calibration shall be performed every three (3) months for flume sites with ultrasonic sensors and once per month for the area-velocity sensors.

c. In addition to the routine calibration, individual flow meters shall be calibrated if their performance is questionable, bad, or if they malfunction.

8 QUALITY ASSURANCE/QUALITY CONTROL

a. A rigorous quality assurance/quality control program shall be implemented to ensure data integrity and accuracy. A Quality Assurance/Quality Control Plan shall be developed and implemented to ensure that dedicated personnel and detailed procedures lead to proper implementation of the Quality Assurance/Quality Control Plan.

END OF GUIDELINE
F. Closed Circuit Television ("CCTV")
Inspection Specifications, Guidelines, and Procedures.
CLOSED CIRCUIT TELEVISION ("CCTV") INSPECTION SPECIFICATIONS, GUIDELINES AND PROCEDURES

The Department of Watershed Management (DWM) Closed Circuit Television (CCTV) Inspection Program is designed to document the condition of the Wastewater Collection and Transmission System (WCTS) in support of sewer maintenance and rehabilitation activities. CCTV is used to document specific locations of defects allowing or having the potential to allow the entry of inflow and infiltration (I/I) into a sewer; locations of debris in a sewer; obstructions such as those caused by fats, oils, and greases (FOG) and roots; pipe misalignments; offset joints; cracked and broken pipes; and other defects within the WCTS. CCTV inspection also aids in locating illegal connections to the WCTS; defective connections; and defective and uncharted manholes.

CCTV inspection is performed by lowering a remotely controlled crawler camera into a sewer through an open manhole. The camera is controlled by an operator located in an on-site CCTV truck, capturing video and other data as it progresses through the sewer. The CCTV operator may stop the camera to inspect defects in greater detail, using specialized software to record the location, type, and severity of the defect. The CCTV crew is usually accompanied in the field by a sewer cleaning crew, which cleans the sewer lines prior to inspection when necessary. Cleaning a sewer before CCTV assures a clear inspection of the structural condition of the sewer, and removes silt, debris, grease, and roots that could obstruct the view of the camera. The cleaning/CCTV sequencing is reversed when the rate of silt deposits, grease, or root growth needs to be established.

The camera operator conducts the first inspection visually while he is recording the video. The video itself allows others to verify his assessment. Each observed defect is coded to facilitate data analysis and the subsequent selection of the most effective rehabilitation or maintenance methods.

It is very important that all CCTV operators collect data in a consistent manner. The National Association of Sewer Service Companies (NASSCO) created the Pipeline Assessment and Certification Program (PACP) to standardize inspection procedures and defect coding. All contracted CCTV operators must be trained and certified in PACP. All vendors that produce software for CCTV data collection use the same PACP coding system. This allows defects to be cataloged and prioritized in a consistent manner. The inspection data collected is integrated with other software systems that will be used to make accurate decisions on the rehabilitation and/or maintenance solutions. CCTV may be used in conjunction with dye-water testing as discussed in the DWM Dye-Water Testing Guidelines (see Appendix E).

There are no serious impediments to CCTV inspection other than limited access to manholes and high levels of flow in the sewer line. Most small diameter sewer lines are located in the street and right of way (ROW), but larger trunk lines are typically located along streams and other waterways, and may require special access provisions. Routine mowing of sewer
easements, access road building, security gates, and other provisions may be needed depending on local conditions.

If certain lines are inaccessible during high flow periods (rain events and peak flow periods) the CCTV operation can be redirected to lower flow areas. Inaccessible areas may also set up a flow diversion system if the inspection of the particular sewer line is time critical. Flow diversion operations are risky and greatly increase the potential for sewer spills and should be used only when absolutely necessary. In cases where wastewater flow diversion is not practical, other sewer inspection methods should be used to document the condition of the sewer. Such methods include sonar or CCTV/sonar inspection.

The general public is normally not inconvenienced by CCTV operations. In most cases the CCTV truck can locate over a manhole in the street without having much, if any impact on traffic in the area. If traffic will be affected, DWM traffic control procedures must be used. In those situations where trunk sewers cross private property, care will be taken to gain access through appropriate means. The County easement only provides access along the length of the pipe, not across private property to access the easement, so crossing private property to gain access to an easement should be minimized whenever possible and should only be done with written permission from the property owner.
CLOSED CIRCUIT TELEVISION INSPECTION PROCEDURES

Date of Revision:   December 17, 2012

ACTIVITY DESCRIPTION
CCTV inspection is designed to document the condition of the WCTS in support of sewer maintenance and rehabilitation activities. CCTV inspection documents structural defects, maintenance concerns, and actual and potential sources of I/I in mainline sewers, service laterals, and manholes. It can also be used to document cross connections to storm drainage facilities when used in conjunction with dyed-water testing. CCTV inspection is effective in all pipe sizes. CCTV may be performed at any time, with consideration to access issues and the amount of flow in the sewer. The deliverables from CCTV inspection are video recordings and electronic data.

ACTIVITY GOALS AND OBJECTIVES
The goals and objectives of CCTV inspection are to document locations of sewer system defects; maintenance concerns; actual and potential sources of I/I (such as broken sewer pipes; offset joints; root intrusion; or faulty service connections); storm sewer cross connections; pipe defects in creek crossings; defective manholes; and abandoned building sewers. Data obtained through CCTV inspection is used to prioritize maintenance and select the appropriate sewer rehabilitation methodology.

SAFETY ANALYSIS – Specific to job site conditions

<table>
<thead>
<tr>
<th>Safety</th>
<th>Potential Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Job Site Analysis for Potential Hazards</td>
<td>• Infectious Diseases</td>
</tr>
<tr>
<td>• Safety Program</td>
<td>• Slip, Trip, and Fall</td>
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<td>• Confined Spaces (Confined Space Entry)</td>
</tr>
<tr>
<td>• Overhead Power Lines (Electrical Safety)</td>
<td>• Traffic</td>
</tr>
<tr>
<td>• Traffic Safety Requirements (Traffic Safety)</td>
<td>• Vehicle Operation</td>
</tr>
<tr>
<td></td>
<td>• Mechanical Tools</td>
</tr>
<tr>
<td></td>
<td>• Electrical Hazards (Electrical Safety)</td>
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<td></td>
<td>• Flooding and Inundation (Confined Space Entry)</td>
</tr>
<tr>
<td></td>
<td>• Lifting</td>
</tr>
</tbody>
</table>

CCTV INSPECTION CHECKLIST

SAFETY – Specific to job site conditions
- Traffic cones
- Reflective vests; hardhats; ear and eye protection; gloves (all for each crew member)
- Flashing beam (mounted on the vehicle)
- Fire extinguisher
- Traffic signs
- Arrow bar/board (for heavy traffic areas, only)
- First-aid kit (fully stocked) and safety manual
- Confined space entry equipment; tripod, winch, harness, gas monitor, blower
- Cellular telephone/2-way Radio
- Drinking water and disposable cups
- Hand cleaner – alcohol, waterless, towel-less cleaner, paper towels

CLERICAL
- General Supplies; pens; highlighters; paper; blank DVDs, labels and envelopes; etc.
- Maps (with area to be inspected indicated)
- Small white board and markers
CLOSED CIRCUIT TELEVISION INSPECTION PROCEDURES

Date of Revision:   December 17, 2012

WORKING
• Fully outfitted CCTV Inspection vehicle
• Extra camera
• Extra transporter
• Extra bulbs for camera
• Tools and supplies for repairs and maintenance of camera and transporter system
• Fully operation CCTV inspection software suite
• PACP manual for reference
• Flashlights with extra batteries
• Shovels
• 300’ tape measure
• 25’ tape measure
• Manhole pulling tools
• Hammer
• Screwdriver set
• Sewer plugs, sized appropriate for assigned work
• Marking paint
• Metal detector
• General tool box
• Lowering ropes for cameras
## SPECIFICATIONS FOR CLOSED CIRCUIT TELEVISION INSPECTION

### Date of Revision: December 17, 2012

#### ACTIVITY/SUBTASK

### SCOPE

A. Internal sewer condition assessment will be used to determine the structural and service condition of sewers prior to abandonment, preconditioning, or rehabilitation. Assessment will be performed using pan and tilt color camera CCTV. In those circumstances where depth of flow is too great for CCTV, sonar or a combination of sonar and CCTV will be used.

B. Two (2) forms of internal condition assessment will be required:

1. **Sewer Survey:** Detailed viewing of the sewer ("survey") either manually or with the aid of CCTV and/or sonar equipment, to assess internal structural condition, service condition, and identify and locate miscellaneous construction features as well as assess the structural and service condition of laterals. Data logging is required.

2. **Sewer Inspection:** Viewing the sewer ("pull-through") pursuant to investigative work possibly incorporating a radio-sonde transmitter for locating purposes and/or following other operational activity including:
   a. Locating manhole(s) and/or lateral(s) with or without radio-sonde.
   b. Sewer preconditioning and cleaning activities.
   c. Sewer rehabilitation including point repairs.
   d. Such other similar purposes as may be required by the

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DeKalb County Department of Watershed Management
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where the depth of flow of sewage is less than twenty-five (25) percent of overall sewer diameter at the start of the survey. A case-by-case determination will be made whether to use CCTV where the depth of flow is more than twenty-five (25) percent level but no greater than forty (40) percent of overall sewer diameter at any time throughout the length.

2. Generally CCTV combined with sonar will be used for internal condition assessment where depth of flow of sewage varies from twenty-five (25) percent to seventy-five (75) percent of overall sewer diameter for sewers greater than twenty-four (24) inches in diameter. Where the sewer is less than twenty-four (24) inches in diameter and depth of flow of sewage exceeds twenty-five (25) percent but is less than seventy-five (75) percent of overall sewer diameter one of the following actions may be taken based on professional judgment: (a) continue using CCTV (where depth of flow is only marginally greater than twenty-five (25) percent of overall diameter) or (b) use sonar (by damming or plugging the sewer so that the depth of flow exceeds seventy-five (75) percent of overall diameter).

3. Generally sonar alone will be used where depth of flow in the sewer exceeds seventy-five (75) percent of overall diameter and the level of the flow will be artificially increased, without the risk of flooding, to ensure that the pipe is completely surcharged.

SURVEY/INSPECTION VEHICLE

A. For contractors, the survey/inspection vehicle will comprise two (2) distinct separate areas. One (1) of these, designated as the viewing area, will be insulated against noise and extremes in temperature, include the provision for air conditioning, and will be provided with means of controlling external and internal sources of light in a manner capable of ensuring that the monitor screen display is in accordance with the requirements of this specification. Seating/and or space accommodations will be available to enable additional workers to clearly view the on-site monitor, which will display the survey/inspection as it proceeds.

B. The working area will be reserved for equipment, both operational and stored, and no equipment utilized within the sewer will be allowed to be stored in the viewing area.
### SPECIFICATIONS FOR CLOSED CIRCUIT TELEVISION INSPECTION

**Date of Revision:** December 17, 2012

#### ACTIVITY/SUBTASK

C. The vehicle will be suitable for carrying the survey team and laborers and will be equipped with the following:

1. Equipment for easing and lifting manhole covers
2. Sewer safety equipment
3. Road safety equipment
4. Protective clothing for the survey/inspection teams comprising coveralls, boots, gloves, hard hats, etc.

#### CCTV SURVEY/INSPECTION AND OPERATIONAL EQUIPMENT REQUIREMENTS

A. The surveying/inspecting equipment will be capable of surveying/inspecting a length of sewer up to at least one-thousand five-hundred (1,500) feet when entry onto the sewer may be obtained at each end and up to one-hundred (100) feet by rodding or up to seven-hundred and fifty (750) feet where a self-propelled unit is used, where entry is possible at one (1) end only. This equipment will be maintained in full working order.

B. Each survey/inspection unit will contain a means of transporting the CCTV camera and/or sonar equipment in a stable condition through the sewer under survey and/or inspection. Such equipment will ensure the maintained location of the CCTV camera or sonar equipment when used independently on or near to the central axis of a circular shaped sewer when required in the prime position.

C. Where the CCTV camera and/or sonar head are towed by winch and bond through the sewer, all winches will be stable with either lockable or ratcheted drums. All bonds will be steel or of an equally non-elastic material to ensure the smooth and steady progress of the CCTV camera and/or sonar equipment. All winches will be inherently stable under loaded conditions.

D. Each unit will carry sufficient numbers of guides and rollers such that, when surveying or inspecting, all bonds are supported away from pipe and manhole structures and all CCTV/sonar cables and/or lines used to measure the CCTV camera's/sonar head location within the sewer are maintained in a taut manner and set at right angles where possible, to run through or over the measuring equipment.
### SPECIFICATIONS FOR CLOSED CIRCUIT TELEVISION INSPECTION

**Date of Revision:** December 17, 2012

<table>
<thead>
<tr>
<th>ACTIVITY/SUBTASK</th>
</tr>
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<tbody>
<tr>
<td>E. Each unit will carry a range of flow control plugs or diaphragms for use in controlling the flow during the survey/inspection. A minimum of one (1) item of each size of plug or diaphragm ranging from six (6) inches to two (2) feet diameter inclusive will be carried.</td>
</tr>
<tr>
<td>F. Each survey/inspection unit will have on-call equipment available to carry out the flushing, rodding, and jetting of sewers when such procedures are deemed to be necessary.</td>
</tr>
</tbody>
</table>

### SEWER CLEANING UNITS AND EQUIPMENT

A. Sufficient sewer cleaning units and equipment will be provided. Contractors will provide standby units in the event of breakdown, in order to complete cleaning operations.

### REASONS FOR CLEANING OF SEWERS

A. Light cleaning of sewers means the removal of minor quantities of silt and debris preventing observation of sewer condition and defects.

B. Heavy cleaning means the removal and extraction of silt, debris, and obstructions from the sewer which actually prevent entry and use of CCTV equipment, or the completion of the sewer run and/or manned-entry inspection of sewers.

### EXTENT OF LIGHT CLEANING

A. Light cleaning is considered to be cleaning of the sewer prior to CCTV or manned-entry survey or inspection, requiring the removal and extraction of minor quantities of silt and debris from the sewer. Light cleaning will only be required when the level of silt is deemed prohibitive to the accurate assessment of the sewer under survey or inspection.

### CCTV/SONAR - GENERAL

A. CCTV Camera/ Sonar Head Prime Position: The CCTV camera/ sonar head will be positioned to reduce the risk of picture distortion. In circular sewers the
SPECIFICATIONS FOR CLOSED CIRCUIT TELEVISION
INSPECTION

Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

CCTV camera lens and/or sonar head will be positioned centrally (i.e. in prime position) within the sewer. In non-circular sewers, picture orientation will be taken at mid-height, unless otherwise agreed, and centered horizontally. In all instances the camera lens/sonar head will be positioned looking along the axis of the sewer when in prime position. A positioning tolerance of ±10% of the vertical sewer dimension will be allowed when the camera is in prime position.

B. CCTV Camera/Sonar Head Speed: The speed of the CCTV camera in the sewer will be limited to six (6) inches per second for surveys to enable all details to be extracted from the hard drive or DVD recording. Similar or slightly higher speed may be used on a case-by-case basis. Stop, for a minimum of 5 seconds at every lateral, defect, or adversity. The speed of scanning sonar will be limited to four (4) inches per second.

C. CCTV Color Camera: A color pan and tilt camera(s) will be provided to facilitate the survey and inspection of all laterals, including defects such as hydrogen sulfide corrosion in the soffit of sewers and benching or walls of manholes over and above the standard defects that require reporting. These will be carried out as part of the normal CCTV assessment as the survey or inspection proceeds. A three-hundred sixty (360) degrees rotational scan indicating general condition must be implemented at every fifty (50) feet interval (min.) along sewers, and at manholes and any salient, specified, defect features. The tilt arc must not be less than two-hundred twenty-five (225) degrees.

D. Data Transfer: Upon completion of CCTV inspection, transfer inspection data to an external hard drive (HD) or DVD of sufficient capacity and compatibility with Owner’s equipment; include code required for proper playback of video file.

1. Labeling:
   a. Provide printed label on outside of HD or DVD that indicates the following:
      1) Name of owner
      2) Project title
      3) Date of inspection
## SPECIFICATIONS FOR CLOSED CIRCUIT TELEVISION INSPECTION

**Date of Revision:** December 17, 2012

### ACTIVITY/SUBTASK

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>4)</td>
<td>Inspection company</td>
</tr>
<tr>
<td>5)</td>
<td>Deliverable number</td>
</tr>
<tr>
<td>6)</td>
<td>Range of pipe structure identification numbers or asset feature, IDs included</td>
</tr>
</tbody>
</table>

2. **Media:**
   - a. **Video:**
     1) Inspections completed, with a unique filename per inspection
     2) Encoded in .MPG (preferred), .WMV, or .AVI format

3. **Audio:**
   - a. Embedded in video file
   - b. Operator will include description of inspection setup, including related information from log form and unusual conditions
   - c. Operation changes (for example, remove roots and restart inspection at footage prior to root removal)
   - d. Verbal description and location of each defect
   - e. Verbal description and location of each service connection

4. **Still Photographs:**
   - a. Provide digital photographs showing inspection image whenever observation or defect has a moderate or major severity, unless otherwise instructed by the Owner or Engineer;
   - b. Each with unique filename;
   - c. Encoded in .JPEG format;
   - d. Minimum 640 x 480 resolution; and
e. Provide label on front of photograph with structure identification number, footage (if not visible on photograph), and defect code.

5. Database:
   a. Include all inspections. Creating a database per inspection is not acceptable.
   b. Provide database of collected data including:
      1) Asset information
      2) Inspection information, where each inspection includes no more than one manhole-to-manhole segment
      3) Defect codes
      4) Start and stop footages for continuous defects
   c. File Type: MS Access, .MDB, .ACCDB
   d. Database Format: NASSCO PACP data will be exported into standard PACP Exchange database.
   e. List inspection media names in corresponding asset/inspection/defect information field within database.

E. Linear Measurement:
   1. The CCTV/sonar monitor display will incorporate an automatically updated record in feet and tenths of a foot of the footage of the camera or center point of the transducer, whichever unit is being metered, from the cable calibration point. The relative positions of the two (2) center points will also be noted.
   2. A suitable metering device will be used to enable the cable length to be accurately measured; this will be accurate to ± 1% or three (3) inches whichever is the greater.

F. Data Display, Recording and Start of Survey/Inspection:
1. At the start of each sewer length being surveyed or inspected and each reverse set-up, the length of pipeline from zero (0) footage, the entrance to the pipe, up to the cable calibration point will be recorded and reported in order to obtain a full record of the sewer length. Only one (1) survey will be indicated in the final report. All reverse set-ups, blind manholes, and buried manholes will be logged on a separate log. Video digits will be recorded so that every recorded feature has a correct tape elapsed time stamp. Each log will make reference to a start (ST) and finish (FH) manhole unless abandonment took place because of blockage. Manhole number will be indicated in the remark's column of the detail report.

2. The footage reading entered on to the data display at the cable calibration point must allow for the distance from the start of the survey/inspection to the cable calibration point such that the footage at the start of the survey is zero (0).

3. In the case of surveying through a manhole where a new header sheet must be completed, the footage will be set at zero (0) with the camera focused on the outgoing pipe entrance.

4. At the start of each manhole length a data generator will electronically generate and clearly display on the viewing monitor and subsequently on the CD-ROM recording a record of data in alpha-numeric form containing the following minimum information:
   a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0)
   b. Sewer dimensions
   c. Manhole/pipe length reference numbers
   d. Date of survey
   e. Road name/location
   f. Direction of survey
**SPECIFICATIONS FOR CLOSED CIRCUIT TELEVISION INSPECTION**

**Date of Revision:** December 17, 2012

<table>
<thead>
<tr>
<th>ACTIVITY/SUBTASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>g. Time of start of survey</td>
</tr>
<tr>
<td>h. Sewer use (SS - Sanitary Sewer)</td>
</tr>
<tr>
<td>i. Material of construction of the pipe</td>
</tr>
</tbody>
</table>

5. The size and position of the data display will be such as not to interfere with the main subject of the picture.

6. Once the survey of the pipeline is under way, the following minimum information will be continually displayed:
   - a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0).
   - b. Sewer dimensions in inches.
   - c. Manhole or pipe length reference number (PLR). General convention allows upstream manhole number to be designated PLR.
   - d. Direction of survey, i.e., downstream or upstream.

7. Correct adjustment of the recording apparatus and monitor will be demonstrated by use of the test tape or other appropriate device. Satisfactory performance of the camera will be demonstrated by the recording of the appropriate test device at the commencement of each day for a minimum period of thirty (30) seconds.

8. Footage and corresponding time elapsed video digit will be given throughout survey/inspection for all relevant defects and construction features encountered unless otherwise agreed.

9. Where silt encountered is greater than ten (10) percent of the diameter of the pipe, the depth of silt will be measured and recorded at approximately fifty (50) foot intervals.

10. All continuous defects will incorporate a start and finish abbreviation in
the log report.

G. Coding: Defect Coding, as well as material, shape, and lining coding, and conventions used will comply with PACP formats and compatible with the County GIS.

MAN ENTRY SURVEY - GENERAL

A. Photographic Camera Position - General Illustration of Sewer Interior:

1. The hand-held photographic camera or CCTV camera will be positioned to reduce the risk of picture distortion. In circular sewers the camera lens will be positioned centrally looking along the axis of the sewer. In non-circular sewers picture orientation will be taken at mid-height, unless otherwise agreed, and centered horizontally.

2. The hand held photographic camera or CCTV camera will be positioned so that the long side of the photograph or CD-ROM frame is horizontal.

B. Photographic Camera Position - Laterals/ Specific Defect: A means of accurately locating the photographic or camera’s footage and any recorded lateral or defect, along the sewer will be provided, to an accuracy of ± 1% or six (6) inches whichever is greater.

C. Photographic Quality: The in-sewer photographic camera or hand held CCTV system and suitable illumination will be capable of providing an accurate, uniform and clear record of the sewer’s internal condition.

CCTV, MAN ENTRY, AND SONAR SURVEY DATA SPECIFICATION

A. Survey Reporting: Following the completion of a sewer survey/ inspection, a hard copy of all details, i.e. typed “Full English” report including summary statistical breakdown of all defects encountered and a CD-ROM will be generated.

B. Site Coding Sheets: Each sewer length, i.e. the length of sewer between two (2) consecutive manholes, will be entered on a separate coding sheet or entered separately electronically. Thus where a "pull through" a manhole during a CCTV...
and/or sonar survey or "walk through" during a “man entry” survey is performed, a new coding sheet will be started at the manhole "pulled or walked through" and the footage re-set to zero (0) on the coding sheet. Where a length of sewer between consecutive manholes is surveyed from each end (due to an obstruction) two (2) coding sheets will be used. Where a length of sewer between two (2) consecutive manholes cannot be surveyed or attempted for practical reasons a (complete header) coded sheet will be made out defining the reason for abandonment. At uncharted manholes a new coding sheet will be started and the footage re-set to zero (0).

C. Measurement Units: All dimensions will be in feet and inches. Measurement of sewers will be to the nearest inch.

D. CCTV and Man-Entry Photographs:

1. Photographs will be taken of all defective laterals and pipeline defects. Where a defect is continuous or repeated the photographs will be taken at the beginning of the defect and at not less than ten (10) foot intervals thereafter.

2. CCTV photographs must clearly and accurately show what is displayed on the monitor, and will be in proper adjustment.

3. Photographs must be durable and 4 inch x 6 inch size and will be supplied in a suitable album or storage drawer.

4. Still photographs will be durable and clearly identified in relation to the photograph number (cross referenced to the site survey sheet) street location, sewer dimensions, manhole start and finish numbers, survey direction, footage and date when the photograph was taken.

5. The annotation will be clearly visible and in contrast to its background, will have a figure size no greater than fourteen (14) point, and be type printed in upper case.

6. The annotation will be positioned so as not to interfere with the subject of the photograph.

7. Color photographs will be taken using a digital camera.
SPECIFICATIONS FOR CLOSED CIRCUIT TELEVISION INSPECTION

Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

CCTV/ SONAR PERFORMANCE

A. Color CCTV/ Sonar: All CCTV and/or sonar work will use color CCTV/ sonar reproduction.

B. CCTV Picture Quality:

1. A test device will be maintained on-site of the work area at all times.

2. The test card will be Marconi Regulation Chart No. 1 or equivalent with a color bar, clearly differentiating between colors, with no tinting, to show the following: White, Yellow, Cyan, Green, Magenta, Red, Blue, and Black.

3. At the start of each and every working shift, the camera will be positioned centrally and at right angles to the test card at a distance where the full test card just fills the monitor screen. The Contractor will ensure that the edges of the test card castellations coincide with the edges of the horizontal and vertical scan (raster). The card will be illuminated evenly and uniformly without any reflection. The illumination will be to the same color temperature as the color temperature of the lighting that recorded for subsequent use, the recording time will be at least thirty (30) seconds. The type of camera used will be identified on the test recording. The recording must show the camera being introduced into the test device and reaching its stop position.

C. Shades of Gray: The gray scale will show equal changes in brightness ranging from black to white with a minimum of five (5) clearly recognizable stages.

D. Color: With the monitor adjusted for correct saturation, the six (6) colors plus black and white will be clearly resolved with the primary and complementary colors in order of decreasing luminance. The gray scale will appear in contrasting shades of gray with no tint.

E. Linearity: The background grid will show squares of equal size, without convergence/divergence over the whole picture. The center circle will appear round and have the correct height/width relationship (±5%).
F. Resolution: The live picture will be clearly visible with no interference and capable of registering a minimum number of TV lines/picture height lines. The resolution will be checked with the monitor color turned down. In the case of tube cameras this will be six-hundred (600) lines.

G. Color Constancy: To ensure the camera will provide similar results when used with its own illumination source, the lighting will be fixed in intensity prior to commencing the survey. In order to ensure color constancy, generally no variation in illumination will take place during the survey.

H. CCTV Focus/Iris/Illumination: The adjustment of focus and iris will allow optimum picture quality to be achieved and will be remotely operated. The adjustment of focus and iris will provide a minimum focal range from six (6) inches in front of the camera’s lens to infinity. The distance along the sewer in focus from the initial point of observation will be a minimum of twice the vertical height of the sewer. The illumination must allow an even distribution of the light around the sewer perimeter without the loss of contrast picture, flare out, or shadowing.

I. Sonar Survey Requirements:

1. Sonar will provide a complete structural and service assessment equivalent to that obtained through conventional CCTV imagery.

2. Sonar assessment will provide for a continuous output on conventional annotated CD-ROM format of all sewers surveyed, supported by complete defect code sheets. Additionally, silt levels will be assessed as a percentage depth of sewers at twenty-five (25) foot intervals for each pipeline surveyed. To facilitate this requirement, and in addition, to assist in diametrical measurement particularly where a sewer is deformed and/or where a sewer has suffered hydrogen sulfide corrosion; screen graphic facilities will be made available to enable measurements to be taken in any position across the diametrical profile of the sewer as the Sonar survey proceeds and where specifically directed by the Engineer.

3. Where combined CCTV and sonar imagery is used the output will display combined CCTV and sonar images of the sewer being surveyed. The sonar image will be superimposed on the real CCTV image as a combined operation.
4. A comprehensive final report will be provided on the findings concerning major defects, including fractures, displaced joints, deformation, corrosion, and lateral intrusions, as well as dominant surface features, including encrustation and silt depths.

5. The monitor display resolution will be a minimum of 512 x 512 pixels. The color palette will have a minimum of sixteen (16) colors with text.

6. The picture update speed will not compromise compliance with Sub-clause A (1) or result in unsatisfactory picture resolution.

7. The range of resolution will be ±1/10 inch.

8. The maximum beam width of sonar energy pulse will be no greater than two (2) degrees from the center of the transducer.

9. The transducer will be of the continuous scanning type.

J. Data Quality Control Procedure:

1. A quality control system will be implemented to effectively gauge the accuracy of all survey reports produced. The system will be such that the accuracy of reporting is a function particularly of:
   a. The number of faults not recorded (omissions)
   b. The correctness of the coding and classification of each fault recorded

2. The minimum levels of accuracy to be attained under the various survey headings are as follows:
   a. Header Accuracy: ninety-five (95) percent
   b. Detail Accuracy: eighty-five (85) percent

K. Data accuracy: The minimum acceptable accuracy of the data will be eighty-five (85) percent.
## C.C.T.V. Inspection Form

| Surveyor's Name | Certifying Number | System Owner | Survey Customer | Drainage Area | Sheet No. | P.O. No. | Pipeline Segment Reference | Date | Time | Location (Street Name and Number) | Notes | Downstream Manhole Number | Rim to Invert | Grade to Invert | Rim to Grade | Use of Sewer | Direction | Flow Control | Height | Width | Material | Liner Method | Pipe Joint Length | Total Length | Length Surveyed | Year Laid | Year Rehabilitated | Tape / Media Number | Purpose | Sewer Category | Pre-Cleaning | Cleaned Year | Weather | Location Code | Additional Information | Remarks |
|----------------|-------------------|--------------|----------------|--------------|-------------|----------|---------------------------|------|------|-------------------------------|-------|--------------------------|-------------|----------------|-------------|-------------|-------------|-------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|---------|--------------|-------------|-------------|---------|-------------|----------------|--------|
# C.C.T.V. Inspection Continuation Form

<table>
<thead>
<tr>
<th>Distance (feet/meters)</th>
<th>Video Ref.</th>
<th>Code</th>
<th>Continuous defect</th>
<th>Value</th>
<th>Joint</th>
<th>Circumferential Location</th>
<th>Image Ref.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group/Descriptor</td>
<td>Modifier/Severity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field Name</td>
<td>Data Type</td>
<td>Field Size</td>
<td>Required</td>
<td>Sample</td>
<td>Description/Instructions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>---------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surveyed_Name</td>
<td>Text</td>
<td>30</td>
<td>Y</td>
<td>all UC User's First Initial and Last Name - KTRAN</td>
<td>Name of individual conducting survey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificate_Number</td>
<td>Text</td>
<td>15</td>
<td>Y</td>
<td>U-007-4106</td>
<td>NASSCO PACP # of Surveyor</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Owner</td>
<td>Text</td>
<td>30</td>
<td>Y</td>
<td>DEKALB DWM</td>
<td>Owner of collection system surveyed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer</td>
<td>Text</td>
<td>30</td>
<td>Y</td>
<td>District &amp; Map Index or number</td>
<td>Entity commissioning the survey</td>
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<td></td>
<td></td>
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<tr>
<td>Drainsage_Area</td>
<td>Text</td>
<td>15</td>
<td>Y</td>
<td>10 on imp. Basin Name - 5 on assigned</td>
<td>Abbreviated Name of Basin - see attached list</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PO_Number</td>
<td>Text</td>
<td>15</td>
<td>Y</td>
<td>Contract Number</td>
<td>Contract number you are working under</td>
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<td></td>
<td></td>
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<tr>
<td>Pipe_Segment_Reference</td>
<td>Text</td>
<td>25</td>
<td>Y</td>
<td>Pipe ID</td>
<td>LL-USUSEDDPMH</td>
<td></td>
<td></td>
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<tr>
<td>Date</td>
<td>Date/Time</td>
<td>N/A</td>
<td>Y</td>
<td>YYYYMMDD</td>
<td>Inspection Date</td>
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<tr>
<td>Time</td>
<td>Date/Time</td>
<td>N/A</td>
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<td>Military Time format</td>
<td>Time Inspection Started</td>
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<tr>
<td>Street</td>
<td>Text</td>
<td>64</td>
<td>Y</td>
<td>Number and Street Name - all UC</td>
<td>Enter insured street number and name if not known, enter insured place name and general description</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>Text</td>
<td>64</td>
<td>Y</td>
<td>City name - all UC</td>
<td>City name where sewer located</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location_Details</td>
<td>Text</td>
<td>64/255*</td>
<td>Y</td>
<td>Example: BACK YARD IN MUDDLED FLOWER BED - or BIG DOG - all UC</td>
<td>Descriptive explanation of sewer location</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upstream_MH</td>
<td>Text</td>
<td>25</td>
<td>Y</td>
<td>USUSEID</td>
<td>Client provided designation for upstream manhole</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up_Rim_to_Invert</td>
<td>Number</td>
<td>Single</td>
<td>Y</td>
<td>Pit and 10ths of ft. Measure from invert of pipe being surveyed, if rim not level, measure from invert to top of frame.</td>
<td>Distance (ft and tenths of ft) or meters to 2 decimal places max from rim to invert of upstream manhole</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up_Grade_to_Invert</td>
<td>Number</td>
<td>Single</td>
<td>Y</td>
<td>Pit and 10ths of ft. Measure depth between ground level and invert of pipe being surveyed. If ground not level, measure from ground space above pipe being surveyed.</td>
<td>Distance (ft and tenths of ft) or meters to 2 decimal places max from average grade to invert of upstream manhole</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Up_Rim_to_Grade</td>
<td>Number</td>
<td>Single</td>
<td>Y</td>
<td>Pit and 10ths of ft. Measure distance between rim and ground level. If ground not level, measure from lowest point of pipe being surveyed.</td>
<td>Distance (ft and tenths of ft) or meters to 2 decimal places max from rim to average grade of upstream manhole</td>
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</tr>
<tr>
<td>Downstream_MH</td>
<td>Text</td>
<td>25</td>
<td>Y</td>
<td>DUSUSEID</td>
<td>Client provided designation for downstream manhole</td>
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<tr>
<td>Down_Rim_to_Invert</td>
<td>Number</td>
<td>Single</td>
<td>Y</td>
<td>Pit and 10ths of ft. Measure from invert of pipe being surveyed, if rim not level, measure from lowest point on top of frame.</td>
<td>Distance (ft and tenths of ft) or meters to 2 decimal places max from rim to invert of downstream manhole</td>
<td></td>
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</tr>
<tr>
<td>Field Name</td>
<td>Data Type</td>
<td>Field Size</td>
<td>Required</td>
<td>Sample</td>
<td>Description/Instructions</td>
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<td>--------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Down_Grade_to_Invert</td>
<td>Number</td>
<td>Single</td>
<td>Y</td>
<td>FT and 10th's of FT. Measure depth between ground level and invert of pipe being surveyed. If ground not level, measure from ground space above pipe being surveyed.</td>
<td>Distance (ft and tenths of foot) or (2 decimal places) max from average grade to invert of downstream manhole.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Down_Rim_to_Grade</td>
<td>Number</td>
<td>Single</td>
<td>Y</td>
<td>FT and 10th's of FT. Measure distance between rim and ground level. If ground not level, measure from ground space above pipe being surveyed.</td>
<td>Distance (ft and tenths of foot) or (2 decimal places) max from rim to average grade of downstream manhole.</td>
<td></td>
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</tr>
<tr>
<td>Sewer Use</td>
<td>Text</td>
<td>List-defined</td>
<td>Y</td>
<td>See Valid List - Sanitary</td>
<td>Purpose of sewer</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Direction</td>
<td>Text</td>
<td>List-defined</td>
<td>Y</td>
<td>Upstream or Downstream</td>
<td>Direction of survey. Upstream or Downstream. All inspections should be performed Downstream unless otherwise specified.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Flow_Control</td>
<td>Text</td>
<td>List-defined</td>
<td>Y</td>
<td>See Valid List - Not controlled, Owncleared, Plugged if VS. is 25% or greater, level must be controlled. No inspection should occur in an line with more than 25% water level.</td>
<td>Type restriction of flow used.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>Number</td>
<td>Integer</td>
<td>Y</td>
<td>Diameter</td>
<td>Diameter of sewer (ft/height if non-circular) to nearest inch (0.06) or nearest mm (0.006)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>Number</td>
<td>Integer</td>
<td>Y</td>
<td>required for non-circular sewers</td>
<td>Width of non-circular sewer to nearest inch (0.06) or nearest mm (0.006)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Shape</td>
<td>Text</td>
<td>List-defined</td>
<td>Y</td>
<td>See Valid List - Circular</td>
<td>Sewer shape</td>
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<tr>
<td>Material</td>
<td>Text</td>
<td>List-defined</td>
<td>Y</td>
<td>See Valid List - Polyvinyl Chloride</td>
<td>Type of pipe material</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Linng_Method</td>
<td>Text</td>
<td>List-defined</td>
<td>Y</td>
<td>See Valid List - Cured in Place</td>
<td>Type of process used to line the lead pipe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipe_Joint_Length</td>
<td>Number</td>
<td>Single</td>
<td>Y</td>
<td>Nearest 10th of a R</td>
<td>Length of pipe joint sections measured to one decimal place whether it is feet or meter.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Length</td>
<td>Number</td>
<td>Single</td>
<td>Y</td>
<td>Estimated distance in feet or GIS estimate</td>
<td>Distance between the exit of the start manhole and the entrance of the finish measured to one decimal place whether it is feet or meter.</td>
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*Required field means that it must be populated. Additional notes: Persistent Video Display should be at the bottom of the screen, USMH and DSMH should be displayed, along with Footage counter.
Tables below are valid codes to be used in the PACP process

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<td>VR</td>
<td>O &amp; M</td>
<td>Vermin Rat</td>
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<td>VZ</td>
<td>O &amp; M</td>
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<td>Weld Failure Longitudinal</td>
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<td>Collapse Brick Sewer</td>
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<tr>
<td>XP</td>
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### Pipe Material Codes

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<td>Asbestos Cement</td>
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<tr>
<td>BR</td>
<td>Brick</td>
</tr>
<tr>
<td>CAS</td>
<td>Cast Iron</td>
</tr>
<tr>
<td>CMP</td>
<td>Corrugated Metal Pipe</td>
</tr>
<tr>
<td>CP</td>
<td>Concrete Pipe (non-reinforced)</td>
</tr>
<tr>
<td>CSB</td>
<td>Concrete Segments (bolted)</td>
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<tr>
<td>CSU</td>
<td>Concrete Segments (unbolted)</td>
</tr>
<tr>
<td>CT</td>
<td>Clay Tile</td>
</tr>
<tr>
<td>DIP</td>
<td>Ductile Iron Pipe</td>
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<tr>
<td>FRP</td>
<td>Fiberglass Reinforced Pipe</td>
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<tr>
<td>GRC</td>
<td>Glass Reinforced Cement</td>
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<tr>
<td>OB</td>
<td>Pitch Fiber (Orangeburg)</td>
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<tr>
<td>PCCP</td>
<td>Pre-stressed Concrete Cylinder Pipe</td>
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<tr>
<td>PE</td>
<td>Polyethylene</td>
</tr>
<tr>
<td>PP</td>
<td>Polypropylene</td>
</tr>
<tr>
<td>PSC</td>
<td>Plastic/Steel Composite</td>
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<tr>
<td>PVC</td>
<td>Polyvinyl Chloride</td>
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<td>RCP</td>
<td>Reinforced Concrete Pipe</td>
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<tr>
<td>RPM</td>
<td>Reinforced Plastic Pipe (Truss Pipe)</td>
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<tr>
<td>SB</td>
<td>Segmented Block</td>
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<tr>
<td>SP</td>
<td>Steel Pipe</td>
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<td>TTE</td>
<td>Transite Pipe</td>
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<td>VCP</td>
<td>Vitrified Clay Pipe</td>
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<tr>
<td>WD</td>
<td>Wood</td>
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<td>XXX</td>
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### Pipe Shape Codes

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<tr>
<td>A</td>
<td>Arched, with flat bottom</td>
</tr>
<tr>
<td>B</td>
<td>Barrel, beer-barrel shape</td>
</tr>
<tr>
<td>C</td>
<td>Circular</td>
</tr>
<tr>
<td>E</td>
<td>Egg Shaped</td>
</tr>
<tr>
<td>H</td>
<td>Horseshoe, inverted U</td>
</tr>
<tr>
<td>Z</td>
<td>Other, state in remarks</td>
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<tr>
<td>O</td>
<td>Oval (elliptical)</td>
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<tr>
<td>R</td>
<td>Rectangular</td>
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<tr>
<td>S</td>
<td>Square</td>
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<tr>
<td>T</td>
<td>Trapezoidal</td>
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<tr>
<td>U</td>
<td>U-Shaped, with flat top</td>
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### Lining Codes

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<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>CP</td>
<td>Cured in Place</td>
</tr>
<tr>
<td>FF</td>
<td>Fold and Form or Deform/Reform</td>
</tr>
<tr>
<td>ZZ</td>
<td>Other</td>
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<td>SN</td>
<td>Segmented Panel</td>
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<tr>
<td>SP</td>
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<td>SW</td>
<td>Spiral Wound</td>
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Direction Codes

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<tr>
<td>D</td>
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<tr>
<td>U</td>
<td>Upstream</td>
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Note: Where practical all PACP surveys should be conducted with the flow.

Location Codes

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<tbody>
<tr>
<td>A</td>
<td>Main Highway - Urban</td>
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<tr>
<td>B</td>
<td>Main Highway - Suburban/Rural</td>
</tr>
<tr>
<td>C</td>
<td>Light Highway</td>
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<tr>
<td>D</td>
<td>Easement/Right of Way</td>
</tr>
<tr>
<td>E</td>
<td>Woods</td>
</tr>
<tr>
<td>F</td>
<td>Sidewalk</td>
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<tr>
<td>G</td>
<td>Parking Lot</td>
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<tr>
<td>H</td>
<td>Alley</td>
</tr>
<tr>
<td>I</td>
<td>Ditch</td>
</tr>
<tr>
<td>J</td>
<td>Building</td>
</tr>
<tr>
<td>K</td>
<td>Creek</td>
</tr>
<tr>
<td>L</td>
<td>Railway</td>
</tr>
<tr>
<td>M</td>
<td>Airport</td>
</tr>
<tr>
<td>Y</td>
<td>Yard</td>
</tr>
<tr>
<td>Z</td>
<td>Other</td>
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Note: If any portion of the pipe crosses underneath a road described by A, B, or C, enter that code. Otherwise enter the code that best describes the predominate ground cover over the pipe segment.
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<td>Combined</td>
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<tr>
<td>FM</td>
<td>Force Main</td>
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<td>ZZ</td>
<td>Other</td>
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<td>PR</td>
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<td>SW</td>
<td>Stormwater</td>
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**Weather Codes**

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<td>2</td>
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<td>Light Rain</td>
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<td>4</td>
<td>Snow</td>
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<td>5</td>
<td>Saturated</td>
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<td>6</td>
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**Pre-cleaning Codes**

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<tr>
<td>J</td>
<td>Jetting</td>
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<tr>
<td>N</td>
<td>No Pre-Cleaning</td>
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**Purpose of Survey Codes**

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<tr>
<td>B</td>
<td>Infiltration/Inflow Investigation</td>
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<tr>
<td>C</td>
<td>Post Rehabilitation Survey</td>
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<td>D</td>
<td>Pre-Rehabilitation Survey</td>
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<td>E</td>
<td>Pre-Acceptance</td>
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<td>F</td>
<td>Routine Assessment</td>
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<td>G</td>
<td>Capital Improvement Program Assessment</td>
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<td>H</td>
<td>Resurvey</td>
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<tr>
<td>V</td>
<td>Reversal</td>
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<tr>
<td>Z</td>
<td>Not Known</td>
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<tr>
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<td>Description</td>
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<tr>
<td>------</td>
<td>---------------------------</td>
</tr>
<tr>
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</tr>
<tr>
<td>D</td>
<td>De-Watered using Jetter</td>
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<td>Lift Station</td>
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<td>Work Order Abbreviation</td>
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<tr>
<td>Upper Snapfinger Creek</td>
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<tr>
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</tr>
<tr>
<td>Yellow River</td>
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</table>
GRAVITY SEWER LINE AND FORCE MAIN DEFECT ANALYSIS GUIDELINES

The purpose of assessing the condition of a sewer system infrastructure (sewers, manholes, service laterals, etc.) is to characterize service conditions; identify locations of defects; and facilitate the identification and prioritization of rehabilitation measures needed to reduce and/or eliminate its likelihood of failure, improve its service conditions, and extend its usable life. The Department of Watershed Management (DWM) gravity sewer line and force main defect analysis program establishes standard procedures for the analysis of gravity sewer line and force main defects identified during the assessment of the Initial and Additional Priority Areas. In developing its sewer line and force main defect analysis program, the County has utilized technological advancements in technology, lessons learned during the last several years by other entities, and knowledge and experience gained by County personnel in their day-to-day maintenance and operation of the County's WCTS. A variety of techniques are typically utilized to evaluate the condition of force mains and their likelihood of failure. The County will determine the most appropriate techniques on a case by case basis.

The gravity sewer line defect analysis program will utilize the data obtained from various condition assessment tools and programs (manhole condition assessment, smoke testing, Closed Circuit Television (CCTV), dyed-water testing, and corrosion defect identification programs, etc.) to identify and prioritize rehabilitation measures within the County's WCTS. During the assessment of the Initial and Additional Priority Areas, defects will be identified and cataloged using standard National Association of Sewer Service Companies (NASSCO) Manhole Assessment and Certification Program (MACP), Pipeline Assessment Certification Program (PACP), and Lateral Assessment and Certification Program (LACP) defect codes. Whenever feasible, data collection software will be used to capture and record data pertaining to the inspected sewer lines, manholes, and service laterals. The data fields and formats used will be consistent with the NASSCO PACP specification (matrices for the applicable NASSCO codes are listed in the CCTV Inspection Guidelines). To the extent feasible, data and scores will be recorded in InfoWorks™ and the InfoNET™ databases. Assets will be assigned a permanent, unique identification (ID) number. This ID number will be referenced in data systems containing data on that asset, including the CMMS, InfoWorks™, InfoNET™, and the Geographic Information System (GIS). The grades assigned to various assets will be used as a tool to identify and to prioritize rehabilitation measures within the Initial and Additional Priority Areas.

The internal condition grade descriptions included below will generally be used as a guide to categorize defects from 1 to 5 (least to greatest defect condition). Examples of common defects are shown in the table below along with a logical thought progression for remedial action.
<table>
<thead>
<tr>
<th>Internal Condition Grade</th>
<th>Typical Defect Condition</th>
<th>Typical Renewal Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Pipe/BS(^1) already collapsed; or Pipe/BS deformation &gt;10% and broken; or Extensive areas of missing pipe or brickwork; or Pipe/BS fractured with deformation &gt;10%; or Concrete/Mortar loss extreme(^2)</td>
<td>Replace – On-line or Off-line <strong>Immediate Action</strong></td>
</tr>
<tr>
<td>4</td>
<td>Pipe/BS broken; or Pipe/BS deformation &lt;10% and broken; or Pipe/BS fractured with deformation 5-10%; or Multiple pipe fracture; or Serious loss of gradient; or Severe concrete corrosion(^2); or Many displaced bricks</td>
<td>Renovate (lining) or Repair <strong>Rehabilitation Program</strong></td>
</tr>
<tr>
<td>3</td>
<td>Pipe/BS fractured with deformation &lt;5%; or Longitudinal cracking or multiple cracking; or Severe joint defects; or Badly made connections; or Moderate concrete corrosion(^2); or Some displaced bricks</td>
<td>Possibly Renovate, Repair or <strong>Monitor</strong></td>
</tr>
<tr>
<td>2</td>
<td>Light corrosion(^2); or Circumferential pipe/BS cracking; or Moderate joint defects</td>
<td><strong>Do Nothing</strong></td>
</tr>
<tr>
<td>1</td>
<td>No corrosion or structural defects</td>
<td><strong>Do Nothing</strong></td>
</tr>
</tbody>
</table>

\(^1\) **BS** = Brick Sewers  
\(^2\) Expressed as percentage of wall thickness (not inches)
# GRAVITY SEWER LINE DEFECT ANALYSIS PROCEDURE

**Date of Revision:** December 17, 2012

## ACTIVITY DESCRIPTION
The analytical evaluation of gravity sewers and force mains using a standardized, methodical approach by assigning values in order to devote the appropriate level of resources to inspect, maintain, and rehabilitate different areas of the system.

## ACTIVITY GOALS AND OBJECTIVES
Goals and objectives for this activity are to identify gravity sewer and force main defects for rehabilitation or repair to maintain the required level of service.

## SAFETY ANALYSIS

<table>
<thead>
<tr>
<th>Safety</th>
<th>Potential Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

## DEFECT ANALYSIS CHECKLIST
- N/A

## ACTIVITY/SUBTASK

### PRE-WORK ACTIVITIES
Assemble all Condition Assessment data including:
- Flow Monitoring Data
- Manhole Condition Assessment Data and Associated Analysis
- Smoke Testing Data
- Dyed-Water Testing Data
- GIS Shapefiles (Right-of Ways, Easements, and Sewer System Maps)
- Topographical Maps of Basin
- Current SSES CCTV Videos (NASSCO PACP, MACP, LACP Compliant)
- Data from Corrosion Defect Program

### SITE PREPARATION
N/A

### GENERAL PROCEDURES

1. **Prioritization Process Overview**

As indicated in the DWM *Criteria for Identifying and Prioritizing Rehabilitation Measures* within the Initial and Additional Priority Areas, conditions associated with the occurrence of sanitary sewer overflow (SSOs) can generally be grouped into three (3) major categories: (1) capacity limitations, structural defects, and maintenance problems. Capacity limitations may result from one or more of the following...
GRAVITY SEWER LINE DEFECT ANALYSIS PROCEDURE

Date of Revision: December 17, 2012

conditions: excessive I/I entering the County’s wastewater collection and transmission system (WCTS) through sewer defects, manhole defects, and/or unauthorized connections; sewers and/or lift stations whose capacities are not adequate to handle dry-weather peak flows; and maintenance problems. Structural defects may result from deterioration of pipe construction material due to age; material corrosion (internal or external); poor construction (bedding, compaction, loading, etc.); excessive external loads (hydrostatic head, dead loads, tree roots, and live loads); and internal hydraulic load. Maintenance problems are predominantly associated with the accumulation of fats, oils, and grease (FOG) and other debris into the sewer system and root intrusion from vegetation around the sewer.

Sewer system rehabilitation measures within the DeKalb County WCTS will be identified and prioritized based on several factors including their potential to advance the objectives of the Consent Decree (elimination of SSOs), cost effectiveness of various rehabilitation measures or combinations thereof, and the assessed risk associated with various defects or system conditions [consequence (impact) and likelihood (condition) of failure].

As indicated in the DWM Criteria for Identifying and Prioritizing Rehabilitation Measures within the Initial and Additional Priority Areas, certain defects will be scheduled for rehabilitation immediately upon their discovery during the sewer system condition assessment. Such defects will include those that pose danger to humans, animals, and/or the environment; those determined to be contributing to the occurrence of SSO, based on their severity; and those that are determined to have the potential to pose danger to humans, animals, and/or the environments and/or have a great potential to cause SSOs if left unattended. The determination as to whether a defect should be scheduled for rehabilitation will be made based on professional judgment and experience.

To ensure consistency in data collection, defect analysis, and identification and prioritization of effective rehabilitation measures, DWM has adopted methods consistent with the standards established by the NASSCO MACP, PACP, and LACP.

2. Applying the NASSCO Standards
   a. The MACP, PACP, and LACP were developed by NASSCO to provide a means of providing a reliable mechanism to evaluate and describe pipe conditions.
   b. The DWM considers consistency as of paramount importance in the data gathering, data evaluation and analysis, and identification of rehabilitation measures processes. Field crews will be required to look closely at all defects and document visual observations clearly. Designers and engineers will evaluate and analyze data based on adopted consistent standards ensuring that rehabilitation measures selected and implemented achieve the desired results consistently throughout the implementation of the Priority Areas Sewer Assessment and Rehabilitation Program (PASARP) and beyond. The MACP, PACP, and LACP allow for consistency of documentation and a repeatable process for evaluation. In this way, a long-term approach to sewer system rehabilitation will be undertaken rather than simply reacting when problems arise.
   c. The objectives of the MACP, PACP, and LACP coding are to define attributes and features of structures; document and explain defects; develop ratings for each applicable component of a manhole, pipe segment, or service lateral [structural rating, operations and maintenance (O&M) rating, I/I rating]; and record dimensional data that can be used for selecting rehabilitation measures. This standardized method for reporting the results of condition assessments ensures consistency, promotes cost efficiency, and avoids unnecessary rehabilitation work.
   d. Following the completion of condition assessment, the assessment data shall be reviewed by
GRAVITY SEWER LINE DEFECT ANALYSIS PROCEDURE

Date of Revision: December 17, 2012

NASSCO assessment certification and grading system.

Note: DWM has the option of evaluating other nationally recognized scoring systems that can convert defect codes as this program progresses.

3. Program Value Standards - Approach

a. Using the MACP, PACP, and LACP Code Matrix, each defect code will be assigned a condition grade of 1 to 5. Grades will be assigned based on potential for further deterioration, I & I contribution, or pipe failure. The MACP, PACP, and LACP define failure as when the manhole, pipeline, or lateral failure can no longer meet its design objectives. Grades will be assigned in two categories, Structural and O&M defects. Grades are as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Priority Guideline</th>
<th>General Grade Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Immediate Attention</td>
<td>Defects requiring immediate attention</td>
</tr>
<tr>
<td>4</td>
<td>Poor</td>
<td>Severe defects that will become Grade 5 in foreseeable future</td>
</tr>
<tr>
<td>3</td>
<td>Fair</td>
<td>Moderate defects that will continue to deteriorate</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
<td>Defects that have not begun to deteriorate</td>
</tr>
<tr>
<td>1</td>
<td>Excellent</td>
<td>Minor defects</td>
</tr>
</tbody>
</table>

b. The following general guidelines are provided in the MACP and PACP by totaling individual defects within a manhole or pipe segment to estimate the amount of the infrastructure’s remaining service life. The DWM will be guided by these guidelines in its identification and prioritization of rehabilitation measures. Prevailing local conditions will be a major factor.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Estimated PACP System Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Failure has occurred or is imminent</td>
</tr>
<tr>
<td>4</td>
<td>Failure likely in foreseeable future</td>
</tr>
<tr>
<td>3</td>
<td>Failure unlikely in near future</td>
</tr>
<tr>
<td>2</td>
<td>Minimal failure risk</td>
</tr>
<tr>
<td>1</td>
<td>Acceptable structural condition</td>
</tr>
</tbody>
</table>

END OF GUIDELINE
SMOKE TESTING SPECIFICATIONS, GUIDELINES AND PROCEDURES

The Department of Watershed Management (DWM) smoke testing program is designed to provide evidence of the presence of sewer system defects that have the potential to allow the entry of I/I and to confirm the locations of unauthorized connections from buildings, residences, and structures to the Wastewater Collection and Transmission System (WCTS).

Smoke testing is performed by placing a blower over a centrally located manhole and blowing non-toxic smoke-filled air through a sewer line. Smoke is created using either a smoke bomb or liquid smoke. The fans create a pressure differential that forces the smoke into the sewer at a pressure above atmospheric. The smoke under pressure fills the main line plus any lateral service connections. When the smoke fills the pipe and service connections, it then finds exit points (cracks, offset joints, unauthorized connections, etc.). It then navigates its way to the ground surface, buildings, residences, or structures revealing the evidence of sewer system defects and confirming locations of unauthorized connections.

After placing the blower and filling the lines with smoke, the field crews perform visual inspections of the area being tested and mark the locations where smoke is observed exiting the ground, buildings, residences, and/or structures. If smoke rises from the street or the ground, this is an indication of a potential entry point for surface water. Locations of smoke exit points are mapped using a global positioning system or conventional survey methods to aid in the analysis of sewer system condition assessment data.

Smoke testing is an efficient way to determine if buildings are properly connected to the wastewater collection and transmission system. It is normal for the smoke to rise from the plumbing vent stack of a building, residence, or structure which has a properly connected plumbing system. However, the entry of smoke into a building, residence, or structure, is an indication of a plumbing problem that could be allowing the entry of sewer gasses into the building, residence, or structure; posing a health hazard to humans and the environment.

Possible causes for smoke entering buildings, residences, and structures include the following:

- The vents connected to the building’s sewer lateral are inadequate, defective, or installed improperly.
- The traps under sinks, tubs, basins, showers, floor drains, etc., are dry, defective, installed improperly, or missing.
- The pipes, connections, and seals of the building’s sewer system are damaged, defective, have plugs missing, or are installed improperly.

For optimum results, smoke testing should be performed during periods of relatively dry weather conditions. Following a period of rain, two to three lines should be re-smoked as sample test lines to ensure ground conditions are dry enough to continue smoke testing. The results from the test are compared to the results of the original smoke test. Occasionally, after a rainfall event, fewer defects may be encountered than during dry weather because smoke is less
able to maneuver through moist soil conditions. If this is the case, smoke testing should be delayed further. If it were to begin raining during smoke testing, testing must be discontinued.

A public relations and notification program must be implemented to minimize public concerns raised by smoke testing. Such activities include the notification of residents, businesses, and institutions within the area to be smoke tested (through door hangers, door to door verbal notifications, etc.), publication of public notices in the newspaper, and daily communication with the fire, police, and emergency response departments. Special circumstances may necessitate the adjustment of smoke testing schedules to accommodate critical facilities such as hospitals and schools. Also, facilities may wish to have their own personnel present during testing so that testing may be stopped quickly if necessary.
ACTIVITY DESCRIPTION
Smoke testing is performed to gather evidence of the presence of sewer system defects that have the potential to allow the entry of I/I and to confirm the locations of unauthorized connections from buildings, residences, and structures to the WCTS. Smoke testing results are only reliable when the test is performed during periods of dry weather conditions, with relatively low to no wind, and when the soil moisture content is low to non-existent. Smoke testing results are documented with photographs, in writing, and GPS and conventional surveying.

ACTIVITY GOALS AND OBJECTIVES
The objective of smoke testing the County’s sewer system is to gather evidence of the presence of indirect sources of infiltration (such as broken sewer pipes, offset joints, and other sewer defects) and to confirm locations of direct inflow (such as connections from roof leaders, stairwells, yard drains, driveways, patios, area drains, foundation drains, broken or un-capped clean-outs, defective manholes, and abandoned building sewers).

SAFETY ANALYSIS - Specific to job site conditions

<table>
<thead>
<tr>
<th>Safety</th>
<th>Potential Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Program</td>
<td>Infectious Diseases</td>
</tr>
<tr>
<td>Protective Clothing and Equipment (Personal Protection Equipment)</td>
<td>Slip, Trip, and Fall</td>
</tr>
<tr>
<td>Gases and other Hazardous Atmospheres Analysis (Confined Space Entry)</td>
<td>Poisonous Snakes, Pests</td>
</tr>
<tr>
<td>Overhead Power Lines (Electrical Safety)</td>
<td>Confined Spaces (Confined Space Entry)</td>
</tr>
<tr>
<td>Underground Services Utilities Locations</td>
<td>Traffic</td>
</tr>
<tr>
<td>Traffic Safety Requirements (Traffic Safety)</td>
<td>Vehicle Operation</td>
</tr>
<tr>
<td></td>
<td>Mechanical Tools</td>
</tr>
<tr>
<td></td>
<td>Electrical Hazards (Electrical Safety)</td>
</tr>
<tr>
<td></td>
<td>Flooding and Inundation (Confined Space Entry)</td>
</tr>
<tr>
<td></td>
<td>Lifting</td>
</tr>
</tbody>
</table>

SMOKE TESTING CHECKLIST - Specific to job site conditions

SAFETY
| Traffic Cones                                   |
| Yellow Vests (for each crew member)             |
| Flashing Beam (mounted on the vehicle)          |
| Fire Extinguisher                               |
| Traffic Signs                                   |
| Arrow Bar/Board (for heavy traffic areas, only) |
| First-Aid Kit (fully stocked) and Safety Manual |
| Cellular Telephone/2-way Radio                  |
| Drinking Water and Disposable Cups              |
| Hand Cleaner – Alcohol, waterless, towel-less cleaner, paper towels |

CLERICAL
| Supply of Smoke Test Forms                      |
| Supply of Field Photo Forms                     |
| Supply of Smoke Test Notices (Letters and Door Hangers) |
### SMOKE TESTING PROCEDURE

**Date of Revision: December 17, 2012**

- Clipboards
- Scotch Tape
- Maps – Street and Sanitary Sewer
- Small Note Pads (for each crew member)
- Pencils and Pens (for each crew member)
- County ID and Vendor/Contractor Name Badges (for each crew member)
- Carpenter’s Aprons (for each crew member)
- Small white board and markers

#### WORKING

- Smoke Blowers
- Full Gas Cans for Smoke Blowers
- 2 Cycle Engine Oil
- 30 Weight Motor Oil
- Carburetor Cleaner/WD-40
- Extra Spark Plugs for Smoke Blowers
- Sand Bags (4-5 per vehicle) with 15’- 20’ Ropes
- Extra Rope
- Supply of Smoke Bombs or liquid smoke
- Lighters for Smoke Bombs
- 50’ or 100’ Measuring Tape
- J-Hook
- Pick
- Shovels
- Sledge Hammers
- Camera and supplies
- Probing rod
- Flashlights
- Measuring Wheels
- Marking Paint
- Pin Flags
- Tool Box with spark plug, wrench and large socket set with breaker bar, bucket for used bombs
## SMOKE TESTING SPECIFICATIONS

### ACTIVITY/SUBTASK

### PRE-WORK ACTIVITIES

1. **Public Notification:** Residents, institutions, and businesses in the area to be smoke tested shall be notified prior to initiation of smoke testing. Various methods shall be used to notify residents and businesses including door hangars, signs, and verbal discussions where feasible. Notifications will be performed as follows:

   a. Crews shall distribute pre-approved advance notice flyers forty eight (48) to seventy two (72) hours before smoke testing. If smoke testing is delayed, crews shall re-distribute flyers forty eight (48) to seventy two (72) hours prior to the rescheduled time of smoke testing. The flyer shall contain the following information at a minimum:

      - The reason for the testing.
      - The date of testing.
      - The location and area affected by the testing.
      - The time of the testing.
      - The contractor’s name.
      - Contact telephone/County representative for further information

   b. Twenty-four (24) hours prior to the test, crews shall notify the Dispatch, Fire and Police Departments closest to the area to be tested.

   c. Crews shall identify a contact person at the appropriate Police Department and notify them daily as to the area, start time, and ending time of the smoke test.

   d. The Fire Department shall be notified about the exact locations where the tests would be performed; the specific time frames when the tests would be performed; the date/time when flyers were distributed to residents, businesses, and institutions; and that Right-of-Way signs, as described below, are in position.

   e. Two (2) hours prior to the test, crews shall make personal contact with a responsible person at schools, hospitals, nursing homes, and all other institution/public facilities in the immediate area of the smoke testing.

   f. Crews shall keep a daily log of the distribution of the flyers and the Fire, Police, and institutional/public facilities contacts made with responsible persons noted.

   g. Crews shall place “Right-of-Way” signs in prominent locations where testing is planned twenty-four (24) hours in advance of commencing the tests. Signs shall be a minimum
<table>
<thead>
<tr>
<th>ACTIVITY/SUBTASK</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SMOKE TESTING SPECIFICATIONS</td>
<td></td>
</tr>
<tr>
<td>and/or photo documentation, testing shall cease until such time that weather conditions permit an accurate record of smoke testing results.</td>
<td></td>
</tr>
<tr>
<td>Any standing water indicates that additional drying out time is necessary. Drying time is affected by temperature and rainfall recurrence intervals. The Supervisor shall make the final determination as to when it is dry enough to continue smoke testing. Previously notified residents, businesses, and institutions shall be re-notified if smoke test date ranges have expired before completion.</td>
<td></td>
</tr>
<tr>
<td>4. Flow Control: Smoke testing shall normally be accomplished without the need for bypass pumping. Crews shall set up temporary plugs or flow barriers as required to contain an adequate volume of smoke within the section of sewer being tested. Crews shall coordinate with other DWM field staff if a line is to be plugged as part of the smoke test. Crews shall monitor the resulting surcharged sewer at the manhole upstream of the section of sewer being tested, or at another location if so directed by the Supervisor, and prevent overflow conditions from occurring by removing the flow barriers in a timely manner.</td>
<td></td>
</tr>
<tr>
<td>SITE PREPARATION</td>
<td></td>
</tr>
<tr>
<td>5. Review Work Order:</td>
<td></td>
</tr>
<tr>
<td>a. The Supervisor shall review Work Order with Smoke Testing Crew(s).</td>
<td></td>
</tr>
<tr>
<td>b. The Supervisor shall ensure that all necessary material and equipment have been gathered before leaving the yard.</td>
<td></td>
</tr>
<tr>
<td>c. Vehicle Operation Safety Procedures shall be followed at all times.</td>
<td></td>
</tr>
<tr>
<td>6. System Evacuation / Preparation: When crews open a manhole cover during the smoke testing procedures, prior to placing any smoke into the manhole – crews should check gas readings. If the gas readings are above a safe level, crews should evacuate the system with a blower to ensure that any collection of explosive gas and any odor that may be introduced into the homes and businesses have been dispersed prior to pressurizing the sewer with smoke. Evacuation is accomplished by removing the manhole covers of all manholes in the run, then placing a vacuum on the manhole where the blower is located, and/or blowing air into the manhole.</td>
<td></td>
</tr>
<tr>
<td>7. Site Security: The work site shall be secured by placing traffic control signs and safety devices at the boundary of the work site.</td>
<td></td>
</tr>
<tr>
<td>a. Traffic Safety Procedures shall be adhered to.</td>
<td></td>
</tr>
<tr>
<td>b. Safety vests, hardhats, safety glasses, and steel toe boots shall be donned.</td>
<td></td>
</tr>
<tr>
<td>c. One or more traffic lanes shall be isolated with flags, cones, traffic control signs, etc. where work is on the roads or immediately adjacent to roads.</td>
<td></td>
</tr>
<tr>
<td>d. Equipment shall be kept away from overhead power lines, otherwise, the corresponding utility shall be contacted to de-energize or shield the power lines before equipment is placed near the power lines.</td>
<td></td>
</tr>
<tr>
<td>e. The closest Fire Department shall be notified daily to stand by in case of emergencies.</td>
<td></td>
</tr>
</tbody>
</table>
### SMOKE TESTING SPECIFICATIONS

#### ACTIVITY/SUBTASK

#### 8. General Procedures:

a. Determine the location of the manhole on GIS the map. Use metal detection if manhole is not visible.

b. Check sewer main by removing manhole lids in the vicinity of the home/business until a free flowing manhole is found.

c. Lift the manhole cover using a hook. Drag the cover with the hook; avoid bending over and using hands whenever possible.

d. For heavier manholes, use a truck-mounted winch.

e. Follow OSHA Confined Space Entry Procedures after obtaining an entry permit (only if trained and certified)

f. Follow OSHA Personal Protection Equipment (PPE) Program.

g. DO NOT place your face near the manhole opening. Let the manhole 'breathe’' for 10 minutes before looking in.

h. DO NOT SMOKE near manholes regardless of whether the cover is on or off.

i. DO NOT STAND on a removed manhole cover.

j. USE IMPERVIOUS GLOVES when working with an open manhole.

k. USE DISPOSABLE TYVEK COVERALLS to keep sewage off of your clothes.

l. Ensure proper operation of blower.

m. Isolate sections if necessary with sandbags, baffles, or other approved method.

n. Set up blower over an open manhole on the sewer segment to be inspected.

#### 9. Start the smoke testing procedure:

a. Review Work Order with details on area (including linear feet and pipe size of sewer mains and laterals) identified for smoke testing.

b. Start the blower and force air into the line at least 5-10 minutes prior to setting off the smoke bombs.

c. Stand upwind of the smoke to avoid breathing the smoke.

d. Light one or more smoke bombs or canisters and lower into the sewer segment to be inspected or use the liquid smoke.
### SMOKE TESTING SPECIFICATIONS

<table>
<thead>
<tr>
<th>ACTIVITY/SUBTASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>generation for a minimum of nine (9) minutes.</td>
</tr>
<tr>
<td>g. Up to three (3) main segments but no more than nine hundred (900) feet of sewer main may be tested at one time. Main sections shall be adequately isolated if necessary by using sandbags, baffles, or other methods approved by the Supervisor.</td>
</tr>
<tr>
<td>h. Smoke emanating from vents on building or adjacent manholes will determine the extent of successful smoke testing.</td>
</tr>
<tr>
<td>i. Only clearly visible, dense smoke will qualify the sewer main tested for acceptance.</td>
</tr>
<tr>
<td>j. The perimeter of each residence or commercial building shall be inspected for sources of smoke. If inaccessible during testing, inspection will be noted for rescheduling at a later date. The inspection shall include yard drains, catch basins, etc. that might be connected to the sewer system. The roofs of each building shall be visually inspected for evidence of roof drains connected to sanitary drains.</td>
</tr>
<tr>
<td>k. Each smoke leak shall be documented as a defect, catalogued, and marked with a flag and a clearly visible paint mark made with non-permanent paint mark on public ground surfaces only. Flags only should be utilized on private property.</td>
</tr>
<tr>
<td>l. Excess smoke emitting from the blower can cause a traffic hazard and can obscure the field of view for nearby traffic. Smoke testing may need to be halted until sewer lines can be cleaned or testing can be performed at low flow periods of the day.</td>
</tr>
</tbody>
</table>

10. Observe and record evidence of smoke escaping from the sewer through leaks, breaks, and other I/I sources:

   a. Walk the surrounding area to visually detect sources of smoke emissions.
   b. Record the smoke testing results and document each defect with photographs labeled with date, time, and location. [Refer to Attachment A (Smoke Testing Form and Instructions)]
   c. Code enforcement will be notified of any private property defect and the property owner will be given a notice letter.
   d. Visually inspect manholes suspected of having direct inflow connections into sanitary sewers.
   e. Identify direct inflow connections to sewers and interconnections between sanitary and storm sewer systems.
   f. Survey all smoke exit points with a global positioning system (GPS) or conventional survey methods if GPS survey is not feasible.

11. **Confined Space Entry:** Crews shall minimize the physical entry of personnel into the sewer facilities. If required, manhole entry shall be performed in accordance with Federal state, and local laws, regulations, policies, requirements, and standards especially those promulgated by OSHA. Only trained crews and staff should conduct confined space entry after obtaining an entry permit. Staff must use safety equipment required for manhole entry operations, including harnesses, ventilation equipment, etc.
## SMOKE TESTING SPECIFICATIONS

### ACTIVITY/SUBTASK

<table>
<thead>
<tr>
<th>ACTIVITY/SUBTASK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>12. Safe Work Area:</strong> The work area shall be protected at all times by means of an adequate number of cones, barricades, flags, flaggers, and other measures necessary to meet Manual for Uniform Traffic Control Devices (MUTCD) standards to properly and safely protect both vehicular and pedestrian traffic. Flag men shall work to secure all affected streets. Further requirements for traffic control may be imposed by the specific agency having jurisdiction. All traffic control measures shall comply with the requirements of MUTCD, Part 6 – Temporary Traffic Control, Latest Edition as published by US DOT / FHWA.</td>
</tr>
<tr>
<td><strong>13. Unsafe Conditions:</strong> Any condition deemed to be an unsafe condition shall be immediately reported to the Supervisor. Unsafe conditions shall require all work to be stopped immediately and a Safety Officer shall inspect the site.</td>
</tr>
<tr>
<td><strong>14. Scheduling Time:</strong> Crews shall begin testing after 8:00 am and terminate testing no later than 5:00 pm each day. County authorization should be obtained if work is to be performed outside of the designated hours. Work should be performed in timeframes that will allow compliance with the County’s noise ordinance.</td>
</tr>
</tbody>
</table>

### DOCUMENTATION

<table>
<thead>
<tr>
<th>DOCUMENTATION</th>
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</thead>
<tbody>
<tr>
<td><strong>15. Record Data:</strong> Crews shall record data on the Smoke Testing Report Form (Refer to Attachment A) and enter codes into the Smoke Testing database (using Microsoft Access).</td>
</tr>
<tr>
<td>a. Smoke testing data collected includes:</td>
</tr>
<tr>
<td>• Description of the smoke leak, including intensity of smoke code and amount [(i.e. equivalent gallons per minute (gpm)].</td>
</tr>
<tr>
<td>• Date and time of the test.</td>
</tr>
<tr>
<td>• Location, including reference to the relevant manhole (upstream and downstream manholes ID numbers) and the nearest street address.</td>
</tr>
<tr>
<td>• Area and type of surface drained at the location of the smoke leak.</td>
</tr>
<tr>
<td>• Weather conditions.</td>
</tr>
<tr>
<td>• Testing personnel.</td>
</tr>
<tr>
<td>• Digital color photographs of the results of each test.</td>
</tr>
<tr>
<td>• Defect source type.</td>
</tr>
<tr>
<td>b. Schematic Layout: Crews shall draft out a schematic layout of the manholes and sewer mains under testing including address and location, manhole ID numbers, photo number and direction taken, defect source type, accurate location of defect within the test area and type of surface drained. (Note geographical orientation relative to north)</td>
</tr>
</tbody>
</table>
carefully scrutinized to ensure that a conservative determination of public vs. private side defects is made. If on the private side, code enforcement will be notified and notice will be provided to the property owner.

16. Photographic Documentation:
   a. Crews must document each smoke leak or series of leaks using digital camera supplied by the Supervisor. Each photograph shall be referenced in the database by filename along with the location of the smoke leak.
   b. Photographs shall be taken to show the smoke leak as clearly visible in the foreground and a distinct fixed reference is visible in the background (such as a house).
   c. A placard shall be placed in the photo referencing the smoke leak number.
   d. A close up picture shall be taken to show a detailed view of the defect.
   e. Digital photographs shall be horizontally oriented (4x6 inch) in Report.
   f. The digital photographs shall incorporate references including the date the photograph was taken. Each picture shall have clearly annotated text that shall follow this naming convention: [LandLot][ManholeID][PhotoIncrementalNumber].jpg

WORK SITE BREAK DOWN
17. Break down work site and report the work completed:
   a. Remove tools, sandbags, plugs and any other materials.
   b. Replace manhole cover by dragging it with the hook.
   c. When manhole cover is in place, remove Tyvek coveralls and place in garbage bag for disposal. Wash down and disinfect outside of boots. Remove gloves.
   d. Complete clean up of work site and any sewage spills in the work site. Disinfect and sanitize area affected by sewage contamination if any.
   e. Clean equipment and place in truck.
   f. Complete /fill out Work Order information. Record linear feet of sewer line inspected and document all photographs and videos.
# SMOKE TESTING

**Project No.:**

**Sub-Basin No.:**

## Line Segment:

<table>
<thead>
<tr>
<th>Upstream</th>
<th>To</th>
<th>Downstream</th>
</tr>
</thead>
</table>

### Weather Conditions:

- **Pipe Length (ft):**
- **Pipe Diameter (in):**

### Ground Conditions:

1. **1** = dry, **2** = moist, **3** = wet, **4** = saturated

### Precipitation:

1. **1** = dry, **2** = drizzle, **3** = rain

### Last Rain Event:

| Date: | / | / |

### Status Code:

- **1** = C.N.L.  
- **2** = D.N.E.  
- **3** = Shored  
- **4** = Complete

### Measure Code:

- **1** = Served From Map  
- **2** = Walking Wheel  
- **3** = Tape Measure

## PART A: PRIVATE SECTOR

<table>
<thead>
<tr>
<th>Defect No.</th>
<th>Defect Type</th>
<th>Address</th>
<th>Offset</th>
<th>Tributary Area (sq ft)</th>
<th>Smoke Intensity</th>
<th>Photo ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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</tbody>
</table>

### Defect Type:

1. **1** = Downspout  
2. **2** = Uncapped Cleanout  
3. **3** = Driveway Drain

### Smoke Intensity:

- **1** = Light  
- **2** = Medium  
- **3** = Heavy

## PART B: PUBLIC SECTOR

<table>
<thead>
<tr>
<th>Defect No.</th>
<th>Defect Type</th>
<th>Offset (L/R)</th>
<th>Tributary Area (sq ft)</th>
<th>Photo ID</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
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</tbody>
</table>

### Defect Type:

1. **1** = Catch Basin  
2. **2** = Manhole Defect  
3. **3** = Line Defect

### Smoke Intensity:

- **1** = Light  
- **2** = Medium  
- **3** = Heavy

Additional Comments:
INSTRUCTION FOR COMPLETING THE SMOKE TESTING FORM

Note: Include the Smoke Diagram Form for documenting the defects encountered during smoke testing including locations with reference to permanent structures in the area.

The smoke testing form is divided into three (3) separate sections. The top portion of the form includes general information about the inspection including the date, sewer line being tested, and weather conditions. The middle section provides specific information about private sector defects located during smoke testing. Private sector defects found during building inspections can be cross-referenced with private sector smoke defects. Finally, the bottom portion of the form provides specific information about public sector defects detected during smoke testing. Included in the public sector portion of the sheet is a section that cross-references smoke defects with dye test results.

The top portion of the Smoke Testing Form:

---

**Date**: Enter the date on which the smoke test was completed.

**Crew**: Enter the initials of the smoke test crew, beginning with the crew leader.

**Crew No.**: Enter the crew number.

**City of**: Enter the City where the smoke test is being conducted.

**Work Order No.**: Enter the Work Order Number.

**Line Segment**: Enter the upstream sewershed number in the parentheses and the upstream manhole number on the first line. Enter the downstream sewershed number in the...
parentheses and the downstream manhole number on the next line. Manhole numbers shall have the same convention as the Manhole Inspection Form.

Weather Conditions: Enter the code that describes the current temperature.

Ground Conditions: Enter the current ground conditions.

Precipitation: Enter current weather conditions.
Last Rain Event: Enter the estimated date of the last measurable rain event in the area, generally greater than 0.25”.

Pipe Length: Enter the length of the pipe as measured on the ground from the upstream manhole to the downstream manhole. Measurement is normally recorded using a measuring wheel. It is approximate.

Pipe Diameter: Enter the inside diameter of the pipe.

Status Code: Enter the number code that describes the status of the line and/or manhole being smoke tested.
1 = C.N.L.: Cannot Locate
2 = D.N.E.: Does Not Exist
3 = Buried
4 = Line too long
5 = Diameter too large
6 = Complete

Measure Code: Enter the number code that describes the method used to measure the pipe length.
1 = Scaled from Map
2 = Walking Wheel
3 = Tape Measure
4 = Survey
5 = Estimated
### PART A: PRIVATE SECTOR

**Bldg. Defect No.:** Enter the building defect number that corresponds with the defect located during smoke testing. Omit filling out this section in the field. Wait till the results can be crossed referenced with the Building Inspection record.

**Address:** Enter the street address of the property where the smoke defect was located.

**Defect Type (DT):** Enter the code number that corresponds with the type of private sector defect located.

<table>
<thead>
<tr>
<th>DT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Downspout</td>
</tr>
<tr>
<td>2</td>
<td>Uncapped Cleanout</td>
</tr>
<tr>
<td>3</td>
<td>Driveway Drain</td>
</tr>
<tr>
<td>4</td>
<td>Stairwell Drain</td>
</tr>
<tr>
<td>5</td>
<td>Foundation Drain</td>
</tr>
<tr>
<td>6</td>
<td>Area Drain</td>
</tr>
<tr>
<td>7</td>
<td>Service Lateral</td>
</tr>
<tr>
<td>8</td>
<td>Window Well</td>
</tr>
<tr>
<td>9</td>
<td>Plumbing Defect</td>
</tr>
</tbody>
</table>

**Optional:**

**Footage:** Enter the distance measured from the downstream manhole to the defect located (and flagged).

**Offset (L/ R):** Direction (left or right) of the defect from the downstream manhole, looking upstream.

**Offset Footage:** The perpendicular distance from the defect to the sewer line.
Tributary Area (TA): Estimated area draining to the defect.

Smoke Intensity (SI): Enter the code number that best describes the intensity of smoke coming from the defect.

Comments: Write any comments about the manholes or the sewer line being smoke tested.

The bottom portion of the Smoke Testing Form:

<table>
<thead>
<tr>
<th>Defect Type</th>
<th>Smoke Intensity</th>
<th>Tributary Area (sq. ft.)</th>
<th>Smoke Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
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</tr>
</tbody>
</table>

PART B: PUBLIC SECTOR

Defect Type (DT): Enter the code number that corresponds with the type of public sector defect located.

1 = Curb Inlet
2 = Area Drain
3 = Line Defect
4 = Indirect Storm
5 = Manhole Defect (always write as upstream defects)
6 = Drainage Crossing
7 = Water Valve
8 = Direct Storm

Optional:

Footage: Enter the distance measured from the downstream manhole to the defect located (and flagged).

Offset (L/ R): Direction (left or right) of the defect from the downstream manhole, looking upstream.
Offset Footage: The perpendicular distance from the defect to the sewer line.

Tributary Area (TA): Estimated area draining to the defect.

Smoke Intensity (SI): Enter the code number that best describes the intensity of smoke emanating from the defect.

Comments: Write any comments about the manholes or the sewer line being smoke tested.

Additional Comments: Write any general comments about the manholes or the sewer line being smoke tested.

Smoke Test Diagram: Field sketches of all observed sources must be drawn on the Smoke Test Diagram form showing adjacent streets, location and distance of defect with respect to the upstream or downstream manholes, and measured distances from permanent structures to facilitate easier future identification of the source. The field sketch should be drawn such that the top of the page is always north.

Smoke Photo: All observed defects must be photographed, whether by Polaroid cameras, 35mm cameras, digital cameras, or another device that can capture a permanent record of the location of the defect and the intensity of smoke so that it may be traced back at a later time for follow-up rehabilitation. Photographs must show smoke coming from the defect and a permanent landmark such as a building, tree or power pole for reference. Each Polaroid photograph shall be labeled with the line ID smoke defect number, street address, if known, smoke intensity, type of defect, and estimated drainage area to the defect. Photographs shall be mounted on the Smoke Photo Form labeled with the corresponding sewer line segment. When using a 35mm or digital cameras, a log sheet must be created to track all photographs taken. All data required for Polaroid shall also be included on the log sheet in addition to the photograph and film roll number.
# IMPORTANT NOTICE

**DeKalb County Department of Watershed Management**

## Notice of Smoke Testing Work

DeKalb County Department of Watershed Management will soon begin Smoke Testing in your neighborhood. Information collected during Smoke Testing will be used to improve and repair the wastewater collection system. The Department of Watershed Management has contracted with “Contractor’s Name” to perform this work.

- Smoke testing is a way of finding defects or improper connections in sewer lines. The smoke is forced into the line and comes out of cracks, holes, and other defects in the sewer system.
- **It is normal to see smoke exit the vent stacks on your home or building.** Smoke can enter the home through defects that may exist in your home’s plumbing. If smoke comes out of the gutter, you may have an illegal cross connection. Call your plumber if smoke is detected inside your home. **Remember: The smoke is non-toxic, creates no fire hazard, and will not harm children, pets, or plants.** Persons with severe asthma should avoid breathing any smoke to avoid irritation.

**Upon receiving this notice, please run or pour water in all drains that are not often used such as garage/basement floor drains.**

Material Safety Data Sheet (MSDS) for smoke agent is available through the contacts below.

We appreciate your cooperation. This testing is an important “tool” used in the evaluation of sanitary sewer lines and will result in substantial savings to DeKalb County and its ratepayers. Should you have any questions regarding the smoke testing, please contact “contact person” at “Contact’s phone number” or contact’s 2nd phone number.”
Attachment C – Sample Letter

Date

TO WHOM IT MAY CONCERN

This letter is to notify you that the DeKalb County Department of Watershed Management and its contractors will be working on the sanitary sewer system in your area. DeKalb County is in the process of investigating sewers and manholes in order to identify repairs that are needed to improve the performance of the sewers and to eliminate sanitary sewer overflows. In the next several months, some residents will notice smoke coming from their sanitary sewers. This is part of a testing program to find leaks and unauthorized connections into the sewer system. The non-toxic, odorless smoke is blown into sewer manholes in the street, goes through the pipes, and comes out where there are broken pipes and where roof downspouts, outside area drains, or foundation drains are connected to the sanitary sewers.

The smoke testing program and necessary repairs of sewer pipes are part of the County’s multi-million dollar planned investment over the next seven (7) years to repair sewer pipes and to make improvements to the overall sewer system. This investment is in addition to regular operations; maintenance, and routine capital projects and is the beginning of a major investment in the aging infrastructure. This investment by ratepayers is not funded by taxes but rather is funded by the rates paid for sewer service on the utility bill.

Work will begin in your area in the next few weeks. Smoke testing teams typically have one (1) to four (4) people. Their trucks will have the DeKalb County logo or DeKalb County’s contractor logo displayed on the door panels for easy identification. In addition, each inspector will be wearing an identification badge. Their work will occur during the day from 8:00 A.M. – 5:00 P.M. Monday through Friday.

During the process of smoke testing, it is normal for smoke to come out of your roof vents. The smoke is not harmful, and should not enter buildings unless there are leaks or defects in your plumbing which could be allowing harmful sewer gases into your house or building.

In order to help keep smoke from entering your building, please pour 24 ounces of water into your basement floor drains and all drains in sinks, bathtubs, showers. If smoke enters your building, the room can be easily ventilated through an open window or door. Let the field technician outside know there is smoke or call Name and Number.

If you are disabled, have respiratory problems, or are aware of any shut-ins, please call our office. If you have questions or concerns, please contact us at:

DeKalb County, Department of Watershed Management

**Phone Number** 7:00 am to 5:30 pm weekdays

**Phone Number** after hours

[www.dekalbcounty.gov](http://www.dekalbcounty.gov)

Sincerely,

Name,

Collection System Supervisor
APPENDIX 4

REHABILITATION SPECIFICATIONS

A. Jacking and Boring
B. Lining with Cured-In-Place Pipe
C. Lining with Ultra Violet Light Fiberglass Cured-in-Place-Pipe
D. Cured-In-Place-Pipe for Lateral Renewal
E. Internal Point Repairs with CIPP
F. Sewer Lateral Reconnection and Replacement
G. Gravity Flow Sanitary Sewers
H. Wastewater Flow Control
   I. Manhole Height Adjustment
   J. Manhole Frame and Cover Installation
   K. Manhole Frame Sealing
   L. Precast Concrete Manholes
M. Testing for Acceptance of Sanitary Sewers
N. Point Repairs to Sanitary Sewer and Service Laterals
O. Sanitary Sewer Manhole Rehabilitation
P. Pipe Bursting
Q. Rehabilitation of Concrete and Masonry Structures with a Protective Coating
A. Jacking and Boring
A. Jacking and Boring
SECTION 02446 – JACKING AND BORING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section of the specifications provides for furnishing all labor, equipment, and materials required for the jacking and boring of casing pipe under roadways, railways, highways and/or other locations as required. This section also includes provisions for uncased boring/free boring as indicated.

1.2 RELATED SECTIONS

A. Section 02205 – Dewatering
B. Section 02315 – Excavation and Backfill for Structures
C. Section 02537 – Ductile Iron Sanitary Sewer Pipe Fittings

1.3 REFERENCES

A. ASTM A36 - Standard Specification for Carbon Structural Steel
C. ANSI/ASSE A10.16-2009 - Safety Requirements for Tunnels, Shafts, and Caissons
D. American Welding Society (AWS)
E. American Water Works Association (AWWA)
F. OSHA 29CFR 1926 - Safety and Health Regulations for Construction
G. Georgia Department of Transportation (GDOT) Standards Specifications Construction of Transportation Systems
H. SSPC SP-10 - Near-White Metal Blast Cleaning

1.4 OVERVIEW

A. The Contractor shall be held fully responsible for protecting against surface subsidence, damage, or disturbance to adjacent property and facilities from his/her construction methods. In case loose material is encountered and cave-ins occur or are anticipated, all jacking/auguring shall be discontinued, shoring shall be provided and all voids filled either by pressure grouting or other methods all of which shall be approved by the County Engineer before jacking/auguring is continued. Any settlement or upheaval of the existing roadway pavements during and up to the date of final acceptance and throughout the warranty period shall be corrected at the Contractor’s expense.
B. All jacking/auguring operations must be performed in compliance with the rules and regulations of the County, the State of Georgia Department of Transportation (GDOT), or other authorities having jurisdiction.

1.5 WORK INCLUDED

A. The Contractor shall, under this item, furnish all material, labor, tools, and equipment necessary for and shall install uncased boring, jacked casing, and casing/open cut as may be required.

B. In general, the Work shall include steel pipe casing, skids, excavation, backfill, restoration of site, sheeting, grout, brick work, earth augers, jacking machine and all labor, tools, material, and accessories to complete the Work as specified, indicated or required.

1.6 QUALIFICATIONS

A. Boring and jacking casings is deemed to be specialty contractor work. If the Contractor elects to perform the work, the Contractor shall provide evidence of experience to the County Engineer. A minimum of five (5) continuous years of experience in boring and jacking casing construction is required of the casing installer. Evidence of this experience shall be provided with the shop drawings for review by the County Engineer.

B. The filling of the void between the casing wall and carrier pipe is deemed to be specialty contractor work. If the Contractor elects to perform this work, the Contractor shall provide evidence of at least five years of experience and at least 12 similar installations.

C. The Contractor shall submit evidence to the County Engineer that manufacturers have consistently produced products of satisfactory quality and performance over a period of at least two (2) years.

1.7 SUBMITTALS

A. The Contractor shall submit for approval by the County and GDOT, all working drawings and schedules of procedure proposed to follow in the prosecution of the Work under this item.

B. Working drawings shall show in detail the size and location of jacking pits together with all sheeting and shoring to be used in supporting embankments, trench walls, and all other structural details together with large scale plan and profile of the proposed jacked installation and affected structures.

C. Where pipe is installed by jacking, the Contractor shall furnish for the County Engineer’s review, a plan showing his proposed method of handling, including the design for the jacking head, jacking support or back stop, arrangement and position of jacks, pipe guides, etc., complete in assembled position. The review of this plan by the County Engineer will not relieve the Contractor from his responsibility to obtain the specified results.

D. Schedules shall set forth the sequence of the various operations together with the time the Contractor proposes to begin and complete the several phases of the Work.
E. Evidence of qualifications and experience required in Section 1.6 - Qualifications shall be submitted to the County Engineer.

F. Material Submittals: the Contractor shall provide shop drawings and other pertinent specifications and product data as follows:

1. Shop drawings for casing pipe showing sizes and connection details.
2. Design mixes for concrete and grout.
3. Casing spacers.

G. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the County Engineer.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.
10. Disposals: Type and quantity of debris (including liquids).

1.8 STORAGE AND PROTECTION

A. All materials shall be stored and protected in accordance with the manufacturer’s recommendations and as approved by the County Engineer.

1.9 MEASUREMENT AND PAYMENT

A. Measurement for jacking and boring for sanitary sewers is on a linear foot basis, complete in place including carrier pipe, casing pipe, grout, jacking and boring, and testing. Payment shall be full compensation for furnishing all labor, tools, equipment, materials, and incidentals necessary to complete sanitary sewer installation by jacking and boring. Payment shall be made under: Jacking and Boring, Steel Casing (size), Pipe Diameter (size), per linear foot.
B. Measurement for uncased boring/free boring for sanitary sewers is on a linear foot basis. Payment shall be full compensation for furnishing all labor, tools, equipment, materials, and incidentals necessary to complete sanitary sewer installation by uncased boring/free boring. Payment shall be made under: Uncased boring/free boring, Pipe Diameter (size), per linear foot.

C. The cost for providing flagging protection, watchmen, or any work necessary to keep railroad tracks safe will be considered incidental to the Work and shall be included in the Contractor’s unit prices bid for jacking and boring.

1.10 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.11 GENERAL SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.
B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 - PRODUCTS

2.1 CARRIER PIPE

A. The carrier pipe shall be ductile iron pipe meeting the requirements of Section 02537, Ductile Iron Sanitary Sewer Pipe and Fittings.

2.2 CASING PIPE

A. The casing shall be new and unused pipe. The casing shall be made from steel plate having minimum yield strength of 35,000 psi. The steel plate shall also meet the chemical requirements of ASTM A36.

B. The outside of the casing pipe shall be coated with coal tar epoxy having a minimum dry film thickness of sixteen (16) mils. Surface preparation shall be SSPC-SP-10. Epoxy shall have a minimum solids content of sixty-five (65) percent by volume and shall be air or airless spray applied; minimum drying time shall be seven days. Brushing shall be permitted in small areas only. All coating and recoating shall be done in strict accordance with the manufacturer’s recommendations. Epoxy shall be Tnemec, Carboline, or Valspar.

C. The thicknesses of casings shown below are minimum thicknesses. Actual thicknesses shall be determined by the casing installer, based on its evaluation of the required forces to be exerted on the casing when jacking. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to the County.

D. The minimum diameters of casings are shown below. Larger casings, with the County Engineer’s approval, may be provided at no additional cost to the County, for whatever reasons the Contractor may decide, whether casing size availability, line and grade tolerances, soil conditions, etc.

E. Casing Sizes:

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<thead>
<tr>
<th>Pipe Diameter (inches)</th>
<th>Casing Diameter (inches)</th>
<th>Wall Thickness (inches)</th>
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### UNDER HIGHWAYS

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<th>Wall Thickness (inches)</th>
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F. Casing Spacers: Casing spacers shall meet one of the following requirements:

1. Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch thick also having a hardness of eighty-five (85) to ninety (90) durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing. Casing spacers shall be as manufactured by Cascade Waterworks Manufacturing Company or Advanced Products & Systems, Inc.

2. Casing spacers shall be a two-section, flanged, bolt-on style constructed of heat fused PVC coated steel, minimum fourteen (14) gauge band and ten (10) gauge risers, with two (2) inch wide glass reinforced polyester insulating skids, heavy duty PVC inner liner, minimum 0.09-inch thick having a hardness of eighty-five (85) to ninety (90) durometer, and all stainless steel or cadmium plated hardware shall be as manufactured by Pipeline Seal and Insulator, Inc.

G. Grout: Grout may be used for filling the void between the casing pipe and the carrier pipe. Cement shall conform to the requirements of ASTM C 150, Type I or Type II. Grout shall have a minimum compressive strength of 100 psi attained within twenty-four (24) hours.

H. Surface Settlement Markers: Surface settlement markers within pavement areas shall be P.K. nails. Surface settlement markers within non-paved areas shall be wooden hubs.

### 2.3 EQUIPMENT

A. A cutting head shall be attached to a continuous auger mounted inside the casing pipe.
B. On casing pipe for gravity sewers over sixty (60) feet in length, the installation equipment shall include a steering head and a grade indicator.

C. The steering head shall be controlled manually from the bore pit. The grade indicator shall consist of a water level attached to the casing which would indicate the elevation of the front end of the casing or some other means for grade indication approved by the County Engineer.

D. The steering head and grade indicator shall utilize a laser guidance system.

PART 3 - EXECUTION

3.1  GENERAL

A. The casing pipe shall be constructed to prevent leakage of substances from within the casing throughout its length.

B. The Contractor shall make arrangements with all governmental and other parties affected by the Work in sufficient time for each to take appropriate action to ensure successful and timely completion of boring and jacking operations. The Contractor shall pay all costs involved.

C. The Contractor shall accomplish the jacking and boring operations in accordance with all applicable requirements of owners of roads, railroads, utilities, and private property encountered in the Work.

D. Interpretation of the Geotechnical Data Report investigating the site of the Work and determination of the soil conditions at the site of the Work prior to bidding is the sole responsibility of the Contractor. Any subsurface investigation by the Bidder or Contractor must be approved by the appropriate authority having jurisdiction over the site of the Work.

E. Casing construction shall be performed so as not to interfere with, interrupt, or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. The Contractor shall support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages, and shafts stable. The Contractor shall be responsible for all settlement resulting from casing operations and shall repair and restore damaged property to its original or better condition at no cost to the County.

F. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing.

G. Casing Design: Design of the bore pit and required bearing to resist jacking forces is the responsibility of the Contractor. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing shown on the Plans are the minimum lengths required. The length of the casing may be extended for the convenience of the Contractor, at no additional cost of the County. Due to restrictive right-of-way and construction easements, casing lengths less than the nominal twenty (20) foot length may be necessary.
H. Highway Crossings:

1. The Contractor shall be held responsible and accountable for coordinating and scheduling all construction work within the highway right-of-way.

2. Work along or across the MARTA and GDOT right-of-way shall be subject to inspection and approved by MARTA and GDOT.

3. All installations shall be performed to leave free flows in drainage ditches, pipes, culverts, or other surface drainage facilities of the highway, street, or its connections.

4. No excavated material or equipment shall be placed on the pavement or shoulders of the roadway without the express approval of the GDOT and the County Engineer.

5. In no instance will the Contractor be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are placed on the right-of-way in advance of construction, shall be placed in such a manner as not to interfere with the safe operation of the roadway.

6. The Contractor shall be responsible for providing the County sufficient information to obtain a blasting permit in a timely manner.

I. MARTA/Railroad Crossings:

1. The Contractor shall secure permission from the railroad owner to schedule work so as not to interfere with the operation of the railroad.

2. Additional insurance is required for each railroad crossing. The Contractor shall furnish the railroad owner with such additional insurance as may be needed. Cost of the same shall be borne by the Contractor.

3. All work on the railroad right-of-way, including necessary support of tracks, safety of operations and other standard and incidental operation procedures may be under the supervision of the appropriate authorized representative of the railroad affected and any decisions of this representative pertaining to contraction and/or operations shall be final and construction must be governed by such decisions.

4. If, in the opinion of the railroad owner, it becomes necessary to provide flagging protection, watchmen, or the performance of any other work in order to keep the tracks safe for traffic, the Contractor shall coordinate such work and shall reimburse the railroad owner, in cash, for such services, in accordance with accounting procedures agreed on by the Contractor and the affected railroad owner before construction is started.

5. No blasting shall be permitted within the railroad right-of-way.
3.2 GROUNDWATER CONTROL

A. The Contractor shall control groundwater throughout the construction of the casing.

B. Methods of dewatering shall be at the option and responsibility of the Contractor. The Contractor shall maintain close observation to detect settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, the Contractor shall notify the County Engineer immediately and take such action as necessary to maintain safe conditions and prevent damage.

C. When water is encountered, the Contractor shall provide and maintain a dewatering system of sufficient capacity to remove water on a twenty-four (24) hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. The Contractor shall dewater into a sediment trap and comply with the requirements of Section 02205- Dewatering.

3.3 SAFETY

A. The Contractor shall provide all necessary bracing, bulkheads, and shields to ensure complete safety to all traffic, persons, and property at all times during the Work in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it.

B. The Contractor shall observe all applicable requirements of the regulations of the authorities having jurisdiction over the site of the Work. The Contractor shall conduct the operations in such a manner that Work will be performed below the level of the roadbed.

C. The Contractor shall perform all activities in accordance with the Occupational Safety and Health Act of 1970 (PL-596), as amended, applicable regulations of the Federal Government, OSHA 29CFR 1926, and applicable criteria of ANSI A10.16-81, “Safety Requirements for Construction of Tunnel Shafts and Caissons”.

3.4 SURFACE SETTLEMENT MONITORING

A. The Contractor shall provide surface settlement markers for casings twenty-four (24) inches in diameter and larger. The Contractor shall place markers as specified in these Specifications and as directed by the County Engineer. The Contractor shall place settlement markers outside of pavement area, along the centerline of the casing at twenty (20) foot intervals and offset ten (10) feet away from the centerline of the casing. Markers shall also be placed at each shoulder of the roadway, at each edge of pavement, at the centerline of the pavement, and at ten (10) and twenty-five (25) feet in each direction from the centerline of the casing. The Contractor shall tie settlement markers to benchmarks and indices sufficiently removed as not to be affected by the casing operations.

B. The Contractor shall make observations of surface settlement markers, placed as required herein, at regular time intervals acceptable to the County Engineer. In the event settlement or heave on any marker exceeds one (1) inch, the Contractor shall immediately cease work and using a method approved by the County Engineer and the authority having jurisdiction over the site of the Work, take immediate action to restore surface elevations to that existing prior to start of casing operations.
C. The Contractor shall take readings and permanently record surface elevations prior to start of dewatering operations and/or shaft excavation. The following schedule shall be used for obtaining and recording elevation readings: all settlement markers, once a week; all settlement markers within fifty (50) feet of the casing heading, at the beginning of each day; more frequently at the County Engineer’s direction if settlement is identified. The Contractor shall make all elevation measurements to the nearest 0.01 foot.

D. The Contractor shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by, and at the expense of, the Contractor.

E. The Contractor shall promptly report any settlement and horizontal movement immediately to the County Engineer and take immediate remedial action.

3.5 CASING INSTALLATION

A. Shaft:

1. The Contractor shall conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, the Contractor shall place the shaft on the downstream end of the bore.

2. The shaft shall be rectangular and excavated to the width and length required for ample working space. If necessary, the Contractor shall sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to site and soil conditions. The Contractor shall keep preparations dry during all operations. The Contractor shall perform pumping operations as necessary.

3. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, the Contractor shall excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base if directed by the County Engineer due to soil conditions.

B. Jacking Rails and Frame:

1. The Contractor shall set jacking rails to proper line and grade within the shaft. The Contractor shall secure rails in place to prevent settlement or movement during operation. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.

2. The Contractor shall place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.

3. The jacking frame shall be of the adequate design for the magnitude of the job. The Contractor shall apply thrust to the end of the pipe in such a manner to impart a uniformly balanced lead to the pipe barrel without damaging the joint ends of the pipe.
C. Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing, or wet boring.

D. The Contractor shall auger the hole and jack the casing through the soil simultaneously.

E. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.

F. The Contractor shall execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner so as to prevent any voids in the earth around the outside of the perimeter of the pipe. The Contractor shall make all investigations and determine if the soil conditions are such as to require the use of a shield.

G. As the casing is installed, the Contractor shall check the horizontal and vertical alignment frequently. The Contractor shall make corrections to continuing operation. For casing pipe installations over one-hundred (100) feet in length, the auger shall be removed and the alignment and grade checked at minimum intervals of sixty (60) feet.

H. Any casing pipe damaged in jacking operations shall be repaired, if approved by the County Engineer, or removed and replaced at Contractor’s own expense.

I. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire joint circumference, in accordance with the American Welding Society (AWS) recommended procedures. Prior to welding the joints, the Contractor shall ensure that both ends of the casing sections being welded are square.

J. The Contractor shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.

K. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.

L. Care shall be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.

M. The Contractor shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.

N. Adequate sheeting, shoring, and bracing for embankments, operating pits, and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring, and bracing shall be left in place, cut off, or removed, as designated by the County Engineer.

O. Trench excavation, all classes and types of excavation, the removal of rock, muck, debris, the excavation of all working pits and backfill shall be performed in accordance with the requirements of Section 02315, Excavation and Backfill for Structures and Section 02324, Trenching and Trench Backfilling.
P. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.

Q. Grout backfill shall be used for unused holes or abandoned pipes.

R. Any replacement of carrier pipe in an existing casing shall be considered a new installation, subject to the applicable requirements of these Specifications.

3.6 VENTILATION AND AIR QUALITY

A. The Contractor shall provide, operate, and maintain for the duration of casing project a ventilation system to meet safety and OSHA requirements.

3.7 ROCK EXCAVATION

A. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of the County Engineer, cannot be removed through the casing, the County Engineer may authorize the Contractor to complete the crossing by a method established in a change order.

3.8 INSTALLATION OF CARRIER PIPE

A. After the steel casing pipe has been installed, the ductile iron carrier pipe shall be installed in the casing pipe push-on joints. Care shall be exercises at all times to protect the coating and lining of the casing pipe and to maintain tight, full-seated joints in the carrier pipe. The carrier pipe shall be installed at the proper line and grade without any sags or high spots.

B. The carrier pipe shall be held concentric in the casing pipe by blocks spaced radially around the pipe and secured together so that they remain firmly in place. The spacing of such blocks longitudinally in the casing pipe shall not be greater than ten (10) feet.

C. The annular space between the casing and the carrier pipe shall be backfilled with sand or grout and plugged at each end of the casing pipe by an eight (8) inch thick masonry wall.

D. The pits or trenches excavated to facilitate jacking or boring operations shall be backfilled immediately after the installation of the carrier pipe has been completed.

3.9 UNCASED BORING / FREE BORE

A. When directed by the County, the Contractor shall use an earth auger machine to bore a controlled hole to the line and grade required and as necessary. Said hole shall be of a constant diameter which shall not exceed four (4) inches larger than the joint diameter of the pipe, and shall be maintained until the pipe is installed through the hole. If the annular space between the earthen hole and the pipe exceeds six (6) inches, then the Contractor shall fill such space either by pressure grouting or pumping in a flowable fill to eliminate possible settlement.

3.10 SHEETING REMOVAL

A. The Contractor shall remove sheeting used for shoring from the shaft and off the site of the Work. The removal of sheeting, shoring, and bracing shall be done in such a manner
as not to endanger or damage either new or existing structures, private or public properties, and also to avoid cave-ins or sliding in the banks.

3.11 INTERSTATE RESTORATION

A. When boring and jacking operations encroach upon the rights-of-way of the federal interstate system, the Contractor shall restore all screening trees with seedlings of like species.

3.12 CLEANUP

A. The Contractor shall remove and dispose of all debris and leave the site of the Work in a neat and orderly condition acceptable to the County Engineer. The debris is to be disposed of properly in accordance with all laws. The County can furnish a letter to the landfill stating that the contractor is authorized to dispose of non hazardous materials. Debris and liquids quantities are to be tracked in the daily contractor diary.

3.13 WARRANTY

A. The Contractor shall guarantee his work for a warranty period of one (1) year from the date of final acceptance.

B. Within the warranty period, the County may inspect the work, and if repairs are needed, the repairs shall be made on a case by case basis at no cost to the County. For the localized repairs, the warranty period shall be one additional year.

END OF SECTION
B. Lining with Cured-In-Place Pipe
SECTION 02500 – LINING WITH CURED-IN-PLACE PIPE

PART 1 - GENERAL

1.1 SECTION INCLUDES

This section of the specifications provides for the rehabilitation of a full length of an existing sewer main, from manhole to manhole, by the trenchless method known as Cured-In-Place Pipe (CIPP) lining. CIPP shall consist of the installation of a resin-impregnated flexible tube that is either inverted or pulled into the existing sewer main and expanded to fit tightly against the said main by the use of water or air pressure. The resin system shall then be cured /hardened by elevating the temperature of the fluid (water/air) used for the inflation to a sufficient enough level for the initiators in the resin to effect a reaction. The resultant shall be a hard, impermeable pipe within a pipe.

1.2 RELATED SECTIONS

A. Section 01510 - Sanitary Sewer Television-Sonar Inspection
B. Section 01520 - Sanitary Sewer Cleaning
C. Section 02600 - Wastewater Flow Control

1.3 REFERENCES

G. ASTM D2837 - 11 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
I. ASTM F1216 - 09 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
1.4 QUALIFICATIONS

A. The system proposed (material, methods, workmanship) must have been proven through previous successful installations to an extent and nature satisfactory to the County. Since CIPP is intend to have a fifty (50) year design life, only products deemed to have this performance standard will be accepted. All products and their licensed installer must be pre-approved by the County prior to the formal opening of proposals.

B. Products and Installers must meet all of the following criteria to be deemed commercially acceptable:

1. For a Product to be considered commercially proven it shall have been successfully in service in applications similar to this project for a minimum of five (5) years. Additionally, a minimum of 250,000 linear feet and 1,000 line sections must have successfully been installed in the USA. The Manufacturer (Licensor) shall have completed sufficiently enough testing to document that the material and the method(s) of installation proposed will produce the desired long-term performance.

2. For an Installer to be considered commercially proven, the Installer must have at least three (3) years active experience in the commercial installation of the CIPP liner. The Installer’s key personnel shall each have at least 100,000 linear feet and 300 line sections of successful experience in CIPP lining of gravity sewers.

3. The Installer shall demonstrate that they have a quality assurance program to standardize the materials, manufacture, wet out and installation of the specific CIPP product in place.

4. Documentation for products and installers seeking pre-approved status must be submitted to the County prior to the proposal due date to allow time for adequate consideration. The County will advise of acceptance (or rejection). The deadlines for submitting the proposal and for obtaining a response from the County will be specified in the bid documents. All required submittals must be satisfactory to the County.

1.5 SUBMITTALS

A. The Contractor shall submit details of the following comprehensive construction sequencing plan for approval prior to the beginning of the project that includes at minimum:
1. A proposed schedule.

2. Identification of all proposed access routes.

3. Identification of set-up locations for lining installation.

4. Bypass pumping plan in accordance with the requirements of the Section 02600 - Wastewater Flow Control.

5. Traffic Control Plan in accordance with GDOT requirements, where applicable.

6. Erosion Control Plan in accordance with the requirements of the Erosion and Sedimentation Control specifications section.

B. The Contractor shall submit the following items for product and installer approval:

1. Manufacturer’s certificate demonstrating that the materials to be used meet the referenced standards and the requirements of these specifications.

2. License or certificate verifying Manufacturer’s/Licensor’s approval of the installer.

3. Proposed equipment and procedures for accomplishing the cured-in-place pipe lining work.

4. Product data and Manufacturer’s installation procedures for resin and catalyst system.

C. The Contractor shall submit the following information during the project for approval of the use of CIPP at a particular location:

1. Field measurements.

2. Design wall thickness calculations, signed and sealed by a professional engineer registered in the state of Georgia who is also proficient in the design of CIPP systems.

3. Contractor’s procedures and materials for installation of the liner and renewal of sewer services including time and duration of sewer service unavailability.

4. Sampling procedures and locations for obtaining representative samples of the finished liner.

5. The Contractor shall submit, prior to the installation or use of any lining materials or equipment, certified test results from the manufacturers which indicate that all materials conform to the applicable requirements.

6. The Contractor shall submit test results of the resin proposed that meet the chemical resistance requirements of ASTM F2019. The chemical resistance tests
will be completed in accordance with Test Method ASTM D543 or the equivalent

7. Field sampling procedure shall be in accordance with ASTM F2019.

8. The Contractor shall submit Material Safety Data Sheets for all resins, and other additives such as accelerants, colorants, and lubricants utilized in the pipe liner/lining process.

D. The Contractor shall submit manufacturer information that describes the materials, curing speeds, recommended cure schedule, curing installation processes, installation pressures, temperature limitations, and recommended post curing documentation.

E. A final certificate of compliance with the requirements of this specification section shall be provided by the manufacturer for all lining materials furnished. Testing for compliance shall be performed by an independent laboratory in accordance with applicable ASTM standards and the manufacturer’s quality control program.

F. The Contractor shall complete a daily written record (diary) detailing the work performed and any small items which were incidental to the Work in the form of an email. The Contractor shall include the following information in his daily record:

1. Delays and causes of delays: Dense traffic, lack of information, sickness, labor, or equipment shortage, etc.

2. Weather conditions: Rain, sunny, windy, temperature, snow, etc.

3. Types of equipment on site: Specialty cleaning, by-pass equipment, etc.

4. Submittals: To the County Engineer (Project Manager).

5. Personnel on site: Name, labor category, specialty personnel, etc.

6. Accidents/injuries: Injuries, vehicle/equipment accidents, etc.

7. Incidents: Vehicle and equipment damage, damage to property, property owner complaint, etc.

8. Major defects encountered: Collapsed pipe, cave-ins, sink holes, etc.


10. Disposals: Type and quantity of debris (including liquids).

G. The County shall certify receipt of the daily record (in email format) noting any items and adding any observations with reference to claims for payment to the Contractor. The County Engineer may, at his/her discretion, for which the Contractor must receive direction in writing, provide weekly submission in the form of progress report.
H. As-built drawings including the identification of the work completed by the Contractor and the post-installation CCTV shall be submitted within 2 weeks after the project is completed.

1.6 EXPERIENCE

A. Manufacturer – see the above requirements in Section 1.4 – Qualification Requirements.

B. Installer - see the above requirements in Section 1.4 – Qualification Requirements.

C. The Contractor shall have a minimum of three (3) years of experience in installing cured-in-place pipe liner including safe work practices, etc.

D. The Contractor’s supervisor of the field crews shall have a minimum of three (3) years of experience in performing such assignments including safe work practices, etc.

E. Field crew leaders shall have the proper training in cured-in-place pipe liner installation and have a minimum of two (2) years of experience in performing such assignments including safe working practices, etc.

F. The Contractor shall submit written documentation (certification) that the supervisor, field crew leader, and all crewmembers responsible for these assignments have the proper training and the requisite experience.

G. No crewmembers of the Manufacturer, Installer, or Contractor shall enter confined spaces without the necessary certified training.

H. The required training and experience shall be documented in the Contractor’s bid submittal.

1.7 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for the delivery, storage, and handling of materials products. No materials or products shall be shipped to the Site of the Work without the approval of the County Engineer.

B. The Contractor shall keep products safe from damage. The Contractor shall promptly remove damaged products from the Site of the Work and replace damaged products with undamaged products acceptable to the County Engineer.

C. All materials shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the manufacturer. The liner wet-out report must be provided for liner material and resin type. The ratio of resin and fabric must be provided by the manufacturer. All damaged materials rejected by the County Engineer shall be promptly removed from the project site at the Contractor’s expense and disposed of in accordance with current applicable regulations.
1.8 MEASUREMENT AND PAYMENT

A. Payment for CIPP shall be made at the unit price bid. CIPP shall be measured by linear foot of sewer line from center of the upstream manhole to the center of the downstream manhole. Post television inspection shall be used to verify measurements. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, testing, field measurements, and equipment necessary to perform all work. Payment for CIPP shall be made under Pipe Rehabilitation, Cured-In-Place Pipe – Full Length, Pipe Diameter (size), Liner Thickness, per linear foot.

B. Payment for service lateral reinstatement shall be paid at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, testing, field measurements, and equipment necessary to perform all work associated with service lateral reinstatement. Payment for service lateral reinstatement shall be made under Pipe Rehabilitation, Cured-In-Place Pipe – Full Length, Remote or Man Entry Service Reinstatement, per each.

C. No separate measurement and payment will be made for television inspection when such inspection is associated with the installation of CIPP. The work and materials being considered as integral to and part of the CIPP unit bid prices.

D. No separate measurement and payment will be made for the cleaning of the sewer lines when such cleaning is associated with the installation of CIPP. The work and materials being considered as incidental to and part of the CIPP unit bid prices.

E. No separate measurement and payment will be made for wastewater flow control associated with the installation of cured-in-place pipe. The work and materials being considered as incidental to and part of CIPP unit prices. As discussed in Section 02600 – Wastewater flow control, the large diameter bypass (15” and greater) will be paid for separately if flow needs to be shut down for more than 24 hours to perform the rehabilitation.

F. Payment for a pre-liner, if call for in the plan or approved by the County Engineer, shall be made at the unit price bid. Pre-liners shall be measured by linear foot of sewer line from the center of the upstream manhole to the center of the downstream manhole. Payment for pre-liners shall be made under Pipe Rehabilitation, Pre-Liner for CIPP – Full Length, per linear foot.

1.9 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For
C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.10 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 - PRODUCTS

2.1 GENERAL

A. The thickness of each Liner installed shall be determined using calculation methods that are consistent with applicable ASTM standards. The Contractor shall submit stamped and signed designs prior to the installation of any Liner. The designs shall include a step by step calculation that shows all equations, defines all variables, lists all assumptions, and clearly indicates all values used for the design.

B. The Design Engineer shall set the long term (50 year extrapolated) Creep Retention Factor at 50% of the initial design flexural modulus as determined by ASTM D790 test method.

C. The cured in place pipe material (CIPP) shall conform to the structural properties as listed below or as recommended by the manufacturer.

1. MINIMUM PHYSICAL PROPERTIES
2. Wall Thickness: ASTM D2122 per ASTM F2019
3. Flexural Modulus of Elasticity ASTM D790 (short term): 250,000 psi
4. Flexural Strength ASTM D-790: 4,500 psi

D. The required structural CIPP wall thickness shall be based as a minimum on the physical properties indicated above, the Design Equations in the appendix of ASTM F1216, and the following design parameters:
   1. Design Safety Factor 2.0
   2. Creep Retention Factor 50%
   3. Ovality 2%
   4. Modulus of passive soil reaction 1000psi
   5. Groundwater Depth Assume at surface if not specified on the plans
   6. Soil Depth (above the crown) See Plan Set
   7. Poisson’s ratio of 0.3
   8. Live Load H-25 (Highway Loading)
   10. Pipe Condition Fully Deteriorated
   11. Minimum service life 50 years

E. The finished pipe liner in place shall be fabricated from materials which when complete are chemically resistant to and will withstand internal exposure to common domestic sewage having a pH range of 5 to 11 and temperatures up to 150°F.

F. Liner design may be based on material properties of the liner that exceed the minimum values specified in ASTM F1216. However, the initial flexural modulus used in structural design calculations shall not exceed 400,000 psi.

G. The minimum length shall be that deemed necessary by the Contractor to effectively span the distance between the outlet of the upgradient manhole to the inlet of the downgradient manhole of the sewer segment being rehabilitated, unless otherwise shown on the Plans, specified in these specifications, or directed by the County Engineer. The Contractor shall verify the lengths in the field before manufacturing.

H. Prior to design and manufacture of the liner, the Contractor shall obtain all the information needed for design, including, but not limited to, the condition of the host pipe, diameter, ovality, deflection, length of the host pipe, bury conditions, soil type, soil
loading factor and hydrostatic load, to ensure that the liner is designed for the specific field conditions.

I. The liner shall be designed for a minimum service life of 50 years.

J. The liner shall be structurally designed to meet the specific sewer segment’s field conditions with the following minimum conditions: earth load of 8.0 feet at the pipe invert; hydrostatic load at the pipe invert of 80% of the pipe’s depth or 8.0 feet (whichever is greater); fully deteriorated host pipe/direct bury condition; prism loading; soil loading of 125 pcf; factor of safety of 2.0; 2% ovality; maximum deflection of 5%; soil modulus of 1000 psi, maximum lining enhancement factor of 7; H-25 live loading; and 50% long-term modulus reduction factor. For brick sewers, use 2% ovality or the actual ovality measured in the field, whichever is greater.

2.2 CURED-IN-PLACE LINER

A. All cured-in-place lining products shall comply with the requirements of ASTM F-1216.

B. The flexible tube shall be fabricated to a size that when installed will neatly fit the internal circumference of the existing sanitary sewer lines (including services). Allowance shall be made for circumferential stretching during insertion so that the final cured product is snug against the wall of the host pipe.

C. Unless otherwise shown on the Plans, specified in these specifications, or directed by the County Engineer, the Contractor shall furnish a general purpose, unsaturated, polyester or vinyl ester resin and catalyst system compatible with the reconstruction inversion process that provides cured physical strengths specified in these specifications.

D. The resin to tube ratio, by volume, shall be furnished as recommended by the manufacturer.

E. The resin system shall not contain non-structural enhancing fillers of any kind. The Contractor shall submit for approval, by the County Engineer, the proposed resin system.

PART 3 - EXECUTION

3.1 PREPARATION

A. The following installation procedures shall be adhered to unless otherwise approved by the County Engineer:

1. The Contractor shall carry out all operations in accordance with all Federal, State, and local safety laws, regulations, standards, policies, and procedures including those promulgated by OSHA and those recommended by the manufacture. Particular attention is drawn to those safety requirements involving entering confined spaces (follow OSHA requirements) and steam curing. Curing with pressurized steam creates additional safety concerns with regard to high temperatures, quick burn times, potential blow offs, etcetera. The Contractor shall take additional precautions to secure the work area and insure the safety of everyone in or around the curing apparatus. Before utilizing this method, the
Contractor shall submit a copy of the Contractor’s standard operating procedures that address safety issues for this methodology to the County Engineer.

2. The Contractor shall remove all internal debris and clean the existing sewer line, to the satisfaction of the County Engineer, prior to the installation of the liner. (The debris is to be disposed of properly in accordance with all laws. The County can furnish a letter to the landfill stating that the contractor is authorized to dispose of the materials. Debris and liquids quantities are to be tracked in the daily contractor diary.) Moving material from manhole to manhole shall not be allowed. Cleaning and disposal of material shall be performed in conformance with the requirements of the Sanitary Sewer Cleaning section of these specifications.

3. Experienced personnel trained in locating conditions that would adversely affect the installation of a CIPP liner, such as pipe breaks, obstacles, dropped joints, protruding service connections, collapsed pipe and service connections, etc. by closed circuit television inspection shall perform inspection of existing sewer lines prior to the installation of the CIPP liner. Protruding service connections must be cut back to within ½”-1” of the sewer pipe wall before installing the CIPP. The interior of the pipe shall be inspected to determine the location of any conditions that may prevent proper installation of the CIPP liner. Such conditions shall be recorded and corrected before installation. A video recording and suitable log shall be kept for later reference by the County Engineer as specified in the Sanitary Sewer Television-Sonar Inspection section of these Specifications. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction prior to lining. Pre-lining point repairs will be paid for at the unit prices bid and must be pre approved by the County Engineer.

4. The Contractor shall bypass wastewater around the sewer segment or sewer segments designated for lining as specified in the Wastewater Flow Control section of these specifications. Service connection effluent may be plugged only after proper notification to the affected properties.

5. Do not install liner if ground water temperatures and/or ambient temperatures are excessive for the manufacturer’s recommended installation procedures.

B. Where practicable, liners may be installed in continuous runs through manholes where there are two or more continuous sewer segments, especially to connect several short segments with a continuous lining. If a road/lane must be closed to traffic, the Contractor shall furnish a detailed traffic control plan and all labor and equipment necessary. No separate payment will be made for traffic control. It is an incidental part for CIPP installation.

C. The Contractor shall verify the lengths of pipe to be relined and the inside diameters.

D. The fabric tube shall be fully impregnated with resin (wet-out). The impregnation equipment shall contain devices to secure a proper distribution of the resin. Following the impregnation, the fabric tube shall be exposed to a resin thickening procedure.
Certification documentation concerning date, type of resin (manufacturer, trade name and lot number), resin calculation, and volume of resin used shall be attached to the impregnated fabric tube.

3.2 INSTALLATION

A. General:

1. The Contractor shall install the CIPP liner in accordance with the manufacturer’s specifications, as shown on the Plans, and as specified in these specifications.

2. Alternative methods of liner insertion, pressurization, and processing may be used for products and processes approved by the Georgia Department of Natural Resources and the County Engineer, and when the final liner product meets the intent of applicable ASTM installation procedures as determined by the County Engineer. Installation shall be performed in accordance with manufacturer’s recommendations, which shall be available for verification by the County Engineer.

3. If the CIPP liner fails to make a tight seal due to broken or misaligned pipe at the manhole wall or other reason, the Contractor shall apply a seal at that point. The Contractor shall obtain the County Engineer’s approval before applying the seal.

4. The temperature of water discharged into the sewer system from processing liners shall not exceed 100°F maximum or the level allowed by State or local standards.

B. Cured-In-Place Liner:

1. The Contractor shall designate a location where the reconstruction tube will be vacuum impregnated prior to installation. The Contractor shall allow the County to inspect the materials and “wet out” procedure. A catalyst system compatible with the resin and reconstruction tube shall be used. Sufficient excess resin shall be provided to flow into cracks in the host pipe and to ensure a mechanical bond with the host pipe after curing.

2. The wet out reconstruction tube shall be inserted into the pipe through an existing manhole or other approved access by means of an inversion process or other method as approved by the County Engineer. The wet out reconstruction tube shall then be pulled in place or through the application of a hydrostatic head, or equivalent pressure sufficient to fully extend it to the next designated manhole or termination point. The reconstruction tube shall be inserted into the vertical inversion standpipe with the impermeable plastic membrane side out. The inversion head shall be adjusted to be of sufficient height to cause the impregnated tube to invert from manhole to manhole and hold the tube tight to the pipe wall, produce dimples at side connections and flared ends at the manholes. Groundwater levels shall be taken into account when considering the necessary hydrostatic pressure on the CIPP liner. The use of a lubricant is recommended. Care shall be taken during the elevated curing temperature so as not to overstress the felt fiber.
3. After inversion is completed the Contractor shall supply a suitable heat source and recirculation equipment. The equipment shall be capable of delivering the heat source throughout the pipe segment uniformly to raise the temperature above the temperature required to cure of the resin. This temperature shall be determined by the resin/catalyst system employed. Remote temperature sensors shall be provided to document the temperature and curing times.

4. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing heat source. Another such gauge shall be placed between the impregnated reconstruction tube and the pipe invert at the remote manhole to determine the temperatures during cure. The resin manufacturer shall recommend temperature in the line during the cure period.

5. Initial cure shall be deemed to be completed when inspection of the exposed portions of cured pipe appear to be hard and sound and the remote temperature sensor indicates that the temperature is of a magnitude to realize the exothermal properties of the resin system. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the cured-in-place inversion process, during which time the recirculation of the heat source and cycling of the heat exchanger to maintain the temperature continues.

6. The Contractor shall cool the hardened pipe to a temperature of 100°F or below before relieving the static head in the inversion standpipe. Cool-down may be accomplished by the introduction of cold water into the inversion standpipe to replace water being drained from a small hole made in the downstream end discharging into to the sewer. Care shall be taken in the release of the static head so that a vacuum will not be developed that could damage the newly installed CIPP liner.

C. Service Lateral Re-Instatement:

1. Existing sewer service laterals will be internally reinstated to 100% of their pre-CIPP flow diameter once the mainline liner has fully cured. The finished opening shall be smooth with no ragged edges and shall prevent clogging or blockages. This shall be done without excavation in pavement areas, and in the case of non-man-entry pipes, from the interior of the pipeline by means of a 360° television camera and a cutting device that re-establishes the service connection. When a remote cutting device is used and a cleanout is available, then a mini-camera down the service may also be used to assist the operator in cutting or trimming.

2. All service lateral reinstatements will be wire brushed to eliminate burrs and snags.

3.3 POST INSTALLATION

A. The cured Liner shall be continuous over the entire length of an installation run and be free of material defects. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.
B. Any defect, which will or could affect the structural integrity, strength, capacity, or future maintenance of the installed Liner, shall be repaired at the Contractor’s expense, in a manner approved by the County Engineer.

C. Both ends of the cured Liner shall be cut smoothly 2” from the inlet and outlet points in the manhole, and sealed with an epoxy or resin mixture compatible with the Liner/resin system, providing a watertight seal. Sealing material and installation method shall be submitted and approved by the County Engineer prior to start of construction. Hydraulic cements and quick-set cement products are not acceptable.

D. Where liners of any type are installed in two or more continuous manhole to manhole segments, the liner invert through the intermediate manholes shall be left intact. Final finishing of the installation in those intermediate manholes shall require removal of the top of the exposed liner and neat trimming of the liner edge where it touches the lip of the manhole bench.

E. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the County.

F. All manhole drop connections shall be reviewed on an individual basis. The Contractor shall reinstate openings for all drop assemblies after relining mainline sewer. Everywhere possible, outside drop assemblies shall be lined with a cured-in-place liner compatible with the mainline liner, for the full length of the drop assembly and bend. Drop assemblies inside manholes are not required to be relined, unless directed by the County Engineer.

G. Each line segment lined shall be inspected utilizing CCTV as soon as practical after processing to assure complete curing. Segments not fully conforming to these Specifications must immediately be brought to the attention of the County Engineer with a proposed method of correction without cost to the County.

3.4 TESTING

A. The Contractor shall have an independent testing laboratory analyze finished liner samples taken from manhole cutoffs, service coupons, etc.

1. A minimum of one (1) sample shall be taken from the first segment installed, or as directed by the County Engineer.

2. A minimum of two (2) samples shall be taken for each 2,500 LF of liner material installed or for each manufacturing lot, if less, or as directed by the County Engineer.

3. A minimum of six (6) samples per project shall be taken for each type of liner furnished, or as directed by the County Engineer.

4. Tests in accordance with applicable ASTM standards for Tensile Properties, Flexural Modulus, Flexural Strength, and wall thickness shall be conducted.

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<th>Property</th>
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<td>Thickness</td>
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5. The Contractor shall determine sampling locations and procedures to ensure that representative samples are obtained from the finished liner, subject to the approval of the County Engineer.

6. The Contractor shall furnish removable sizing sleeves, when possible, to collect liner samples, which accurately replicate the host pipe diameter.

7. If properties test do not meet the minimum physical and thickness requirements, the CIPP shall be repaired or replaced at the contractor’s expense.

8. All curing, cutting, and identification of samples will be witnessed by the County’s inspector.

3.5 MANUFACTURER CERTIFICATION

A. The manufacturer shall certify that the contractor is properly trained in the method or system being used.

B. The manufacturer should be on site for 2 to 5 eight-hour days or more depending on project size to confirm that the contractor is doing the installation correctly.

3.6 TELEVISION INSPECTION

A. As soon as practical after completing the installation of the CIPP liner, renewing service connections, and completing manhole rehabilitation/replacement, the Contractor shall inspect the CIPP liner and manholes utilizing CCTV equipment with a 360° integral lighthead camera to verify proper installation, measurement and payment, and above ground measurement.

B. The CCTV inspection of the CIPP liner and manholes shall be performed in accordance with the requirements of the Sanitary Sewer Television-Sonar Inspection section of these Specifications.

3.7 LOW PRESSURE AIR TESTING

A. Installed CIPP liners may be tested by low pressure air in accordance with the requirements of the DeKalb County Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards (latest edition). A representative of the County will observe the test. The Contractor shall be responsible for determining the ground water level.

B. The contractor shall follow all safety precautions specified in the DeKalb County potable water main, gravity sanitary sewer, and sanitary sewer and force main design standards.
In addition, the contractor shall provide a safety release device set to release at 10 psi between the air supply and the sewer under test.

3.8 ACCEPTANCE

A. The Contractor shall perform a CCTV inspection in accordance with ASTM F2019, section 7.3 after installation of the CIPP Liner and reconnection of the active side sewer laterals. The quality of the post-installation CCTV inspection shall be held to the same standards as the pre-installation CCTV inspection.

B. The Contractor shall submit to the County Engineer, for acceptance and approval, two (2) copies of unedited post-installation CD/DVDs and associated curing reports for each sewer main segment within 10 working days of the Liner installation. No more than one sewer main segment shall be included on a post-installation Inspection CD/DVD or curing report.

C. It is the intent of these specifications that the completed liner with all appurtenances shall be essentially equivalent in final quality and appearance to new sewer pipe installation. The conditions of the existing host pipe will be taken into consideration.

D. The finished CIPP liner shall be continuous over the entire segment between manholes and homogenous throughout.

E. The finished CIPP liner shall be fully rounded and as free as commercially practicable from visible defects, including but not limited to damage, deflection, holes, delamination, ridges, cracks, uncured resin, foreign inclusions or other objectionable defects.

F. There shall be no visible infiltration through the liner, around the liner at manhole connections, or at the service lateral connections. The Contractor shall repair any visible leaks.

G. Where, in the opinion of the County Engineer, a defect in the CIPP liner requires removal of a section of the CIPP liner, the Contractor shall make all repairs as directed by the County Engineer and shall install a segmental liner, compatible with the CIPP liner, to accomplish a continuous finished liner. No separate measurement and payment will be made for such defect repair or for the post-repair segmental liner.

3.9 COLLAPSED SEWERS/DEFECTIVE MANHOLES

A. Any sewer found with greater than ten (10) percent deformation (i.e. collapsed or near collapse) shall be reported to the County Engineer.

B. Any manhole found broken, cracked, with missing covers, or surcharged, shall be reported to the County Engineer.

C. Any sewer found where the existing conditions pose a threat of personal injury to the public, such as a collapsed sewer with attendant depression to roadway, shall be protected by the Contractor until the County Engineer arrives at the Site of the Work.
D. Any manhole found where the existing conditions pose a threat to personal injury such as broken, cracked, or missing covers, or covers found in traveled portions of any sidewalk or roadway shall be protected by the Contractor until the County Engineer arrives at the Site of the Work.

3.10 PRIVATE SERVICE LINE SHUTDOWN

A. When it is necessary to shutdown a private sewer service line while work is in progress and before the service lines are reconnected, the residents shall be notified by the Contractor at least forty-eight (48) hours prior to the shutdown. No sewer or water service is to remain shutdown for more than a period of eight (8) hours unless the Contractor provides substitute services for the residents. Commercial sewer services shall be maintained at all times that the business is open. No sewage from the services or main line shall be discharged on the ground or in waterways. Holding pits or tanks are not allowed unless permitted by Federal, State, and Local authorities having jurisdiction.

3.11 PROSECUTION OF WORK

A. The number of service connections on some sewer segments may exceed the number of buildings actually served. It is the Contractor’s responsibility to determine through dye-water testing, or other acceptable methods, the services that are live and require reinstatement prior to commencing lining of the sewer main. Services that are confirmed to be inactive shall not be reconnected. Services that are inactive, but reinstated, shall be plugged at the Contractor’s expense.

B. Inactive services to vacant parcels shall be renewed, unless otherwise directed by the County Engineer.

3.12 CLEANUP

A. After the CIPP liner installation work has been completed and all testing acceptable, the Contractor shall clean up the work area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.13 DOCUMENTATION

A. The Contractor shall complete work on each asset as assigned via the County’s Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/County Engineer. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.
3.14 WARRANTY

A. The Contractor shall guarantee his work for a warranty period of two (2) years from the date of final acceptance. If, at anytime during the warranty period, any leakage, cracking, loss of bond, or other discontinuity is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

**END OF SECTION**
C. Lining with Ultra Violet Light Fiberglass Cured-in-Place Pipe
 SECTION 02501 – LINING WITH ULTRA-VIOLET LIGHT FIBERGLASS CURED-IN-PLACE PIPE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Work under this section shall include the rehabilitation of a full length of an existing sewer main, from manhole to manhole, by the trenchless method known as Cured-In-Place Pipe Lining (CIPP) by ultraviolet (UV) light cure in accordance with these Specifications. CIPP shall consist of the installation of a resin-impregnated fiberglass material tube (Liner) which when cured shall extend the full length of the original pipe and provide a structurally sound, smooth, joint-less and watertight pipe.

1.2 RELATED SECTIONS

A. Section 01510 - Sanitary Sewer Television-Sonar Inspection
B. Section 01520 - Sanitary Sewer Cleaning
C. Section 02600 - Wastewater Flow Control

1.3 REFERENCES

B. ASTM D578/D578M - Standard Specification for Glass Fiber Strands
C. ASTM D618 - Standard Practice for Conditioning Plastics for Testing
F. ASTM D1598 - Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
I. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
K. ASTM D3567 - Standard Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings
L. ASTM F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
M. ASTM F1743 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)
N. ASTM F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)
O. ASTM D5813 – Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe

1.4 DEFINITIONS
A. Ultra Violet (UV) CIPP is defined as a hollow cylinder consisting of a glass reinforced fabric tube with cured (cross linked) UV light sensitive resin. Interior and exterior coatings shall be included. The CIPP is formed within an existing pipe and takes the shape of and fits tightly to the pipe. All as defined in ASTM Standard F1743, Subsection 3.2.1. The definitions for CIPP within ASTM Standard F1216, Subsection 3.2.1 and ASTM F2019 shall also apply.

1.5 QUALIFICATIONS
A. The system proposed (material, methods, workmanship) must have been proven through previous successful installations to an extent and nature satisfactory to the County. Since CIPP is intend to have a fifty (50) year design life, only products deemed to have this performance standard will be accepted. All products and their licensed installer must be pre-approved by the County prior to the formal opening of proposals.

B. Products and Installers must meet all of the following criteria to be deemed commercially acceptable:

1. For a Product to be considered commercially proven it shall have been successfully in service in applications similar to this project for a minimum of five (5) years. Additionally, a minimum of 250,000 linear feet and 1,000 line sections must have successfully been installed in the USA. The Manufacturer (Licensor) shall have completed sufficiently enough testing to document that the material and the method(s) of installation proposed will produce the desired long-term performance.
2. For an Installer to be considered commercially proven, the Installer must have at least three (3) years active experience in the commercial installation of the CIPP liner. The Installer’s key personnel shall each have at least 100,000 linear feet and 300 line sections of successful experience in CIPP lining of gravity sewers.

3. The Installer shall demonstrate that they have a quality assurance program to standardize the materials, manufacture, wet out and installation of the specific UV CIPP product in place.

4. Documentation for products and installers seeking pre-approved status must be submitted to the County prior to the proposal due date to allow time for adequate consideration. The County will advise of acceptance (or rejection). The deadlines for submitting the proposal and for obtaining a response from the County will be specified in the bid documents. All required submittals must be satisfactory to the County.

1.6 SUBMITTALS

A. The Contractor shall submit details of the following comprehensive construction sequencing plan for approval prior to the beginning of the project that includes at minimum:

1. A proposed schedule.

2. Identification of all proposed access routes.

3. Identification of set-up locations for lining installation.

4. Bypass pumping plan in accordance with Section 02600 - Wastewater Flow Control.

5. Traffic Control Plan in accordance with GDOT requirements, where applicable.


B. The Contractor shall submit the following information to the County for product and installer approval:

1. Manufacturer’s certificate that the materials to be used meet the referenced standards and the requirements of these Specifications.

2. License or certificate verifying Manufacturer’s/Licensor’s approval of the installer.
3. Proposed equipment and procedures for accomplishing the work.

4. Product data and Manufacturer’s installation procedures for resin and catalyst system.

C. The Contractor shall submit the following information during the project for approval of the use of CIPP at a particular location:

1. Field measurements.

2. Design calculations for the wall thickness, signed and sealed by a professional engineer registered in the State of Georgia and proficient in the design of CIPP systems.

3. Contractor’s procedures and materials for the installation of the liner and renewal of sewer services including time and duration of sewer service unavailability.

4. Sampling procedures and locations for obtaining representative samples of the finished liner.

D. The Contractor shall submit, prior to the installation or use of any lining materials or equipment, certified test results from the manufacturers which indicate that all materials conform to the applicable requirements.

E. The Contractor shall submit test results of the resin proposed that meet the chemical resistance requirements of ASTM F2019. The chemical resistance tests will be completed in accordance with Test Method ASTM D543 or the equivalent.

F. Field sampling procedure shall be in accordance with ASTM F2019.

G. The Contractor shall submit Material Safety Data Sheets for all resins, and other additives such as accelerants, colorants, and lubricants utilized in the pipe liner/lining process.

H. The Contractor shall submit manufacturer information that describes the materials, curing speeds, recommended cure schedule, curing installation processes, installation pressures, temperature limitations, and recommended post curing documentation.

I. A final certificate of compliance with this specification shall be provided by the manufacturer for all lining material furnished. Tests for compliance by an independent laboratory shall be made according to the applicable ASTM specification and the manufacturer’s quality control program.
J. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the County Engineer.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.
10. Disposals: Type and quantity of debris (including liquids).

K. The County shall certify receipt of the daily record (in email format) noting any items and adding any observations with reference to claims for payment to the Contractor. The County Engineer may, at his/her discretion, for which the Contractor must receive direction in writing, provide weekly submission in the form of progress report).

L. As-built drawings including the identification of the work completed by the Contractor and the post-installation CCTV shall be submitted within 2 weeks after the project is completed.

1.7 EXPERIENCE

A. Manufacturer – see the above requirements in Section 1.5– Qualifications.

B. Installer - see the above requirements in Section 1.5– Qualifications.

C. The Contractor shall have a company history of supporting this type of function including the proper training in these types of materials, equipment and activities and have a minimum of three (3) years experience in performing such assignments including safe work practices, etc.
D. Supervisor of the field crews shall have a history of supporting this type of function including these types of materials, equipment and activities and have a minimum of three (3) years experience in performing such assignments including safe work practices, etc. This person will be assigned full time to the project. He/she must be certified for erosion and sediment control.

E. Field crew leaders shall have a history of supporting this type of function including the proper training in these types of materials, equipment and activities and have a minimum of two (2) years experience in performing such assignments including safe working practices, etc.

F. The Contractor shall provide the County with written documentation (certification) that the supervisor, field crew leader and all crewmembers responsible for these assignments have the proper training and the requisite experience.

G. No crewmembers of the Manufacturer, Installer or Contractor shall enter confined spaces without the necessary certified training.

H. The required training and experience shall be documented in the Contractor’s Bid Documents.

1.8 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for the delivery, storage, and handling of products. No products shall be shipped to the job site without the approval of the County's Representative. UV light cured liners must be stored in a light proof, cool environment.

B. Keep products safe from damage. Promptly remove damaged products from the job site. Replace damaged products with undamaged products.

C. All materials shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the manufacturer. The liner wet-out report must be provided for liner material and resin type. The ratio of resin and fiberglass must be provided by the manufacturer. All damaged materials rejected by the County Engineer shall be promptly removed from the project site at the Contractor’s expense and disposed of in accordance with current applicable regulations.

1.9 MEASUREMENT AND PAYMENT

A. Payment for UV Light Cured Fiberglass CIPP shall be made at the unit price bid. UV Light Cured Fiberglass CIPP shall be measured by linear foot of sewer line from center of the upstream manhole to center of the downstream manhole. Post television inspection shall be used to verify measurements. Payment will be full compensation for furnishing all materials, labor, tools, traffic control, testing,
field measurements and equipment necessary to perform all work. Payment for UV Light Cured Fiberglass CIPP shall be made under Pipe Rehabilitation, UV Light Cured Fiberglass CIPP – Full Length, Pipe Diameter (size), Liner Thickness, per linear foot.

B. Payment for service lateral reinstatement shall be paid at the unit price bid. Payment will be full compensation for furnishing all materials, labor, tools, traffic control, testing, field measurements, and equipment necessary to perform all work. Payment for service lateral reinstatement shall be made under Pipe Rehabilitation, UV Light Cured Fiberglass CIPP – Full Length, Remote or Man Entry Service Reinstatement, per each.

C. No separate payment will be made for television inspection (CCTV) when that inspection is associated with the installation of UV Light Cured Fiberglass CIPP. The work and materials are considered as incidental to and part of the UV Light Cured Fiberglass CIPP unit bid prices.

D. No separate payment will be made for cleaning of the sewer line when that cleaning is associated with the installation of UV Light Cured Fiberglass CIPP. The work and materials are considered as incidental to and part of the UV Light Cured Fiberglass CIPP unit bid prices.

E. No separate payment will be made for wastewater flow control associated with the installation of UV Light Cured Fiberglass CIPP. The work and materials are considered as incidental to and part of UV Light Cured Fiberglass CIPP unit prices. As discussed in Section 02600 – Wastewater flow control, the large diameter bypass (15” and greater) will be paid for separately if flow needs to be shut down for more than 24 hours to perform the rehabilitation.

1.10 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is
fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.11 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.1 GENERAL

A. The thickness of each Liner installed shall be determined using calculation methods that are consistent with applicable ASTM standards. The Contractor shall submit stamped and signed designs prior to the installation of any Liner. The designs shall include a step by step calculation that shows all equations, defines all variables, lists all assumptions, and clearly indicates all values used for the design.

B. The design engineer shall set the long term (50 year extrapolated) Creep Retention Factor at 50% of the initial design flexural modulus as determined by ASTM D790 test method.

C. The cured in place pipe material (CIPP) shall conform to the structural properties as listed below or as recommended by the manufacturer.

1. MINIMUM PHYSICAL PROPERTIES

   (i) Wall Thickness: ASTM D2122 per ASTM F2019
(ii) Flexural Modulus of Elasticity ASTM D790

(iii) (short term): 725,000 psi

(iv) Flexural Strength ASTM D-790: 6,500 psi

D. The required structural CIPP wall thickness shall be based as a minimum on the physical properties indicated above, the Design Equations in the appendix of ASTM F1216, and the following design parameters:

1. Design Safety Factor 2.0
2. Creep Retention Factor 50% (UV fiberglass liners typically tests at >65%)
3. Ovality 2%
4. Modulus of passive soil reaction 1000psi
5. Groundwater Depth Assume at surface if not specified on the plans
6. Soil Depth (above the crown) See Plan Set
7. Poisson’s ratio of 0.3
8. Live Load H-25 (Highway Loading)
10. Pipe Condition Fully Deteriorated
11. Minimum service life 50 years

E. The finished pipe liner in place shall be fabricated from materials which when complete are chemically resistant to and will withstand internal exposure to common domestic sewage having a pH range of 5 to 11 and temperatures up to 150°F.

F. Liner design may be based on material properties of the liner that exceed the minimum values specified in ASTM F1216. However, the initial flexural modulus used in structural design calculations shall not exceed 1,750,000 psi.

G. The minimum length shall be that deemed necessary by the Contractor to effectively span the distance from the inlet to the outlet of the respective manholes unless otherwise specified. The Contractor shall verify the lengths in the field before manufacturing.

H. Prior to design and manufacture of the liner the Contractor shall take all necessary field measurements (including, but not limited to, the condition of the host pipe, diameter, ovality, deflection and length of the host pipe, bury conditions, soil
type, soil loading factor and hydrostatic load) to ensure the liner is designed for the particular location’s conditions.

I. The liner must be designed for a minimum service life of 50 years.

J. Unless field measurements determine other conditions, the liner shall be structurally designed for the following minimum conditions: earth load of 8.0 feet at the pipe invert; hydrostatic load at the pipe invert of 80% of the pipe’s depth or 8.0 feet (whichever is greater); fully deteriorated host pipe/direct bury condition; prism loading; soil loading of 125 pcf; factor of safety of 2.0; 2% ovality; maximum deflection of 5%; soil modulus of 1000 psi, maximum lining enhancement factor of 7; - (H-25) live loading; and 50% long-term modulus reduction factor. For brick sewers, use 2% ovality or the actual ovality measured in the field, whichever is greater.

2.2 CURED-IN-PLACE LINER

A. The fiberglass within the Liner shall be non-corrosion (E-CR Glass) material and shall be free from tears, holes, cuts, foreign materials and other surface defects. Its glass fibers must extend in a direction to insure no longitudinal stretching during the pull-in process.

B. The Liner shall be constructed to withstand installation pressures as required by Manufacturer’s recommendations.

C. The Liner shall be manufactured to a size that when installed will tightly fit the internal circumference and the length of the original pipe. The tube be able to stretch to fit irregular pipe sections and negotiate bends of up to 20 degrees and shall have sufficient strength to bridge missing pipe sections, with the use of a canvas sleeve if necessary.

D. Liner shall be constructed in accordance with ASTM F2019. This construction insures that the liner can be pulled in place using its own glass construction design without the aid of additional filler materials inserted into the liner. The tube shall consist of at least two separate tubes made of corrosion resistant (E-CR) glass fibers. The glass fibers shall extend in a direction to ensure no longitudinal stretching during the pull-in process. The tube shall be impregnated with the aid of a vacuum process to insure no air enters the resin.

E. Interior and exterior plastics shall be styrene resistant to protect and contain the resin used in the Liner.

F. The exterior plastic shall be ultra violet light resistant and translucent to allow visual inspection of the impregnation of the resin within the glass fibers.

G. The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with CCTV inspection may be made.
H. The nominal Liner wall thickness shall be constructed to the nearest 0.5mm increment.

I. All cured-in-place lining products shall comply with ASTM F1216 or intent thereof as determined by the County.

J. The flexible tube shall be fabricated to a size that when installed will neatly fit the internal circumference of the existing sanitary sewer lines (including services). Allowance shall be made for circumferential stretching during insertion so that the final cured product is snug against the wall of the host pipe.

K. Unless otherwise specified, the Contractor shall furnish a general purpose, unsaturated, polyester or vinyl ester resin and catalyst system compatible with the reconstruction inversion process that provides cured physical strengths specified herein.

L. The resin to tube ratio, by volume, shall be furnished as recommended by the manufacturer.

M. Resin system shall not contain non-structural enhancing fillers of any kind. The Contractor shall submit for approval, by the County, the proposed resin system.

PART 3 – EXECUTION

3.1 PREPARATION

A. The following installation procedures shall be adhered to unless otherwise approved by the County’s representative.

1. The Contractor shall carry out his operations in strict accordance with all OSHA, State, local, and manufacturer’s safety requirements. Particular attention is drawn to those safety requirements involving entering confined spaces (follow OSHA requirements).

2. It shall be the responsibility of the Contractor to remove all internal debris and clean the existing sewer line prior to installation of the liner and dispose of the debris properly. Moving material from manhole to manhole shall not be allowed. Cleaning and disposal of material shall be performed in conformance with Section 01520 - Sanitary Sewer Cleaning. (The debris is to be disposed of properly in accordance with all laws. The County can furnish a letter to the landfill stating that the contractor is authorized to dispose of the materials. Debris and liquids quantities are to be tracked in the daily contractor diary.)

3. Experienced personnel trained in locating breaks, obstacles and service connections by closed circuit television shall perform inspection of existing sewer lines. The interior of the line shall be carefully inspected to determine the location of any conditions that may prevent proper
installation of the liner pipe into the lines, and such conditions shall be noted so they can be corrected. A video recording and suitable log shall be kept for later reference by the County as specified in Section 01510 - Sanitary Sewer Television-Sonar Inspection.

4. The Contractor shall provide for the flow of sewage around the section or sections of pipe designated for lining as specified in Section 02600, Wastewater Flow Control. Service connection effluent may be plugged only after proper notification to the affected properties.

5. The Contractor shall clear the line of obstructions such as solids, dropped joints, protruding service connections and/or collapsed pipe. Protruding service connections must be cut back to within ½”-1” of the sewer pipe wall before installing the CIPP.

6. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction prior to lining. Pre-lining point repairs will be paid for at the unit prices bid and must be pre-approved by the County Engineer. Do not install liner if ground water temperatures and/or ambient temperatures are excessive for the manufacturer’s recommended installation procedures.

7. Where practicable, liners can be installed in continuous runs through manholes where there are two or more continuous sewer segments, especially to connect several short segments with a continuous lining. If a road/lane must be closed to traffic, the Contractor shall furnish a detailed traffic control plan and all labor and equipment necessary. No separate payment will be made for traffic control. It is an incidental part for CIPP installation.

8. The Contractor shall verify the lengths of pipe to be relined and the inside diameters.

9. The fabric tube shall be fully impregnated with resin(wet-out). The impregnation equipment shall contain devices to secure a proper distribution of the resin. Following the impregnation, the fabric tube shall be exposed to a resin thickening procedure. Certification documentation concerning date, type of resin (manufacturer, trade name and lot number), resin calculation, and volume of resin used shall be attached to the impregnated fabric tube.

3.2 INSTALLATION

A. General
1. The CIPP Liner shall be installed in the host pipe per the manufacturer’s specifications as submitted in these Specifications. CIPP installation shall be in accordance with applicable ASTM F2019 and the following:

   (i) Final Cleaning and Inspection - The existing host pipe shall be cleaned just prior to insertion of the Liner. A maximum of one hour may elapse between this final cleaning/flushing pass and the insertion of the Liner. After the cleaning is complete, a recorded video inspection shall be made to verify the cleanliness of the line, this recording shall be available to the County Engineer upon request.

   (ii) Liner protection – Prior to inserting the Liner, a plastic sheet 10 mil thick will be pulled into the host pipe to protect the Liner from damage as the Liner is pulled in.

   (iii) Liner Insertion – The Liner shall be pulled-in through an existing manhole or approved access point and fully extend to the next designated manhole or termination point. The pulling speed shall not exceed 15 ft/min. Care shall be exercised not to damage the tube during the pulling phase.

   (iv) Liner Inflation – The Liner shall then be inflated with air with sufficient pressure to hold the Liner tight to the host pipe wall.

   (v) Liner Inspection – The Contractor will video record the Liner prior to commencement of the curing process, and make the recording available to the County Engineer upon request.

B. Cured-In-Place Liner

1. CIPP curing shall be in accordance with applicable ASTM F2019, with the following modifications:

   (i) The ultraviolet curing lamps shall operate in a sufficient frequency range to insure the curing of the resin.

C. Service Lateral Re-instatement

1. After the Liner has been properly cured, the Contractor shall internally reinstate the existing side sewer laterals robotically or by hand in the case of man-entry size sewer. Internal reinstatement of laterals shall be performed by a qualified individual with experience in successful internal lateral cuttings. The cutting device shall produce a neat, clean and smooth opening of 100% of the existing side sewer lateral circumference. The finished opening shall be smooth with no ragged edges and shall prevent clogging or blockages. Care shall be exercised to prevent overcutting of
side sewer laterals. Overcuts or undercuts may require repair by the Contractor at no expense to the County.

2. Because there is negligible shrinkage of UV fiberglass liners after curing, and because the liners are of such strength that roots are not able to affect them, no lateral seals are required to be made except when there is damage to the lateral itself. Only those laterals identified by the County Engineer as defective and needing seals will be sealed by the contractor.

3. All service lateral reinstatements will be wire brushed to eliminate burrs and snags.

3.3 POST INSTALLATION

A. The cured Liner shall be continuous over the entire length of an installation run and be free of material defects. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.

B. Any defect, which will or could affect the structural integrity, strength, capacity, or future maintenance of the installed Liner, shall be repaired at the Contractor’s expense, in a manner approved by the County Engineer.

C. Both ends of the cured Liner shall be cut smoothly 2” from the inlet and outlet points in the manhole, and sealed with an epoxy or resin mixture compatible with the Liner/resin system, providing a watertight seal. Sealing material and installation method shall be submitted and approved by the County Engineer prior to start of construction. Hydraulic cements and quick-set cement products are not acceptable.

D. Where liners of any type are installed in two or more continuous manhole segments, the liner invert through the intermediate manholes shall be left intact. Final finishing of the installation in those intermediate manholes shall require removal of the top of the exposed liner and neat trimming of the liner edge where it touches the lip of the manhole bench.

E. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the County.

F. All manhole drop connections will be reviewed on an individual basis. Reinstate openings for all drop assemblies after relining mainline sewer. Everywhere possible, outside drop assemblies shall be lined with a cured-in-place liner compatible with the mainline liner, for the full length of the drop assembly and bend. Drop assemblies inside of manholes are not required to be relined, unless directed by the County.

G. Each line segment lined shall be CCTV inspected as soon as practical after processing to assure complete curing. Segments not fully conforming to these
Specifications must be immediately brought to the County’s attention with a proposed method of correction without cost to the County.

3.4 TESTING

A. The Contractor shall have an independent testing lab analyze finished liner samples taken from manhole cutoffs, service coupons, etc. The County will approved the 3rd party testing facility. No separate pay item will be made to cover the testing.

1. A minimum of 1 sample shall be taken of the first segment installed, or as directed by the County.

2. A minimum of 2 samples shall be taken for each 2,500 LF of liner material installed or for each manufacturing lot, if less, or as directed by the County.

3. A minimum of 6 samples per project shall be taken for each type of liner furnished, or as directed by the County.

4. Tests in accordance with ASTM standards for Flexural Modulus, Flexural Strength and wall thickness shall be conducted.

<table>
<thead>
<tr>
<th>Property</th>
<th>ASTM Test Method</th>
<th>Minimum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural Strength</td>
<td>D790</td>
<td>6,500 psi</td>
</tr>
<tr>
<td>Flexural Modulus</td>
<td>D790</td>
<td>725,000 psi</td>
</tr>
<tr>
<td>Thickness</td>
<td>D2122 (per F2019)</td>
<td>Contract requirement</td>
</tr>
</tbody>
</table>

B. The Contractor shall determine sampling location and procedures to ensure representative samples are obtained from the finished liner, subject to approval by the County. The sample shall be cut from a section of cured CIPP that has been pulled through a like diameter pipe, or other restraining device, which has been held in place by a suitable heat sink such as sandbags. For pipe greater than 12 inches, alternate sampling procedures may be required.

C. The Contractor shall furnish removable sizing sleeves, when possible, to collect liner samples, which accurately replicate the host pipe diameter.

D. If properties test do not meet the minimum physical and thickness requirements, the CIPP shall be repaired or replaced at the contractor’s expense.

E. All curing, cutting, and identification of samples will be witnessed by the County’s inspector.
3.5 MANUFACTURER CERTIFICATION

A. The manufacturer shall certify that the contractor is properly trained in the method or system being used.

B. The manufacturer should be on site for 2 to 5 eight-hour days or more depending on project size to confirm that the contractor is doing the installation correctly.

3.6 TELEVISION INSPECTION

A. After completing lining, service renewals where directed by the County, and manhole rehabilitation/replacement, every liner and manhole shall be CCTV inspected with a 360° integral lighthead camera as soon as practical to verify proper installation, measurement and payment, and above ground measurement.

B. All lines must be CCTV inspected following the protocols and formats as outlined in Section 01510 - Sanitary Sewer Television-Sonar Inspection specifications. The contractor shall submit the post lining CCTV inspection to the County at no additional cost.

3.7 ACCEPTANCE

A. The Contractor shall perform a CCTV inspection in accordance with ASTM F2019, section 7.3 after installation of the CIPP Liner and reconnection of the active side sewer laterals. The quality of the post-installation CCTV inspection shall be held to the same standards as the pre-installation CCTV inspection.

B. The Contractor shall submit to the County Engineer, for acceptance and approval, two (2) copies of unedited post-installation CD/DVDs and associated curing reports for each sewer main segment within 10 working days of the Liner installation. No more than one sewer main segment shall be included on a post-installation Inspection CD/DVD or curing report.

C. It is the intent of these specifications that the completed liner with all appurtenances shall be essentially equivalent in final quality and appearance to new sewer pipe installation. The conditions of the existing host pipe will be taken into consideration.

D. The finished liner shall be continuous over the entire segment between manholes and homogenous throughout.

E. The finished liner shall be fully rounded and as free as commercially practicable from visible defects, including but not limited to damage, deflection, holes, delamination, ridges, cracks, uncured resin, foreign inclusions or other objectionable defects.
F. There shall be no visible infiltration through the liner, around the liner at manhole connections, or at the service lateral connections. Contractor shall repair any visible leaks.

G. Where a defect in the liner requires removal of a section of the liner, in the County’s opinion, the Contractor shall make all repairs as required by the County and shall install a segmental liner, compatible with the liner, to accomplish a continuous finished liner. No separate payment will be made for such defect repair or for the post-repair segmental liner.

3.8 COLLAPSED SEWERS/DEFECTIVE MANHOLES

A. Any sewer found with greater than ten (10) percent deformation (i.e. collapsed or near collapse) shall be reported to the County Engineer immediately for remedial action.

B. Any manhole found broken, cracked, with missing covers, or surcharged, shall be reported to the County Engineer immediately for remedial action.

C. Any sewer found where the existing conditions pose a threat of personal injury to the public, such as a collapsed sewer with attendant depression to roadway, shall be protected by the Contractor until the County Engineer arrives at the site of the Work.

D. Any manhole found where the existing conditions pose a threat of personal injury to the public, such as broken, cracked, or missing covers, or covers found in traveled portions of any sidewalk or roadway shall be protected by the Contractor until the County Engineer arrives at the site of the Work.

3.9 PRIVATE SERVICE LINE SHUTDOWN

A. When it is necessary to shut down a private sewer service line while work is in progress and before the service lines are reconnected, the residents are to be notified by the Contractor at least 48 hours prior to the shutdown. No sewer or water service is to remain shut down for more than a period of eight (8) hours unless the Contractor provides substitute services for the residents. Commercial sewer services shall be maintained at all times that the business is open. No sewage from the services or main line shall be discharged on the ground or in waterways. Holding pits or tanks are not allowed unless permitted by the State.

3.10 PROSECUTION OF WORK

A. The Contractor shall note that not all sewer lines segments have been televised in their entirety due to obstructions blocking further entry, etc. These obstructions shall be cleared to allow TV viewing of the entire segment length before lining is commenced.
B. The number of service connections on some sewer segments may exceed the number of buildings actually served. It is the Contractor’s responsibility to determine through dye testing, or other acceptable methods, the services that are live and require reinstatement prior to commencing lining of the sewer main. Services that are confirmed to be inactive shall not be reconnected. Services that are inactive, but reinstated, shall be plugged at the Contractor’s expense.

C. Inactive services to vacant parcels shall be renewed, unless otherwise directed by the County.

3.11 DOCUMENTATION

A. The Contractor shall complete work on each asset as assigned via the County’s Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the County Engineer. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.12 CLEANUP

A. After the CIPP liner installation work has been completed and all testing acceptable, the Contractor shall clean up the work area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.13 WARRANTY

A. The Contractor shall guarantee his work for a warranty period of two (2) years from the date of final acceptance. If, at anytime during the warranty period, any leakage, cracking, loss of bond, or other discontinuity/abnormalities is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION
D. Cured-In-Place-Pipe for Lateral Renewal
SECTION 02510 CURED-IN-PLACE PIPE (CIPP) FOR LATERAL RENEWAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The work covered under this section includes the rehabilitation of service laterals by the trenchless technology method known as Cured-in-Place Pipe (CIPP). CIPP shall consist of the installation of a resin-impregnated flexible tube that is either inverted or pulled into the existing sewer lateral and expanded to fit tightly against the said lateral by the use of water or air pressure. The resin system shall then be cured/hardened by elevating the temperature of the fluid (water/air) used for the inflation to a sufficient enough level for the initiators in the resin to effect a reaction. The resultant being a hard, impermeable pipe within a pipe.

1.2 RELATED SECTIONS

A. Section 01510 - Sanitary Sewer Television-Sonar Inspection
B. Section 01520 - Sanitary Sewer Cleaning
C. Section 02500 - Lining with Cured-In Place Pipe (CIPP)
D. Section 02600 - Wastewater Flow Control

1.3 REFERENCES

G. ASTM D2837 - 11 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.

I. ASTM F1216 - 09 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.

J. ASTM F1743 - 08 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe.


L. Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management.

1.4 QUALIFICATIONS

A. The system proposed (material, methods, workmanship) must have been proven through previous successful installations to an extent and nature satisfactory to the County. Since CIPP is intend to have a 50-year design life, only products deemed to have this performance will be accepted. All products and their licensed installer must be pre-approved prior to the formal opening of proposals.

B. Products and Installers must meet all of the following criteria to be deemed commercially acceptable:

1. For a Product to be considered commercially proven it shall have been successfully in service in applications similar to this project for a minimum of five (5) years. Additionally, a minimum of two-thousand (2,000) lateral liners must have successfully been installed in the USA. The Manufacturer (Licensor) shall have completed sufficiently enough testing to document that the material and the method(s) of installation proposed will produce the desired long-term performance.

2. For an Installer (not a parent or related company or the qualifications of an individual/s) to be considered commercially proven he/she must have at least three (3) years active experience in the commercial installation of the product bid. The Installer’s key personnel shall each have at least two hundred (200) successful installations of lateral liners.

3. The Installer shall demonstrate that they have a quality assurance program in place to standardize the materials, manufacture, wet out and installation of the specific CIPP product.
4. Documentation for products and installers seeking pre-approved status must be submitted to the County prior to the proposal due date to allow time for adequate consideration. The County will advise of acceptance (or rejection). The deadlines for submitting the proposal and for obtaining a response from the County will be specified in the bid documents. All required submittals must be satisfactory to the County.

1.5 SUBMITTALS

A. The Contractor shall submit the following information to the County for product and installer approval:

1. Manufacturer’s certificate that the materials to be used meet the referenced standards and the requirements of these Specifications.

2. License or certificate verifying Manufacturer’s/Licensor’s approval of the installer.

3. Proposed equipment and procedures for accomplishing the work.

4. Product data and Manufacturer’s installation procedures for resin and catalyst system.

B. The Contractor shall submit the following information during the project for approval of the use of CIPP at a particular location:

1. Field measurements.

2. Design calculations for the wall thickness, signed and sealed by a professional engineer registered in the State of Georgia and proficient in the design of CIPP systems.

3. Contractor’s procedures and materials for the installation of the liner and renewal of sewer services including time and duration of sewer service unavailability.

4. Sampling procedures and locations for obtaining representative samples of the finished liner.

C. A final certificate of compliance with the requirements of these Specification shall be provided by the manufacturer for all lining material furnished by the Contractor. Tests for compliance by an independent laboratory shall be made according to the applicable ASTM specification and the manufacturer’s quality control program.
D. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the County Engineer.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.
10. Disposals: Type and quantity of debris (including liquids).

1.6 EXPERIENCE

A. Manufacturer – see the above requirements in Section 1.4 – Qualification Requirements.

B. Installer - see the above requirements in Section 1.4 – Qualification Requirements.

C. The Contractor shall have a company history of supporting this type of function including the proper training in these types of materials, equipment, and activities and have a minimum of three (3) years of experience in performing such assignments installing cured-in-place pipe liner including safe work practices, etc.

D. The Contractor’s Supervisor of the field crews shall have a history of supporting this type of function including these types of materials, equipment, and activities and have a minimum of three (3) years of experience in performing such assignments including safe work practices, etc.

E. Field crew leaders shall have a history of supporting this type of function including the proper training in these types of materials, equipment, and have a
minimum of two (2) years of experience in performing such assignments including safe working practices, etc.

F. The Contractor shall submit written documentation (certification) that the supervisor, field crew leader, and all crewmembers responsible for these assignments have the proper training and the requisite experience.

G. No crewmembers of the Manufacturer, Installer, or Contractor shall enter confined spaces without the necessary certified training.

H. The required training and experience shall be documented in the Contractor’s submittal.

1.7 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for the delivery, storage, and handling of products. No products shall be shipped to the Site of the Work without the approval of the County Engineer.

B. The Contractor shall keep products safe from damage. The Contractor shall promptly remove damaged products from the Site of the Work and damaged products with undamaged products acceptable to the County Engineer.

C. All materials shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the manufacturer. The liner wet-out report must be provided for liner material and resin type. The ratio of resin and fabric must be provided by the manufacturer. All damaged materials rejected by the County Engineer shall be promptly removed from the project site at the Contractor’s expense and disposed of in accordance with current applicable regulations.

1.8 MEASUREMENT AND PAYMENT

A. Payment for CIPP lining of laterals shall be made at the unit bid price. The unit bid price for the lining shall include the mainline/lateral interface seal. CIPP lining shall be measured by the linear foot of lining material from the sewer main wall to the end of the lining in the lateral. Payment shall constitute full compensation for furnishing all labor, tools, traffic control, and equipment necessary to perform the work associated with CIPP lining of the service laterals. Payment for CIPP lining of laterals shall be made under Service Laterals, Service Lateral Rehabilitation with CIPP, Pipe Diameter (size) of the lateral, per linear foot.

B. Payment for a PVC cleanout installation shall be made at the unit price. Payment shall constitute full compensation for furnishing all labor, tools, traffic control, excavation, pipe bedding, backfill, surface restoration, and equipment necessary
to perform all work associated with the installation of PVC clean-outs. Payment for PVC cleanout installation shall be made under Service Laterals, Service Lateral Rehabilitation with CIPP, PVC Cleanout Installation, per each.

1.9 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.10 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.
B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 - PRODUCTS

2.1 PRODUCT

A. The system proposed (materials, methods, workmanship) must be proven through previous successful installations to an extent and nature satisfactory to the County that it is consistent with the size of the project being proposed. Since CIPP is intended to have a minimum fifty- (50) year design life, only products deemed to have this performance will be accepted.

B. All CIPP lining products shall comply with the requirements of the latest versions of ASTM D5813 and ASTM F1216 or ASTM F1743.

2.2 STRUCTURAL REQUIREMENTS

A. Each CIPP shall be designed to withstand internal and/or external loads as dictated by the site and pipe conditions. When not specified by the County in the contract documents, the design thickness of the CIPP shall be arrived at using standard engineering methodology as found in ASTM F1216, Appendix X1. In no case shall the finished thickness of the cured liner be less than three (3) millimeters. The long-term modulus shall not exceed fifty (50) percent of the short-term value for the resin system and shall be verifiable through testing. The thickness calculations, signed and sealed by a professional engineer registered in the state of Georgia, shall be submitted to the County Engineer prior to CIPP installation.

B. When ground water levels are not known, the Contractor shall assume groundwater levels are at the surface. The earth load calculations shall be based upon one hundred twenty five (125) pcf at the depth of the lateral. The Contractor shall also assume H-20 loading at the surface.

C. When multiple layers are present, the layers of the finished CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or such that the knife blade moves freely between the layers. If separation of the layers occurs during testing of the field samples the CIPP shall be rejected.

D. The cured liner shall meet the following minimum strength requirements:

<table>
<thead>
<tr>
<th>Property</th>
<th>ASTM Test Method</th>
<th>Minimum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINIMUM PHYSICAL PROPERTIES</td>
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CIPP For Lateral Renewal 02510-7
21173139v5
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<thead>
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<tr>
<td>Flexural Modulus (Initial)</td>
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<tr>
<td>Flexural Modulus (50-year)</td>
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</tr>
<tr>
<td>Tensile Strength</td>
<td>D638</td>
<td>3,000 psi</td>
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</tbody>
</table>

2.3 MATERIALS

A. Lateral Liner Tube:

1. The tube shall consist of one or more layers of a flexible needled felt or an equivalent non-woven or woven material, or a combination of non-woven and woven materials, capable of absorbing and holding the liquid resin, withstanding installation pressures, and curing temperatures. The tube shall be compatible with the resin system to be used on this project. The material shall be able to stretch to fit irregular pipe up to two (2) percent ovality sections and negotiate bends. Projected changes in groundwater level; temperature and other loading factors shall cause no significant changes in the service characteristics or service life of the sewer pipe liner.

2. The liner shall be fabricated from materials which when cured, will be chemically resistant to reagents as defined in ASTM F1216, ASTM F1743, and ASTM D543.

3. The tube shall be fabricated under controlled conditions to a size that, when installed, will tightly fit the internal circumference and the length of the original conduit. Allowances shall be made for the longitudinal and circumferential stretching that occurs during placement of the tube. Maximum stretching allowances shall be as defined in ASTM F1216 or ASTM F1743. The Contractor shall verify the lengths in the field before cutting the liner to length.

4. The tube shall be uniform in thickness and when subjected to the installation pressures shall meet or exceed the designed wall thickness.

5. Any plastic film applied to the tube on what will become the interior wall of the finished CIPP shall be compatible with the resin system used, translucent enough that the resin is clearly visible, and shall be firmly bonded to the felt material.

6. At time of manufacture, each lot of liner shall be inspected and certified to be free of defects. The tube shall be marked for distance at regular intervals along its entire length, not to exceed five (5) feet. Such markings shall also include the Manufacturer’s name or identifying symbol.

7. Liners may be made of single or multiple layer construction but any layer must not be less than one and one-half (1 ½) mm thick. A suitable
mechanical strengthener membrane or strip may be placed in between layers where required to control longitudinal stretching.

B. Resin Components:
   1. The resin system shall be a corrosion resistant polyester, vinyl ester, and catalyst system that when properly cured within the tube composite meets the minimum requirements specified in this section or those that are to be utilized in the design of the CIPP for this project. The catalyst system may be accelerated to promote curing.

   2. The resin used shall not contain non-strength enhancing fillers.

   3. The Contractor shall submit the resin characteristics, including filler identification, to the County Engineer for approval prior to lining activities.

C. Interface Seal:

   1. The interface seal shall be a polyester impregnated, corrosion resistant fiberglass insert. The seal shall be of one-piece construction and shall be designed such that when expanded shall tightly fit both T and Y connections at the interface between the mainline and lateral sewer. The seal shall extend into the mainline a minimum of four (4) inches and shall provide a minimum of a three- (3) inch overlap inside the mainline pipe.

   2. The epoxy sealant rated for piping applications shall be applied to the seal to ensure that any gap between the interface between the mainline pipe and the CIPP lateral lining is air and watertight.

PART 3 - EXECUTION

3.1 GENERAL

A. It is the intent of this specification to provide for the rehabilitation of sewer service laterals by the installation of a resin-impregnated flexible tube, a mainline/lateral connection seal and if required a PVC cleanout. The tube will either be inverted or pulled into the original service lateral through a newly installed (during lateral lining) or opened (by means of limited excavation) cleanout, basement drain, or similar access point and then expanded to fit tightly against the lateral by the use of water or air pressure. The resin system shall then be cured by elevating the temperature of the fluid (water/air) used for the inflation to a sufficiently enough level for the initiators in the resin to effect a reaction. The finished pipe shall be such that when the thermosetting resin cures, the total wall thickness shall be a homogeneous and monolithic felt and resin composite matrix that will be chemically resistant to withstand internal exposure to domestic wastewater.
B. After the installation of the CIPP liner in the service lateral, an interface seal shall be provided to seal the mainline/lateral interface. The seal shall consist of a polyester impregnated fiberglass insert and shall be installed from inside of the sewer main and cured. The finished seal shall be such that when the thermosetting resin cures, the seal bonds to the lateral liner forming an airtight and watertight interface and will provide chemical resistance to domestic sewage.

C. The Contractor shall deliver the liner to the Site of the Work and provide all equipment required to insert the liner into the host pipe and cure it in place. The Contractor shall designate a location where the tube will be vacuum impregnated prior to installation. The Contractor shall notify the County at least seventy-two (72) hours prior to wet-out to allow the County Engineer to observe the materials and wet-out process. All procedures to prepare the liner for installation will be in strict accordance with the manufacturer’s recommendations. Any material not properly prepared shall be rejected and replaced with acceptable materials at the Contractor’s expense.

D. The liner shall be impregnated with resin not more than one hundred and twenty (120) hours before the time of installation and stored out of direct sunlight at a temperature of less than seventy (70) degrees F.

E. The contractor will repair any damaged cleanout. If there is no clean out, then the County, as part of a specific upgrade project, may instruct the contractor to install a clean out that is appropriate to the existing lateral size (4", 6", 8", or as directed) from the property line to the main. This includes the "Y" in connection back to the home owner's line as part of the installation.

3.2 PREPARATION

A. The Contractor shall notify all residents affected by this construction twenty-four (24) to seventy two (72) hours prior to any service disruption affecting their service connection. The mainline sewer shall be kept in operation during the lateral lining operations.

B. The Contractor shall perform cleaning, videotaping, and inspection prior to the installation of the CIPP. The Contractor, when required, shall remove all debris and liquids out of the pipeline that are likely to interfere with the installation of the CIPP. The debris and liquids are to be disposed of properly in accordance with all applicable laws.

C. It shall be the responsibility of the Contractor to notify the County of line obstructions, offset joints, or collapsed pipe that would prevent or interfere with the insertion of the tube or significantly reduce the capacity of the lateral. The County, with input from the Contractor, shall determine the method of pipe repair required and shall address these concerns on a case-by-case basis.
D. Laterals or services protruding into the sewer main shall be trimmed flush 1/2” to 1” of the sewer pipe wall prior to lining. Trimming shall not cause damage to the lateral or service beyond the inside face of the main sewer.

E. Cleanouts, if required, shall be installed per the County’s requirements and specifications.

3.3 **BYPASS PUMPING**

A. When the flow within the lateral as determined by the County Engineer requires that bypass pumping be performed, the Contractor shall furnish all necessary pumping equipment, conduit, etc. to adequately and safely divert wastewater flow around the work in a manner approved by the County Engineer and as discussed in Section 02600 – Wastewater flow control. No wastewater shall be discharged on the surface, into storm sewers, in ditches, or in waterways.

3.4 **TELEVISION INSPECTION**

A. The Contractor shall provide television equipment capable of properly documenting the conditions as found within the lateral. The camera equipment shall be capable of launching into the full length of each lateral and providing an accurate picture of the lateral to be lined. Lighting for the camera shall illuminate the entire periphery of the lateral.

B. Both a pre-lining and post-lining CCTV inspection shall be submitted to the County for approval. Each lateral connection must be inspected, utilizing CCTV inspection methods, following the protocols and formats as outlined in the Sanitary Sewer Television-Sonar Inspection.

3.5 **CIPP LINER INSTALLATION**

A. The CIPP shall be installed in accordance with the requirements of ASTM F1216 (for direct inversion installations) or ASTM F1743 (for pulled-in-place installations). The quantity of resin used for the tube’s impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances being made for polymerization shrinkage and the loss of any resin through cracks and irregularities in the original pipe wall. The resin application process shall achieve a uniform distribution of the resin throughout the tube.

B. The resin-impregnated tube shall be installed into the host pipe by methods approved by the manufacturer and proven through previous successful installations. The insertion method shall not cause abrasion or scuffing of the tube. Hydrostatic or air pressure shall be used to inflate the tube and hold it against the walls of the host pipe. The use of wastewater in the pipe in lieu of clean water for insertion and/or curing is prohibited.
C. The tube shall be installed at a rate sufficient to cause controlled installation of the tube into the conduit. The tube shall be installed in such a manner that no damage is done to the tube.

3.6 CURING

A. After inversion is completed the Contractor shall cure the resin as recommended by the resin manufacturer.

B. If heat is used to cure the resin, the Contractor shall supply a suitable heat source and recirculation equipment. The equipment shall be capable of delivering heat throughout the section to uniformly raise the temperature above the temperature required to cure the resin. This temperature shall be determined by the resin/catalyst system employed.

C. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing heat supply. The water or air temperature in the pipe during the curing period shall be as recommended by the resin manufacturer.

D. The curing temperature and cure time period shall be of a duration recommended by the resin manufacturer, during which time the heat exchanger to maintain the temperature continues. The heat source shall be shut down during the post cure.

3.7 COOL DOWN

A. When heat has been used for the curing process the cool down may be accomplished by the introduction of cool water or air into the installation standpipe to replace the initial heating agent. The Contractor shall cool the hardened pipe to a temperature below 100° F before relieving the pressure in the pressure apparatus. A minimum period of post cure shall be maintained under a static head to provide a minimum hoop tension on the felt tube. Care shall be taken in the release of the static head so that a vacuum will not be developed.

3.8 FINISH

A. The finished CIPP liner pipe shall be continuous over the entire length of the lateral and be as free as commercially practical from visual defects such as foreign inclusions, dry spots, pinholes, and delamination. The lining shall be homogeneous, impervious, and free of any leakage from the surrounding ground to the inside of the lined pipe. The lateral CIPP shall not inhibit the post installation television inspection of the mainline or the service lateral pipes.

3.9 INTERFACE SEALING

A. The interface between the mainline and the lateral shall be sealed.
B. The Contractor shall seal the interface through the use of grout or other method as approved by the County Engineer.

C. The finished seal shall be continuous over the entire interface. The seal shall be homogeneous, impervious, and free of any leakage from the surrounding ground to the inside of the lined pipe. The interface seal shall not inhibit the post installation television inspection of the mainline or the service lateral pipes.

3.10 MANUFACTURER CERTIFICATION

A. The manufacturer shall certify that the contractor is properly trained in the method or system being used.

B. The manufacturer should be on site for 2 to 5 eight-hour days or more depending on project size to confirm that the contractor is doing the installation correctly.

3.11 QUALITY ASSURANCE PROCEDURES

A. For every week, defined as five (5) working days, of CIPP lateral installations or for every thirty (30) laterals installed, whichever comes first, two (2) flat plate samples shall be processed and tested.

B. Testing shall be completed by an accredited, independent laboratory at the Contractor’s expense. The Contractor shall submit the chosen laboratory with appropriate accreditation documentation for approval by the County Engineer prior to testing. Testing results shall be submitted to the County Engineer within seven (7) days of receipt.

C. Samples shall be conditioned and prepared in accordance with the requirements of ASTM D618 and ASTM D5813 to ensure consistency in laboratory results.

D. Thickness shall be measured in accordance with the requirements of ASTM D5813, latest version, with only the structural portion of the CIPP being measured.

E. Flexural testing shall be in accordance with the requirements of ASTM D790, latest version, with only the structural portion of the CIPP being tested.

F. For pressure application, tensile testing shall be in accordance with the requirements of ASTM D638, latest version, with only the structural portion of the CIPP being tested.

3.12 CLEANUP

A. After the CIPP liner installation work has been completed and all testing acceptable, the Contractor shall clean up the work area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the
Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.13 **WARRANTY**

A. The Contractor shall guarantee his work for a warranty period of two (2) years from the date of final acceptance. If, at anytime during the warranty period, any leakage, cracking, loss of bond, or other discontinuity/abnormalities is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

**END OF SECTION**
E. Internal Point Repairs with CIPP
SECTION 02520 INTERNAL POINT REPAIRS TO SANITARY SEWERS

PART 1 – GENERAL

1.1 SECTION INCLUDES

   A. The work covered under this section includes furnishing all labor, equipment, and materials required to furnish, install, test, and inspect internal point repairs of sanitary sewers with cured-in-place pipe (CIPP) liner as shown on the Plans and specified in this section.

1.2 RERATED SECTIONS

   A. Section 01510 - Sanitary Sewer Television-Sonar Inspection
   B. Section 01520 - Sanitary Sewer Cleaning
   C. Section 02500 - Lining with Cured-In Place Pipe (CIPP)
   D. Section 02600 - Wastewater Flow Control

1.3 REFERENCES

   E. ASTM F1216 - 09 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
   F. ASTM F1743 - 08 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe.
   H. Potable Water Main, Gravity Sewer, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management.
1.4 QUALIFICATION REQUIREMENTS

A. The system proposed (material, methods, workmanship) must have been proven through previous successful installations to an extent and nature satisfactory to the County. Since CIPP is intend to have a fifty (50) year design life, only products deemed to have this performance standard will be accepted. All products and their licensed installer must be pre-approved by the County prior to the formal opening of proposals.

B. Products and Installers must meet all of the following criteria to be deemed commercially acceptable:

1. For a Product to be considered commercially proven, a minimum of 500 Point Repairs using the same manufacturer’s product must have successfully been installed and in place for a minimum period of 5 years. The Manufacturer (Licensor) shall have completed enough testing to document the material and the method(s) of installation proposed will produce the desired long-term performance.

2. For an Installer to be considered commercially proven, the Installer must satisfy all insurance, financial, and bonding requirements of the County, and must have at least three (3) years active experience in the commercial installation of the product bid. The Installer’s key personnel shall each have at least three hundred (300) successful point repair installations with the majority of those installations within pipes in the range of eight (8) to twenty-seven (27) inch diameter. The Installer shall demonstrate that they have a quality assurance program in place.

3. Documentation for products and installers seeking pre-approved status must be submitted to the County prior to the proposal due date to allow time for adequate consideration. The County will advise of acceptance (or rejection). The deadlines for submitting the proposal and for obtaining a response from the County will be specified in the bid documents. All required submittals must be satisfactory to the County.

1.5 SUBMITTALS

A. The Contractor shall submit details of the following items for approval prior to the beginning of the project:

1. A comprehensive construction sequencing plan. At minimum the plan shall include the following:

   (i) A proposed schedule.

   (ii) Identification of all proposed access routes.

   (iii) Identification of set-up locations for CIPP point repair installation.
(iv) Bypass pumping plan in accordance with the requirements of the Wastewater Flow Control section of these Specifications.

(v) Traffic Control Plan in accordance with GDOT requirements (where applicable).

(vi) Erosion Control Plan in accordance with the DeKalb County Department of Watershed Management Protocol for Providing Erosion & Sedimentation Controls on Construction Projects.

B. The Contractor shall submit the following items for product and installer pre-approval:

1. Manufacturer’s certificate that the materials to be used meet the referenced standards and the requirements of these Specifications.

2. License or certificate verifying manufacturer’s/licensor’s approval of the installer.

3. Proposed equipment and procedures for accomplishing the work.

4. Product data and manufacturer’s installation for resin and catalyst system.

C. The Contractor shall submit the following information during the project for approval of the use of CIPP point repair at a particular location:

1. Calculations for the wall thickness designs including data, field measurements, and assumptions. To be completed by a registered professional engineer proficient in the design of CIPP systems.

2. The Contractor’s procedures and materials for service renewal including time and duration of sewer service unavailability, if point repair area contains service connections.

D. A final certificate of compliance with this specification shall be provided by the manufacturer for all lining material furnished. Tests for compliance by an independent laboratory shall be performed in accordance with applicable ASTM standards and the manufacturer’s quality control program.

E. The Contractor shall furnish an extended warranty for liner materials from the Contractor and the liner manufacturer for a total of one (1) year from the date of Final Acceptance.

F. The Contractor shall complete a daily written record (diary) detailing the work performed and any small items which were incidental to the Work in the form of an email. The Contractor shall include the following information in his daily record:
1. Delays and causes of delays: Dense traffic, lack of information, sickness, labor, or equipment shortage, etc.

2. Weather conditions: Rain, sunny, windy, temperature, snow, etc.

3. Types of equipment on site: Specialty cleaning, by-pass equipment, etc.

4. Submittals: To the County Engineer (Project Manager).

5. Personnel on site: Name, labor category, specialty personnel, etc.

6. Accidents/injuries: Injuries, vehicle/equipment accidents, etc.

7. Incidents: Vehicle and equipment damage, damage to property, property owner complaint, etc.

8. Major defects encountered: Collapsed pipe, cave-ins, sink holes, etc.


10. Disposals: Type and quantity of debris (including liquids).

G. The County shall certify receipt of the daily record (in email format) noting any items and adding any observations with reference to claims for payment to the Contractor. The County Engineer may, at his/her discretion, for which the Contractor must receive direction in writing, provide weekly submission in the form of progress report.

H. As-built drawings including the identification of the work completed by the Contractor and the post-installation CCTV shall be submitted within 2 weeks after the project is completed.

1.6 EXPERIENCE

A. Manufacturer – see the above requirements in Section 1.4 – Qualification Requirements.

B. Installer – see the above requirements in Section 1.4 – Qualification Requirements.

C. The Contractor shall have a company history of supporting this type of function including the proper training in these types of materials, equipment, and activities and have a minimum of three (3) years, or three (300) successful installations, experience in performing such assignments including safe work practices, etc.

D. Supervisor of the field crews shall have a history of supporting this type of function including these types of materials, equipment and activities and have a minimum of three (3) years, or two hundred (200) successful installations, experience in performing such assignments including safe work practices, etc.
E. Field crew leaders shall have a history of supporting this type of function including the proper training in these types of materials, equipment, and activities and have a minimum of two (2) years, or one hundred (100) successful installations, experience in performing such assignments including safe working practices, etc.

F. The Contractor shall provide the County with written documentation (certification) that the supervisor, field crew leader, and all crewmembers responsible for these assignments have the proper training and the requisite experience.

G. No crewmembers of the Manufacturer, Installer, or Contractor shall enter confined spaces without the necessary certified training.

H. The required training and experience shall be documented in the Contractor’s bid submittal.

1.7 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for the delivery, storage, and handling of products. No product shall be shipped to the Site of the Work without the approval of the County Engineer.

B. The Contractor shall keep products safe from damage. The Contractor shall promptly remove damaged products from the Site of the Work and replace damaged products with undamaged products acceptable to the County Engineer.

1.8 MEASUREMENTS AND PAYMENT

A. Payment for point repairs with cured-in-place pipe shall be made at the unit price bid. The length of the point repair shall be 0 to 8 feet. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, and equipment necessary to perform all work. Payment for CIPP point repair shall be made under Point Repairs, Cured-In-Place Pipe (CIPP) – Point Repairs, Pipe Diameter (size), Liner Thickness, per each.

B. Payment for additional liner thickness shall be paid at the unit price bid. Each different liner thickness is listed in the bid tab.

C. Payment for service lateral reinstatement shall be paid at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, and equipment necessary to perform all work associated with service lateral reinstatement. Payment for service lateral reinstatement shall be made under Point Repairs, Cured-In-Place Pipe – Service Lateral Reinstatement, per each.
D. No separate measurement and payment will be made for television inspection when such inspection is associated with the installation of CIPP. The work and materials being considered as integral to and part of the CIPP unit bid prices.

E. No separate measurement and payment will be made for the cleaning of the sewer lines when such cleaning is associated with the installation of CIPP. The work and materials being considered as incidental to and part of the CIPP unit bid prices.

F. No separate measurement and payment will be made for wastewater flow control associated with the installation of cured-in-place pipe. The work and materials being considered as incidental to and part of CIPP unit prices. As discussed in Section 02600 – Wastewater flow control, the large diameter bypass (15” and greater) will be paid for separately if flow needs to be shut down for more than 24 hours to perform the rehabilitation.

1.9 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details on spill response, refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan. This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24)
hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.10 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.1 GENERAL

A. All materials shall be in strict compliance with the requirements of ASTM, ANSI, and/or AWWA and the requirements of these Specifications.

B. The finished pipe liner in place shall be fabricated from materials which when complete is chemically resistant to and will withstand internal exposure to domestic wastewater.

C. Field measurements of the existing pipe diameters, ovality, and length shall be taken by the Contractor to verify actual pipe dimensions.

2.2 CURED-IN-PLACE LINER

A. All cured-in-place lining products shall comply with the most recent versions of ASTM F-1216, ASTM F-1743 or intent thereof as determined by the County Engineer.

B. The flexible tube shall be fabricated to a size that when installed will neatly fit (minimum 99.75%) the internal circumference of the existing sanitary sewer lines (including services). Allowance shall be made for circumferential stretching during insertion so that the final cured product is snug against the wall of the host pipe.

C. The minimum length shall be that deemed necessary by the Contractor to effectively span the distance from the adjacent pipe joints plus 1.0 feet each side unless otherwise shown on the Plans or directed by the County Engineer. The Contractor shall verify the lengths in the field before impregnation.

D. Unless otherwise shown on the Plans or directed by the Engineer, the Contractor shall furnish a general purpose, unsaturated, polyester or vinyl ester resin and
catalyst system compatible with the reconstruction inversion process that provides cured physical strengths specified in this section.

E. Physical Strength:

1. The cured pipe shall conform to the following minimum structural standards:

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural Stress</td>
<td>ASTM D790</td>
</tr>
<tr>
<td>Flexural Modulus of Elasticity</td>
<td>ASTM D790</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>ASTM D638</td>
</tr>
</tbody>
</table>

2. The liner thickness shall be sized for a minimum hydrostatic load of eight (8) feet and the maximum depth of earth cover as shown on the Plans. The hydrostatic load shall be increased to manhole depth plus one (1) foot for bury depths in excess of eight (8) feet.

F. Corrosion Requirements:

1. The cured pipe shall be chemically resistant to internal exposure of sewage having a pH range of 5 to 11 and a peak temperature of 180°F.

PART 3 – EXECUTION

3.1 PREPARATION

A. The following installation procedures shall be adhered to unless otherwise approved by the County Engineer.

1. The Contractor shall carry out his operations in strict accordance with all OSHA and manufacturer’s safety requirements. Particular attention is drawn to those safety requirements involving entering confined spaces.

2. It shall be the responsibility of the Contractor to remove all internal debris and clean the existing sewer line prior to installation of the liner. Cleaning and disposal of material shall be performed in conformance with the requirements of the Sanitary Sewer Cleaning section of these Specifications. (The debris is to be disposed of properly in accordance with all applicable laws. The County can furnish a letter to the landfill stating that the contractor is authorized to dispose of non hazardous materials. Debris and liquids quantities are to be tracked in the daily contractor diary.)

3. Experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit television shall perform inspection of existing sewer lines. The interior of the line shall be carefully inspected to determine the location of any conditions which may prevent proper
installation of the CIPP point repair into the lines, and such conditions shall be noted so they can be corrected. A video recording and suitable log shall be kept for later reference by the County as specified in the Sanitary Sewer Television-Sonar Inspection section of these Specifications.

4. The Contractor shall provide for the flow of wastewater around the section or sections of pipe designated for internal point repairs as specified in the Wastewater Flow Control section of these Specifications.

5. The Contractor shall clear the line of obstructions such as solids, dropped joints, protruding service connections or collapsed pipe that will prevent the insertion of the materials or equipment. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment or robotic equipment, then the Contractor may be ordered to make a point repair excavation to uncover and remove or repair the obstruction.

6. Groundwater temperatures and ambient temperatures shall not be excessive for the product installation procedures.

3.2 INSTALLATION

A. Cured-in-Place Liner:

1. The Contractor shall designate a location where the reconstruction tube will be impregnated prior to installation. The Contractor shall allow the County to inspect the materials and “wet out” procedure. A catalyst system compatible with the resin and reconstruction tube shall be used. Sufficient excess resin will be provided to insure a mechanical bond with the host pipe after curing.

2. The wet out reconstruction tube shall be inserted through an existing manhole or other approved access and the application of a hydrostatic head sufficient to fully extend it to the termination point. The head shall be adjusted to sufficient height to hold the tube tight to the pipe wall, produce dimples at side connections, and flared ends at the manholes. The use of a lubricant is recommended. Care shall be taken during the elevated curing temperature so as not to overstress the felt fiber. Alternative methods of liner insertion and pressurization may be used for products and processes approved by the Georgia Department of Natural Resources and the County, and when the final cured-in-place product meets the intent of ASTM F1216. Installation shall be in accordance with the manufacturer’s recommendations, which shall be available for verification by the inspector.

3. After insertion is completed the Contractor shall supply a suitable heat source and water recirculation equipment. The equipment shall be capable
of delivering hot water throughout the section by means of a prestrung hose to uniformly raise the water temperature above the temperature required to affect a cure of the resin. This temperature shall be determined by the resin/catalyst system employed.

4. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply. The water temperature in the line during the cure period shall be as recommended by the resin manufacture.

5. Initial cure shall be deemed to be completed when the temperature sensor indicates that the temperature is of a magnitude to realize an exotherm. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the cured-in-place process, during which time the recirculation of the water and cycling of the heat exchanger to maintain the temperature continues.

6. The Contractor shall cool the hardened pipe to a temperature below one-hundred (100) degrees F before relieving the static head. Cool-down may be accomplished by the introduction of cool water to replace water being drained from a small hole made in the downstream end. Care shall be taken in the release of the static head so that a vacuum shall not be developed that could damage the newly installed pipe. The discharge water temperature shall not exceed the level allowed by State or local standards.

7. The finished pipe shall be continuous over the length of the internal point repair and be as free as commercially practicable from visual defects such as foreign inclusions, wrinkles, dry spots, pinholes, and delamination. It shall also meet the leakage test requirements.

8. Alternate curing mediums may be used, including, but not limited to steam and ambient cure. When alternate curing mediums are used, the end product must meet or exceed the requirements of this section. Alternate curing mediums and alternate installation methodologies must be submitted for approval to the County prior to the bid opening date as specified in the bid documents. Notification of approval (or rejection) shall be made prior to bid opening.

9. When alternate curing mediums and/or alternate installation methodologies are approved for use, the Contractor shall follow all of the manufacturer’s recommendations for installation and curing, no exceptions shall be permitted.

3.3 POST INSTALLATION

A. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the County.
B. Each internal point repair shall be CCTV inspected as soon as practical after internal repair. The Contractor shall provide a copy of the video to the County Engineer on an External Hard Drive media.

3.4 MANUFACTURER CERTIFICATION

A. The manufacturer shall certify that the contractor is properly trained in the method or system being used.

B. The manufacturer should be on site for 2 to 5 eight-hour days or more depending on project size to confirm that the contractor is doing the installation correctly.

3.5 TESTING

A. After installation every liner shall be CCTV inspected with a 360-degree integral lighthead camera as soon as practical to verify proper installation.

B. At the existing pipe/internal point repair interface, no visible leaks shall be allowed.

3.6 EXISTING UTILITIES

A. The Contractor shall protect all existing sewers, water lines, gas lines, sidewalks, curbs, gutters, pavements, electric lines, and other utilities and structures in the vicinity of the work from damage at all times. Where it is necessary for the proper execution of the work to repair, remove, and/or replace any such utility or structure, the Contractor shall do so in accordance with the provisions set forth in the General and Special Conditions of the Contract. Any such work to be done at the Contractor’s expense shall be considered incidental to the construction of sewers, and no additional payment will be allowed therefore.

3.7 COLLAPSED SEWERS/DEFECTIVE MANHOLES

A. Any sewer found with greater than ten (10) percent deformation (i.e. collapsed or near collapse) shall be reported to the County Engineer immediately for remedial action.

B. Any manhole found broken, cracked, with missing covers, or surcharged, shall be reported to the County Engineer immediately for remedial action.

C. Any sewer found where the existing conditions pose a threat of personal injury to the public, such as a collapsed sewer with attendant depression to roadway, shall be protected by the Contractor until the County Engineer arrives at the Site of the Work.

D. Any manhole found where the existing conditions pose a threat of personal injury to the public, such as broken, cracked, or missing covers, or covers found in
traveled portions of any sidewalk or roadway shall be protected by the Contractor until the County Engineer arrives at the Site of the Work.

3.8 PRIVATE SERVICE LINE SHUTDOWN

A. When it is necessary to shutdown a private sewer service line while work is in progress and before the service lines are reconnected, the residents shall be notified by the Contractor at least one (1) day prior to the shutdown. No sewer or water service is to remain shutdown for more than a period of eight (8) hours unless the Contractor provides substitute services/accommodations to the residents. Commercial sewer services shall be maintained at all times the business is open. No wastewater from the services or main line shall be discharged on the ground or in waterways. Holding pits or tanks are not allowed unless permitted by the State and the County.

3.9 CLEANUP

A. After the CIPP liner installation work has been completed and all testing acceptable, the Contractor shall clean up the work area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.10 WARRANTY

A. The Contractor shall guarantee his work for a warranty period of two (2) years from the date of final acceptance. If, at anytime during the warranty period, any leakage, cracking, loss of bond, or other discontinuity/abnormalities is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

**END OF SECTION**
F. Sewer Lateral Reconnection and Replacement
SECTION 02530 SERVICE LATERAL RECONNECTION AND REPLACEMENT

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Work this section includes the reconnection of existing service laterals to the sewer main and the replacement of sewer laterals.

1.2 RELATED SECTIONS

A. Section 02315 – Excavation and Backfill for Structure
B. Section 02324 – Trenching and Trench Backfilling
C. Section 02535 – Gravity Flow Sanitary Sewers
D. Section 02537 – Ductile Iron Sanitary Sewer Pipe and Fittings

1.3 SECTION 02600 – WASTEWATER FLOW CONTROL REFERENCES

C. ASTM D3034 - 08 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
E. Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management

1.4 SUBMITTALS

A. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the County Engineer.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).

6. Accident: Report (e.g., all injuries, vehicles, etc.).

7. Incident: Report (e.g., damage to property, property owner complaint, etc.).

8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.


10. Disposals: Type and quantity of debris (including liquids).

1.5 EXPERIENCE

A. The supervisor of the field crews shall have received proper training and have a minimum of three (3) years experience in performing the type of work covered under this section of these Specifications including safe working practices, confined space entry procedures, the types of equipment being used, product/materials being used, etc.

B. Field crew leaders shall have received proper training in this function and have a minimum of two (2) years experience in performing the type of work covered under this section of these Specifications including safe working practices, confined space entry procedures, the types of equipment being used, product/materials being used, etc.

C. No crewmembers shall enter confined spaces without the necessary certified training as required under applicable Federal, State, and local laws, regulations, standards, policies, procedures, and requirements.

D. The Contractor shall provide the County Engineer with written documentation that the supervisor, crew leader/s, and all crewmembers have received the proper training and where required the requisite experience.

E. For epoxy coating and fiberglass liner applicators/installers, the Contractor shall submit the following information:

1. Manufacturer’s certification that the applicator/installer has been trained in the proper handling, mixing, application, and installation of the high build epoxy coating and/or fiberglass liner and is approved by the manufacturer.

2. Documentation of the applicator/installer’s experience with high build epoxy coating and/or fiberglass inserts. Documentation must include names of references with contact phone numbers. The applicator/installer must prove reasonable experience, as determined by the County Engineer, with the coating and/or insert they intend to use on the project.
1.6 MEASUREMENT AND PAYMENT

A. Payment for service lateral replacement shall be made at the unit bid price. A service lateral replacement shall be made by the excavation and removal of the existing service lateral in its entirety; placement of pipe bedding; installation of a new service lateral made of PVC pipe (or other material acceptable to the County Engineer), trench backfill in accordance with the requirements of the Trench Backfill section of the County’s Specifications; and surface restoration from the sewer main up to the ROW line or easement line, whichever applies. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, and equipment necessary to perform all work associated with service lateral replacement. Payment for the service lateral replacement shall be made under Service Laterals, Service Lateral Replacement, Sewer Main Size, per linear foot.

B. Payment for service lateral replacements made with DIP in-lieu-of PVC shall be made at the unit bid price and shall include all pipe and fittings. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, and equipment necessary to perform all work associated with service lateral replacement. Payment for service lateral replacement made with DIP in-lieu-of PVC shall be made under Service Laterals, Service Lateral Replacement, depth of cut, per linear foot. This payment will be in addition to the payments for the service lateral replacement with PVC.

C. Payment for a PVC clean-out installation for a service lateral replacement shall be made at the unit price. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, and equipment necessary to perform all work. Payment for PVC clean-out installation shall be made under Service Laterals, Service Lateral Replacement, PVC Cleanout Installation, per each.

D. Payment for service lateral reconnection shall be made at the unit bid price. A service lateral reconnection will be made by the removal of the existing service connection from the sewer main up to the first service lateral fitting or five (5) feet, whichever occurs first, and replacement with new PVC pipe, new fittings, and new service connection to the sewer main. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, and equipment necessary to perform all work associated with service lateral reconnection. Payment for the service lateral reconnection shall be made under Service Laterals, Service Lateral Reconnection, Sewer Main Size, per each.

E. Payment for service lateral reconnection made with DIP in-lieu-of PVC shall be made at the unit bid price and shall include all pipe and fittings. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, and equipment necessary to perform all work associated with service lateral reconnection. Payment for service lateral reconnection made with DIP in-lieu-of PVC shall be made under Service Laterals, Service Lateral Reconnection,
6-inch DIP as an extra, per linear foot. This payment will be in addition to the payments for the service lateral reconnection with PVC.

F. Payment for a PVC clean-out installation for a service lateral reconnection shall be made at the unit price. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, and equipment necessary to perform all work associated with PVC clean-out installation. Payment for PVC clean-out installation shall be made under Service Laterals, Service Lateral Replacement, PVC Cleanout Installation, per each.

G. No separate measurement and payment will be made for wastewater flow control. The work and materials being considered as incidental to and part of CIPP unit prices. As discussed in Section 02600 – Wastewater flow control, the large diameter bypass (15” and greater) will be paid for separately if flow needs to be shut down for more than 24 hours to perform the reconnection or replacement.

1.7 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24)
hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.8 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.1 PIPE AND FITTINGS

A. All materials shall be pre-approved by the County.

B. The Contractor shall use PVC (minimum SDR 35) pipe, or class 50 ductile iron pipe for 6-inch service laterals.

C. PVC pipe shall be gasket jointed conforming to the requirements of ASTM D-3212.

D. For reconnection of existing services, the Contractor shall select service connection pipe diameter to match existing service diameter.

E. The Contractor shall connect service laterals to the sewer mains with prefabricated sewer wye conforming to the specifications for the sewer main pipe material as specified in other sections of these Specifications, or other as approved by County Engineer.

2.2 PIPE SADDLES

A. The Contractor shall use pipe saddles only on rehabilitated sanitary sewer mains.

B. The Contractor shall supply Romac Industries, Inc. Style “CB” sewer saddle, branch type universal or County approved equal. The Contractor shall use a saddle fabricated to fit the outside diameter of the pipe to which it will be attached.

2.3 COUPLINGS AND ADAPTER

A. For connection between new PVC pipe or DIP service lateral and an existing service, the Contractor shall use a PVC C-900 rubber-gasket transition adapter when going from D.I. or C-900 to Schedule 40.
2.4 CLEANOUTS

A. PVC, SDR 35 pipe and fitting shall be utilized for the installation of six- (6) inch cleanouts.

B. Rubber couplings as manufactured by Fernco, Inc. or County approved equal shall be utilized for pipe connection to the existing pipe.

C. Rubber doughnut gasket adaptors shall be manufactured by Fernco, Inc. or County approved equal.

D. Non-traffic grade cleanout boxes shall comply with the Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management.

E. Traffic grade cleanout boxes shall comply with the Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management.

PART 3 – EXECUTION

3.1 PROTECTION

A. The Contractor shall not allow sand, debris, or runoff to enter the sewer system.

B. The Contractor shall ensure that wastewater does not backup into private property. The Contractor shall establish a plan to prevent sewer backups when reconnections are not accomplished in a timely manner.

C. The Contractor shall provide for diversion of wastewater if necessary, in accordance with the requirements of the Wastewater Flow Control section of these Specifications. The County may direct the Contractor to use cleanouts to bypass wastewater from adjacent facilities if the possibility of wastewater backup is likely.

D. The Contractor shall be responsible for any and all damage to property due to his work.

3.2 PREPARATION

A. The Contractor shall provide a minimum of forty-eight- (48) hour written notice to property owners whose sanitary sewer service will potentially be interrupted.

B. The Contractor shall properly disconnect existing connections from the sewer and reconnect to the main line, as described in this section.
C. The Contractor shall reconnect service connections, including those that go to unoccupied or abandoned buildings, unless directed otherwise by the County Engineer.

D. The Contractor shall complete reconnection of all service lines within twenty-four (24) hours.

3.3 RECONNECTION OF SEGMENTS REPLACED VIA PIPE BURSTING

A. The Contractor shall remove a portion of the existing sanitary sewer main or host pipe to expose the new sewer main and to provide sufficient working space for installing a prefabricated pipe saddle.

B. The Contractor shall use a tapping machine to carefully cut the new sewer main making a circular hole properly sized to accept the stub-out protruding from the underside of the saddle.

C. The Contractor shall strap on the saddle using a stainless steel band on each side of the saddle and tighten the bands to produce a watertight seal.

D. The Contractor shall remove and replace cracked, offset, or leaking service line from the center of the new sewer main up to the first fitting or five (5) feet, whichever occurs first.

E. The Contractor shall make up the connection between new sewer main and existing service lateral using PVC C-900 or ductile iron sewer pipe and approved fittings and couplings.

3.4 RECONNECTION ON REPLACEMENT SEGMENTS

A. The Contractor shall install a new service wye on the new sanitary sewer main for each service connection. The service wye shall be of a material compatible with the sewer main material.

B. The Contractor shall remove and replace cracked, offset, or leaking service line from the center of the new sewer main up to the first fitting or five (5) feet, whichever occurs first.

C. The Contractor shall make up the connection between new sewer main and existing service lateral using PVC C-900 or ductile iron sewer pipe and approved fittings and couplings.

3.5 UTILITY SERVICE REPAIRS

A. Where service connections or lines from water or gas mains or sewers to the user’s premises are disconnected, broken, damaged, or otherwise rendered inoperative by the Contractor for any reason, the Contractor shall, at his own expense, arrange with the respective utility company for any repairs of lines under
their jurisdiction. For lines not within their jurisdiction, the Contractor shall repair or replace same and restore service to the premises.

3.6 CLEANSOUTS

A. The contractor will repair any damaged cleanout. If there is no clean out, then the County, as part of a specific upgrade project, may instruct the contractor to install a clean out that is appropriate to the existing lateral size (4", 6", 8", or as directed) from the property line to the main. This includes the wye in connection back to the home owner's line as part of the installation.

B. This work requires the Contractor to excavate and expose the existing sanitary sewer service lateral connection between the edge of pavement and the outer edge of the road right-of-way or within an easement area.

C. The Contractor shall excavate the area, staying within the right-of-way or easement, to sufficient width and depth to facilitate the proper saw cut and preparation of the pipe to allow for the installation of the cleanout. The Contractor shall not excavate on private property unless directed in writing by the County Engineer.

D. No saddles or cut-in taps will be allowed.

E. In the excavation where the service lateral is exposed, the Contractor shall install a PVC wye on the service lateral to facilitate a rigid connection. In excavations where a non-PVC pipe is exposed, Fernco couplings shall be utilized to make this connection.

F. In those excavations that do expose the four- (4) inch house lateral on the customer side of the excavation, the installation shall be connected as shown in the Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management.

G. In excavations that do not expose the four- (4) inch house lateral on the customer side, PVC SDR 35 pipe shall be coupled to the 6-inch PVC wye.

H. All installations shall be bedded utilizing #57 stone to support and secure the cleanout.

I. The cleanout shall be extended to within two (2) inches of final grade and at an angle not to exceed 11 ¼ degrees in any direction after backfill is completed. Only “sweeping bends” may be utilized to adjust the vertical alignment of the cleanout to facilitate video and maintenance equipment.

J. Excavation shall be carefully backfilled to eliminate the possibility of damaging the cleanout.
K. Cleanout box shall be centered over the cleanout and installed at finished grade level with pre-excavated conditions.

L. The Contractor shall restore or replace all removed or damaged paving, curbing, sidewalks, gutters, shrubbery, fences, sod, grass, or other disturbed surfaces or structures in a condition equal to or better than the existing conditions of that prior to work beginning and to the satisfaction of the County Engineer within seven (7) calendar days of completing each individual cleanout installation.

M. All excess materials, dirt, and rubbish shall be removed from the work site and disposed of by the Contractor within seven (7) calendar days. All such materials shall be disposed of in accordance with all applicable Federal, State, and local laws and regulations and at no cost to the County. Debris and liquids quantities are to be tracked in the daily contractor diary.

3.7 SPECIAL CONSIDERATIONS

A. The Contractor shall notify the County Engineer of any service stub that is collapsed, has severe root intrusions, or is otherwise in poor condition. The County Engineer will make a determination on a case-by-case basis whether to proceed with the cleanout installation or replace the entire service stub. All replacement service stubs will be six- (6) inch and shall be installed in accordance with the Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management.

B. The Contractor shall notify the County of conflicts with other utilities, which prevent the installation of a cleanout as specified herein and make recommendations to resolve such conflicts.

C. Every effort shall be made to complete the installation and backfill excavations each day. In situations where the installation cannot be completed, the site may only be left open overnight with proper safety barriers and warning signs alerting the public to the hazard. The Contractor shall be responsible for providing and installing all barriers, barricades, fence, warning tape, and other items necessary to safely secure the work site.

D. Without written permission from the property owner, the spoil pile may only be placed within the easement area, right-of-way or County roadway and is not to be placed on private property. Where pedestrian or vehicular traffic is obstructed, the Contractor shall provide adequate safety measures to protect against accident or injury.

E. Vehicles and construction equipment shall not be parked and left on private property.

F. The Contractor shall repair damages to sprinkler systems including those that are installed within the County right-of-way and/or sanitary sewer easement. It is
recommended that the Contractor confer with each property owner concerning the possibility of sprinklers and the locations thereof during the notification process.

3.8 TESTING

A. The completed cleanout installation shall be televised, both externally and internally with a color CCTV camera. The same camera shall capture and record a picture of the house or street address of the installation. Without pause in recording, the Contractor shall pan over the restoration of property, the cleanout box, and insert the camera into the cleanout installation. The Contractor shall pass the camera through the cleanout, into the wye and through that portion of the six- (6) inch pipe installed. A copy of the video recording (DVD format) showing each installation shall be provided to the County Engineer along with the request for payment. Any defects found during inspection shall be noted and corrected at no additional expense to the County. The Contractor shall make appropriate repairs until the cleanout installation passes the video inspection.

B. When directed by the County Engineer, the Contractor shall perform smoke testing, dye testing, or low pressure hydraulic testing to confirm reconnection.

C. All inspections shall be submitted following the standards and formats as outlined in the Sanitary Sewer Television-Sonar Inspection section of these Specifications.

3.9 CLEANUP

A. After installation work has been completed and all testing acceptable, the Contractor shall clean up the work area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.10 WARRANTY

A. The Contractor shall guarantee his work for a warranty period of two (2) years from the date of final acceptance.

B. Within the warranty period, the County may inspect the work, and if repairs are needed, the repairs shall be made on a case by case basis at no cost to the County. For the localized repairs, the warranty period shall be one additional year.
C. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

**END OF SECTION**
G. Gravity Flow Sanitary Sewers
G. Gravity Flow Sanitary Sewers
SECTION 02535 GRAVITY FLOW SANITARY SEWERS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. The work covered under this section includes furnishing all labor, equipment, and materials required to furnish, install, test, and inspect gravity flow sanitary sewers as shown on the Plans and specified in this section. Unless directed otherwise in writing by the County Engineer, the Contractor shall use only the pipe size and material specifically designated on the Plans.

1.2 RELATED SECTIONS

A. Section 02205-Dewatering
B. Section 02315-Excavation and Backfill for Structures
C. Section 02530-Service Lateral Reconnection and Replacement
D. Section 02537-Ductile Iron Sanitary Sewer Pipe and Fittings
E. Section 02641-Precast Concrete Manholes
F. Section 02650-Testing for Acceptance of Sanitary Sewers

1.3 REFERENCES

D. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
E. ASTM D1557 - Standard Test Method for Laboratory, Compaction Characteristics of Soils Using Modified Proctor Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
G. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
1.4 SUBMITTALS

A. Submittals shall conform to the requirements of the DeKalb County General Conditions of the Contract and the Submittals section of these Specifications.

B. The Contractor shall submit proposed methods, equipment, materials, and sequence of operations for sewer construction. The Contractor shall plan operations to minimize disruption of utilities and to occupied facilities on adjacent property.

C. The Contractor shall submit manufacturers’ instructions indicating special procedures required to install products specified.

D. The Contractor shall submit certifications that products meet or exceed the requirements specified in these Specifications.

E. The Contractor shall submit a set of plans (modified to show as-built conditions.)

F. The Contractor shall submit test reports.

G. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the County Engineer.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.
10. Disposals: Type and quantity of debris (including liquids).
1.5 QUALITY ASSURANCE

A. The Contractor shall provide the County Engineer with the product manufacturers’ written certification that all products furnished comply with all applicable provisions of these Specifications. Except as may be modified herein, all materials used in the manufacture of pipe, linings, manholes, and castings shall be new and shall be tested in accordance with the referenced standards, as applicable. The Contractor shall be responsible for performing and paying for sampling and testing as necessary for the certifications. The County Engineer shall have the right to witness testing of the materials.

B. The sewer pipe shall be tested and inspected at the place of manufacture for all requirements of the latest applicable ASTM standards, and certified copies of the test report covering each shipment shall be submitted to the County Engineer prior to laying. After delivery, pipe and fittings will be subject to inspection by and approval of the County Engineer. No broken, cracked, misshaped, or otherwise damaged or unsatisfactory pipe, fittings, or damaged concrete lining shall be used.

C. Each pipe shall be clearly marked as required by the applicable ASTM standard specifications to show pipe class, date of manufacture, date coated, type of coating, and manufacturer’s trademark.

D. All pipe, accessories, and specials shall be new material.

E. If directed by the County Engineer, each pipe manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe. This service will be furnished for a minimum of five (5) days during initial pipe installation.

F. All pipes shall be subject to inspection by the County Engineer at the place of manufacture. The Contractor shall notify the County Engineer in writing of the manufacturing start date at least fourteen (14) days prior to the start of manufacturing. The Contractor shall be responsible for all inspection costs.

G. All pipes shall be inspected upon arrival. If any portion of a shipment is found to be defective in diameter or thickness, the entire shipment shall be rejected and removed from the Site of the Work at no cost to the County. Each section of pipe shall again be thoroughly inspected immediately prior to lowering it into the trench to insure that the interior is clean and to check for joint scratches, chipped ends, and imperfect gasket seats. Any defective pipe or fitting discovered after the pipe is laid shall be removed and replaced with a satisfactory pipe or fitting without additional cost to the County.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall inspect pipe materials and fittings upon arrival at the Site of the Work.
B. The Contractor shall handle and store pipe materials and fittings to protect them from damage due to impact, shock, shear, or free fall. The Contractor shall not drag pipe and fittings along the ground. The Contractor shall not roll pipe unrestrained from delivery trucks.

C. The Contractor shall use mechanical means to move or handle pipe. The Contractor shall employ acceptable clamps, rope, or slings around the outside barrel of pipe and fittings.

1.7 MEASUREMENT AND PAYMENT

A. Measurement for installation of Gravity Flow Sanitary Sewers is on a linear foot basis, complete in place including pipe, excavation, shoring, connections to manholes and/or junction boxes, testing, traffic control, and backfill. The depth of cut shall be measured from the original ground surface to the invert of the pipe as placed. Payment shall be full compensation for furnishing all labor, tools, equipment, materials, and incidentals necessary to complete the Gravity Flow Sanitary Sewer installation work. Payment shall be made under:


2. Gravity Flow Sanitary Sewer, PVC pipe (size) Diameter, (depth) to (depth), per linear foot.

B. Measurement and payment for trench excavation, trench foundation and stabilization, bedding and haunching, initial backfill, select backfill, flowable fill, final backfill, compacted granular material, testing and inspection, and disposal of excess excavated material shall be made under the Trenching and Trench Backfilling section of the County’s Specifications.

C. Measurement and payment for reinforced concrete as shown on the Plans for reinforced concrete cradles and reinforced concrete encasement shall be paid as Class “A” Concrete as specified in the Cast-In-Place Concrete section of the County’s Specifications.

D. Measurement and payment for unreinforced concrete, as shown on the Plans or as directed by the County Engineer, for unreinforced cradles and encasement shall be paid as Class “B” concrete as specified in the Cast-In-Place Concrete section of the County’s Specifications.

E. Measurement and payment for manholes will be made under the Precast Concrete Manholes section of these Specifications.

F. No separate measurement and payment for full-bodied tees will be made under this section. Measurement and payment for full-bodied tees will be made under the Sanitary Sewer Service Lateral Reconnection and Repairs section of these Specifications.
G. No separate measurement and payment will be made for wastewater flow control. The work and materials being considered as incidental to and part of CIPP unit prices. As discussed in Section 02600 – Wastewater flow control, the large diameter bypass (15” and greater) will be paid for separately if flow needs to be shut down for more than 24 hours to perform the reconnection or replacement.

H. Measurement and payment for service line stubouts will be made under the Sanitary Sewer Service Lateral Reconnection and Repairs section of these Specifications.

I. Measurement and payment for service lateral cleanout installation shall be made under the Sanitary Sewer Service Lateral Reconnection and Repairs section of these Specifications.

J. Measurement and Payment for polyethylene wrap, where shown on the Plans or directed by the County Engineer shall be per linear foot.

1.8 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24)
hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.9 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.1 PIPE MATERIALS

A. All materials used in the construction of gravity flow sanitary sewers shall be new, unused, and shall be of the sizes indicated on the Plans.

B. All materials shall be in strict compliance with the required standards and specifications including ASTM, ANSI, and AWWA.

C. At points of the sewer where a change in pipe classification is shown on the Plans, the Contractor may begin at the next joint of pipe rather than cutting the pipe and constructing a collar unless there is a change in horizontal or vertical alignment. In the event the pipe is cut, there shall be no torch cutting, only saw cutting will be allowed.

D. Ductile Iron Pipe and fittings shall conform to the requirements of the Ductile Iron Sanitary Sewer Pipe and Fittings section of the County’s Specifications.

2.2 TRANSITION COUPLINGS

A. Transition joints between sewer pipes of different materials shall be accomplished by the use of DeKalb County standard concrete collar walls. Use of any other material shall require approval by the County Engineer.

2.3 APPURTENANCES

A. Service connections shall conform to requirements of the Sanitary Sewer Service Lateral Reconnection and Repairs section of these Specifications.

B. Manholes shall conform to the requirements of the Precast Concrete Manholes section of these Specifications.
2.4 BACKFILL

A. Pipe backfill materials shall conform to the requirements of the Excavation and Backfill for Structures and the Trenching and Trench Backfilling sections of the County’s Specifications.

B. Topsoil shall conform to the requirements of the Site Restoration section of the County’s Specifications.

2.5 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.
2.6 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 3 – EXECUTION

3.1 GENERAL

A. The Contractor shall control traffic in accordance with the requirements of the Traffic Regulation section of the County’s Specifications.

B. All activities shall be performed in accordance with the manufacturers’ recommendations and regulations established by OSHA. Particular attention shall be drawn to those safety requirements involving working with scaffolding and entering confined spaces.

C. The Contractor shall identify the locations of all existing underground utilities prior to commencing excavation activities. The Contractor shall consult with utility companies to verify the locations of existing underground utilities.

D. The Contractor shall notify the agency or company owning any utility line which is damaged, broken, or disturbed. The Contractor shall obtain approval from the County Engineer and the utility owner prior to performing any temporary or permanent repairs or relocation of utilities.

E. The Contractor shall install and operate a dewatering system in accordance with the requirements of the Dewatering section of these Specifications.

F. Where wastewater flow diversion is required for the performance of the Work, the Contractor shall provide wastewater flow diversion in accordance with the requirements of the Wastewater Flow Control section of these Specifications.

G. The contractor will repair any damaged cleanout. If there is no clean out, then the County, as part of a specific upgrade project, may instruct the contractor to install a clean out that is appropriate to the existing lateral size (4", 6", 8", or as directed) from the property line to the main. This includes the "Y" in connection back to the homeowner's line as part of the installation.

3.2 MANUFACTURER CERTIFICATION

A. The manufacturer shall certify that the contractor is properly trained in the method or system being used.
B. The manufacturer should be on site for 2 to 5 eight-hour days or more depending on project size to confirm that the contractor is doing the installation correctly.

3.3 PIPE LAYING

A. The Contractor is responsible for accurately placing pipe to the exact line and grade shown on the Plans. The control of vertical and horizontal alignments shall be accomplished by the use of a laser beam instrument. When a laser is used, the elevation and alignment of the pipe shall be checked by transit and level rod every fifty (50) feet for smaller pipe and every joint for pipe forty eight (48) inches and larger. Other approved methods of controlling vertical and horizontal alignments may be used if specifically authorized by the County Engineer. The pipe section may be adjusted by the use of “come-along” of approved design and anchorage. The practice of bumping or snatching (with backhoe or crane, etc.) used to adjust pipe after placement in the trench, will not be permitted. The Contractor shall furnish all labor and materials necessary for controlling the line and grade.

B. Each piece of pipe and special fitting shall be carefully inspected before it is placed, and no defective pipe shall be laid in the trench. Before a sewer pipe is placed in position in the trench, the bottom and sides of the trench shall be carefully prepared. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells uphill. Trench bottoms found to be unsuitable for foundations shall be undercut and brought to exact line and grade with pipe cushion, concrete cradles, foundation backfill, or as directed by the County Engineer.

C. For bell and spigot pipe, bell holes shall be of sufficient size to allow ample room for properly making the pipe joints. Bell holes shall be cut no more than five (5) joints ahead of pipe laying. The bottom of the trench between bell holes shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets or inequalities in the flow line.

D. Water shall not be allowed to run or stand in the trench while pipe laying is in progress or before the trench has been backfilled. The Contractor shall not open up at anytime more trench than his available pumping facilities are able to dewater. Movement of water that would tend to erode or affect the trench walls will not be allowed.

E. As the work progresses, the interior of all pipe in place shall be thoroughly cleaned. After each line of pipe has been laid, it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.

F. Backfilling of trenches shall be started immediately after the pipe is in place and the joints completed, inspected, and approved by the County Engineer.
G. At times when work is not in progress, open ends of pipe and fittings shall be securely closed, to the satisfaction of the Engineer, so that trench water, earth or other substances will not enter the pipe or fittings.

3.4 JOINT CONSTRUCTION

A. For bell and spigot pipe, the inside of all bells and the outside of all spigots shall be wiped to remove all dirt, water, or other foreign matter so that their surfaces are clean and dry when the pipes are joined.

B. Rubber ring gasket joints for sewer pipe shall be installed in accordance with the pipe manufacturer’s specifications and recommendations. Extreme care shall be used in joining large diameter pipe to avoid damaging the rubber ring or displacing it from the proper operating position.

C. Joints on ductile iron pipe sewers shall be compression joints, except where mechanical or flanged joints are called for on the Plans, and shall be installed in accordance with the pipe manufacturers’ specifications and recommendations.

D. After the joints have been completed, they shall be inspected by the County Engineer before they are covered. Any leaks or defects discovered at any time after completion of the Work shall be repaired immediately. Testing of gravity sewers shall be performed in accordance with the requirements of Testing for Acceptance of Sanitary and Sewers section of these Specifications. All pipes in place shall be carefully protected from damage until the backfilling operations have been completed. Any pipe which has been disturbed after jointing shall be removed, the joint cleaned and remade and the pipe re-laid at the Contractor’s expense.

3.5 TEE CONNECTIONS

A. Tee branches shall be installed in sanitary sewer lines at all points shown on the Plans or as directed by the County Engineer. If such branches are not to be used immediately, they shall be closed with approved stoppers and shall be physically restrained.

B. Tees shall be installed in sanitary sewers so as to properly connect each existing house and to serve each vacant lot facing or abutting on the street or alley in which the sewer is being laid and at such other locations as may be designated by the County Engineer. The exact location of each connection shall be recorded by the Contractor, on the record drawings, utilizing conventional GPS survey, before backfilling and said records delivered to the County Engineer.

C. Tees shall be standard manufactured tees.
3.6 CONNECTING RISERS

A. Where shown on the Plans, included in Special Conditions, or directed by the County Engineer, and where the depth of cut is over eight (8) feet or where the grade of a sanitary sewer is lower than necessary to drain abutting property, and at such other locations as may be designated by the County Engineer, connecting risers shall be installed to connect each existing house and to serve each vacant lot facing or abutting on the street on which the sewer is being laid.

B. Connecting risers shall be sized in accordance with the plumbing code in effect at the time of construction but shall not be smaller in size than shown on the Plans. Risers shall be installed from a tee connection to the elevation needed to connect house services, the elevations shown on the Plans, or as directed by the County Engineer. The tee connection shall be installed at the location shown on the Plans, and in accordance with the Detail Drawings. Open ends of connecting risers shall be closed with approved stoppers and be physically restrained. Backfilling shall be carefully done around risers using materials specified in the Excavation and Backfill section of these Specifications, and compacted to the equivalent density of the surrounding undisturbed material.

C. For more details of infrastructure acceptance process per review the Infrastructure Acquisition Program document. This document can be found on Department of Watershed Management website under the Consent Decree Program.

3.7 HOUSE SEWERS AND MULTIPLE DWELLING SEWERS

A. Stubouts for house service lines and multiple dwelling service lines shall be installed when stipulated in the Special Conditions or shown on the Plans. However, additional connections shall be installed by the Contractor when directed by the County Engineer.

B. House service lines for single dwelling units shall consist of six (6) inch diameter sewer pipes. Service lines for multiple dwelling units served by a single line shall consist of eight (8) inch diameter or larger sewer pipes, constructed as specified in this section. If the County Construction Standards in effect at the time of construction specifies larger pipe or if the existing house service line is larger/smaller than the specified diameters, then the larger/smaller pipe shall be installed. House service line stubouts for vacant lots shall be installed at the locations shown on the Plans or designated by the County Engineer to provide a service line from the tee in the sewer. House service line stubouts shall be installed in accordance with the Detail Drawings. The open end of such stubouts shall be closed with approved stoppers and properly restrained.

C. Cleanouts shall be installed for each continuous run of one hundred (100) feet and at each change in horizontal or vertical direction. Cleanouts shall be constructed in accordance with the Detail Drawings. Cleanouts shall be plugged with approved stoppers. Stoppers shall be properly restrained.
D. Backfilling for service lines shall commence immediately upon acceptance by the County Engineer. Backfill materials shall be as specified in the Excavation and Backfill section of the County’s Specifications, and shall be compacted to the equivalent density of the surrounding undisturbed material.

E. For more details of infrastructure acceptance process per review the Infrastructure Acquisition Program document. This document can be found on Department of Watershed Management website under the Consent Decree Program.

3.8 CONNECTING EXISTING SANITARY SEWERS TO NEW SANITARY SEWERS

A. All new sanitary sewers shall be connected to existing sanitary sewers as shown on the Plans or as directed by the County Engineer. Connections shall be made by the construction of a manhole or utilization of an existing manhole.

B. Connection of lateral collector sewers to large diameter trunk sewers shall be made at existing manholes or new manholes.

C. Connections to existing manholes shall be made by coring a hole in the wall of the existing manhole, installing a boot, inserting a minimum length of eighteen (18) feet of ductile iron pipe into the hole, filling around same with non-shrinking grout and troweling the inside and outside surfaces of the joint to a neat finish.

3.9 TOLERANCES

A. Invert Elevations: The invert elevations shown on the Plans shall be for the invert at the centerline of the precast concrete manhole. Prior to setting the laser or other vertical alignment control system for the sewer upstream of the manhole, the Contractor shall verify the elevation of the sewer installed at the manhole. Should the elevation differ from that shown on the Plans, the Contractor shall take the following corrective action:

1. If the sewer is laid at negative grade, the Contractor shall remove and reinstall the sewer at the correct grade at no additional cost to the County.

2. If the sewer is laid at a grade less than that shown on the Plans, thus reducing the sewer’s capacity, the County may require the sewer to be removed and re-laid at the correct grade at no additional cost to the County. As a minimum, the grade to the next upstream manhole shall be adjusted such that the next upstream manhole shall be set at the correct elevation.

3. If the sewer is laid at a grade greater than that shown on the Plans, and if the Contractor can show that there are no conflicts with upstream existing utilities or obstructions, the Contractor shall adjust the grade of the next upstream manhole such that the next upstream manhole shall be set at the correct elevation. If such an adjustment, in the County Engineer’s
opinion, is substantial, the grade adjustment shall be spread over multiple sections of the sewer. If such an adjustment, in the County Engineer’s opinion, significantly reduces the sewer’s capacity, the County may require the Contractor to remove and relay that portion of the sewer laid at the improper grade.

3.10 PIPE PROTECTION

A. Where foundation conditions are not satisfactory, as determined by the County Engineer, the sewer pipe shall be protected with proper pipe protection as shown on the Plans or as directed by the County Engineer.

B. Plain concrete ditch checks may be required by the County Engineer on steep slopes and other locations to prevent erosion of the backfilled trench.

3.11 TESTING

A. All manholes and gravity flow sanitary sewer and joints shall be vacuum tested in accordance with the requirements of the Testing for Acceptance of Sanitary and Sewers section of these Specifications. Testing shall be performed in the presence of the County Engineer.

3.12 CLEANUP

A. After completing each section of the sewer line, the Contractor shall remove all debris and construction materials and equipment from the Site of the Work; grade and smooth over the surface on both sides of the line; and leave the entire construction area in a clean, neat, and serviceable condition. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor. The Contractor shall restore the Site of the Work to the original or better condition in accordance with requirements of the Site Restoration section of these Specifications.

B. Prior to requesting a final inspection, the Contractor shall remove and dispose of all shipping timbers, shipping bands, boxes, and other like debris brought to the Site of the Work.

C. Any lawns, fences, drainage culverts, or property damaged by the sewer construction shall be repaired or replaced to equal or better condition than existing prior to commencement of the Work.

D. All shoulders, ditches, culverts, and other areas affected by the sewer construction shall be at the proper grades and smooth in appearance to provide positive drainage of the Site of the Work.
E. All manhole covers shall be brought to grade, as shown on the Plans, or as directed by the County Engineer. Manholes in the unpaved area shall be above grade according to the County Design Standards.

3.13 WARRANTY

A. The Contractor shall guarantee his work for a warranty period of one (1) year from the date of final acceptance.

B. Within the warranty period, the County may inspect the work, and if repairs are needed, the repairs shall be made on a case by case basis at no cost to the County. For the localized repairs, the warranty period shall be one additional year.

C. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION
H. Wastewater Flow Control
SECTION 02600 – WASTEWATER FLOW CONTROL

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. The purpose of this section is to define the various methods of wastewater flow control including plugging/blocking and bypass/diversion pumping. Wastewater flow control shall maintain an efficient and uninterrupted level of service to the sewer system while investigative or construction operations (including rehabilitations, repair or replacement) are performed.

1.2 RELATED SECTIONS

A. Section 01510 - Sanitary Sewer Television-Sonar Inspection
B. Section 01520 - Sanitary Sewer Cleaning
C. Section 01580 - Flow Isolation
D. Section 02730 - Point Repairs to Sanitary Sewers and Service Laterals
E. Section 02800 - Gravity Sewer Rehabilitation
F. Section 02500 - Lining Cured-In-Place-Pipe (CIPP)
G. Section 02520 - Internal Point Repairs with CIPP
H. Section 02950 - Pipe Bursting Sanitary Sewer Replacement

1.3 REFERENCES

A. ASTM D1238 - Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
B. ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
C. ASTM D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique
D. ASTM D1693 - Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics
F. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings

G. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

1.4 QUALIFICATIONS

A. Qualification documentation will be submitted as a part of all Requests for Proposals and Prequalifications.

B. The Contractor must meet all of the following criteria to be considered qualified to propose and/or bid on the subject contract:

1. The Contractor, or their subcontractor, must document that they, not their parent company or related company or the experience of an individual/s, have been in this line of business a minimum of five (5) years.

2. The Contractor, or their subcontractor, must document that they, not their parent company or related company or the experience of an individual/s, have performed gravity sewer bypass/diversion pumping for the sizes of sewer mains and flows expected under this contract in the past two (2) years. This documentation shall include locations, references (including names and phone numbers), pipe sizes, pump sizes and pumping rates. This documentation must include a minimum of ten (10) different projects and must cover the range of sizes of sewer mains and flows expected under this contract.

1.5 SUBMITTALS

A. Seven (7) calendar days prior to any bypass/diversion pumping activity the Contractor shall submit six (6) copies of the complete and detailed plan to the County for review. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction. The Contractor may submit a general bypass/diversion pumping plan that will be used when bypassing sewer mains smaller than 15-inch diameters. Once the Contractor has received written approval from the County for this smaller than 15-inch sewer main plan the Contractor may use that plan without re-submittal.

B. The bypass/diversion pumping plan submittal shall have sufficient detail to show the following:

1. Lowest overflow point upstream of the bypass/diversion.

2. Pump stations upstream of the bypass/diversion.
3. Staging area for pumps
4. Sewer plugging method and types of plugs
5. Number, size, material, location and method of installation of suction piping
6. Number, size, material, location and method of installation of discharge piping
7. Bypass pump sizes, capacity, number of each size to be onsite and the power requirements
8. System curve design calculations detailing the static lift, friction losses, velocity losses and flow velocities.
9. Pump curves with the system curves plotted showing the pump operation range and confirming the pump size, horsepower and impeller required
10. Standby power generator size and location, if utilized
11. Noise control and abatement measures
12. Downstream discharge plan including pipe routing plan and profile views
13. Sections showing suction and discharge pipe depth, embedment, joint restraints, thrust blocking and backfilling
14. Method of protecting discharge manholes or structures from erosion and damage
15. Location and position, in detail, where pipes cross roadways and driveways

C. For bypass plans associated with 15-inch or larger sewer mains a Georgia certified Professional Engineer must sign and seal the bypass/diversion plan.

D. The Contractor will provide an emergency response plan for each bypass/diversion pumping. The plan will be followed in the event of failure of the bypass/diversion pumping system. The Contractor shall provide names and phone numbers for twenty-four (24) hour emergency contact.

E. The Contractor must identify all pump stations and the lowest overflow point upstream of the plugging/block and/or bypass/diversion pumping. The Contractor may be required to station personnel at upstream pump stations and overflow points.
F. The Contractor shall notify the County 48 hours prior to commencing any plugging/block and/or bypass/diversion pumping.

G. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the County Engineer.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.
10. Disposals: Type and quantity of debris (including liquids).

1.6 EXPERIENCE

A. Experience documentation will be submitted as a part of all Requests for Proposals and Prequalification. The Contractor shall provide the County with written documentation that the supervisor and field crew leaders responsible for this work have received the proper training, are certified, and have the requisite experience. This documentation will include dates of hands-on experience, employer, description of duties/experience, contact name and phone number. Documentation on any person shall not be longer than one (1) page.

B. Supervisor of the field crews must be properly trained in this function and have a minimum of three (3) years experience in performing gravity sewer bypass/diversion pumping including safe working practices, the types of equipment and the operation of the equipment that will be used for this contract.

C. Field crew leaders must be properly trained in the function and have a minimum of two (2) years hands-on experience in performing bypass/diversion pumping.
including safe working practices, the types of equipment and the operation of the equipment that will be used for this contract.

D. No crewmembers shall enter confined spaces without the necessary certified training.

1.7 PERSONNEL

A. The Supervisor must daily visit the project site checking on their personnel and subcontractors, meeting with the field crew leaders as well as checking on the status and progress of the project.

B. A field crew leader must be with their crew when their crew is working. Each field crew leader can only have one crew. Each crew must have its own field crew leader.

1.8 MEASUREMENT AND PAYMENT

A. No separate payment will be made for the wastewater flow control method of plugging/blocking. The work and materials being considered as incidental to and part of other unit bid prices.

B. No separate measurement or payment will be made for the wastewater flow control associated with cured-in-place pipe (CIPP). The work and materials being considered as incidental to and part of CIPP unit prices.

C. No separate measurement or payment will be made for Contractor personnel that maybe required to monitor pump stations and/or overflow points upstream of any plugging/block and/or bypass/diversion pumping. The work, materials and personnel being considered as incidental to plugging/blocking operations and bypass/diversion pumping unit prices.

D. Payment for bypass/diversion pumping for pipe sizes 15” and greater shall be made at the unit price bid. Bypass/diversion pumping shall be measured by the following methods and payment will be full compensation for furnishing all labor, tools, fuels, maintenance, traffic control, and equipment necessary to perform all work:

1. Payment for bypass pump setup shall be made under Pump Size (inches), Bypass Pump Setup, per each.

2. Payment for bypass pump discharge line shall be made under Discharge Line, Pump Size (inches), Bypass Pump, per linear foot.

3. Payment of bypass pump operation shall be made under Operation, Pump Size (inches), Bypass Pump, per hour.
1.9 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contribute to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.10 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.
PART 2 – PRODUCTS

2.1 PIPE FOR FLOW DIVERSION

A. Ductile Iron Pipe: Ductile iron pipe as specified in DeKalb County Design Standard for Ductile Iron Sanitary Sewer Pipe and Fittings is acceptable for use for flow diversion during construction.

B. Steel pipe is permitted for flow diversion.

C. High Density Polyethylene Pipe (HDPE) is permitted for flow diversion. Polyethylene material shall comply with the requirements for Type III polyethylene, C-5 and P-34 as tabulated in ASTM D-1248 and has the Plastic Pipe Institute recommended designation PE3406. The material shall also have an average specific base resin density of between 0.94 g/cc and 0.955 g/cc (ASTM D-1505). Pipe made from these resins must have a long-term strength (50 years) rating of 1,250 psi or more per hydrostatic design basis categories of ASTM D-2837. The polyethylene resin shall contain antioxidants and be stabilized against ultraviolet degradation to provide protection during processing and subsequent weather exposure. The polyethylene resin shall have an environmental stress crack resistance; condition C as shown in ASTM D-1693, to be greater than 500 hours, 20% failure. All pipes shall be made from virgin quality material. No rework compound, except that obtained from the manufacturer’s own production of the same formulation shall be used. The polyethylene resin shall have an average melt flow index, condition E as shown in ASTM D-1238, not in excess of 0.25 g/10 mm. Pipe shall be homogeneous throughout, and free of visible cracks, holes, foreign material, blisters, or other deleterious faults. Diameters and wall thickness shall be measured in accordance with ASTM D-2122. Pipe joining will be done by thermal butt fusion method in accordance with ASTM D-2657.

D. Polyvinylchloride (PVC) pipe is permitted for flow diversion. PVC pipe shall be rigid and securely coupled with a minimum number of connections. Glued PVC is not allowed.

E. Lay flat hose is permitted for use with 2” and 3” gas powered man portable pumps.

F. Irrigation type piping is not allowed.

G. No more than two (2) pump discharge hoses will be allowed at any given time. The length of these hoses shall be limited at the direction of the County.

H. The Contractor, at a minimum, shall design all piping, joints and accessories to withstand twice the maximum operating pressure or 100 psi whichever is greater.

I. If required the Contractor must provide air relief (air relief valves, etc) on bypass/diversion pumping discharge piping to insure proper operation.
J. All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system. The pumps may be electric or diesel powered, provided they meet all specified sound level requirements. If electric pumps are used, the combined generator/pump system shall meet the specified sound level requirements. All pumps used shall be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows.

K. Unless specified otherwise in these Specifications or approved by the County Engineer, all pumps (and generators if used) shall be fully sound attenuated and shall produce a noise level of sixty-five (65) dBA or less at a distance of twenty-three (23) feet.

L. The Contractor shall provide the necessary stop/start controls for each pump.

PART 3 – EXECUTION

3.1 GENERAL STANDARDS AND REQUIREMENTS

A. Prior to commencing each bypass/diversion pumping activity the Contractor must receive written approval from the County.

B. Ensure all levels of sewage flow are continuously and effectively handled.

C. The Contractor shall use ingenuity and skill to develop a bypass/diversion pumping plan.

D. The back-up pump, appropriate piping, fuel, lubrication and spare parts shall be incorporated into the bypass/diversion pumping arrangement at the site, ready for use in case of a breakdown.

E. At no cost to the County, the Contractor will carry out a “trial run” of the bypass/diversion arrangement on all sewers greater than 12-inches. This trial run must be conducted before the County will accept the arrangement. The “trial run” shall demonstrate the incorporation of all standby equipment to handle flows when the main pump set is switched off.

F. All materials used for bypass/diversion pumping shall be pre-approved by the County prior to commencing pumping activities.

G. When wastewater flows at the upstream manhole of the sewer main being televised are above the maximum allowable requirements for television inspection, or do not allow the proper sewer or manhole repair, the flows shall be reduced to the levels required by one of the following methods: plugging/blocking or bypass/diversion pumping of the flows, as approved by the County.
H. In some applications, the wastewater flow may be plugged/blocked and contained within the capacity of the collection system. This shall only be done when it has been determined by the Contractor and approved by the County that the system can accommodate the surcharging without any adverse impact.

I. When a sanitary sewer is being rehabilitated or replaced, the Contractor, at his own expense and at no cost to the County, shall provide and maintain temporary outlets and connections for all private or public service laterals connected to or served by the sewer main being rehabilitated or replaced, and where necessary, shall provide adequate pumping facilities; and shall maintain these services until such time as the permanent sewers and connections are installed and in service.

J. During construction, flows in sections of the existing sewer being rehabilitated by removal and replacement shall be accommodated by plugging/blocking or bypass/diversion pumping.

K. The plan must keep the wastewater flowing without discharge or spills into any adjacent creeks or on to the ground. The Contractor will seek and obtain inspection of each section of newly laid sewer before removing the flow diversion from service and placing the newly installed or rehabilitated section into service.

L. In sections of the existing sewer being rehabilitated by laying a new line parallel to the existing sewer, the existing sewer may be used to accommodate the existing flow, and no bypass/diversion pumping will be necessary if the existing sewer is not damaged or its use restricted by the Contractor’s operations.

M. All pipe materials utilized in wastewater flow control shall be in good condition, and free of defects, and leaks. The Contractor at no cost to the County shall replace any defective material. Upon completion of the job, wastewater flow control materials shall be removed from the site.

N. Before any wastewater flow control equipment is installed the Contractor shall de-silt the segment of sewer to be bypassed while it is still under flow. Subsequent jetting and final cleaning before inspection or repair shall be undertaken while the segment of sewer is bypassed.

O. The Contractor is responsible for locating any existing utilities in the area the Contractor selects to locate the bypass pipelines. The Contractor shall locate his bypass pipelines to minimize any disturbances to existing utilities and shall obtain approval of the pipeline locations from the County Engineer. All costs associated with relocating utilities and obtaining all approvals shall be paid by the Contractor.

P. During all wastewater flow control operations, the Contractor shall protect manholes and all local sewer lines from damage inflicted by any equipment. The
Contractor shall be responsible for all physical damage to mainlines, manholes, and all local sewer lines caused by human or mechanical failure.

Q. The Contractor shall complete all wastewater flow control activities with the minimum sound level compatible with accepted industry standards for sound attenuated temporary pumping systems.

3.2 DEPTH OF FLOW

A. In performing television inspection, joint testing, and/or sealing and other sewer rehabilitation work, the Contractor shall control the depth of flow in the sewer within the following guidelines:

<table>
<thead>
<tr>
<th>Television Inspection</th>
<th>Joint Testing and Sealing</th>
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<tbody>
<tr>
<td>Pipe Size % Pipe Dia.</td>
<td>Pipe Size % Pipe Dia.</td>
</tr>
<tr>
<td>6”-12” 15</td>
<td>6”-12” 20</td>
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<tr>
<td>15”-24” 25</td>
<td>15”-24” 25</td>
</tr>
<tr>
<td>27” or larger 25</td>
<td>27” or larger 30</td>
</tr>
</tbody>
</table>

B. When sewer line flows, as measured in the first manhole upstream of the sewer segment being rehabilitated, exceed the maximum depth listed above or inspection of the complete pipe periphery is necessary for effective testing, sealing, or line work, the Contractor shall implement wastewater flow control methods. The implementation of the flow control method shall be reviewed and approved by the County.

C. In performing any other activities such as relining and pipe bursting etc., there shall be NO flow allowed in the sewer main unless otherwise approved by the County Engineer.

3.3 PLUGGING AND BLOCKING

A. The Contractor shall insert a sewer line plug into the line at a manhole upstream from the section being inspected or repaired. The plug shall be so designed that all or any portion of the operation flow can be released. Plugs should be secured to manhole to prevent movement downstream. Flows shall be shut off or reduced to within the maximum flow limits specified. Wastewater flow shall be restored to normal following completion of work.

B. No Plumbers plugs will be allowed.

3.4 BYPASS/DIVERSION PUMPING

A. When bypass/diversion pumping is required, a pump size shall be recommended by the Contractor and approved by the County. The Contractor shall supply the
necessary pumps, conduits, and other equipment to divert the flow of wastewater around the sewer section in which the work is to be performed. The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during periods of rainstorms as indicated from the flow monitoring program. The Contractor shall be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. A “setup” consists of the necessary pumps, conduits, and other equipment required to divert the flow of wastewater from the start to finish of work performed.

B. Wastewater shall be pumped directly into the nearest available downstream manhole, provided that the existing sewer has capacity to transport the flow. The Contractor shall request the County to determine the capacity of the downstream existing system. The Contractor shall request this determination fourteen (14) calendar days prior to the planned bypass/diversion pumping.

C. The Contractor shall be responsible for keeping the pumps running continuously 24 hours a day, if required, until the bypass operation is no longer required. The Contractor shall have standby pumps at all times.

D. Bypass pumping systems shall have sufficient capacity to pump peak flows in the pipes being bypassed (flows in the existing interceptor sewers can increase dramatically during periods of wet weather). The Contractor shall provide all pipeline plugs, pumps of adequate size to handle wet weather peak flows, and temporary discharge piping to ensure that the total flow of the interceptor sewer is safely diverted around the section to be repaired. Wastewater flow control system will be required to be operated twenty-four (24) hours per day.

E. Maintenance personnel capable of starting, stopping, refueling, and maintaining the pumps and equipment during the bypass/diversion pumping operation shall continuously monitor pumps and equipment. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum.

3.5 FLOW CONTROL PRECAUTIONS

A. Where the wastewater flow is plugged/blockaded, the Contractor shall be responsible for taking sufficient precautions to protect public health. The sewer lines shall also be protected from damage. The following shall apply:

1. No wastewater shall be allowed to back up into any homes or buildings.

2. No wastewater shall overflow any manholes, cleanouts, or any other outlet.

3. Customers upstream of the flow control area shall be able to use all their water and sewer utilities without interruption.
4. If any of the above occur or are expected to occur, the Contractor shall provide bypass/diversion pumping to alleviate one or all of the conditions. Additionally, the Contractor shall observe the conditions upstream of the plug and be prepared to immediately start bypass/diversion pumping, if needed.

B. Any sump pumps, bypass pumps, trash pumps, or any other type of pump, which pulls wastewater or any type of material out of the manhole or sewer, shall discharge the material into another manhole, or appropriate vehicle or container approved by the County. Under no circumstances shall this material be discharged, stored, or deposited on the ground, swale, road, or open environment.

C. The Contractor shall take appropriate steps to ensure that all pumps, piping, and hoses that carry raw wastewater are protected from traffic. Traffic control shall be performed in accordance with the requirements of the governing agency.

D. Prior to any wastewater flow control operations the Contractor will identify the pump station/s and lowest overflow point upstream of the planned plugging/blocking or bypass/diversion. During operations the Contractor will monitor the pump stations and lowest points to ensure overflow does not occur.

E. In the event, during any form of “Wastewater Flow Control,” that raw wastewater is spilled, discharged, leaked, or otherwise deposited in the open environment the Contractor shall be responsible for any cleanup of solids and stabilization of the area affected. This work shall be performed at the Contractor’s expense with no additional cost to the County. The Contractor shall also be responsible for notifying the County’s sewer system maintenance personnel and complying with any and all regulatory requirements for cleaning up the spill at no additional cost to the County. The Contractor shall be responsible for any fines assessed by regulatory agencies including the Georgia Environmental Protection Division (EPD).

F. During wastewater flow control operations; the Contractor shall take proper precautions to prevent damage to existing sanitary sewer facilities, flooding, or damage to public or private property.

G. The Contractor shall make repairs, replacements or rebuilds, as directed by the County, to any portion of the sewer system damaged during any plugging or bypass/diversion pumping operation. All such repairs, replacements, and rebuilding shall be paid for by the Contractor.

H. The Contractor shall make such provisions as are necessary for handling all flows in existing sewers, connections, and manholes by pipes, flumes, or by other approved methods at all times, when his operations would, in anyway, interfere with normal functioning of those facilities.
I. The Contractor shall be responsible for the removal of any debris and sedimentation in the existing sewers, laterals, and manholes, etc., which is attributable to his work under this Contract. The Contractor is responsible for the proper disposal of these items. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.

J. It is the Contractor’s responsibility to notify in writing any property owner and/or resident having a sewer service connection on the sewer being rehabilitated or replaced. The Contractor shall notify property owners 24 to 72 hours prior to commencing sewer rehabilitation or replacement. The Contractor shall be solely responsible for any damage caused by property service connection backups caused by the sewer rehabilitation operations.

END OF SECTION
I. Manhole Height Adjustment
SECTION 02607 MANHOLE HEIGHT ADJUSTMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section of the specifications provides for the adjustment of height of manholes whose tops are below grade to eliminate the inflow of storm or surface water into the manhole.

1.2 RELATED SECTIONS

A. Section 02608 – Manhole Frame and Cover Replacement.
B. Section 02900 – Sanitary Sewer Manhole Rehabilitation

1.3 REFERENCES

A. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Made From Clay or Shale).
C. ASTM C270 - 12a Standard Specification for Mortar for Unit Masonry

1.4 SUBMITTALS

A. The Contractor shall submit shop drawings and product data in accordance with the requirements of the Submittals section of these Specifications.

B. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the County Engineer.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.


10. Disposals: Type and quantity of debris (including liquids).

1.5 MEASUREMENT AND PAYMENT

A. Payment for Raising Manhole Frame & Cover Elevation Up To 1.0-foot shall be made at the unit price bid. This work would typically be accomplished by grade adjustment with bricks and/or concrete grade rings. Payment will be full compensation for furnishing all materials, labor, tools, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Manhole Adjust, Raise Manhole Frame & Cover Elevation 1.0-Foot, per each. Restoration shall be paid at unit price.

B. Payment for installing a 1.0-Foot Precast Manhole Barrel Section shall be made at the unit price bid. Payment will be full compensation for furnishing all materials (including barrel), labor, tools, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Manhole Adjust Install 1.0-Foot Manhole Barrel Section, Diameter (48, 60 or 72-inch), per each. Restoration shall be paid at unit price.

C. Payment for installing a 2.0-Foot Precast Manhole Barrel Section shall be made at the unit price bid. Payment will be full compensation for furnishing all materials (including barrel), labor, tools, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Manhole Adjust Install 2.0-Foot Manhole Barrel Section, Diameter (48, 60 or 72-inch), per each. Restoration shall be paid at unit price.

D. Payment for installing a 4.0-Foot Precast Manhole Barrel Section shall be made at the unit price bid. Payment will be full compensation for furnishing all materials (including barrel), labor, tools, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Manhole Adjust Install 4.0-Foot Manhole Barrel Section, Diameter (48, 60 or 72-inch), per each. Restoration shall be paid at unit price.

E. Payment for Installing a Precast Manhole Cone shall be made at the unit price bid. Payment will be full compensation for furnishing all materials (including cone), labor, tools, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Manhole Adjust Install Manhole Cone, Diameter (48, 60 or 72-inch), per each Restoration shall be paid at unit price.

F. Payment for Lowering Existing Manhole Frame & Cover Up To 1.0-Foot by Removal Of Grade Adjustment shall be made at the unit price bid. This work
would typically be accomplished by grade adjustment of the bricks and/or concrete grade rings. Payment will be full compensation for furnishing all materials labor, tools, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Manhole Adjust, Lower Manhole Frame & Cover Elevation 1.0-Foot, per each. Restoration shall be paid at unit price.

G. Payment for Lowering Existing Manhole Frame & Cover By Removal of 1.0-Foot Precast Manhole Barrel shall be made at the unit price bid. Payment will be full compensation for furnishing all materials labor, tools, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Manhole Adjust Lowering Manhole Frame & Cover By Removal of 1.0-Foot Manhole Barrel Section, per each. Restoration shall be paid at unit price.

H. Payment for Lowering Existing Manhole Frame & Cover By Removal of 2.0-Foot Precast Manhole Barrel shall be made at the unit price bid. Payment will be full compensation for furnishing all materials labor, tools, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Manhole Adjust, Lowering Manhole Frame & Cover By Removal of 2.0-Foot Manhole Barrel Section, per each. Restoration shall be paid at unit price.

I. Payment for Lowering Existing Manhole Frame & Cover By Removal of 4.0-Foot Precast Manhole Barrel shall be made at the unit price bid. Payment will be full compensation for furnishing all materials labor, tools, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Manhole Adjust, Lowering Manhole Frame & Cover By Removal of 4.0-Foot Manhole Barrel Section, per each. Restoration shall be paid at unit price.

1.6 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

02607-3
Manhole Height Adjustment
C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.7 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 - PRODUCTS

2.1 BRICK

A. Brick shall conform to the requirements of ASTM C32 for grade SM. Bricks shall conform to the following dimensions, unless otherwise approved by the County Engineer:

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>Width (inches)</th>
<th>Length (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Size</td>
<td>2¼</td>
<td>3¾</td>
</tr>
<tr>
<td>Allowable Variation</td>
<td>±¼</td>
<td>±¼</td>
</tr>
</tbody>
</table>

B. All brick shall be new and whole, of uniform standard size, and with substantially straight and parallel edges and square corners. Bricks shall be of compact textures, burned hard entirely through, tough and strong, free from injurious cracks and flaws, and shall have a clear ring when struck together. No soft or salmon brick shall be used. Brick shall be culled after delivery, if required, and
no culls shall be used except at such places, to such extent, and under such conditions as may be approved by the County Engineer.

2.2 MORTAR

A. The Contractor shall use mortar meeting the requirements of ASTM C270 Type S unless directed otherwise by the County Engineer.

B. The Contractor shall prepare mortar only in quantities needed for immediate use. Mortar which has been mixed for more than thirty (30) minutes, which has set, or which has been retempered shall not be used.

PART 3 - EXECUTION

3.1 MANHOLE ENTRY

A. The Contractor shall exercise extreme caution during any manhole entry operations. Particular attention shall be paid while working on larger diameter sewers. The Contractor shall implement all necessary safety precautions, in accordance with OSHA regulations, to give maximum protection at all times to persons or property at or near the Site of the Work.

3.2 PROCEDURES FOR MANHOLE HEIGHT ADJUSTMENT

A. The Contractor shall utilize maps, surveys, sounding instruments, or information from local residents to determine approximate locations of buried manholes. Manholes shall be exposed utilizing hand techniques or by carefully probing with mechanical equipment. Manhole exposure in paved areas shall be accomplished by making a square cut in the surface with sufficient width to allow for the excavation of the material around the manhole to expose it to a depth necessary for adequate adjustment.

B. The Contractor shall adjust the top elevation of the manhole frame to grade where indicated on the Plans or as directed by the County Engineer using brick and mortar conforming to the requirements of this section. A maximum adjustment of twelve (12) inches will be allowed using brick and mortar. Mortar shall be applied to create a smooth finish on the interior and exterior prior to backfill. Adjustments greater than twelve (12) inches shall be made by removing the cone section and adding the appropriate precast riser section.

C. When a manhole height adjustment is performed in a paved area and the manhole is not to be rehabilitated by any other method, then the Contractor shall install a manhole frame seal in accordance with the requirements of the Manhole Frame Sealing section of these Specifications.
3.3 CLEANUP

A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.

B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.

C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.4 DOCUMENTATION

A. The Contractor shall complete work on each asset as assigned via the County’s Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/County Engineer. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.5 WARRANTY

A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at anytime during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION
J. Manhole Frame and Cover Installation
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section includes procedures for Manhole Frame and Cover Installation.

1.2 RELATED SECTIONS

A. Section 02600 - Wastewater Flow Control.
B. Section 02607 - Manhole Height Adjustment.
C. Section 02900 - Sanitary Sewer Manhole Rehabilitation

1.3 REFERENCES

B. Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management.

1.4 SUBMITTALS

A. Submittals shall conform to the requirements of the General Conditions of the Contract and the Submittals section of these Specifications.
B. The Contractor shall submit shop drawings of manhole frames and covers to the Engineer for approval before installation.
C. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
3. Equipment: On site (e.g., specialty cleaning by-pass equipment, etc.).
4. Submittals: To the County Engineer.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).

8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.


10. Disposals: Type and quantity of debris (including liquids).

1.5 MEASUREMENT AND PAYMENT

A. Payment for removing existing manhole frame & cover and replacing with DeKalb County standard frame & cover shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all material, labor, tools, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Manhole Adjustment, Removing Existing Frame & Cover and Replace with Standard Frame & Cover, per each. Restoration shall be paid at the unit price bid.

B. Payment for removing existing manhole frame & cover and replace with DeKalb County watertight (bolt down) frame & cover including bolt down steel bolts and watertight gasket shall be made at the unit price bid. Payment will be full compensation for furnishing all materials, labor, tools, flow control of plugging/blocking and equipment necessary to perform all work including anchoring the frame to concrete with four (4) stainless steel anchor bolts and epoxy cement to form a watertight joint between the frame and the concrete, removal of the existing gasket, preparation of the manhole frame seating surface and installation of a new gasket. Payment shall be made under Manhole Adjustment, Removing Existing Frame & Cover and Replace with Watertight Frame & Cover, per each. Restoration shall be paid at unit price.

1.6 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.
C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.7 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 - PRODUCTS

2.1 GENERAL

A. The Contractor shall provide and install complete manhole covers and frames at each new sanitary sewer manhole, and in all other locations shown on the Plans or directed by the County Engineer.

B. Manhole covers shall be of either Standard Type (non-bolted) or Bolt-Down Type, as indicated on the Plans or as otherwise specified. If not otherwise indicated, manhole covers shall be Standard Type.

C. The Contractor shall provide manhole covers and frames approved by the County.

2.2 MATERIALS

A. Manhole covers and frames shall be constructed of cast iron conforming to the requirements of ASTM A48-83 Class 30, as a minimum. Tensile strength of the cast iron shall be a minimum of 30,000 psi.
B. Covers and frames shall be “Heavy Duty” type, rated for a minimum of H-20 loading.

C. All castings shall be sound, smooth and clean, and free of blisters, pits, cracks, and other defects. Castings judged to be defective by the County Engineer will be rejected, and shall be replaced by the Contractor at no additional cost to the County.

D. Casting tolerances shall be $\pm \frac{1}{16}$-inch, with an additional one-sixteenth ($\frac{1}{16}$) inch per foot of dimension.

E. Manhole covers shall be cast with two (2) non-penetrating type pick-holes, located as indicated in the Detail Drawings. Pick-holes shall conform to the dimensions indicated in the Detail Drawings. Manhole covers shall not have vent holes.

F. Frames shall have integrally cast, full perimeter mud rings. Frames shall be cast with four (4), one-inch (1) diameter holes in the flange for anchor bolts. Anchor bolt holes shall be located as shown in the Detail Drawings.

G. The seating surfaces of frames and covers shall be machined flat to ensure contact between the cover and frame along the full perimeter.

H. Gaskets shall be provided and installed on all manhole frames. Gaskets shall be secured to the seating surface of the frame with non-degrading glue by the manufacturer. Gaskets shall be flat, one-eighth ($\frac{1}{8}$) inch thick, black neoprene, with a tensile strength of 2,000 psi.

I. For manhole covers indicated as Bolt-Down Type, frames shall be cast and machined to accept four (4) cover bolts, on the pattern shown in the Detail Drawings. Covers shall be cast with four (4) holes, three-quarter (¾) inch diameter, for the bolts on the pattern shown in the Detail Drawings. Bolts shall be stainless steel, $\frac{5}{8}$" - 1 ½ x 2” hex-head cap screws, and shall be provided with all bolt-down type covers. Bolts shall include stainless steel washers and rubber sealing gaskets.

J. Covers and frames shall bear the emblem of “DeKalb County Sanitary Sewer” as illustrated in the Detail Drawings. No substitute cover designs will be accepted.

K. Covers shall be cast with four (4) stacking lugs, each five-eight ($\frac{5}{8}$) inch wide by two (2) inches long, on the bottom of the lid.

L. Covers and frames shall conform to the following critical dimensions:

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Bolt-Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall frame height</td>
<td>6 3/4 to 8”</td>
<td>6 3/4 to 8”</td>
</tr>
<tr>
<td>Cover diameter</td>
<td>23 1/2”</td>
<td>23 1/2”</td>
</tr>
<tr>
<td>Cover thickness, min.</td>
<td>1 3/8”</td>
<td>1 3/8”</td>
</tr>
</tbody>
</table>
### Frame opening specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame opening for cover</td>
<td>23 11/16&quot;</td>
<td>23 3/4&quot;</td>
</tr>
<tr>
<td>Frame opening for entry</td>
<td>22&quot;</td>
<td>20 5/8&quot;</td>
</tr>
<tr>
<td>Mud ring O.D.</td>
<td>25 7/8&quot;</td>
<td>25 3/4&quot;</td>
</tr>
<tr>
<td>Mud ring height, min.</td>
<td>3/4&quot;</td>
<td>1 5/8&quot;</td>
</tr>
</tbody>
</table>

### PART 3 - EXECUTION

#### 3.1 PROCEDURES FOR MANHOLE FRAME AND COVER INSTALLATION

A. The Contractor shall prepare the manhole top cone for frame installation per manhole and manhole cover manufacturer recommendations.

B. The Contractor shall prepare and install manhole frames and covers per manufacturer recommendations.

C. The Contractor shall check the installation of gaskets and replace all missing gaskets.

D. The Contractor shall install new frames and covers to the required elevations shown on the Plans or to the existing grade as directed by the County Engineer.

E. The Contractor shall check the manhole covers for fit in the frame. If a manhole cover is either excessively loose or tight in the frame, or rocks, wobbles, or otherwise moves in its frame, the frame and cover shall be removed and replaced by the Contractor at no additional cost to the County.

F. The Contractor shall install and tighten stainless steel bolts on all Bolt-Down Type covers.

#### 3.2 CLEANUP

A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.

B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.

C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.
3.3 DOCUMENTATION

A. The Contractor shall complete work on each asset as assigned via the County’s Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/County Engineer. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.4 WARRANTY

A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at anytime during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION
K. Manhole Frame Sealing
SECTION 02609 MANHOLE FRAME SEALING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. This section covers the materials and methods for sealing leaking manhole frames for sanitary sewers.

1.2 RELATED SECTIONS

A. Section 02600 Wastewater Flow Control

B. Section 02900 Manhole Rehabilitation

1.3 REFERENCES


D. ASTM D476-00(2005) - Standard Classification for Dry Pigmentary Titanium Dioxide Products.


F. ASTM D1004 - 13 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.


1.4 SUBMITTALS

A. Submittals shall conform to the requirements of the General Conditions of the Contract and the Submittals section of these Specifications.

B. The Contractor shall submit manufacturer’s Certificate of Compliance certifying compliance with applicable specifications and standards.

C. The Contractor shall submit certified copies of test reports of factory tests required by the applicable standards and this Section.
D. The Contractor shall submit manufacturer’s installation instructions and procedures and insertion runs.

E. The Contractor shall submit procedures and materials for manhole frame sealing.

F. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.

2. Weather: Conditions (e.g., rain, sunny, windy, etc.).

3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).

4. Submittals: To the County Engineer.

5. Personnel: On site by name (e.g., all labor, specialty services, etc.).

6. Accident: Report (e.g., all injuries, vehicles, etc.).

7. Incident: Report (e.g., damage to property, property owner complaint, etc.).

8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.


10. Disposals: Type and quantity of debris (including liquids).

1.5 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for delivery, storage, and handling of products.

B. Products shall be kept safe from damage. Damaged products shall be removed from the Site of the Work promptly. Damaged products shall be replaced with undamaged products.

1.6 MEASUREMENT AND PAYMENT

A. Manhole Frame Sealing shall be paid at the unit price bid per manhole frame seal. It shall include all repairs, cleaning, surface preparation, flow control, materials, installation, cleanup, inspection, testing, and any other work or materials necessary to complete the work. Measurement shall be based on the actual number of manhole frame seals installed.
PART 2 – PRODUCTS

2.1 GENERAL

A. All materials used for manhole frame sealing shall be pre-approved by the Engineer.

B. The installer shall warrant and save harmless the County against all claims for patent infringement and any loss thereof.

C. The Contractor shall handle and store all materials and shall dispose of all wastes in accordance with applicable Federal, State, and local laws and regulations.

D. All Work shall be performed in strict observance of OSHA regulations, especially those related to confined space entry.

E. The Contractor shall notify the DeKalb County Fire Department and the DeKalb County Department of Watershed Management and obtain approval and water meter, if required, before using fire hydrants.

2.2 FLEXIBLE RUBBER SLEEVE

A. Flexible rubber sleeve manhole frame seal shall be manufactured by Cretex Specialty Products or a similar approved product. The pre-approval of another product must be made by the County prior to the formal opening of proposals. It is the contractor’s responsibility to timely submit information/tests for the County to make the determination.

B. The flexible rubber sleeve, extensions and wedge strips shall be extruded or molded from a high grade rubber compound conforming to the applicable requirements of ASTM C923, with a minimum of 1500 psi tensile strength, maximum eighteen (18) percent compression set and a hardness (durometer) of forty eight (48) ± 5.

C. The flexible rubber sleeve shall be either double or triple pleated with a minimum unexpanded vertical height of eight (8) inches and ten (10) inches respectively and a minimum thickness of 3/16 inch. The top and bottom section of the flexible rubber sleeve shall contain an integrally formed expansion band recess and multiple sealing fins.

D. The top section of the extension shall have a minimum thickness of 3/32 inch and shall be shaped to fit into the bottom band recess of the flexible rubber sleeve under the bottom chimney seal band and the remainder of the extension shall have a minimum thickness of 3/16 inch. The bottom section of the extension shall contain an integrally formed expansion band recess and multiple sealing fins matching that of the flexible rubber sleeve.
1. Any splice used to fabricate the flexible rubber sleeve and extension shall be hot vulcanized and have a strength such that the sleeve shall withstand a 180 degree bend with no visible separation.

2. The continuous wedge strip used to adapt the flexible rubber sleeve to sloping surfaces shall have the slope differential needed to provide a vertical band recess surface, be shaped to fit into the band recess, and have an integral band restraint. The length of the wedge strip shall be such that, when its ends are butted together, it will cover the entire inside circumference of that band recess needing slope adjustment.

E. The expansion bands used to compress the sleeve against the manhole shall be integrally formed from sixteen (16) gauge stainless steel conforming to the requirements of ASTM A240, Type 304, with no welded attachments and shall have a minimum width of 1 ¾ inches.

1. The bands shall have a minimum adjustment range of two (2) diameter inches and the mechanism used to expand the band shall have the capacity to develop the pressures necessary to make a watertight seal. The band shall be permanently held in this expanded position with a positive locking mechanism. Any studs and nuts used for this mechanism shall be stainless steel conforming to the requirements of ASTM F-923 and 594, Type 304.

2.3 FLEXIBLE URETHANE RESIN

A. Flexible urethane resin manhole frame seal shall be Flex-Seal Utility Sealant as manufactured by Sealing Systems, Inc., or an approved equal product.

B. The flexible urethane resin manhole frame seal shall be used to form a flexible seal to stop inflow/infiltration and provide corrosion protection to the internal wall of a manhole from three (3) inches above the bottom of the frame to three (3) inches below the top of the cone. The finished product shall conform to the minimum requirements listed below:

<table>
<thead>
<tr>
<th></th>
<th>Prime Coat</th>
<th>Final Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness</td>
<td>ASTM-D 2240</td>
<td>85-90</td>
</tr>
<tr>
<td>Elongation</td>
<td>ASTM-D 442</td>
<td>400%</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>ASTM-D 412</td>
<td>3200 psi</td>
</tr>
<tr>
<td>Adhesive Strength</td>
<td>ASTM-D 903</td>
<td>400 lb I/in</td>
</tr>
<tr>
<td>Tear Resistance</td>
<td>ASTM-D 1004</td>
<td>210 lb I/in</td>
</tr>
</tbody>
</table>
2.4 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

2.5 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.
PART 3 – EXECUTION

3.1 GENERAL

A. All activities shall be performed in accordance with the manufacturer’s recommendations and in accordance with the requirements of Federal, State, and local laws and regulations.

B. Prior to entering manholes, an evaluation of the atmosphere will be conducted to determine the presence of toxic, flammable vapors, or possible lack of oxygen. The evaluation shall be in accordance with Federal, State, and local safety regulations.

C. The Contractor shall provide traffic control in accordance with the requirements of the Traffic Regulation section of these Specifications.

3.2 FLEXIBLE RUBBER SLEEVE

A. All manhole frames that are misaligned from the chimney or cone/corbel by three (3) inches or more shall be excavated and realigned. All existing frames shall be thoroughly cleaned before reinstallation.

B. All loose and protruding mortar and brick that would interfere with the seal’s performance shall be removed and the appropriate areas of the manhole frame, chimney, and/or cone/corbel cleaned by wire brushing. All sealing surfaces shall be reasonably smooth and circular, clean, and free of any loose material or excessive voids.

C. Detailed surface preparation, including providing a vertical surface on a cone when none exists, shall be in accordance with the frame seal manufacturer’s instructions.

D. The Contractor shall install the flexible rubber sleeve in accordance with the manufacturer’s instructions.

E. The Contractor shall field measure the manhole to determine the information required on the manufacturer’s “Sizing and Ordering” procedure. This information is needed to obtain the proper size of bands, the size and shape of the rubber sleeve and the need for and size of any extensions.

F. The Contractor shall be properly trained, certified, and licensed in the installation of frame seals by the manufacturer and shall have a manufacturer’s recommended expansion tool and all other equipment/tools necessary to install the frame seals.
3.3 FLEXIBLE URETHANE RESIN

A. All manhole frames that are misaligned from the chimney or cone/corbel by three (3) inches or more shall be excavated and realigned. All existing frames shall be thoroughly cleaned before reinstallation.

B. All loose and protruding mortar and brick that would interfere with the seal’s performance shall be removed and the appropriate areas of the manhole frame, chimney, and/or cone/corbel cleaned by wire brushing. All sealing surfaces shall be reasonably smooth and circular, clean, and free of any loose material or excessive voids.

C. Detailed surface preparation shall be in accordance with the frame seal manufacturer’s instructions.

D. The Contractor shall install the flexible rubber sleeve in accordance with the manufacturer’s instructions.

E. The Contractor shall be properly trained, certified, and licensed in the installation of frame seals by the manufacturer and shall have a manufacturer’s recommended expansion tool and all other equipment/tools necessary to install the frame seals.

3.4 INSPECTION

A. Manhole frame seals shall be visually inspected after installation to insure that the seal is properly installed and that no voids or leakage points exist and that the manhole frame seal will not detach from the manhole. Any seals failing this visual test shall be reworked as necessary and retested at no additional cost to the County.

3.5 TESTING

A. Any seals not passing this visual inspection may, at the Contractor expense, be tested for leakage using a method approved by the County Engineer.

3.6 CLEANUP

A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.

B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.
C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.7 DOCUMENTATION

A. The Contractor shall complete work on each asset as assigned via the County’s Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/County Engineer. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.8 WARRANTY

A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at anytime during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION
L. Precast Concrete Manholes
SECTION 02641 PRECAST CONCRETE MANHOLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

The work covered by this section includes furnishing all labor, equipment, and materials required to install precast concrete manholes complete with frames and covers as described herein and as shown on the Plans.

1.2 RELATED SECTIONS

A. Section 02205 – Dewatering
B. Section 02324 – Trenching and Trench Backfilling
C. Section 02650 – Testing for Acceptance of Sanitary Sewers

1.3 REFERENCES


1.4 SUBMITTALS

A. Submittals shall conform to the requirements of the General Conditions of the Contract and the Submittals section of these Specifications.
B. The Contractor shall submit manufacturer’s data and details of the following items for approval:
   1. Shop drawings of manhole sections and base units and construction details, including reinforcement, jointing methods, and materials.
   2. Summary of criteria used in the manhole design including, as a minimum, material properties, loadings, load combinations, and dimensions assumed.
3. Materials to be used in fabricating drop connections.
4. Materials to be used for pipe connections at manhole walls.
5. Materials to be used for stubs and stub plugs, if required.
6. Materials and procedures for corrosion resistant liner and coatings, if required.
7. Plugs to be used for vacuum testing.
8. Manufacturer’s data for pre-mix (bag) concrete, if used for channel inverts and benches.

C. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the County Engineer.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.
10. Disposals: Type and quantity of debris (including liquids).

1.5 DESIGN CRITERIA

A. Manholes shall be constructed of specified materials to the sizes, shapes, and dimensions and at the locations shown on the Plans or as otherwise directed by the County Engineer. The height or depth of the manhole will vary with the
locations, but unless shown otherwise on the Plans shall be such that the top of the manhole frame will be at the finished grade of the pavement or higher than the ground surface as shown on the Plans and the invert will be at the designed elevations.

1.6 QUALITY ASSURANCE

A. Prior to delivery, all basic materials specified in this section shall be tested and inspected by an approved independent commercial testing laboratory or, if approved by the County Engineer, certified copies of test reports prepared by the manufacturer’s testing laboratory will be acceptable. All materials which fail to conform to these Specifications shall be rejected.

B. After delivery to the Site of the Work, any materials which have been damaged in transit or are otherwise unsuitable for use in the Work shall be rejected and removed from the Site of the Work.

1.7 MEASUREMENT AND PAYMENT

A. Precast Concrete Manholes shall be measured for payment by vertical feet installed in place including standard frame and cover and invert. Measurement will be made from the invert of the sewer to the top of the manhole cone, or from the top of the saddle to the top of the manhole cone. Manhole saddles shall be measured for payment per each saddle installed and accepted by the County Engineer. Bolted manhole frames and covers shall be measured as a single unit per each. Payment shall be full compensation for furnishing all labor, traffic control, and materials for the installation of the manhole, with standard frame and cover and invert including all trenching and backfilling. Payment will be made under:

1. Manhole installation, Forty-Eight (48) inch Diameter, 1-10 feet in depth, Precast Concrete, per each.

2. Manhole Installation, Forty-Eight (48) inch Diameter, 10 feet and greater, Precast Concrete, per Vertical Foot.

3. Manhole Installation, Sixty (60) inch Diameter, 1-10 feet in depth, Precast Concrete, per each.

4. Manhole Installation, Sixty (60) inch Diameter, 10 feet and greater, Precast Concrete, per Vertical Foot.

5. Manhole installation, Seventy-two (72) inch Diameter, 1-10 feet in depth, Precast Concrete, per each.

6. Manhole Installation, Seventy-Two (72) inch Diameter, 10 feet and greater Precast Concrete, per Vertical Foot.
7. Bolted Down Manhole Frame with Cover, per Each.

8. Outside drop connection, per each.

9. Inside drop manhole, per each.

B. The cost for flexible manhole sleeves (boots) with stainless steel clamps and bolt assemblies as well as bitumastic coated steel strap anchors shall be included in the cost for manholes.

1.2 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contribute to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.
1.3 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE MANHOLES

A. Unless specified otherwise in the Plans or in the Special Conditions of the Contract, all manholes will be precast concrete manholes as specified in this section.

B. The precast reinforced concrete manholes shall be constructed in accordance with the requirements of ASTM C478. Reinforced concrete manholes shall consist of manhole base sections, riser sections, transition sections, and conical sections as described in this section. The manhole components shall be configured to minimize the number of joints required per manhole (see Detail Drawings). The County Engineer may require any manhole that is not composed of the minimum number of sections to be replaced.

C. Portland cement concrete used in the precast reinforced concrete manholes shall have a minimum compressive strength of 4,000 psi at twenty-eight (28) days.

1. The concrete shall contain type II Portland cement with a C3A content of five and one-half (5½) percent or less and meet the requirements of ASTM C478.

2. Limestone aggregate for concrete, except for maximum size and gradation, shall be as specified in applicable sections of these Specifications.

3. To aid in achieving the specified concrete compressive strength, newly cast manholes shall be cured in accordance with the requirements of ASTM C478. The method of curing proposed must be submitted to the County Engineer prior to manufacture. Manholes shall be cured for a minimum of seven (7) days prior to shipment to the Site of the Work unless otherwise instructed by the County Engineer.

4. The manhole manufacturer shall test the compressive strength of a minimum of two (2) concrete cylinders per calendar week. Reports verifying the results of the compression tests shall be maintained at the manufacturer’s facility. Reports shall be made available for inspection and review by the County Engineer. The manhole manufacturer shall
permit the County Engineer to make unannounced reviews of compression
test records and inspection of manufacturing facilities at any time during
normal business hours.

5. The manhole manufacturer shall notify the County Engineer of all
manholes delivered for use in the County’s WCTS which were
manufactured during a week for which a concrete compressive strength
test yielded a result of less than 4,000 psi.

(i) Such notification shall be in the form of a letter sent to:

DeKalb County Department of Watershed Management
Engineering and Technical Services
1580 Roadhaven Dr.
Stone Mountain, Georgia 30083
Attention: Director

(ii) Notification shall include, at a minimum, the project name,
Contractor name, date of manhole component manufacture, and
description of manhole component(s) affected.

(iii) The County Engineer may require additional testing, repairs, or
removal and replacement, at no additional cost to the County, of
any or all manhole components provided for use in the County’s
WCTS which were manufactured during a calendar week for
which a concrete compressive strength test yields a result of less
than 4,000 psi.

D. Reinforcing steel shall be bars of intermediate grade, open hearth, billet steel,
conforming to the requirements of ASTM A615, or Cold-Drawn Steel Wire for
Concrete Reinforcement conforming to the requirements of ASTM A82; or of
wire fabric conforming to the requirements of ASTM A185. The circumferential
reinforcement in the riser and conical top sections shall have an area of not less
than 0.12 square inches per linear foot.

E. The interior and exterior surfaces of the manhole shall have a smooth hard finish,
and shall be free from cracks, chips, and spalls.

F. The maximum allowable absorption of the concrete used for manhole
construction shall not exceed eight (8) percent of the dry weight.

G. Manhole base sections shall be circular, wet cast, and may be supplied in forty-
eight (48) inches, sixty (60) inches, and seventy-two (72) inches diameters.
Heights shall range from forty-eight (48) inches to ninety-six (96) inches
depending on availability with diameter and as specified or approved by the
County Engineer. All base sections shall be supplied with Manhole Lift System
inserts. Lifting eye bolts shall be supplied to the Contractor upon request.
Manhole bases manufactured with pipe openings eighteen (18) inches or less shall be furnished with Kor-N-Seal flexible pipe-to-manhole connectors. Pipes with diameters greater than eighteen (18) inches shall be secured with a concrete cradle installed to the springline of the pipe utilizing Class “B” concrete conforming to the requirements of the Cast-In-Place Concrete section of these Specifications.

H. Riser sections shall be circular, wet or dry cast, and may be supplied in forty-eight (48) inches, sixty (60) inches, and seventy-two (72) inches diameters. Heights shall range from sixteen (16) inches to forty-eight (48) inches in sixteen (16) inch multiples depending on availability with diameter and as specified or approved by the County Engineer. All riser sections shall be supplied with Manhole Lift System inserts. Lifting eye bolts shall be supplied to the Contractor upon request.

I. Transition sections shall be wet or dry cast. Conical transition sections shall be supplied for sixty (60) inches to forty-eight (48) inches diameter transitions. Conical transitions shall be thirty-two (32) inches high. Sixteen (16) inches high conical transitions may only be used when approved by the County Engineer. All conical transition sections shall be supplied with a Manhole Lift. Flat slab transitions shall be supplied for base sections seventy-two (72) inches to ninety-six (96) inches in diameter. Flat slab transitions shall be manufactured structurally to meet individual project requirements. Clear access openings shall be provided to accommodate riser sections as shown in the Plans or as detailed in the Detail Drawings.

J. Conical sections shall be wet or dry cast, concentric only. Eccentric sections will not be allowed. Conical sections shall transition from forty-eight (48) inches diameter to a twenty-seven (27) inches clear access opening and be either twenty-four (24) inches, thirty-six (36) inches, or forty-six (46) inches high. They shall be supplied with a Manhole Lift.

K. Precast manhole riser joints shall be offset tongue and groove type, supplied with Tylox Super Seal pre-lubricated gasket. Each joint shall also be supplied with Conseal CS-231 waterstop sealant as manufactured by Concrete Sealants, in widths as recommended by the manufacturer. All joints shall be permanently strapped utilizing three (3) bitumastic coated steel strap anchors located one-hundred and twenty (120) degrees apart.

L. The ends of each reinforced concrete manhole riser section and the bottom end of the manhole top section shall be so formed that when the manhole risers and the top are assembled, they will make a continuous uniform manhole.

M. Standard manholes of precast concrete construction, and other manholes of precast concrete construction having entering sewers of twenty-four (24) inches diameter or smaller shall have precast openings in the manhole walls for incoming or outgoing sewers as indicated on the Plans.
N. All components of a manhole for a particular location shall be clearly marked in order that the manhole may be correctly assembled to suit construction conditions existing at that particular location.

O. All precast concrete manhole base sections and drop manhole bases shall be set on a foundation of #57 compacted stone aggregate, twelve (12) inch minimum thickness, and covering the entire bottom of the excavation for the manhole. Aggregate size may be adjusted by the County Engineer based on field conditions.

P. Manhole steps shall conform to the requirements of this section.

2.2 STRUCTURAL MATERIALS AND CASTINGS

A. Structural steel shall conform to the requirements of ASTM A283, unless otherwise indicated on the Plans.

B. Steel castings shall conform to the requirements of ASTM A27. The grades to be used will be specified in the Special Conditions of the Contract or indicated on the Plans.

C. Gray iron castings shall conform to the requirements of ASTM A48. All castings shall be clean and free of scale, adhesions, or inclusions. Gray iron castings for manhole or inlet frames and covers or gratings shall be cast from Class 30B cast iron. Bearing surfaces between manholes, inlet frames, and covers or gratings shall be such that the cover or grating shall seat in any position onto the frame without rocking. Bearing surfaces for standard manhole frames and covers shall be machined.

D. Aluminum castings shall conform to the requirements of ASTM B108.

E. Structural aluminum shall conform to the requirements of either ASTM B209, B221, B308, B241, or B211, as applicable. Finished bolts and nuts shall be given an anodic coating of at least 0.0002 inches in thickness.

2.3 FRAMES, COVERS, AND STEPS

A. New manhole rims, toe pockets, frames, and covers shall be cast iron conforming to the requirements of ASTM A48 for Class 30 Gray Iron Castings. All castings shall be made accurately to the required dimensions, fully interchangeable, sound, smooth, clean, and free from blisters or other defects. Defective castings which have been plugged or otherwise treated shall not be used. All castings shall be thoroughly cleaned and painted or coated with bituminous paint. Each casting shall have its actual weight in pounds stenciled or painted on it in white paint.
B. Manhole frames and covers shall be as detailed on the Plans, and as manufactured by Vulcan Foundry, or as manufactured by the Griffin Foundry Co., Russell pipe & Foundry Co., or equal.

C. Sanitary sewer manhole covers shall have the words “DeKalb County Sanitary Sewer” cast on the top in letters two (2) inches high.

D. Manhole inlet steps shall be made of steel reinforced copolymer polypropylene model PS-1 PF. They shall be installed at maximum sixteen (16) inch intervals. Manhole steps shall be as shown in the Detail Drawings with rod and pull ratings meeting OSHA standards.

2.4 SPECIALTY ITEMS

A. One piece manholes shall be manufactured in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings. They shall be cast utilizing 4,000 psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less. They shall be manufactured within a minimum eight (8) inches thick base with dowel steel reinforcement and waterstop. They shall be used only in situations which will not accommodate a twenty-four (24) inch base section and twenty-four (24) inch conical section.

B. 36” x 48” Manhole Tees shall be manufactured in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings. They shall be cast utilizing 4,000 psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less.

C. Saddle manholes shall be manufactured in accordance with the requirements of ASTM C478 and as shown in the Detail Drawings. They shall be cast utilizing 4,000 psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less.

D. Drop Manholes (Memphis Tees) shall be manufactured in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings. They shall be cast utilizing 4,000 psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less.

2.5 BRICK

A. Brick shall comply with the following requirements for which its use is intended. Bricks with holes through them will not be allowed in the Work.

B. Bricks used to adjust manhole frame to grade shall conform to the requirements of ASTM C32 for grade SM. Bricks shall conform to the following dimensions, unless otherwise approved by the Engineer.
<table>
<thead>
<tr>
<th></th>
<th>Depth (Inches)</th>
<th>Width (Inches)</th>
<th>Length (Inches)</th>
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<tbody>
<tr>
<td>Standard Size</td>
<td>2-1/4</td>
<td>3-3/4</td>
<td>8</td>
</tr>
<tr>
<td>Allowable Variation</td>
<td>+1/4</td>
<td>+1/4</td>
<td>+1/2</td>
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C. All brick shall be new and whole, of uniform standard size, and with substantially straight and parallel edges and square corners. Bricks shall be of compact textures, burned hard entirely through, tough and strong, free from injurious cracks and flaws, and shall have a clear ring when struck together. No soft or salmon brick shall be used in any part of the Work. Brick shall be culled after delivery, if required, and no culls shall be used except at such places, to such extent, and under such conditions as may be approved by the County Engineer.

2.6 CONCRETE

A. Concrete shall conform to requirements of the Cast-In-Place Concrete section of these Specifications.

2.7 MORTAR

A. Mortar shall be prepared only in the quantities needed for immediate use. Mortar which has been mixed for more than thirty (30) minutes or which has set or has been retempered shall not be used in the Work.

PART 3 - EXECUTION

3.1 GENERAL

A. All activities shall be performed in accordance with the manufacturer’s recommendations and regulations established by OSHA. Particular attention shall be drawn to those safety requirements involving working with scaffolding and entering confined spaces.

B. The Contractor shall verify that lines and grades are as specified in the Plans.

3.2 INSTALLATION

A. Manholes shall be constructed to the sizes, shapes, and dimensions as detailed in the Detail Drawings and at the locations shown on the Plans. They shall be constructed of precast concrete sections conforming to the requirements of this section. The manholes shall be assembled with the fewest number of sections to make up required height, thereby reducing the number of joints. The composition
of the manhole must be approved by the County Engineer. The County Engineer may require any manhole that is not composed of the minimum number of sections to be replaced. The depth of the manhole will vary with the location but in all cases it shall be such as will place the cover (or lid) at the finished grade of the pavement or ground surface or as otherwise indicate on the Plans. In undeveloped or rural areas, manholes shall be furnished to a height of two (2) feet above ground. The invert shall be placed at the elevation shown on the Plans. Eccentric cone sections and flat top manholes, except for shallow depth where approved by the County Engineer, will not be allowed; only concentric cones will be used.

B. Precast concrete manholes for reinforced concrete sewers forty-eight (48) inches diameter and larger shall be as specified above, except that they shall be installed on a saddle constructed on the barrel of the sewer. Precast concrete manholes for sewers thirty (30), thirty-six (36), and forty-two (42) inches shall be saddle-types or precast base types as specified in the Plans. Reinforcing steel in the saddle shall be welded to the reinforcing steel of the pipe. The design of these saddles shall be approved by the County Engineer prior to manufacture.

C. All joints for precast manhole stacks shall be offset tongue and groove with Tylox Super Seal pre-lubricated gaskets as manufactured by Hamilton Kent. Each joint shall also be sealed with Conseal CS-231 waterstop sealant as manufactured by Concrete Sealants. The width and installation of the joint sealant shall be in accordance with the manufacturer’s recommendations. All joints shall be supplied with 3” x 16” x ½” inch bitumastic coated steel strap anchors. Three (3) strap anchors, one-hundred and twenty (120) degrees apart shall be required per joint.

D. Where the difference in the invert elevation of two (2) or more sewers, eighteen (18) inches in diameter or smaller, intersecting in one (1) manhole is two (2) feet or more, a Drop Manhole (Memphis Tee) shall be constructed in the manner shown in the Detail Drawings. They shall be similar in construction to the standard manhole, except that a drop connection of a pipe and fittings of the proper size and material shall be constructed outside the manhole and supported by Class B concrete as indicated on the Plans and in the Detail Drawings. The manhole and the drop connection shall be placed on twelve (12) inch reinforced concrete base as detailed in the Detail Drawings. The drop connection piping assembly shall be bolted to the barrel of the manhole riser using a minimum of four 5/8-inch diameter stainless steel (316) bolts with suitable washers to prevent failure caused by pulling the bolt head through the manhole wall.

E. Base sections shall be precast with the vertical walls of sufficient height to allow entry of the required pipes as shown on the Plans, and as detailed in the Detail Drawings. Manhole inverts shall be constructed of cement mortar and shall have the same cross-section as the invert of the sewers which they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer
shall be made to a true curve with as large a radius as the size of the manhole will permit.

F. All water standing in the trench shall be removed before placing of concrete is started, and the foundation maintained in a dry condition.

G. Shallow manholes shall be constructed to the sizes, shapes, and dimensions as detailed in the Detail Drawings, and at the locations shown on the Plans. They shall be constructed of precast concrete sections as shown on the Plan or as directed by the County Engineer.

H. The top elevation of manhole frames shall be adjusted to grade in areas such as streets, alleys, and parking lots or where indicated on the Plans. A maximum adjustment of twelve (12) inches will be allowed using brick and mortar. Adjustments greater than twelve (12) inches must be made by changing precast riser sections. Brick used will be in accordance with the requirements of this section.

3.3 PIPE CONNECTIONS AT MANHOLES

A. Openings in manhole walls for incoming and outgoing sewers shall be precast or cored and after installation sealed with an approved non-shrink grout. These manholes shall be installed on choked and compacted stone bedding as detailed in the Detail Drawings.

B. A flexible manhole connector may be approved by the County Engineer as an alternate method of sealing the space between the manhole wall and the pipe. Flexible manhole sleeves shall be required for all pipes eighteen (18) inches and smaller. The manhole connector shall be Kor-N-Seal or equal and conform to the requirements of ASTM C923 and shall be made from ethylene propylene rubber (EPDM) designed to be resistant to ozone, weather elements, chemicals, including acids, alkalis, animal and vegetable fats, oils, and petroleum products. Manhole sleeves shall be secured to pipe by stainless steel clamp and bolt assembly conforming to the requirements of ASTM C923 and ASTM A167.

C. All stainless steel elements of the manhole connector shall be totally non-magnetic Series 304 Stainless, excluding the worm screw for tightening the steel band around the pipe which shall be Series 305 Stainless. The worm screw for tightening the steel band shall be torqued by a break-away torque wrench available from the precast manhole supplier, and set for 60-70 inch/lb. The connector shall be installed in the manhole wall by activating the expanding mechanism in strict accordance with the recommendation of the connector manufacturer. The connector shall be of a size specifically designed for the pipe material and size being utilized on the Project.
3.4 MANHOLE TESTING

A. All manholes shall be vacuum tested in accordance with the requirements of the Testing for Acceptance of Sanitary Sewers section of these Specifications.

3.5 BACKFILL

A. The Contractor shall place and compact backfill materials, in the area of excavation surrounding manholes in accordance with the requirements of the Excavation and Backfill for Structures section of these Specifications.

3.6 CLEANUP

A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.

B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.

C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.7 DOCUMENTATION

A. The Contractor shall complete work on each asset as assigned via the County’s Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/County Engineer. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.8 WARRANTY

A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at anytime during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.
B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION
M. Testing for Acceptance of Sanitary Sewers
SECTION 02650 – TESTING FOR ACCEPTANCE OF GRAVITY SANITARY SEWERS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. This section of the specifications provides for testing for acceptance of non-pressurized sanitary sewer installations. Upon completion of all or a part of a gravity sanitary sewer line installation, the Contractor shall test and/or inspect the sewer for acceptability. Testing and inspection shall be performed in accordance with the requirements of this section.

B. One or more of the following tests and/or inspections may be required:

1. Exfiltration of water.
2. Infiltration of water.
3. Exfiltration of air under pressure.
4. Joint testing.
5. Direct visual inspection.
6. Deflection testing.
7. Closed Circuit Television Inspection (CCTV).
8. Smoke Testing
9. Vacuum Testing

C. Prior to any testing, lines shall be backfilled, cleaned of debris and flushed clean. Debris shall be caught and removed from the line and shall not be flushed into existing live sanitary sewers. (The debris is to be disposed of properly in accordance with all laws. The County can furnish a letter to the landfill stating that the contractor is authorized to dispose of the materials. Debris and liquids quantities are to be tracked in the daily contractor diary.)

1.2 RELATED SECTIONS

A. Section 02535 - Gravity Flow Sanitary Sewers
B. Section 02641 - Precast Concrete Manholes
C. Section 02730 - Point Repairs to Sanitary Sewers
D. Section 01510 - Sanitary Sewer Television - Sonar Inspection
E. Section 01520 - Sanitary Sewer Cleaning
F. Section 01550 - Smoke Testing

1.3 REFERENCES
A. ASTM C924-02 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
B. ASTM C969-02 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
C. ASTM F1417-11a - Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air
D. ASTM C1244-11 – Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test Prior to Backfill

1.4 TEST SECTIONS
A. Unless otherwise specified or directed by the County Engineer, each section of sanitary sewer between manholes shall be tested by the air testing method.
B. Testing shall be conducted in accordance with ASTM C924-02, ASTM C969-02, ASTM F1417-11a, and ASTM C1244-11. The County Engineer may allow alternate testing methods at his discretion or require additional testing methods if, in his opinion, they are warranted.
C. The Contractor may at his option divide the first section of sewer into subsections of more convenient length for testing. If the section or subsection tested does not pass the tests, it shall be repaired and the test repeated until a satisfactory test is obtained.

1.5 MEASUREMENT AND PAYMENT
A. No separate measurement or payment will be made for Testing for Acceptance of Sanitary Sewers, same being considered incidental to the unit price bid for pipe and manhole installation.

1.6 SAFETY
A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.
B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.
1.7 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

PART 2 – PRODUCTS

(None Cited)
PART 3 – EXECUTION

3.1 SANITARY SEWERS INSPECTION AND TESTING METHODS

A. All Testing Methods: All wyes, tees, and stubs shall be plugged with flexible jointed caps, or acceptable alternate, and securely fastened to withstand the internal test pressure. Such plugs or caps shall be readily removable.

B. The Contractor shall backfill, clean and test lines before requesting final acceptance. Where any obstruction is met, the Contractor shall clean the sewers by means of rods, swabs, or other instruments. When requested by the County Engineer, the Contractor shall flush out lines and manholes before final inspection.

C. Alignment: Pipe lines shall be straight and show a uniform grade between manholes, except for curves specifically shown on the Plans or approved by the County Engineer. The Contractor shall correct any discrepancies discovered during inspection at no additional cost to the County.

D. Watertightness: All sewers constructed shall be tested for watertightness to the maximum extent feasible. Infiltration and exfiltration tests shall be performed on all new or replacement sewers constructed as specified in this section, except for those new sewers constructed which have active services tied into them as the pipe is being installed. In such cases the watertightness of the sewers less than or equal to twenty-four (24) inches shall be based on tests as specified in sections 3.1E and 3.1F. For sewers thirty (30) inches and larger testing shall be based on the individual joint test as specified in this section. All visible leaks, including those found via television inspection, shall be repaired at no additional cost to the County.

E. Infiltration Tests:

1. The Contractor shall install suitable weirs in manholes selected by the County Engineer to determine the leakage of ground water into the sewer. The maximum length of line for each infiltration test shall be five-thousand (5,000) feet. The Contractor shall install weirs for a minimum of four (4) hours before measuring flow. If leakage in any section of the sewer line exceeds one-hundred (100) gpd/inch diameter/mile, the Contractor shall locate and repair leaks. Repair methods must be approved by the County Engineer. After repairs are completed, the Contractor shall re-test for leakage. Infiltration testing shall be performed before sanitary sewer lateral reconnections are made.

2. The Contractor shall furnish, install, and remove the necessary weirs, plugs, and bulkheads required to perform the leakage tests.

3. Weirs shall be V-notch type by Pollard.
F. Exfiltration Tests:

1. Low-Pressure Air Test: Sewer diameters less than or equal to twenty-four (24) inches:

(i) Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the Contractor’s option, sewers may be tested in lengths between manholes or in short sections (twenty-five [25] feet or less) using inflatable balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately four (4) psig. After this pressure is reached and the pressure allowed to stabilize (approximately two (2) to five (5) minutes), the pressure may be reduced to three and one-half (3.5) psi before starting the test. If a one (1) psi drop does not occur during the test time, then the line will be considered as having passed the test. If the pressure drops more than one (1) psi during the test time, the line will be presumed to have failed the test, and the Contractor shall be required to locate the failure, make necessary repairs, and retest the line at no additional cost to the County. Refer to ASTM C924-02 and ASTM F1417-11a for detailed testing requirements and minimum test times for various pipe sizes and types.

(ii) Required test equipment, including, but not limited to: inflatable balls, braces, cut-off valves, air hose, rotameter (standard CFM reading with an accuracy of ± two (2) percent), mechanical or pneumatic plugs, time measuring equipment with an accuracy of 0.1s, oil free air source with a singular control panel containing a main shut-off valve, pressure regulating valve, pressure-relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range of 0 psi to at least 10 psi with minimum divisions of 0.10 psi and an accuracy of ± two (2) percent shall be provided by the Contractor. Testing equipment shall be equal to Cherne Air-Loc Testing Systems.

(iii) The Contractor shall keep records of all tests made. Copies of such records shall be given to the County Engineer. Such records shall show date, line number and stations, operator, and such other pertinent information as required by the County Engineer.

(iv) The Contractor is cautioned to observe proper safety precautions in the performance of the air testing. It is imperative that plugs be properly installed, restrained and braced to prevent the sudden expulsion of a poorly installed or partially inflated plug. Care shall
be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the sewer line.

2. Individual Joint Test: Pipe joints for sewers greater than (24) inches in diameter shall be air tested individually as specified in paragraph 3.2 Joint Testing Procedures

G. Smoke Testing: Smoke testing may be used only to locate leaks and in no case shall be considered conclusive or a substitute for air tests, exfiltration tests, or infiltration tests. In all cases a smoke test shall be accompanied by an air test, exfiltration test, or infiltration test. The County Engineer may order a smoke test if another leakage test fails and the source of the leak cannot be determined by other means. Smoke testing may only be performed where ground water is low. Smoke shall be blown into a sealed section of sewer under pressure and the Contractor and County Engineer shall observe for any smoke appearing on top of the ground indicating the presence of leaks. The County Engineer may require that the Contractor excavate the sewer to determine the source of any smoke appearing during the smoke test. All leaks or breaks discovered by the smoke tests shall be repaired and/or corrected by the Contractor at his own expense in a manner acceptable to the County Engineer. Equipment and supplies required for smoke tests shall be furnished by the Contractor. The Contractor may perform smoke tests at any time during construction at his option; however, any such tests shall not supplant the final test of the completed work. Refer to Section 01550 – Smoke Testing

H. Deflection Test: All PVC gravity sewers:

1. The Contractor shall test PVC gravity sewers for excessive deflection by passing a mandrel through the pipe. Deflection of the pipe shall not exceed five (5) percent. The mandrel size shall be based upon the maximum possible inside diameter for the type of pipe being tested, taking into account the allowable manufacturing tolerances of the pipe. The mandrel shall be configured as shown on the Plans or directed by the County Engineer and shall have an odd number of legs, or vanes, with a quantity equal to or greater than nine (9). The legs of the mandrel shall be permanently attached to the mandrel. A mandrel with variable sizes shall not be allowed. The mandrel shall be constructed of steel, aluminum, or other material approved by the County Engineer, and shall have sufficient rigidity so that the legs of the mandrel will not deform when pulling through a pipe. The Contractor shall provide a proving ring for each size mandrel, with a tolerance of no more than 0.02 inch clearance, and the mandrel dimensions shall be checked by the County Engineer using this proving ring, before use by the Contractor.
2. The Contractor shall excavate and install properly any section of pipe not passing this test and re-test until results are satisfactory at no additional cost to the County.

3. This test shall be performed twice:

   (i) Once within the first thirty (30) days of installation, and

   (ii) Once during final inspection, but no sooner than thirty (30) days after pavement backfill is done.

I. Closed Circuit Television Inspection: The County Engineer may require that the interior of a new gravity sewer be subjected to television inspection. Such television inspection shall be conducted and documented in accordance with the requirements of Section 01520 - Sanitary Sewer Cleaning, Section 01510 - Sanitary Sewer Television - Sonar Inspection, and Section 01550 - Smoke Testing. Prior to final acceptance the County shall be provided with one copy of the TV inspection report and CD-ROMs showing the entire length of the gravity sewer tested. The report shall contain the condition of pipe, type of pipe, depth, location of services, length, type of joints, roundness, and distance between manholes. Any pipe found to be cracked, leaking, misaligned, bellied, or otherwise defective shall be removed and replaced at no additional cost to the County.

3.2 JOINT TESTING PROCEDURES

A. Joint Testing Procedures: Each sanitary sewer joint shall be individually air tested using a packer or other approved testing device at a test pressure of Test Pressure:

1 Joint test pressure shall be 3-psi higher than the groundwater pressure, if any, outside the pipe. Groundwater pressure may be determined by positioning the testing device on a visibly infiltrating joint and measuring the resulting VOID pressure with the VOID pressure monitoring equipment. In the absence of groundwater pressure data, the test pressure shall be equal to 1/2 psi per vertical foot of pipe depth or 3 psi, whichever is greater. The testing device shall be positioned within the line in such a manner as to straddle the pipe joint to be tested. The testing device end elements (sleeves) shall be expanded so as to isolate the joint from the remainder of the line and create a VOID area between the testing device and the pipe joint. The ends of the testing device shall be expanded against the pipe with sufficient inflation pressure to contain the air within the VOID without leakage past the expanded ends. Air shall then be introduced into the VOID area until a pressure equal to or greater than the required test pressure is observed with the VOID pressure monitoring equipment. If the required test pressure cannot be developed (due to joint leakage), the joint will have failed the test. After the VOID pressure is observed to be equal to or greater than the required test pressure, the air flow shall be stopped. If the VOID pressure decays
by more than 2 psi within 15 seconds (due to joint leakage), the joint will have failed the test.

1. All test monitoring shall be above ground and in a location to allow for simultaneous and continuous observation by the County Engineer. The void pressure data shall be transmitted electronically from the void to the monitoring equipment.

2. Prior to starting the sanitary sewer joint testing, a two (2) part control test shall be performed as follows:

   (i) To insure the accuracy, integrity, and performance capabilities of the testing equipment, a demonstration test will be performed in a test cylinder constructed in such a manner that a minimum of three (3) known leak sizes can be simulated (0.062, 0.094, 0.125 inch diameter). This technique will establish the test equipment performance capability in relationship to the test criteria and insure that there is no leakage of the test medium from the system or other equipment defects that could affect the joint testing results. If this test cannot be performed successfully, the Contractor shall be instructed to repair or otherwise modify his equipment and re-perform the test until the results are satisfactory to the County Engineer. This test may be required at any other time during the joint testing work if the County Engineer suspects the testing equipment is not functioning properly. The demonstration test may be required, by the County Engineer, at any other time during the joint testing work at no additional cost to the County.

   (ii) After entering each manhole section with the test equipment, but prior to the commencement of joint testing, the test equipment shall be positioned on a section of sound sewer pipe between pipe joints, and a test performed as specified. This procedure will demonstrate the reality of the test requirement, as no joint will test in excess of the pipe capability. Should it be found that the barrel of the sewer pipe will not meet the joint test requirements, the requirements will be modified as necessary.

3. During the sanitary sewer joint testing work, the Contractor shall keep the following records:

   (i) Identification of the manhole to manhole section tested.

   (ii) Test pressure used.

   (iii) Location (footage) of each joint tested.

   (iv) Test results for each joint tested.
B. Lamping Procedures: Lamping will be performed on all sewer pipeline by the County Engineer. When lamping is to be performed by the County Engineer the Contractor shall provide access to the sewer and facilitate the County Engineer in execution, as needed.

3.3 MANHOLE TESTING METHODS

A. All manhole inserts, new manholes, and replacement manholes shall be tested by the Contractor using the vacuum test method, following the manufacturer’s recommendations for proper and safe procedures. Vacuum testing of manholes and structures shall be performed after installation of inserts. Any leakage in the manhole or structure, before, during, or after the test shall be repaired at no additional cost to the County.

B. Manholes:

1. Prior to testing manholes for watertightness, all liftholes shall be plugged with a non-shrink grout, all joints between precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced.

2. Vacuum Tests shall be performed in accordance with ASTM C1244-11: If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout. Retesting shall proceed until a satisfactory test is obtained. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc.

C. The County reserves the right to have third party consultants perform construction materials testing and assessments to any new manhole.

D. The use of soapy water on the manhole walls to help determine the areas of leakage is permitted.

END OF SECTION
N. Point Repairs to Sanitary Sewer and Service Laterals
SECTION 02730 Point Repairs to Sanitary Sewers and Service Laterals

PART 1 – GENERAL

1.1 SECTION INCLUDES

Defining the types and methods of external point repairs to sanitary sewers and service laterals.

1.2 RELATED SECTIONS

A. Section 01520, Sanitary Sewer Cleaning
B. Section 02600, Wastewater Flow Control
C. Section 02500, Dewatering
D. Section 02300, Trenching and Trench Backfilling
E. Section 02650, Gravity Flow Sanitary Sewers

1.3 REFERENCES

F. ASTM D1557 - Standard Test Method for Laboratory, Compaction Characteristics of Soils Using Modified Proctor Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
1.4 DEFINITIONS

A. Point repairs as used in these Specifications shall mean repair of a limited length (not full length) of existing sanitary sewer mains between two manholes and/or a portion of a service lateral between the sewer main and the facility it serves.

1.5 SUBMITTALS

A. The Contractor shall submit shop drawings and product data to the County Engineer for approval.

B. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:
1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.

2. Weather: Conditions (e.g., rain, sunny, windy, etc.).

3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).

4. Submittals: To the County Engineer.

5. Personnel: On site by name (e.g., all labor, specialty services, etc.).

6. Accident: Report (e.g., all injuries, vehicles, etc.).

7. Incident: Report (e.g., damage to property, property owner complaint, etc.).

8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.


10. Disposals: Type and quantity of debris (including liquids).

1.6 EXPERIENCE

A. Supervisor of the field crews shall have the proper training in supervising point repairs to sanitary sewers and service laterals and have a minimum of three (3) years experience in performing such assignments including safe work practices.

B. Field crew leaders performing shall have the proper training in supervising point repairs to sanitary sewers and service laterals and have a minimum of two (2) years experience in performing such assignments including safe working practices, etc.

C. The Contractor shall provide the County Engineer with written documentation (certification) that the supervisor, field crew leader, and all crewmembers responsible for these assignments have the proper training and the requisite experience.

D. No crewmembers shall enter confined spaces without the necessary certified training.

1.7 MEASUREMENT AND PAYMENT

A. Payment for mainline point repairs will be per each point repair for each size of sewer pipe. A mainline point repair shall include repair of up to fifteen (15) linear feet of mainline sewer including manhole connection. Mainline point repairs in excess of fifteen (15) linear feet will be paid at the unit price bid per mainline point repair plus unit price per linear foot for pipe replacement thereafter.

Point Repairs to Sanitary Sewers and Service Laterals
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B. Payment for point repairs being made with DIP in-lieu-of PVC pipe shall be made at the unit bid price. Payment will be full compensation for furnishing all materials, labor, tools, and equipment necessary to perform all work. Payment for point repair made with DIP in-lieu-of PVC pipe shall be made under Point Repairs, Unpaved Area, Pipe Diameter, DIP as an extra, per linear foot. This payment will be in addition to the payments for the point repair up to 15 feet of length and over 15 feet of length.

C. Service lateral reconnection and/or replacements to sewer mains shall be performed in accordance with the requirements of the Sewer Service Lateral Reconnection and Replacement section of these Specifications.

D. Payment for foundation backfill when required by the County Engineer to stabilize the bottom of an unstable trench bottom shall be in accordance with requirements of the Backfill Section of the County’s Specifications.

E. No separate measurement and payment will be made for television inspection. The work and materials being considered as integral to and part of the unit bid prices.

F. No separate measurement and payment will be made for the cleaning of the sewer lines. The work and materials being considered as incidental to and part of the unit bid prices.

G. No separate measurement and payment will be made for wastewater flow control. As discussed in Section 02600 – Wastewater flow control, the large diameter bypass (15” and greater) will be paid for separately if flow needs to be shut down for more than 24 hours to perform the repairs.

1.8 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is
fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.9 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.1 PIPE MATERIAL

A. The Contractor shall use the material shown on the Plans conforming to the requirements of the Gravity Flow Sanitary Sewers section of these Specifications.

PART 3 – EXECUTION

3.1 PREPARATION

A. The Contractor shall establish the locations of existing utilities prior to excavation. All protection required to prevent damage to existing utilities shall be provided by the Contractor.

B. Site preparation shall be performed in accordance with the Site Work Section of these Specifications. When the repairs are to be made on sewers or facilities lying under paved surfaces, those surfaces shall be removed as required for point repairs of the particular size pipe involved (trench width plus two feet for concrete surfaces) unless otherwise approved by the County Engineer.
C. The Contractor shall provide all the materials and equipment necessary to perform wastewater flow control in accordance with the requirements of the Wastewater Flow Control section of these Specifications.

D. The Contractor shall dewater, sheet, and/or brace all excavations as specified in the Dewatering and the Trenching and Trench Backfilling sections of these Specifications.

E. The Contractor shall note all service connections and restore them to original condition following the requirements of the Sewer Lateral Reconnection and Replacement section of these Specifications.

F. Traffic control shall be provided by the Contractor at no additional cost to the County. All traffic control measures and plans shall conform to the requirements of the Manual on Uniform Traffic Control Devices (MUTCD), Part 6 (Temporary Traffic Control), latest edition, as published by the US DOT / FHWA.

G. All activities shall be performed in accordance with the manufacturer’s recommendations and regulations established by OSHA. Particular attention shall be drawn to those safety requirements involving working with scaffolding and entering confined spaces.

3.2 METHOD OF REPAIR

A. The Contractor shall replace a sufficient length of pipe to ensure that defective pipe is removed and replaced up to a length, per repair, of fifteen (15) feet.

B. If the length of the required replacement segment, up to a length of fifteen (15) feet per repair, is not adequate to replace the defective pipe, the Contractor, at the County’s option, may be directed to replace additional length of pipe such that the defective pipe is replaced.

C. The Contractor shall replace service taps encountered within the point repair using the material specified. All services shall be replaced with wyes. Any defective service laterals encountered within the point repair shall be repaired under this specification or in accordance with the Sewer Lateral Reconnection and Replacement section of these Specifications.

D. When a pipe defect can be repaired using shrinkwrap the Contractor will request the County Engineer’s approval to do so.

E. Any service lateral or competent main line pipe broken by the Contractor shall be replaced by the Contractor at the Contractor’s expense.

F. The Contractor shall remove any fences, base materials, storm sewer, etc. that may interfere with the repair made at each specified point. The Contractor is responsible for the replacement of said fences, base materials, storm sewer etc., to an equal or better condition.
G. The bottom of the trench shall be reshaped so that the grade of the pipe replaced will match that required for the existing sewer line. The point repair shall be backfilled in accordance with the requirements of the Trenching and Trench Backfilling section of these Specifications.

H. If the material in the bottom of the trench is of such consistency that it is not stable, then the Contractor shall stabilize the bottom of the trench by placing suitable materials at the direction of the County.

I. Prior to backfilling, the County shall inspect point repairs. After backfilling, point repairs shall be internally televised by the Contractor for final approval by the County Engineer. The cost of the CCTV inspection is included in the bid unit price for the point repair.

J. Where repairs are made on sewers or facilities lying under paved surfaces, those surfaces shall be restored in accordance with the requirements of the GDOT Standard Specifications Construction of Transportation Systems.

3.3 CLEANUP

A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.

B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.

C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.4 DOCUMENTATION

A. The Contractor shall complete work on each asset as assigned via the County’s Computerized Work Order Management system.

B. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/County Engineer. The Contractor shall complete work on each point repair as shown in the Plans or directed by the County Engineer.

C. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.
3.5 WARRANTY

A. The Contractor shall guarantee the work for a warranty period of two (2) years from the date of final acceptance. If, at anytime during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

**END OF SECTION**
O. Sanitary Sewer Manhole Rehabilitation
SECTION 02900 – SANITARY SEWER MANHOLE REHABILITATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. This section of these Specifications provides for the rehabilitation of manholes including the repair/ replacement/rebuilding/sealing of the base, trough, bench, walls, and cone, and removal of unsound construction material. Work includes surface preparation, sealing, and testing.

B. Provide the following items, but not limited to, as directed by the County:

1. Pressure grout leaks.
2. Repair leaking crack, joint and/or lift hole with hydraulic cement mortar.
3. Repair non-leaking crack, joint and/or lift hole with cement mortar.
4. Restore the structural integrity by lining the manhole with cement mortar.
5. Provide corrosion barrier by lining the manhole with an epoxy coating.
6. Restore the structural integrity of the manhole while providing corrosion barrier by installing a fiberglass insert liner.
7. Rebuild bench and trough using cement mortar.
8. Provide thickness gauges, wet film gauges and other testing equipment to test the thicknesses as required by this specification.
10. Provide survey grade (+/- 0.01-foot) data on a manhole using GPS.
11. Provide survey grade (+/- 0.01-foot) data on a manhole using conventional survey methods.
12. Provide bypass pumping to facilitate rehabilitation activities.
13. Provide manhole condition assessment services.
14. Locate and expose buried manholes.
15. Install internal frame seal.
16. Remove intruding pipe or obstruction
17. Remove manhole steps
1.2 RELATED SECTIONS

Section 02600, Wastewater Flow Control

1.3 REFERENCES


C. ASTM C882/C882M-12 -Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear


G. ASTM D-790-Properties of Unreinforced and

H. Reinforced Plastics and Electrical Insulating Materials


J. ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness by Notch Gages

K. Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management

1.4 QUALIFICATIONS –SEE EXPERIENCE

1.5 SUBMITTALS

A. The Contractor shall submit the following items at least thirty (30) calendar days prior to starting manhole/vault rehabilitation:

1. Manufacturers’ Certificate of Compliance certifying compliance with the applicable specifications and standards. The certifications shall list all materials furnished under this Section.
2. Certified copies of test reports of factory tests required by the applicable standards, the manufacturer, and this Section.

3. Manufacturer’s handling, storage, and installation instructions and procedures.

4. Recommended lining thickness design to withstand groundwater pressure as specified in Part 3 of this Section.

5. Shop drawings and samples for any material proposed as equal to a specified material. The Contractor shall submit sufficient manufacturer’s information to support equality with the specified material to the satisfaction of the County Engineer.

B. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.

2. Weather: Conditions (e.g., rain, sunny, windy, etc.).

3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).

4. Submittals: To the County Engineer.

5. Personnel: On site by name (e.g., all labor, specialty services, etc.).

6. Accident: Report (e.g., all injuries, vehicles, etc.).

7. Incident: Report (e.g., damage to property, property owner complaint, etc.).

8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.


10. Disposals: Type and quantity of debris (including liquids).

1.6 EXPERIENCE

A. The supervisor of the field crews shall have received proper training and have a minimum of three (3) years experience in performing the type of work covered under this section of these Specifications including safe working practices, confined space entry procedures, the types of equipment being used, product/materials being used, etc.
B. Field crew leaders shall have received proper training in this function and have a minimum of two (2) years experience in performing the type of work covered under this section of these specifications including safe working practices, confined space entry procedures, the types of equipment being used, product/materials being used, etc.

C. No crewmembers shall enter confined spaces without the necessary certified training as required under applicable Federal, State, and local laws, regulations, standards, policies, procedures, and requirements.

D. The Contractor shall provide the County Engineer with written documentation that the supervisor, crew leader/s, and all crewmembers have received the proper training and where required the requisite experience.

E. For epoxy coating and fiberglass liner applicators/installers, the Contractor shall submit the following information:

1. Manufacturer’s certification that the applicator/installer has been trained in the proper handling, mixing, application, and installation of the high build epoxy coating and/or fiberglass liner and is approved by the manufacturer.

2. Documentation of the applicator/installer’s experience with high build epoxy coating and/or fiberglass inserts. Documentation must include names of references with contact phone numbers. The applicator/installer must prove reasonable experience, as determined by the County Engineer, with the coating and/or insert they intend to use on the project.

1.7 LINING SYSTEMS

A. The lining system used shall result in a monolithic structure to the shape and contour of the interior of the existing manhole. The lining system shall be completely water tight and free of any joints or openings other than pipe inlets, pipe outlets and the rim opening. The junction of the lining material with the pipe material at the inlets and outlets shall be watertight.

1.8 MEASUREMENTS AND PAYMENT

A. Payment for pressure grouting a leak shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, flow control, and equipment necessary to perform all work associated with pressure grouting a leak. Payment shall be made under Manhole Rehab, Pressure Grout Leak, per each.

B. Payment for the pressure grout compound actually injected shall be made at the unit price bid. Payment shall constitute full compensation for furnishing the grout compound including purchase, and delivery to the Site of the Work. Payment shall be made under Manhole Rehab, Pressure Grout Used, per gallon.
C. Measurement and payment for repairing a leaking crack/joint with hydraulic cement shall be made on a linear foot basis. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with repairing a leaking crack/joint. The quantity paid shall be the actual linear feet length of the crack/joint repaired to the nearest 1.0-linear foot. Payment shall be made under Manhole Rehab, Mortar Grout Leaking Crack/Joint, per linear foot.

D. Payment for repairing a leaking lift hole with hydraulic cement shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with repairing a leaking lift hole. Payment shall be made under Manhole Rehab, Mortar Grout Leaking Lift Hole, per each.

E. Payment for repairing a non-leaking crack/joint with cement mortar shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with repairing a non-leaking crack/joint. The quantity paid shall be the actual linear feet length of the crack/joint repaired to the nearest 1.0-linear foot. Payment shall be made under Manhole Rehab, Mortar Grout Non-Leaking Crack/Joint, per linear foot.

F. Payment for repairing a non-leaking lift hole with cement mortar shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with repairing a non-leaking lift hole. Payment shall be made under Manhole Rehab, Mortar Grout Non-Leaking Lift Hole, per each.

G. Payment for cement mortar, ½-inch minimum thickness up to 2-inches thick, rehabilitation of manholes from bench to frame shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with manhole rehabilitation utilizing cement mortar. Payment shall be made under Manhole Rehab, Cement Mortar Rehab, Manhole Diameter (inches), per vertical foot (measured from invert to bottom of frame).

H. Payment for cement mortar, ½-inch minimum thickness up to 2-inches thick, rehabilitation of vaults from bench to frame shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with vault rehabilitation
utilizing cement mortar. Payment shall be made under Manhole Rehab, Cement Mortar Rehab - Vault, per square foot.

I. Payment for additional cement mortar above 2-inches thick, (as determined by the County Engineer) from bench to frame shall be made at the unit price bid. Payment will be full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with the installation cement mortar above 2-inch thick. Payment shall be made under Manhole Rehab, Cement Mortar Rehab – Additional Mortar, per cubic foot.

J. Payment for 150 mils minimum thickness epoxy lining of manholes shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control and equipment necessary to perform all work associated with the installation of epoxy lining in manholes (150 mils minimum thickness). Payment shall be made under Manhole Rehab, 150 Mils Thick Epoxy Lining, Manhole Diameter (inches), per vertical foot (measured from invert to bottom of frame).

K. Payment for 150 mils minimum thickness epoxy lining of vaults shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with the installation of epoxy lining (150 mils minimum thickness). Payment shall be made under Manhole Rehab, 150 Mils Thick Epoxy Lining – Vault, per square foot.

L. Payment for fiberglass insert rehabilitation of manholes shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with fiberglass insert rehabilitation of manholes. Payment shall be made under Manhole Rehab, Fiberglass Insert, Manhole Diameter (inches), per vertical foot (measured from invert to bottom of frame).

M. Payment for fiberglass insert rehabilitation of vaults shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with fiberglass insert rehabilitation of vaults. Payment shall be made under Manhole Rehab, Fiberglass Insert - Vault, per square foot.

N. Payment for bench and trough rehabilitation of manholes shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with bench and
trough rehabilitation of manholes. Payment shall be made under Manhole Rehab, Repair Manhole Bench and Trough, per each.

O. Payment for bench and trough rehabilitation of vaults shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, cleaning, stopping of infiltration, patching, flow control, and equipment necessary to perform all work associated with bench and trough rehabilitation of vaults. Payment shall be made under Manhole Rehab, Repair Vault Bench and Trough, per manhole diameter (inches), per each.

P. Payment for vacuum testing shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, flow control, and equipment necessary to perform all work associated with vacuum testing. Payment shall be made under Manhole Rehab, Vacuum Test, per each.

Q. Payment for resetting an existing manhole frame and cover shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, flow control, and equipment necessary to perform all work associated with resetting manhole frame and cover. Payment shall be made under Manhole Adjust –, Re-set Existing Manhole Frame and Cover, per each. Restoration shall be paid at unit price. Pavement is paid as separate item.

R. Payment for Priority Repair (work completed within forty-eight (48) hours) shall be made at the unit price bid. Payment shall constitute full compensation for completing the requested work within forty-eight (48) hours of receiving notification from the County. Payment shall be made under Miscellaneous, Fee for Priority Repair, per each.

S. Payment for Locating and Exposing Buried Manholes shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, traffic control, and equipment necessary to perform all work associated with locating and exposing buried manholes. Payment shall be made under Manhole Adjust- - Locate and Expose Buried Manhole, per each.

T. Payment for Installing a Precast Manhole Cone shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, labor, tools, flow control, traffic control, and equipment necessary to perform all work associated with installing a precast manhole cone. Payment shall be made under Manhole Adjust-Unpaved Area, Install Manhole Cone, Diameter (48, 60 or 72-inch), per each. Restoration shall be paid at unit price.

U. Payment for Anchoring a Manhole Frame to Concrete With Four (4) Stainless Steel Anchor Bolts and Epoxy Cement, to form a watertight joint between the frame and the concrete, shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials labor, tools, traffic
control, flow control, and equipment necessary to perform all work associated with Anchoring a Manhole Frame to Concrete With Four (4) Stainless Steel Anchor Bolts and Epoxy Cement. Payment shall be made under Manhole Adjust-, Anchor Manhole Frame to Concrete, per each. Restoration shall be paid at unit price.

V. Payment for Removing Manhole Steps shall be made at the unit price bid. Payment will be full compensation for furnishing all materials labor, tools, traffic control, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Remove Manhole Steps, per manhole.

W. Payment for Removing Intruding Pipe or Obstruction shall be made at the unit price bid. Payment will be full compensation for furnishing all materials labor, tools, traffic control, flow control of plugging/blocking and equipment necessary to perform all work. Payment shall be made under Remove Intruding Pipe or Obstruction, per each.

X. Payment for Purchasing DEKALB COUNTY Standard Manhole Frame & Cover shall be made at the unit price bid. Payment shall constitute full compensation for furnishing DEKALB COUNTY standard manhole frame & cover. Payment shall be made under Miscellaneous, Purchase DEKALB COUNTY Standard Manhole Frame & Cover, per each.

Y. Payment for Purchasing DEKALB COUNTY Watertight (boltdown) Manhole Frame & Cover shall be made at the unit price bid. Payment shall constitute full compensation for furnishing DEKALB COUNTY watertight (boltdown) manhole frame & cover. Payment shall be made under Miscellaneous, Purchase DEKALB COUNTY Watertight Manhole Frame & Cover, per each.

Z. Payment for purchasing 5/8-inch diameter by 1-1/2-inch long, hex bolt, full thread, Grade 5, medium carbon steel, zinc coated, 10 threads per inch (not security bolts) that fit DEKALB COUNTY Boltdown Manhole Frame & Cover shall be made at the unit price bid. Payment shall constitute full compensation for furnishing 5/8-inch diameter by 1-1/2-inch long, hex bolt, full thread, Grade 5, medium carbon steel, zinc coated, 10 threads per inch (not security bolts) that fit DEKALB COUNTY Boltdown Manhole Frame & Cover. Payment shall be made under Miscellaneous, Purchase Boltdown Steel Bolts, per each.

AA. Payment for installing watertight gasket that fits DEKALB COUNTY boltdown manhole frame & cover shall be made at the unit price bid. Payment shall constitute full compensation for furnishing all materials, transportation, storage, labor, tools, traffic control, flow control, and equipment necessary to perform all work associated with installing watertight gasket that fits DEKALB COUNTY boltdown manhole frame & cover including removal of the existing gasket, preparation of the manhole frame seating surface and installation of a new gasket. New gaskets will only be installed when a gasket is missing or when the existing
gasket is deteriorated/damaged. Payment shall be made under Miscellaneous, Purchase & Install Watertight Gasket, per each.

BB. Unless approved by the County Engineer in advance, based on level of difficulty and complexity, no payment will be made for accessing a manhole through its frame and cover. Includes, but is not limited to, the use of compounds/methods to loosen bolts, cleaning of bolt & frame threads to remove rust, and use of anti-seize on all threads. The Contractor shall provide all labor, equipment, and materials (except when the County specifically states it will provide standard bolts, security bolts, and/or security bolt keys). At no time is a manhole cover to be pried as this could result in damage to the cover, frame or both. Manhole frames and/or covers damaged by the Contractor shall be replaced at no cost to the County. If an existing bolt can’t be reused then a County provided bolt or a Contractor purchased bolt must be installed. Note: When accessing a boltdown cover it is best to return the cover to its original hole alignment. This assures the best alignment of the hole pattern in the cover with the hole pattern in the frame.

CC. Payment for access to a manhole thru its difficult cover and frame shall be made at the unit price bid. (The difficulty of the frame and cover must be verified by a County Inspector) Includes, but is not limited to, the removal of difficult bolts whether they must be cut, drilled, tapped, pulled, etc. Includes the installation of bolts even when tapping new threads into the frame, etc. are required. The Contractor must provide all labor, equipment and materials (except when the County specifically states it will provide standard bolts, security bolts and/or security bolt keys) required to perform this item. At no time is a manhole cover to be pried as this could result in damage to the cover, frame or both. The standard use of, but is not limited to, the use of compounds/methods to loosen bolts, cleaning of bolt & frame threads to remove rust, and use of anti-seize on all threads is provided at no additional cost. Manhole frames and/or covers damaged by the Contractor shall be replaced at no cost to the County. If an existing bolt can’t be reused then a County provided bolt or a Contractor purchased bolt must be installed. Note: When accessing a boltdown cover it is best to return the cover to its original hole alignment. This assures the best alignment of the hole pattern in the cover with the hole pattern in the frame. Payment shall be made under Miscellaneous, Access Difficult Manhole, per each.

DD. Separate payment will not be made for asset management. The cost of asset management must be included in other unit cost.

1.9 RESPONSIBILITY FOR OVERFLOWS/SPILLS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.
B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

### 1.10 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

### PART 2 – PRODUCTS

#### 2.1 GENERAL

A. Materials:

1. The materials used shall be designed, manufactured, and intended for sewer manhole/vault rehabilitation and the specific application for which they are used. The materials shall have a proven history of performance in sewer manhole/vault rehabilitation. The materials shall be delivered to the
Site of the Work in original unopened packages and clearly labeled with the manufacturer’s identification and printed instructions. All materials shall be stored and handled in accordance with the manufacturers recommendations. All materials shall be mixed and applied in accordance with the manufacturer’s written instructions.

2. The Contractor shall warrant and save harmless the County against all claims for patent infringement and any loss thereof.

3. Dispose of all wastes in accordance with applicable regulations.

4. Each coating/lining system shall be designed for application over wet surfaces (but not active running water) without degradation of the final product and/or the bond between the product and the manhole/vault surfaces.

B. Pressure grout active leaks:

1. Pressure grout shall be an acrylamide gel pressure sealant system provided by a single manufacturer. The acrylamide gel pressure sealant system shall consist of a dry powder chemical that readily dissolves in water to form a low viscosity solution that stiffens to a gel when mixed with an aqueous persulphate catalyst and a triethanolamine activator.

2. The system shall have the following characteristics:

   (i) A minimum of ten (10) percent acrylamide base material by weight in the total sealant mix.

   (ii) A higher concentration (percent) of acrylamide base material may be used to increase strength or offset dilution during injection.

   (iii) Minimum absolute viscosity of 1.2 centipoise.

   (iv) Manufacturer’s provided additives to increase viscosity, adjust cure time though the range of ten(10) seconds to one (1) hour, density, shrinkage, compressive strength, tensile strength, and pH.

   (v) Cured product shall be resistant to dehydration, homogeneous, chemically stable, non-biodegradable, firm, flexible gel.

3. The pressure grout system shall be AV100 acrylamide gel by Avanti International or approved equal.

C. Stopping active leaks (hydraulic cement):

1. A premixed fast-setting, volume-stable waterproof cement plug consisting of hydraulic cement, graded silica aggregates, special plasticizing and
accelerating agents. It shall not contain chlorides, gypsum’s, plasters, iron particles, aluminum powder or gas-forming agents, or promote the corrosion of steel it may come in contact with. Set time shall be approximately one (1) minute. Ten- (10)-minute compressive strength shall be approximately 500 psi.

(i) The product shall be designed to rapidly stop flowing leaks in vertical and horizontal, concrete and masonry surfaces.

(ii) The product shall develop high early compressive and tensile strength

<table>
<thead>
<tr>
<th>Cure Time</th>
<th>Compressive Strength (ASTM C 109)</th>
<th>Tensile Strength (ASTM C190)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day</td>
<td>3500 psi</td>
<td>------</td>
</tr>
<tr>
<td>7 day</td>
<td>4900 psi</td>
<td>290 psi</td>
</tr>
<tr>
<td>28 day</td>
<td>5500 psi</td>
<td>575 psi</td>
</tr>
</tbody>
</table>

(iii) Hydraulic cement shall be Hydra-Plug manufactured by Quadex, Mainstay ML-10 by Madewell Products Corporation, PRECO Patch manufactured by Fosroc, OCTOCRETE manufactured by IPA Systems, or approved equal.

2. A siliconate-based liquid accelerator field mixed with neat Portland cement. The set time shall be approximately one (1) minute.

3. The elastomeric polyurethane resin-soaked method, using dry twisted jute oakum, or resin-rod with polyurethane resin (water activated).

D. Patching, repointing, filling, and repairing nonleaking holes, cracks, and spalls in concrete and masonry manholes (Cement Mortar):

1. A premixed nonshrink cement-based patching material consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents, which has been formulated for vertical or overhead use. It shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder, or gas-forming agents or promote the corrosion of steel it may come into contact with. Set time (ASTM C-191) shall be less than thirty (30) minutes. One- (1) hour compressive strength (ASTM C-109) shall be a minimum of 200 psi and the ultimate compressive strengths (ASTM C-882-Modified) shall be a minimum of 1700 psi.
2. The product shall display the following properties:

<table>
<thead>
<tr>
<th>Strength (psi)</th>
<th>Day</th>
<th>7 Day</th>
<th>28 Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength (ASTM C 109)</td>
<td>3,875</td>
<td>4,550</td>
<td>6,190</td>
</tr>
<tr>
<td>Flexural Strength (ASTM C 78)</td>
<td>------</td>
<td>825</td>
<td>985</td>
</tr>
<tr>
<td>Tensile Strength (ASTM C 190)</td>
<td>------</td>
<td>290</td>
<td>575</td>
</tr>
<tr>
<td>Shrinkage (ASTM C 157, Modified)</td>
<td>0.04 Percent @ 28 Days</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Shall be a factory blended, low shrinkage, high strength, polymer modified, sprayable microsilica mortar.

4. The cement mortar shall be QM-1s Restore by Quadex, Inc., Mainstay ML-72 by Madewell Products Corporation, TPM #723 by Sherwin-Williams or approved alternate.

E. Spray applied or centrifugally cast lightweight structural reinforced cement manhole lining (Cement Mortar):

1. A premixed nonshrink cement-based patching material consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents, which has been formulated for vertical or overhead use. It shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder, or gas-forming agents or promote the corrosion of steel it may come into contact with. Set time (ASTM C-191) shall be less than 30 minutes. One-hour compressive strength (ASTM C-109) shall be a minimum of 200 psi and the ultimate compressive strengths (ASTM C-882-Modified) shall be a minimum of 1700 psi.

2. The product shall display the following properties:

<table>
<thead>
<tr>
<th>Strength (psi)</th>
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<th>7 Day</th>
<th>28 Day</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Tensile Strength (ASTM C 190)</td>
<td>------</td>
<td>290</td>
<td>575</td>
</tr>
<tr>
<td>Shrinkage (ASTM C 157, Modified)</td>
<td>0.04 Percent @ 28 Days</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Shall be a factory blended, low shrinkage, high strength, polymer modified, sprayable microsilica mortar.
4. Shall be suitable for low-pressure spray or trowel application for the repair of vertical and horizontal concrete and masonry structures.

5. Cement mortar shall be QM-1s Restore by Quadex, Inc., Mainstay ML-72 by Madewell Products Corporation, MS-2A by Strong, Silatec MSM by CemTec (A.W.Cook Cements), SewperCoat or approved alternate.

F. Spray applied corrosion protection (epoxy coating):

1. Only structures exhibiting damage due to corrosion shall receive the epoxy coating.

2. The material sprayed onto the surface of the manhole shall be one-hundred percent (100%) solids high build epoxy coating formulated for application within a sanitary sewer environment.

3. The coating thickness shall be a minimum of 125 mils in one (1) or two (2) multi-pass coats.

4. The coating color shall typically be white or off white.

5. If an adhesion coating is required between the concrete structure and the epoxy coating, the cost of that adhesion coat is included in the cost of the 100% solids, high build epoxy coating.

6. The cured epoxy resin system shall conform to the following minimum structural standards:

|                                | Strength (psi) |
|                                |               |
| Compressive Strength (ASTM D-695) | 13,000        |
| Flexural Strength (ASTM D-790)   | 13,000        |
| Tensile Strength (ASTM D-638)    | 7,000         |
| Flexural Modulus (ASTM-790)      | 500,000       |

7. The epoxy coating shall be Mainstay DS-5 by Madewell Products Corporation, Raven 405 by Raven Lining Systems, Cor-Cote SC (Sewer Coat) by Sherwin-Williams or approved alternate.

G. Composite structure/corrosion protection system:

1. Only structures exhibiting damage due to corrosion shall receive the composite system.
2. The product shall display the following properties:

<table>
<thead>
<tr>
<th>Strength (psi)</th>
<th>Day</th>
<th>7 Day</th>
<th>28 Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength (ASTM C 109)</td>
<td>8,000</td>
<td>9,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Flexural Strength (ASTM C 293)</td>
<td>------</td>
<td>1,400</td>
<td>1,600</td>
</tr>
<tr>
<td>Tensile Strength (ASTM C 496)</td>
<td>------</td>
<td>900</td>
<td>900</td>
</tr>
<tr>
<td>Shrinkage (ASTM C 596)</td>
<td>0.08 Percent @ 28 Days</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. The coating thickness shall be a minimum of ½-inch.

4. If an adhesion coating is required between the concrete structure and the composite system the cost of that adhesion coat shall be included in the cost of the composite system.

5. The composite system shall be SewperCoat by Lafarge Aluminates or approved alternate.

H. The hydraulic cement, cement mortar, epoxy coating and composite system do not have to be from the same manufacturer however the Contractor is responsible for assuring compatibility of the various components.

I. Fiberglass Insert Liner:

1. The materials used for lining manholes shall be engineered to support a standard 16,000-pound vertical dynamic wheel load (AASHTO H-20) when used in conjunction with the reinforced precast manhole cone or integral fiberglass cone section.

2. The manhole shall be fitted with a fiberglass liner with no sidewall joints, seams or sections. The fiberglass manhole insert liner shall meet all requirements of ASTM D3753 for glass fiber reinforced polyester manholes.

3. The annular void grout shall be standard 6-bag (Type II) Portland Cement mix with ¼” (maximum) coarse aggregate producing a minimum 3000 psi compressive strength at full cure (28 days).

4. A quick setting, high strength cement grout shall be used for positioning and sealing the fiberglass manhole insert liner prior to annular void grouting.
3.1 REHABILITATION OF MANHOLE STRUCTURE

A. General Procedures:

1. Cleaning: All concrete and masonry surfaces to be rehabilitated shall be clean. All grease, oil, laitance, coatings, loose bricks, mortar, unsound brick or concrete and other foreign materials shall be completely removed. Water blasting utilizing a 5000 psi pressure washer and proper nozzles shall be the primary method of cleaning; however, other methods such as wet or dry sandblasting, acid wash, concrete cleaners, degreasers or mechanical means may be required to properly clean the surface. All surfaces on which these methods are used shall be thoroughly rinsed, scrubbed, and neutralized to remove cleaning agents and their reactant products. Debris resulting from cleaning shall be removed from the manhole and not discharged downstream. (The debris is to be disposed of properly in accordance with all laws. The County can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids quantities are to be tracked in the daily contractor diary.)

2. Stopping Infiltration: After surface preparation and prior to the application of mortars and coatings, infiltration shall be stopped either by plugging with a hydraulic cement or chemical grout sealing.

3. Patching: All large holes and/or voids, joints or pipes, all spalled areas, all lifting holes and all holes caused by missing or cracked brick shall be patched and all missing mortar repointed using a nonshrink cement mortar. All cracked or disintegrated material shall be removed from the area to be patched or repointed, exposing a sound subbase. All cracks not subject to movement shall be cleaned to remove all unsound material so that a solid fixed surface is established and patched with nonshrink patching mortar.

4. Manhole Walls: The thicknesses of the patches, coatings, etc. must be such that a uniform, vertical wall is established from the manhole bench to the manhole cone section.

5. Flow Control: The Contractor shall be responsible for plugging, plugging with flow-thru pipe, or diverting the flow of wastewater as needed for repair and rehabilitation of manholes. Wastewater flow shall be maintained in accordance with the Wastewater Flow Control section of these Specifications. Bypass pumping will not be utilized unless approved in advance by the County Engineer.

6. The Contractor shall remove all loose grout and rubble from the existing channel. The Contractor shall rebuild the existing channel if required by
reshaping, repairing slope of shelves or benches. Manhole rehabilitation work shall include aligning inflow and outflow ports in such a manner so as to prevent the deposition of solids at the transition point. All troughs shall follow the grades of the pipe entering the manhole. Changes in direction of the sewer and entering branch or branches shall have a true curve of as large a radius as the size of the manhole will permit, but will be shaped to allow easy entrance of maintenance equipment including buckets, T.V. camera, etc.

7. Manhole steps: The Contractor shall inspect all manhole steps prior to rehabilitation. The Contractor shall report, to the County Engineer, any steps that appear loose, deteriorated, broken, or otherwise unsafe. Unless directed otherwise by the County Engineer, the Contractor shall cut all loose, deteriorated, broken, or otherwise unsafe steps from the manhole.

8. Each lining system shall be installed in accordance with the manufacturer’s recommendation to withstand groundwater pressures. For manholes greater than twelve (12) feet in depth, the lining shall be capable of withstanding the pressures associated with a groundwater depth equal to the manhole depth. Linings for all other manholes shall be capable of withstanding the pressures associated with groundwater depth of twelve (12) feet. The Contractor shall measure groundwater depth from manhole bench to top of ground surface.

9. Application of products shall be by factory certified applicators.

3.2 SPRAY APPLIED LIGHTWEIGHT STRUCTURAL REINFORCED CEMENT

A. The surface prior to spraying shall be damp without noticeable free water droplets or running water. Materials shall be spray-applied to a minimum uniform thickness to insure that all cracks, crevices, and voids are filled and a smooth surface remains after light troweling. The light troweling is performed to compact the material into voids and to set the bond.

B. The first application shall have begun to take an initial set (disappearance of surface sheen, which could be 15 minutes to 1 hour depending upon ambient conditions) before the second application to assure a minimum total finished thickness of 1/2 inch. The final finished thickness may need to be greater than 1/2 inch as recommended by the manufacturer to withstand groundwater pressures. A depth gauge shall be used during application, at various locations, to verify the required thickness. The surface then shall be trowelled to a smooth finish with care taken not to over trowel so as to bring additional water to the surface and weaken it. The Contractor shall follow the manufacturer’s recommendations.

C. The bench covers used to catch debris shall be removed and the bench and trough sprayed such that a gradual slope is produced from the walls to the trough with the thickness at the edge of the trough being no less than 1/2 inch. The wall-bench
intersection shall be rounded to a uniform radius the full circumference of the intersection.

D. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for twenty-four (24) hours after application. If ambient temperatures are in excess of 95° F, precautions shall be taken to keep the mix temperature at time of application below 90° F, using ice if necessary.

E. The final application shall have a minimum of four (4) hours cure time before being subjected to active flow.

3.3 CENTRIFUGALLY CAST STRUCTURAL REINFORCED CEMENT

A. The rotating casting applicator shall be positioned to evenly apply the material and be withdrawn at a rate to assure a final minimum thickness of 1/2-inch. The final finished thickness may need to be greater than 1/2-inch as recommended by the manufacturer to withstand groundwater pressures. A depth gauge shall be used during application, at various locations, to verify the required thickness. The surface shall be trowelled to a smooth finish with care being taken not to over trowel in a manner that would bring additional water to the surface and weaken it.

B. The bench covers used to catch debris shall be removed and the bench and trough sprayed or hand applied so that a gradual slope is produced from the walls to the trough with the thickness at the edge of the trough being no less than 1/2-inch. The wall-bench intersection shall be rounded to a uniform radius the full circumference of the intersection. The surface shall be trowelled to a smooth finish with care being taken not to over trowel in a manner that would bring additional water to the surface and weaken it.

C. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for 24 hours after application. If ambient temperatures are in excess of 95° F, precautions shall be taken to keep the mix temperature at time of application below 90° F.

D. The final application shall have a minimum of one (1) hour cure time before being subjected to active flow.

3.4 EPOXY COATING

A. The epoxy coating shall be applied onto the interior surfaces of the manhole to produce a smooth coating and yield the required minimum thickness. A depth gauge shall be used during application at various locations to verify the required thickness.

B. The epoxy resin shall be applied at the required minimum thickness. The application shall have a minimum of three hours cure time before being subjected to active flow.
C. The sloped surface of the manhole bench shall be made non-skid by broadcasting aluminum oxide, or sand into the surface prior to gelatin/set.

3.5 FIBERGLASS MANHOLE INSERT LINER

A. This method requires the contractor to excavate and remove the existing manhole frame, manhole cone, and other manhole components as needed to facilitate the installation of a prefabricated fiberglass insert liner.

B. The Contractor shall excavate the area around the top of the existing manhole frame and part of the existing manhole sufficiently wide and deep to facilitate the removal of the manhole frame, cone, and the other components of the existing manhole to facilitate the installation of a prefabricated manhole insert.

C. The bottom of the insert shall be cut to fit the existing manhole bench as closely as possible. Cutouts of inserts shall be made to accommodate existing inlets, drops, and cleanouts.

D. The annular space between the insert and the existing brick or concrete manhole shall be filled with a cement grout, minimum 3000 psi @ 28 days cure time.

E. All lamination of fiberglass shall result in equal thickness and strength as the insert and be constructed in accordance with the manufacturer’s recommendations.

F. The insert shall be lowered into the existing brick or concrete manhole and set into a quick setting grout mixture. A thorough bottom seal shall be obtained in order to prevent loss of grout from the annular space between the outside of the insert and the interior of the existing manhole. A 6-inch minimum height of a quick setting grout shall be placed above the initial bottom seal in the annular space area between the insert and the existing brick or concrete manhole to ensure adequacy of the bottom seal. The gap from drops, cleanouts, laterals and existing piping between the existing manhole and the insert wall shall be bridged with short lengths of pipe of the same material as the insert and/or as approved by the insert’s design engineer.

G. All manhole surfaces not covered by the insert shall be hand covered with like material.

3.6 MANHOLE REHABILITATION ACCEPTANCE

A. All manholes rehabilitated using cement mortar lining, epoxy lining, or fiberglass insert lining shall be subject to testing using the vacuum test method. The contractor shall follow the manufacturer’s recommendations for proper and safe procedures. Vacuum testing of manholes shall be performed after curing of linings. Any visible leakage in the manhole or structure, before, during, or after the test shall be repaired regardless of the test results.
B. If the manhole fails the vacuum test, the Contractor shall perform additional repairs at no additional cost to the County and repeat the test procedures until satisfactory results are obtained.

C. All pipes for vacuum testing entering the manhole shall be installed at the top access point of the manhole.

D. A vacuum of ten (10) inches of mercury (Hg) (5.0 psi) shall be drawn on the manhole, and the time shall be measured for the vacuum to drop to nine (9) inches of mercury (Hg) (4.5 psi). Manholes will be considered to have failed the air test if the time to drop one (1) inch of mercury is less than what is shown in the following table:

<table>
<thead>
<tr>
<th>Vacuum Test Timetable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manhole Diameter – Inches</td>
</tr>
<tr>
<td>Depth - feet</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>24</td>
</tr>
<tr>
<td>+ Each 2’</td>
</tr>
</tbody>
</table>

E. Manhole depths shall be rounded to the nearest foot. Intermediate values shall be interpolated. For depths above twenty-four (24) feet, the Contractor shall add the values listed in the last line of the table for each two (2) feet of additional depth.

F. After the manhole rehabilitation work has been completed, the County shall visually inspect the manhole. The finished surface shall be free of blisters, “runs” or “sags” or other indications of uneven lining thickness. The finished surface shall not have any evidence of visible leaks.

3.7 MANUFACTURER CERTIFICATION

A. The manufacturer shall certify that the contractor is properly trained in the method or system being used.

B. The manufacturer should be on site for 2 to 5 eight-hour days or more depending on project size to confirm that the contractor is doing the installation correctly.

3.8 CLEANUP

A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.
B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.

C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.9 DOCUMENTATION

A. The Contractor shall complete work on each asset as assigned via the County’s Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/County Engineer. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.10 WARRANTY

A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at anytime during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

**END OF SECTION**
P. Pipe Bursting
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This specification covers all Work, materials and equipment required for the rehabilitation of existing sanitary sewers using pipe bursting. Pipe bursting is a method of trenchless pipeline replacement utilizing pneumatically operated equipment with a bursting tool and/or towing tool to split the existing host pipe while simultaneously installing a new High Density Polyethylene pipe of the same size or larger diameter where the old pipe existed. The scope includes the complete installation of the new polyethylene pipe, reconnection of existing sewer service connections, repair/rehabilitation of manholes, initial and final cleaning, CCTV inspection and full site restoration.

B. Only pneumatically operated pipe bursting equipment with either front or rear expanders for the proper connection to the polyethylene pipe will be allowed. The exception to this requirement will only be considered where a static burster unit, or other approved construction technique, is proposed for use on isolated segments of pipeline that are to be replaced and that are closely adjacent to building foundations or other vulnerable structures where pneumatic bursting might be detrimental.

1.2 RELATED SECTIONS

A. Section 01510 - Sanitary Sewer Television – Sonar Inspection

B. Section 01520 - Sanitary Sewer Cleaning

C. Section 02205 - Dewatering

D. Section 02315 - Excavation and Backfill for Structures

E. Section 02324 - Trenching and Trench Backfilling

F. Section 02530 - Sewer Lateral Reconnection and Replacement

G. Section 02600 - Wastewater Flow Control

H. Section 02608 - Manhole Frame and Cover Installation

I. Section 02641 - Precast Concrete Manholes

J. Section 02650 - Testing for Acceptance of Gravity Sanitary Sewers

K. Section 02700 – Pavement Repairs

L. Section 02730 - Point Repairs to Sanitary Sewers and Service Laterals

M. Section 02900 - Sanitary Sewer Manhole Rehabilitation
1.3 REFERENCES

A. ASTM D1248-12 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable


C. ASTM D3550-01 - Standard Practice for Thick Wall, Ring-Lined, Split Barrel, Drive Sampling of Soils.


E. ASTM D1248 – 12 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable


H. ASTM F714 - 13 - Standard Specification for Polyethylene (PE) Plastic Pipe(DR-PR) Based on Outside Diameter

1.4 QUALIFICATIONS

A. The Contractor and any personnel directly involved in the supervision or operation of the pipe bursting system shall be certified by the Pipe Bursting System Manufacturer that they are fully trained licensed installers of their pipe bursting system. The Contractor shall submit all Certificates of Training to the County Engineer.

B. Polyethylene pipe joining shall be performed by personnel trained in the use of thermal butt-fusion equipment and recommended methods for new pipe connections. Personnel directly involved with handling and installing the new pipe shall be certified by a qualified representative of the thermal butt fusion equipment manufacturer on the proper methods for handling and installation of the polyethylene pipe. The Contractor shall submit all Certificates of Training to the County Engineer.

C. The Contractor must have the following experience:

1. Minimum experience of 150,000 linear feet of pipe bursting existing gravity sanitary sewer pipe and replacing with polyethylene pipe.

2. Minimum experience of 10,000 linear feet of other approved construction techniques where pipe bursting is not to be used on isolated segments of pipeline that are to be replaced and that are closely adjacent to building foundations or other vulnerable structures and where pneumatic bursting might be detrimental.

D. The Pipe Bursting Contractor must document that they, not their parent company or related company or the experience of an individual/s, have performed pipe bursting of existing gravity sewer pipe and replacing with polyethylene pipe. This documentation shall include
locations, references (including names and phone numbers), existing pipe sizes and replacement pipe sizes. This documentation must include a minimum of ten (10) different projects.

1.5 SUBMITTALS

A. The Contractor shall submit Contractor’s/manufacturer’s data and details of the following items for approval:

1. A Comprehensive Construction Sequencing Plan. At minimum the plan shall include the following:
   a. A proposed schedule.
   b. Identification of all proposed access routes.
   c. Identification of set-up locations for pipe bursting.
   d. Location and dimensions of the pits to be excavated. Identify proposed modifications to existing manholes or replacement of existing manholes, if any manholes are to be used as machine pits or pipe insertion pits.
   e. Equipment staging area
   f. Dewatering method in accordance with Section 02205 – Dewatering
   g. Method used to reactivate service laterals
   h. Site restoration
   i. Identification of the pipe fusion area and HDPE pipe train staging area.
   j. Bypass pumping plan in accordance with Section 02600 - Wastewater Flow Control.
   k. Traffic Control Plan in accordance with GDOT requirements.
   l. Erosion Control Plan in accordance with Department of Watershed Management Protocol for Providing Erosion & Sedimentation Controls on Construction Projects.

2. Certifications and technical data sheets on each product used, including HDPE pipe, electrofusion saddles, external connection mechanical saddles and any other products, including ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications.

3. Material Safety Data Sheets (MSDS) for each product used.

4. Evidence of qualifications and experience required in Section 1.4 - Qualifications shall be submitted to the County Engineer.

5. Pre-bursting and post-bursting television inspection reports to include CCTV DVD/CD and logs.
B. The Contractor shall provide to the County Engineer the following information in writing prior to the set deadline, or at the indicated frequency, whichever is applicable. The schedule for all other submittals not listed below will be determined by the County Engineer:

<table>
<thead>
<tr>
<th>Type of Submittal</th>
<th>Time/Frequency of Submittal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience Record of Contractor/Subcontractor</td>
<td>At Preconstruction Conference</td>
</tr>
<tr>
<td>Comprehensive Construction Sequencing Plan</td>
<td>At Commencement of Contract</td>
</tr>
<tr>
<td>Listing of Safety Precautions and Traffic Control Measures</td>
<td>At Commencement of Contract</td>
</tr>
<tr>
<td>Tracking quantity of Debris from Cleaning to be Disposed at County Approved Location(s)</td>
<td>At Commencement of Contract</td>
</tr>
<tr>
<td>Specific Project Schedule with a Project completion date</td>
<td>At Commencement of each specific project</td>
</tr>
<tr>
<td>Schedule of Planned Inspections/Cleaning of Sewer Reaches</td>
<td>Post Commencement and Weekly</td>
</tr>
<tr>
<td>Daily Logs and Progress Reports</td>
<td>Daily</td>
</tr>
<tr>
<td>Confined Space Entry Logs</td>
<td>Daily</td>
</tr>
</tbody>
</table>

C. Daily reports (by 9.00 a.m. on the day following survey) and weekly reports (by 9.00 a.m. on Monday following the week of survey) shall be e-mailed to the County Engineer.

D. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:
1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the County Engineer.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.
10. Disposals: Type and quantity of debris (including liquids).

1.6 QUALITY ASSURANCE

A. The Contractor is solely responsible for quality assurance during the length of the project. The Contractor is responsible for any costs associated with corrective measures required to replace or repair items not meeting the quality standards specified by the County at no additional cost to the County.

B. Product manufacturers shall provide the County Engineer with written certification that all products furnished comply with all applicable provisions of these specifications.

C. If ordered by the County Engineer, each pipe manufacturer shall furnish the services of a competent and certified factory representative to supervise and/or inspect the installation of
the pipe. This service shall be furnished for a minimum of five (5) days during initial pipe inspection.

1.7 SITE CONDITIONS

A. Contractor shall conform to all local, state and federal regulations including those set forth by OSHA, RCRA, GDOT, GAEPD, EPA and any other applicable authorities.

B. Method statements and design procedures are to be provided to the County Engineer when confined space entry, flow diversion, debris removal, or bypass is necessary in order for Contractor to perform the specified work.

1.8 FIELD SUPERVISION BY CONTRACTOR

A. The Contractor shall maintain on the Work Site, at all times, a competent certified and trained field supervisor in charge of the Pipe Bursting and polyethylene pipe joining utilizing thermal butt fusion. Refer to Section 1.4 Qualifications.

B. The field supervisor shall be approved in writing by the County Engineer prior to commencement of the Work. Any change of supervisor must be approved in writing by the County Engineer prior to the change. The field supervisor shall be responsible for the safety of all workers and site conditions, as well as ensuring that all work is conducted in conformance with the requirements of these specifications and to the level of quality specified. At any time, at the request of the County Engineer, the Contractor shall immediately replace the Contractor’s field supervisor.

1.9 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the County, County employees, and County elected officials in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to County utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County.
Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.10 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

1.11 MEASUREMENT AND PAYMENT

A. Measurement and payment for pipe bursting shall be on a linear foot basis for various sizes of pipe bursting and shall include access to the site, clearing of the site of the work, clearing and preparation of any areas used for storage or for fabrication of materials; television inspection of the sewer lines, bypass pumping, cleaning of the sewer lines, manhole repair for any damaged manholes in the course of the work; manhole invert reconstruction, excavation and backfill (refer to Section 02315 – Excavation and Backfill for structures); insertion/receiving pits; furnishing and installing of pipe complete with joining materials, mastic fillers, and other appurtenances; making connections of manholes and other sewers, locating and reconnecting all service connections, backfilling, testing, and inspections; and the furnishing of all labor, materials, tools, and appliances necessary to complete the work as specified, as indicated on the drawings, or directed. The pipe bursting unit price shall further include compensation for traffic control, watchmen, erosion control and full restoration of the site.

PART 2 - PRODUCTS

2.1 PIPE BURSTING METHOD

The method approved for rehabilitation of existing sanitary sewers by pipe bursting and installation of new polyethylene (PE) pipe is T.T. Technologies’ GRUNDOCRACK™ Pneumatic Pipe Bursting System or approved equal.

2.2 MATERIALS


B. All pipes shall be made of virgin material. No rework shall be used, except that obtained from the manufacturer’s own production of the same formulation.
C. The pipe shall be homogeneous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

D. Material designation shall be PE 3408 with UV stabilizer of 2 to 3% carbon black in accordance with ASTM D1603-12 - Standard Test Method for Carbon Black Content in Olefin Plastics.

E. Material color shall be white, black or whatever is specified, and wherever possible with the interior of the pipe having a light reflective color to allow easier/better viewing for television inspection.

F. Conventional fusion saddles as manufactured by Central Plastics, Phillips Driscopipe, Plexo or approved equal shall be installed in accordance with the manufacturers recommended procedures.

G. The minimum wall thickness of the polyethylene pipe shall meet the following:

<table>
<thead>
<tr>
<th>Depth of cover (feet)</th>
<th>Minimum Standard Dimension Ratio (SDR) of Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 16.0</td>
<td>17</td>
</tr>
<tr>
<td>&gt; 16.1</td>
<td>17</td>
</tr>
</tbody>
</table>

2.3 EQUIPMENT

A. The pipe bursting tool shall be designed and manufactured to force its way through existing pipe materials by fragmenting the pipe and compressing the old pipe sections into the surrounding soil as it progresses. The bursting unit shall be pneumatic and shall generate sufficient force to burst and compact the existing pipe line. The manufacturer’s specifications shall determine what size tool should be used in what diameter of pipe as well as what size tool should be used for the required line size.

B. The pneumatic burster must be used in conjunction with a constant tension hydraulic twin capstain winch of 20, 10, 8, or 5 tons; the size of the winch depends on the diameter of the pipe to be replaced. In no case is the constant tension on the winch to exceed 20 tons.

C. The pipe bursting tool shall be pulled through the sewer by a winch located at the upstream manhole. The bursting unit shall pull the PE pipe with it as it moves forward. The bursting head shall incorporate a shield/expander to prevent collapse of the hole ahead of the PE pipe insertion. The pipe bursting unit shall be remotely controlled.

D. The pipe bursting tool shall be pneumatic. The bursting action of the tool shall increase the external dimensions sufficiently, causing breakage of the existing pipe but also creating the void into which the bursting toolhead can be winched, enabling forward progress to be made. At the same time the PE pipe, directly attached to the sleeve on the rear of the bursting tool head, shall also move forward.

E. The bursting tool shall have its own forward momentum while being assisted by winching. A hydraulic winch shall give the bursting tool friction by which it can be moved forward. To
form a complete operating system the bursting tool must be matched to a constant tension hydraulic winching system.

F. A winch shall be attached to the front of the bursting unit. The winch shall provide a constant tension to the bursting tool in order that it may operate in an efficient manner. The winch shall ensure directional stability in keeping the unit on line.

G. The winch shall be hydraulically operated providing a constant tension throughout the operation. The winch shall be of the constant tension type but shall be fitted with a direct reading load gauge to measure the winching load.

H. The winch must automatically maintain a constant tension at a set tonnage reading.

I. The winch, cable and cable drum must be provided with safety cage and supports so that it may be operated safely without injury to persons or property.

J. The Contractor shall provide a system of guide pulleys and bracing at each manhole to minimize cable contact with the existing sewer between manholes.

K. The supports to the trench shoring in the insertion pit shall remain completely separate from the winch boom support system and shall be designed so that neither the pipe nor the winch cable shall be in contact with them.

2.4 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver only materials that fully conform to these specifications or for which submittals have been provided to the County Engineer and approved for use.

B. The Contractor shall load, transport, and unload pipe and appurtenances at project site.

C. The Contractor shall store materials and handle to avoid damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. The Contractor shall replace any damaged materials and remove damaged materials from site and replace at Contractor’s cost.

D. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipes in adjacent tiers.

PART 3 EXECUTION

3.1 GENERAL STANDARDS AND REQUIREMENTS

A. In addition to DeKalb County General Conditions and Standard Specifications; the Contractor must comply with the latest editions of the following specifications and standards: Georgia Department of Transportation (GDOT) Specification Construction of Transportation Systems; the Georgia Erosion and Sedimentation Act; the Manual on Uniform Traffic Control Devices for Streets and Highways; the American Society for Testing and Materials, (hereinafter
ASTM); the American Water Works Association (hereinafter AWWA); the American
Association of State Highway and Transportation Officials (hereinafter AASHTO); American
Wood Preservers Bureau (hereinafter AWPB); National Sanitation Foundation (hereinafter
NSF); American Concrete Institute (hereinafter ACI); 33 CFR Parts 323 & 328; and 40 CFR
Part 110; and any other applicable standards.

B. The Work under this contract shall comply with these specifications, requirements of work
orders, and with all applicable codes, laws, and regulations of the County, State, and Federal
Agencies having jurisdiction. In the event of any conflict between the terms of these
specifications and such codes, laws, and/or regulations shall prevail. If the Contractor
performs any work knowing it to be contrary to such codes, laws, or regulations, and without
such notice to the County, the Contractor shall assume full responsibility therefore and shall
bear any and all costs necessary to correct the Work.

C. Prior to initiation of a specific project, a schedule for the project shall be submitted to the
County Engineer. Once the schedule is approved by the County Engineer it will become part
of the scope of work for that specific project. It is the responsibility of the Contractor to
maintain this schedule. If circumstances arise that affect the project schedule, the Contractor
shall notify the County Engineer in writing and request approval from the County Engineer
for a schedule change.

D. It is the responsibility of the Contractor to notify all residents that could be affected by the
Pipe Bursting activities. This notification shall consist of written information and verbal
communication that outlines the Pipe Bursting process and timing of the project. The written
information shall be delivered to each home/business at least one week prior to the start of the
project, and at a minimum shall describe the work, schedule, how it affects the
home/business, and local telephone numbers for the Contractor and County Engineer. The
written notification shall be approved by the County Engineer before distribution. The
Contractor shall communicate verbally with the home/business owners to address their
specific needs and concerns as well. At the request of the County Engineer, the Contractor
shall participate in public meetings regarding the project.

E. The Contractor shall provide water and sewer services to affected property owners in the
event of service interruption, at no additional cost to the County.

3.2 PREPARATORY PROCEDURES

Prior to entering any private property, the Contractor shall ascertain the requirements of applicable
permits or easements, and shall conduct his work in accordance with the requirements thereof;
including the giving of notice and obtaining right-to-enter onto existing easement. The Contractor
shall be fully responsible for complying with the requirements of any permit or easement granting
entry although such requirements may be more stringent than otherwise stipulated by this
Contract. The Contractor shall compensate the County fully for any loss or expense arising from
failure of the Contractor to comply with the aforementioned requirements.

3.3 TRAFFIC CONTROL

A. The Contractor shall be fully responsible for Traffic Control and shall expedite the Work so
as not to interfere with the traffic along and across the street and at entrances to properties.
The Contractor shall not obstruct traffic on major streets or intersections between the hours of
6:00 am to 9:00 am and 4:00 pm to 6:00 pm, Monday through Friday. Major streets shall be defined as those included in Section 8-4011 of the DeKalb County Codes.

B. The flow of traffic will be maintained at all times during all aspects of the Work being performed by permitting at least one lane of traffic to move through the Work site. The Contractor shall furnish all flagmen, warning signs, barricades and lights necessary to control traffic and protect the public, without any additional cost to the County. Traffic control devices shall be in accordance with “The Manual on Uniform Traffic Control Devices for Streets and Highways” most current edition. The County and/or GDOT shall approve all traffic control plans prior to the start of Work.

C. The Contractor shall advise residents when their respective driveways, sidewalks, alley ways, etc. will be blocked by the fused HDPE pipe train prior to installation and according to a notification schedule approved by the County Engineer. Where the fused HDPE pipe train crosses streets, a traffic detour plane must be submitted to the County Engineer for approval prior to the commencement of the activity.

3.4 FLOW CONTROL

Refer to Section 02600 - Wastewater Flow Control, for specification on bypass pumping or plugging of the sewer lines.

3.5 CLEANING

The existing pipe and manholes shall be cleaned prior to the CCTV Pre-Inspection. The installed polyethylene pipe and restored manholes shall be cleaned prior to the Post CCTV inspection. Refer to Section 01520 - Sanitary Sewer Cleaning.

3.6 CCTV PRE-INSPECTION OF SEWER LINE

Refer to Section 01510 - Sanitary Sewer Television - Sonar Inspection. Inspection of the sewer line or lateral shall be performed by experienced personnel trained in locating breaks, obstacles, and service connections by CCTV or man-entry inspection. The interior of the sewer shall be carefully inspected to determine the location of any conditions that may prevent the proper installation of the new pipe utilizing the pipe bursting method. A DVD/CD and log, noting all services and defects, shall be submitted to the County Engineer for future reference. The DVD/CD and the log shall at a minimum state the exact distance from the manhole wall to the middle of each service connection, the manhole number from where the measurement has been taken, and the location of each service connection (i.e., 9 o’clock, 11 o’clock, etc.).

3.7 BURSTING AND PIPE INSTALLATION

A. Disconnect laterals from host sewer main following procedures from approved submittals.

B. Provide access pits as required to facilitate pipe bursting insertion process. Locate pits where interference to vehicular traffic and inconvenience to public is minimized.

C. Use approved lubricant to ease installation friction. Match lubricants to soil and insertion conditions.
D. Any defects which, in the judgment of the County Engineer, will affect the integrity or strength of the pipe shall be repaired or replaced at the Contractor’s expense. The method of repair shall be approved by the County Engineer before any work is performed.

3.8 MANHOLE PREPARATION/REPAIR/REPLACEMENT

A. The Contractor shall enlarge manhole pipe openings to a size that is sufficient to allow bursting head to pass without damaging manhole.

B. The Contractor shall remove manhole drop connections that interfere with the bursting process.

C. Following pipe bursting operations, pipe penetrations to the manhole shall be repaired in accordance with Section 02900 - Sanitary Sewer Manhole Rehabilitation.

D. Manhole frames and covers shall be replaced if damaged during pipe bursting operations at no expense to the County. Refer to Section 02608 – Manhole Frame and Cover Installation.

E. For manholes requiring replacement, refer to Section 02641 – Precast Concrete Manholes.

3.9 SERVICE CONNECTIONS

A. Refer to Section 02530 – Sewer Lateral Reconnection and Replacement. After the pipe has been installed, all existing active laterals and service connections shall be reinstated. All cut laterals and service connections shall be free of burrs, frayed edges, or any restriction preventing free flow of wastewater. Laterals shall be reinstated to a minimum of 100% of their original diameter and no more than 100% of their minimum diameter. The bursted pipe shall be tightly sealed at the cut openings with no gaps.

B. If the Contractor fails to reinstall a lateral or service connection and hence causes flooding or damage to the private property it serves, then the Contractor shall be held responsible. Refer to Section 1.6 Quality Assurance.

C. When it is necessary to shut down a private sewer service line while work is in progress and before the service lines are reconnected, the residents are to be notified by the Contractor at least 48 hours prior to the shutdown. No sewer or water service is to remain shut down for more than a period of eight (8) hours unless the Contractor provides substitute services for the residents. Commercial sewer services shall be maintained at all times that the business is open. No sewage from the services or main line shall be discharged on the ground or in waterways. Holding pits or tanks are not allowed unless permitted by the State.

3.10 TESTING

Tests for compliance with this specification shall be made as specific herein and in accordance with the applicable ASTM Specification. A certificate with this specification shall be furnished, by the manufacturer for all material furnished under this specification. All PE pipe and fittings will be inspected to ensure that they meet the requirements of this specification. Refer to Section 02650 – Testing for Acceptance of Gravity Sanitary Sewers for testing of installed replacement manholes.
3.11 POST CCTV INSPECTION

Refer to Section 01510 Sanitary Sewer Television – Sonar Inspection. Upon completion and before acceptance of the pipe bursting Work by the County Engineer, the Contractor will inspect the rehabilitated pipeline by the use of CCTV cameras and shall submit a DVD/CD and logs of the inspection to the County Engineer for approval/acceptance.

3.12 ACCEPTANCE

It is the intent of these specifications that the completed polyethylene pipe and restored or replaced manholes with all appurtenances shall be essentially equivalent in final quality and appearance to new sewer pipe installations, service connections and manholes.

3.13 WARRANTY

The Contractor shall guarantee his Work for a warranty period of two (2) years from the date of acceptance. During the warranty period, any defects, such as leaks, cracks, loss of bond, etc., which will affect the integrity or strength of the pipe, collect solids, or reduce hydraulic flow capabilities of the product shall be repaired at the Contractor’s expense and the warranty period extended for an additional one (1) year period from the date of repair acceptance by the County Engineer.

3.14 COLLAPSED SEWERS/DEFECTIVE MANHOLES

A. Any sewer found with greater than ten (10) percent deformation (i.e., collapsed or near collapse) shall be reported to the County Engineer immediately for remedial action.

B. Any manhole found broken, cracked, with missing covers, or surcharged, shall be reported to the County Engineer immediately for remedial action.

C. Any sewer found where the existing conditions pose a threat of personal injury to the public, such as a collapsed sewer with attendant depression to roadway, shall be protected by the Contractor until the County Engineer arrives at the site of the Work.

D. Any manhole found where the existing conditions pose a threat of personal injury to the public, such as broken, cracked, or missing covers, or covers founding traveled portions of any sidewalk or roadway shall be protected by the Contractor until the County Engineer arrives at the site of the Work.

3.15 POINT REPAIRS

Refer to Sections 02730 – Point Repairs to Sanitary Sewers and Service Laterals, 02205 – Dewatering, and 02324 – Trenching and Trench Backfilling, for specifications on point repairs that the Contractor may be requested to perform to facilitate inspection and pipe bursting.

3.16 REMOVAL OF DEBRIS

The Contractor shall provide all equipment and personnel necessary to safely remove and extract silt and debris, load it onto trucks for disposal, and dispose of the silt and debris at the site(s) approved by the County Engineer. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the
contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.

3.17 SITE RESTORATION

A. The specific details relating to this section are contained in the “Land Development” ordinance of DeKalb County. The intent is to return all items and all areas disturbed, directly or indirectly by the Work under this Contract, to their original condition or better, as quickly as possible after the Work is completed.

B. The Contractor shall conduct the Work such that upon completion of any part of the Work, the contour and topography of the construction area has not been substantially altered. No alteration of previously established storm drainage patterns will be permitted unless such alteration can be proven to the County Engineer’s satisfaction to substantially improve the drainage pattern. Damage to ground cover, grass, trees, deep ruts, and gouges in the earth occasioned by the passage of heavy equipment or the depositing of any materials or equipment shall be repaired or replaced to its original or better condition as soon as possible. If the Work is being performed in paved areas, the paving shall be restored using the same type of asphalt that was in place before the area was disturbed. Refer to Section 02700 – Pavement Repairs. Refer to Section 02710 – Concrete Curbs and Sidewalks for curb and sidewalk restoration.

3.18 EROSION CONTROL

Refer to Department of Watershed Management Protocol for Providing Erosion & Sedimentation Controls on Construction Projects for specifications on erosion control that the Contractor will be requested to perform.

3.19 WARRANTY

A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at anytime during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION
Q. Rehabilitation of Concrete and Masonry Structures with a Protective Coating
SECTION 02901 – REHABILITATION OF CONCRETE AND MASONRY
STRUCTURES WITH A PROTECTIVE COATING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. This specification covers all Work, materials and equipment required for
protecting and/or rehabilitating concrete and masonry structures such as wet
wells, diversion structures or other structures (does not include sanitary sewer
manholes) by spray-application of a monolithic high-build epoxy coating to
eliminate infiltration, provide corrosion protection, repair voids and enhance
structural integrity. Procedures for surface preparation, application, testing, and
cleaning are described herein. For rehabilitation of sanitary sewer manholes, refer
to Section 02900 - Sanitary Sewer Manhole Rehabilitation.

B. Requirements for surface preparation, repairs and solvent-free epoxy coating
application to specified surfaces.

1.2 RELATED SECTIONS

A. Section 02600 - Wastewater Flow Control.

1.3 REFERENCES

A. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to
Chemical Reagents


C. ASTM D695 - Standard Test Method for Compressive Properties of Rigid
Plastics

D. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced
and Reinforced Plastics and Electrical Insulating Materials

Resins

F. ASTM D2240 - Standard Test Method for Rubber Property—Durometer
Hardness

Portable Adhesion Testers

H. ASTM – The published standards of the American Society for Testing and
Materials, West Conshohocken, PA.
I. NACE – The published standards of National Association of Corrosion Engineers (NACE International), Houston, TX.

J. SSPC- The published standards of the Society of Protective Coatings, Pittsburgh, PA.

1.4 SUBMITTALS

A. All submittals shall be received and approved by County Engineer prior to beginning work.

B. Technical data sheet on each product used, including ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications.

C. Written confirmation by each material manufacturer as to the suitability and compatibility of the composite use of repair materials and protective coating materials.

D. Material Safety Data Sheets (MSDS) for each product used.

E. Manufacturer certification that Contractor has been trained and approved in the handling, mixing and application of the products to be used.

F. Certification by the protective coating manufacturer that the equipment to be used for applying the products has been approved and Contractor personnel have been trained and certified for proper use of the equipment.

G. Five (5) references on projects of similar size and scope (totaling a minimum of 30,000 VF) performed by Contractor indicating successful application of the specified high-build solvent-free epoxy coating by spray or trowel application.

H. List of references documenting qualifications of Competent Field Supervisor referenced in section 1.7 Field Supervision by Contractor.

I. Proof of any necessary federal, state, or local permits or licenses necessary for the project.

J. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.

2. Weather: Conditions (e.g., rain, sunny, windy, etc.).

3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the County Engineer.

5. Personnel: On site by name (e.g., all labor, specialty services, etc.).

6. Accident: Report (e.g., all injuries, vehicles, etc.).

7. Incident: Report (e.g., damage to property, property owner complaint, etc.).

8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.


10. Disposals: Type and quantity of debris (including liquids).

1.5 QUALITY ASSURANCE

A. Contractor shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE, and SSPC standards and the protective coating manufacturer’s recommendations.

1.6 SITE CONDITIONS

A. Contractor shall conform to all local, state and federal regulations including those set forth by OSHA, RCRA and the EPA and any other applicable authorities.

B. Method statements and design procedures are to be provided by Owner when confined space entry, flow diversion, debris removal, or bypass is necessary in order for Contractor to perform the specified work.

1.7 FIELD SUPERVISION BY CONTRACTOR

A. The Contractor shall maintain on the site of the Work, at all times, a Competent Field Supervisor in charge of the survey/inspection. The Competent Field Supervisor shall have been actively involved in the rehabilitation of concrete and/or masonry structures for five (5) years prior to the bid opening. He or she shall have experience with the application of both cementitious base coatings and polymer/epoxy top coatings, vacuum testing, spark arrestor testing and adhesion testing procedures.

B. A list of references shall be submitted to the County Engineer for verification and approval of the Competent Field Supervisor’s experience to include the above referenced experience, including the full charge of the rehabilitation of a minimum of 300 concrete and/or masonry structures. Information contained in the list of references shall include, but not be limited to: project owner, contact name and phone number, project name and dates (start and completion), number of
C. The Competent Field Supervisor shall be approved in writing by the County Engineer prior to commencement of the Work. Any change in the Competent Field Supervisor must be approved in writing by the County Engineer prior to the change. The Competent Field Supervisor shall be responsible for the safety of all workers and site conditions as well as ensuring that all work is conducted in conformance with the requirements of these specifications and to the level of quality specified.

1.8 MEASUREMENT AND PAYMENT

A. Measurement for rehabilitation of structures is on a per square foot basis. The work shall include all materials, tools, equipment, cleaning of surfaces, flow control, and Holiday (spark) testing.

B. Measurement and payment to replace frame and cover shall be per each.

C. Measurement and payment to remove intruding pipe or obstructions shall be per each.

D. Measurement and payment to remove structure steps shall be per structure.

E. Measurement and payment to rebuild bench and invert shall be per sewer main pipe size, per each.

1.9 RESPONSIBILITY FOR OVERFLOWS/SPILLS AND DAMAGE TO PROPERTY AND UTILITY

A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidence of overflows or spills of sewage from the sewer system.

B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the County dispatch center and the County Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.

C. The Contractor shall indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the Contractor, including
the legal, engineering, and administrative expenses of the County in defending such fines and claims.

D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to the sewer lines caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the County Engineer at the Contractor’s expense. Any equipment stuck or left in the sewer line shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility. If the equipment that is stuck or left in the sewer line causes a sanitary sewer overflow (SSO)/spill, then the Contractor is liable for that SSO/spill. The County reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.10 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.1 EXISTING PRODUCTS

A. Standard Portland cement or new concrete (not quick setting high strength cement) must be well cured prior to application of the protective coating.

B. Remove existing coatings prior to application of the new protective coating. Contractor is to maintain strict adherence to applicable NACE and SSPC recommendations with regard to proper surface preparation and compatibility with existing coatings.

2.2 MANUFACTURER(S) SHALL BE:

A. Warren Environmental, Inc.

B. Raven Lining Systems, Inc.

C. SprayWall® products as developed by SprayRoc

D. PerpetuWall™ by Protective Liner Systems

E. Sherwin-Williams Sure-Flex® elastomeric polyurethane coating

F. Cor-Gard® by APM, Inc.

G. Sewpercoat® 100% calcium aluminate mortar and aggregate
H. GeoSpray™ by IWPC
I. Structure-Gard by Quadex
J. Or Approved Equal (products requested approved as an “or equal” shall present full product/system information to DeKalb County 14 days prior to bid closing for review and approval)

2.3 REPAIR MATERIALS

Repair materials shall be used to fill voids, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the County Engineer and protective coating Contractor. Repair materials must be compatible with the specified epoxy coating and shall be applied in accordance with manufacturer recommendations.

2.4 PROTECTIVE COATING MATERIAL

A. The epoxy coating system- a 100% solids, solvent-free two-component epoxy resin system meeting the following performance:

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product type</td>
<td>Amine cured epoxy</td>
</tr>
<tr>
<td>Color</td>
<td>White or as approved by County</td>
</tr>
<tr>
<td>Solids content (vol%)</td>
<td>100</td>
</tr>
<tr>
<td>Mix Ratio</td>
<td>Per manufacturer’s specifications</td>
</tr>
<tr>
<td>Compressive Strength, psi</td>
<td>ASTM D695-13,000 psi</td>
</tr>
<tr>
<td>Tensile Strength, psi</td>
<td>ASTM D638-7,000 psi</td>
</tr>
<tr>
<td>Tensile Elongation, %</td>
<td>ASTM D638-2%</td>
</tr>
<tr>
<td>Flexural Strength, psi</td>
<td>ASTM D790-13,000</td>
</tr>
<tr>
<td>Bond Strength-Concrete</td>
<td>ASTM D4541-Concrete failure</td>
</tr>
<tr>
<td>Chemical Resistance to:</td>
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</tr>
<tr>
<td>Municipal Wastewater</td>
<td>Continuous Service</td>
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<tr>
<td>Sulfuric Acid, 10%</td>
<td>ASTM D543-Immersion Service</td>
</tr>
<tr>
<td>Sodium Hydroxide, 20%</td>
<td>ASTM D543-Immersion Service</td>
</tr>
</tbody>
</table>

2.5 PROTECTIVE COATING APPLICATION EQUIPMENT

Protective coating manufacturer approved plural component spray equipment shall be used for the application of the specified protective coating.

2.6 DELIVERY, STORAGE, AND HANDLING

A. Materials are to be kept dry, protected from weather and stored under cover.
B. Protective coating materials are to be stored between 50 deg F and 90 deg F. Do not store near flame, heat or strong oxidants.
C. Protective coating materials are to be handled according to their material safety data sheets.
PART 3 – EXECUTION

3.1 ACCEPTABLE CONTRACTORS

A. Repair mortar Contractors shall be trained to properly apply cementitious mortar according to manufacturer’s recommendations.

B. Protective coating must be applied by a Certified Contractor of the protective coating manufacturer and according to manufacturer recommendations.

3.2 PREPARATORY PROCEDURES

A. All structures to be coated shall be readily accessible to Contractor.

B. Appropriate actions shall be taken to comply with local, state, and federal regulatory and other applicable agencies with regard to environment, health, and safety.

C. Any active flows shall be dammed, plugged, or diverted as required to ensure that the liquid flow is maintained below the surfaces to be coated.

D. Installation of the protective coating shall not commence until the concrete substrate has properly cured and been prepared in accordance with these specifications.

E. Temperature of the surface to be coated should be maintained between 40 deg F and 120 deg F during application. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated.

3.3 STRUCTURE PREPARATION

A. Contractor shall inspect all surfaces specified to receive a protective coating prior to surface preparation. Contractor shall notify Owner of any noticeable disparity in the surfaces which may interfere with the proper preparation or application of the repair mortar and protective coating.

B. All contaminants including: oils, grease, unsound or incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.

C. All concrete that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface or replaced.

D. Surface preparation method(s) should be based upon the conditions of the substrate and the requirements of the protective coating to be applied.
E. Surfaces to receive protective coating shall be cleaned and abraded to produce a sound concrete surface with adequate profile and porosity to provide a strong bond between the protective coating and the substrate. Generally, this can be achieved with high pressure water cleaning using equipment capable of 50,000 psi at 4gpm. Other methods such as high pressure water jetting (refer to NACE Standard No. 5/SSPC-SP12) or abrasive blasting may also be used. Detergent water cleaning and hot water blasting may be necessary to remove oils, grease or other hydrocarbon residues from the concrete. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound clean neutralized surface that is not excessively damaged.

F. Infiltration shall be stopped by using a material which is compatible with the specified repair mortar and is suitable for top-coating with the specified epoxy protective coating.

3.4 APPLICATION OF REPAIR MATERIALS

A. Repair materials shall meet the specifications contained herein. The materials shall be trowel or spray applied utilizing proper equipment on to specified surfaces. The material thickness shall be specified by the Project Engineer according to Owner’s requirements and manufacturer’s recommendations. The repair materials shall be permitted to cure according to manufacturer recommendations.

B. Cementitious repair materials shall be troweled to provide a smooth surface with an average profile equivalent to coarse sandpaper to optimally receive the protective coating.

C. Cement substrates shall be repaired to fill all bug holes or honeycomb surfaces and properly finished for suitability to receive application of the protective coating.

D. Inverts, channels, and benches shall be rebuilt and/or repaired with adequate slope and smooth transitions for proper sewage flow.

E. After abrasive blast and leak repairs have been performed, all surfaces shall be inspected for remaining laitance prior to protective coating application. Any evidence of remaining contamination or laitance shall be removed by additional abrasive blast or other approved method. If repair materials are used, refer to these specifications for surface preparation. Areas to be coated must also be prepared in accordance with these specifications after receiving a cementitious repair mortar and prior to application of the epoxy coating.

3.5 APPLICATION OF PROTECTIVE COATING

A. Protective coating spray equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order.
B. The protective coating material must be sprayed or trowel applied by a Certified Contractor of the protective coating manufacturer.

C. Specified surfaces shall be coated by a moisture tolerant, solvent-free, 100% solids, epoxy protective coating as further described herein. Application shall result in 150 mils dry film thickness of the epoxy protective coating.

D. If necessary, subsequent top coating or additional coats of the protective coating should occur as soon as the basecoat becomes tack free, no later than the recoat window for the specified product. Additional surface preparation procedures will be required if this recoat window is exceeded.

E. Coating application should be performed so as not to interfere with proper flow of sewage. Inverts, channels, benches and other transition points shall be smooth so as not to collect debris or disturb proper flow.

3.6 TESTING AND INSPECTION

A. During application a wet film thickness gauge shall be used during application of the epoxy protective coating to the specified thickness. WFT results shall be documented and provided to the County Engineer.

B. After the protective coating has set hard to the touch it shall be inspected with high-voltage Holiday detection equipment. Surfaces shall first be dried; an induced Holiday shall then be made on the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for Holidays at that particular area. The spark tester shall be necessary to detect the induced Holiday (refer to NACE RPO188-00). All detected Holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch-up/repair procedures shall follow the protective coating manufacturer’s recommendations.

C. A final visual inspection shall be made with any deficiencies in the finished coating being repaired by Contractor.

D. Municipal sanitary sewer flow may be returned to the areas that have received the epoxy protective coating as soon as the final inspection has taken place.

3.7 CLEANUP

A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.

B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The county can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non
hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.

C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the County Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.8 DOCUMENTATION

The Contractor shall complete work on each asset as assigned via the County’s Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/County Engineer. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.9 WARRANTY

A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at anytime during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the County. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION