(Revised July 11, 2019)

SECTION 01510

SANITARY SEWER MAIN TELEVISION AND SONAR INSPECTION

PART 1 — GENERAL

1.01 SECTION INCLUDES

A. This section includes guidelines and requirements for closed circuit television (CCTV) and sonar Inspection. CCTV inspection will lead to a condition assessment rating of the inspected Wastewater Collection and Transmission System (WCTS) sewers and supports subsequent sewer maintenance and rehabilitation activities. CCTV inspection identifies structural defects, maintenance concerns, and actual and potential sources of I/I in mainline sewers, service laterals, and manholes.

1.02 REFERENCES

A. Codes, Specifications, and Standards

1. NASSCO – National Association of Sewer Service Companies – Pipeline Assessment Certification Program (PACP) Reference Manual, Version 6.0.1, November 2010 or latest version.

B. Manual for Uniform Traffic Control Devices (MUTCD) standards

C. Attachment A – PACP Standard Exchange Database Anticipated Inspection Header Form Attribute Guidance Table (CCTV) (Reference NASSCO PACP Reference Manual, Version 6.0.1, Section 2 for related information

1.03 RELATED SECTIONS

A. Section 01056 – GPS Data Collection

B. Section 01320 - Progress Reports & Videos

C. Section 01520 – Sewer Flow Control

D. Section 02607 - Manhole Height Adjustment

E. Section 02956 – Sanitary Sewer Cleaning

1.04 DEFINITIONS

A. **Television Inspection:** Operation necessary to complete a true-color audio-visual inspection for verification of existing internal pipe conditions including pipe materials, pipe size, pipe grade, connections, cracks, leaking joints, seepage and roots. Contractor shall furnish all labor, materials, equipment, tools, and other incidental services for closed circuit television inspection (CCTV).

B. **MPEG:** MPEG (pronounced M-peg), which stands for Moving Pictures Experts Group, is the nickname given to a family of International Standards used for coding audio-visual information in a digital compressed format. For the purposes of this

specification, MPEG shall be defined as an ISO-MPEG Level 4 standard (MPEG- 4) digital audio-visual coding having a minimum resolution of 500 lines. All video files shall be named using .mpg or .wmv as the file extension.

C. External Hard Drive: For the purposes of this specification, an external hard drive is a peripheral auxiliary device that connects to the computer via a high-speed interface cable. The interface cable allows the external hard drive to communicate with the computer so that data may be passed back and forth. The Contractor will deliver all inspection standard exchange databases, digital reports and media to the Owner/Program Manager on an external hard drive that is compatible with the Owner and Program Manager's equipment and software and will be of adequate storage to contain all deliverables as outlined in the Specifications.

D. Sonar/Totally Integrated Sonar and CCTV Inspection Technique (TISCIT): Operation necessary to complete a simultaneous CCTV and sonar inspection for verification of existing internal conditions. Both the CCTV and sonar will be displayed together on the audio visual documentation. Contractor shall furnish all labor, materials, equipment, tools, and other incidental services for the sonar/TISCIT inspection.

E. Buried Manhole: A manhole where the manhole cover (lid) is not visible at ground surface. Buried manholes usually require removing the material covering the manhole lid and raising the manhole frame and cover (lid). All buried manholes on the sanitary systems shall be reported for raising following their location discovery by the Contractor (Reference Specification Section 02607). Subsequently, the raised manholes shall be inspected.

1. Note that manholes located as indicated on the County's mapping system and covered with a small layer of forest litter and/or a thin layer of soil or grass and where the location is apparent does not represent a "buried" manhole for "Locate & Expose" purposes.

1.05 SUBMITTALS

A. Submittals are to be in color PDF format for printed documents as well as other required formats when applicable for digital transfers.

B. Submit one example video on external hard drive of previous sewer inspection work that shows operational and structural defects in sewers, complete with audio commentary and inspection log(s).

1. Videos and inspection logs will be reviewed by Program Manager to determine if quality of CCTV image is acceptable, if defects were properly identified, picture clarity, advancement speeds and lighting are acceptable and documented according to industry standards and the Program Manager's requirements. This video submittal is expected to represent the standard quality that the Contractor will provide throughout the Contract for all video submittals from all crews.
2. Modify equipment and/or inspection procedures to achieve report material of acceptable quality.
3. Do not commence Work prior to approval of report material quality by the Program Manager. Upon acceptance, report material shall serve as standard for remaining Work.

C. Records reports shall include a separate report for each pipe segment showing inspection setup data, each defect and locations of laterals, and other coded information. Also, each report shall include photographs of moderate and severe defects. Each report shall also note the labeling number of the corresponding video recording of that pipe segment. The video record of the pipe inspections shall be provided digitally on an approved mass storage device. These records shall include all video information and narrations. The video files shall have unique name that are referenced in the PACP inspection database. The file name shall include manhole ID numbers for upstream and then downstream manholes as the start of the file name. It is preferred that the direction of the inspection and inspection date be included as well.

D. Camera specification sheet

E. Sonar/TISCIT survey equipment specification sheet

F. References: Contact names and telephone numbers

G. List of staff and equipment to be used on this Project

H. Supervisor and field crew leader's contact information including name and mobile telephone numbers

I. Confined space entry certification that staff to be used on this project have been properly trained should confined space entry be required

J. Contractor's Safety Plan

K. Training and inspection plan a minimum of 7 days prior to the first inspection

L. 14 day look ahead schedule weekly based on Program Manager's work priority schedule

M. Public notification door hanger based on Program Manager's provided example

N. Inspection (See Documentation Section for additional information);

1. Initial first day's inspections within 24 hours after first day's work is completed.

O. Include the following with each weekly submittal:

1. Inspection media (videos and photographs)
2. Quality controlled Inspection database (PACP Standard Exchange Access Database)
3. Inspection reports (PDF – Digital format)

P. Traffic control plan

Q. Quality control plan

1.06 EXPERIENCE

A. Supervisor of the field crews performing these functions shall have the proper training and up to date NASSCO PACP certification in these types of equipment and monitoring functions and have a minimum of five (5) years' experience in performing such assignments including safe work practices, etc.

B. Field crew leaders performing these functions shall have the proper training and up to date NASSCO PACP certification in these types of equipment and monitoring functions and have a minimum of two (2) years' experience in performing such assignments including safe working practices, etc.

C. The Contractor shall provide the Owner 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 crew members shall enter confined spaces without the necessary certified training and permit.

E. The required experience for the Field Crew Supervisor shall be documented in the Contractor's Bid submittal. Field Crew Leader qualifications will be reviewed and approved (if appropriate) by the Program Manager.

F. A PACP certified technician or supervisor shall control operation of television equipment and encoding of inspection. Should Contractor utilize any personnel to actually document the inspection results that is not PACP certified, those inspections shall be refused and re-survey shall be completely at the Contractor's sole expense.

1.07 RESPONSIBILITY FOR OVERFLOWS/SPILLS AND DAMAGE TO PROPERTY AND UTILITY

A. Reference Specification Section 01030 – Special Project Procedures.

PART 2 — PRODUCTS

2.01 CCTV/SONAR PERFORMANCE

A. The Contractor shall furnish the following, but not limited to: the mobile (off-road) television/sonar inspection studio, television camera, sonar, audio-visual digital encoding equipment / software, and other necessary equipment, materials, power, labor, and technicians as needed to perform the television inspection; Easement machine necessary to perform cleaning of lines.

B. 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.

C. 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.

D. 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. The bonds shall be oriented in such a manner as to enable unhindered extension or retraction through the line.

1. All effort shall be made to prevent damage to the pipe during the television/sonar inspection/cleaning operations. In the case where damage is caused by the Contractor, for any reason, such as would be caused by incorrect deployment of bonds or retrieval of lodged equipment, the cost of repair or remedy shall be borne solely by the Contractor and repaired immediately after notification to the Program Manager, work beginning within 24 hours.

    a. Lodged Equipment (cameras, nozzles, cutters, etc.,):

        1) In the case where damage to the County infrastructure is caused by the Contractor, for any reason, such as would be caused by incorrect deployment of equipment or retrieval of lodged equipment, the cost of repair or remedy shall be borne solely by the Contractor and repaired immediately (repair work to begin within 24-hrs)

        2) Equipment lodged within the sewer main may require an external point repair to retrieve. For Contracts with applicable point repair pay items, the equipment will be retrieved under the applicable line item(s). If an applicable line item(s) is not included in the Contract, the Contractor will provide the County a cost proposal from three (3) qualified contractors capable of completing the work for review. The County will review the circumstances leading to the equipment becoming lodged and make a decision as to payment-to the Contractor for the necessary removal: none, partial, or all.

        3) Should the Contractor have equipment lodged in a sewer line, the Contractor will immediately have on standby, forces necessary to monitor the sanitary sewer collection system upstream of the obstructed line so as to prevent a sanitary sewer overflow and to install by-pass pumping if necessitated. Should the Contract not have a pay item for by-pass pumping, the Contractor will provide a cost proposal to the County representing the total cost of providing an appropriately sized and engineered continuous by-pass operation. The Project Manager as part of the review the circumstances leading to the equipment becoming lodged will make a decision as to payment-to the Contractor for the by-pass pumping: none, partial, or all.

        4) As a result of b and c, lodged equipment not associated with Contractor negligence will be removed by the Contractor at an agreed upon price at the direction of the County. Payment will

be under the appropriate line item(s) if present or under the appropriate allowance.

E. 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.

F. Each unit shall carry or have access to flow control plugs as required to accommodate the diameter range in which inspection is to occur. . See Sewer Flow Control Specification 01520 for additional details and requirements.

G. Each survey/inspection unit will have on-call equipment available to carry out the flushing, rodding, and jetting of sewers for “Light Cleaning” and “Heavy Cleaning”. See the definition of “Light Cleaning” and “Heavy Cleaning” in Sanitary Sewer Cleaning Specification 02956 for details.

H. Television/Sonar Inspection: The Contractor shall inspect pipelines with pan and tilt conventional television imagery and/or sonar as indicated in the contract documents so as to record all relevant features and defects of the pipeline under inspection. Inspection of pipelines shall be carried out utilizing the Owner approved formats only.

I. External Hard Drive (Videos):

1. Audio portion of videos shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of oral report.
2. Store in upright position with temperature range of 45 to 80 degrees F (7 to 27 degrees C).
3. Identify each hard drive with labels showing Owner’s name, Contractor’s name, the inspection period, and project area or sewer segments on the hard drive.

J. Hard Drive Titling:

Each segment shown on the external hard drive should have its own video titled with the beginning and end point of the pipe segment.

K. 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 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.

L. CCTV Camera/Sonar Head Speed:

The speed of the CCTV camera in the sewer will be limited to six (6) inches per second or 30 ft./min for surveys. Similar or slightly higher speed may be used on a case-by-case basis. Stop for a minimum of five (5) seconds at every lateral, defect, or adversity. The speed of scanning sonar will be limited to four (4) inches per second.

M. CCTV Color Camera:

The television camera used for the pipe line inspection shall be one specifically designed for hazardous and corrosive environments and constructed for pipeline inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall adhere to the following requirements:

1. Waterproof and shall be operative in 100% humidity conditions without lens fogging and any conditions that may be encountered in the inspection environment. Camera lens will be free of scratches and other faults that may reduce the video quality. The operator will take precautions to clean the lens of all foreign matter prior to inserting the camera and will attempt to reduce the amount of water on the lens during the survey/cleaning process.
2. Self-leveling, color pan and tilt camera(s) 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.
3. 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.
4. The tilt arc must not be less than two-hundred seventy (270) degrees with adjustable supports designed for operation in connection with pipe inspection with a viewing angle of not less than 65 degrees.
5. The view seen by the television camera shall be transmitted to a monitor of not less than 11 inches in size.
6. The travel speed of the television inspection camera (through the pipe) shall be uniform and shall not exceed the maximum speed herein specified.
7. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the Program Manager; and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.
8. The adjustment of focus and iris will allow optimum picture quality to be achieved and will be remotely operated.
9. 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.
10. 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.
11. The illumination must be mounted on and turned in the direction of the camera such as to allow an even distribution of the light around the sewer perimeter without the loss of contrast picture, flare out, or shadowing, light sensitivity to be greater than 1.5 lux minimum, minimize reflective glare, remote variable intensity control, provide a clear in-focus picture of entire

inside periphery of pipe and the ability to achieve proper balance of tint and brightness.

N. Color CCTV/Sonar:

All CCTV and/or sonar work will use color CCTV/sonar reproduction.

O. CCTV Side Scanning Camera:

The Program Manager will consider high resolution digital CCTV side scanning cameras if proposed by the Contractor. The Program Manager may not accept the side scanning camera use for this project if the contractor cannot provide supporting documents showing previous successful application.

P. Sonar Survey Requirements:

1. Sonar assessment will provide for a continuous output on external hard drive format of all sewers surveyed, supported by complete defect code sheets. Additionally, silt levels will be assessed as a percentage depth of sewers at a minimum of twenty-five (25) foot intervals for each pipeline surveyed in addition to locations where the silt layer varies from the previous by 5% or more .
2. 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.

Q. The survey/inspection vehicle for general public streets or assessable locations 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.

R. 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.

S. The vehicle will be suitable for carrying the survey team and laborers and the equipment necessary to safely perform the work.

T. Off road inspection equipment/easement machine proposed by the Contractor shall be reviewed and approved by the Program Manager before the Contractor utilizes said equipment.

PART 3 – EXECUTION

3.01 GENERAL

A. The following guidelines concerning the use of CCTV and sonar will be followed:

1. Generally CCTV alone will be used for internal condition assessment where the depth of flow 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. The use of flow control (plugging, flow restriction and/or bypassing pumping) to reduce flow to 25% or less is required.
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 or equal to eighteen (18) inches in diameter. Where the sewer is less than eighteen (18) 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 the Contractor and Program Manager's agreement: (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) or (c) use plugging and/or bypassing to reduce flow to 25% or less.
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.

B. Confined Space Entry: Crews shall minimize the physical entry into manholes. 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.

C. The Contractor shall make map verifications and record and deliver GIS map corrections as necessary (Refer to Section 01056).

D. Traffic Control: All traffic control measures shall comply with the requirements of MUTCD, Part 6 – Temporary Traffic Control, Latest Edition as published by USDOT/FHWA.

E. Site Security: Wear all required safety equipment, such as safety vests, hardhats, safety glasses, and steel toe boots. Follow all applicable state and local traffic safety procedures. Alert the closest fire department/Emergency Medical Services (EMS) as to the location of the day's work and to stand by for emergencies.

F. Scheduling Time: Crews shall begin inspections after 8:00 am and terminate inspections no later than 5:00 pm each day unless otherwise directed by the Program Manager in order to address localized special requirements. Authorization should be obtained if work is to be performed outside of the designated hours. Work should be performed by the Contractor in time frames that will allow compliance with the County's noise ordinance.

G. Permits for Rights of Ways & Contract Utility Licensing:

The Contractor shall obtain work permits for all work to be performed in State and/or County Right of Ways. The Contractor shall also plan for all other insurances, traffic control measures, and other terms of the permit in advance. The Contractor shall also obtain all necessary and applicable licensing.

H. Sequence of Work:

1. Perform Work in the following sequence:
    a. Clean sewer lines and manholes in accordance with "Light Cleaning" requirements of Section 02956, Sanitary Sewer Cleaning.
    b. Contractor shall remove debris in accordance with guidance in Section 02956, Sanitary Sewer Cleaning.
    c. After cleaning, the manhole sections shall be visually inspected by means of closed-circuit television. The inspection then will be done one linear section at a time and the flow in the section being inspected will be suitably controlled as specified (see Sanitary Sewer Flow Control Specification). All CCTV inspections shall be performed in accordance with PACP standards including the specific date and time of inspection.

I. Inspection equipment shall utilize software capable of providing complete survey reports, inspection standard exchange database, and linked media files; equipped with modules necessary for NASSCO Pipeline Assessment and Certification Program inspection.

J. If television/sonar inspection(tractor mounted) of an entire manhole to manhole sewer segment cannot be successfully performed from one manhole, a reverse setup shall be performed to obtain a complete inspection. A reverse setup shall be considered incidental to and included in the segment's unit price bid for CCTV inspection. If upstream (reverse) setup, is required, establish new inspection run separate from downstream (normal) setup so two inspection records exist in the software, one with the normal setup and one with the reverse setup.

K. Televised pipe segment inspection is represented by one manhole-to-manhole pipe segment or other structural access-to-access point; not multiple manhole-to-manhole segments.

L. Show continuous footage reading and other required information on inspections image. Place on screen where it is clearly visible (if black font, do not place on dark background, if white font, do not place on light background).

M. Viewing shall be in direction of flow, except while camera is being used in a reverse setup. Inspection shall proceed from upstream to downstream, unless prohibited by obstruction.

N. Keep camera lens clean and clear. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with recording operation.

O. Camera lens shall remain above visible water level and may submerge only while passing through clearly identifiable line sags or vertical misalignments. If flow exceeds 25 percent of diameter, such that the camera lens becomes obscured, pause inspection until flow subsides. If necessary, reschedule CCTV operation.

Surcharging and flooding of camera lens is not an excusable condition if it has been artificially created upstream, i.e., placement of flow plugs or freshwater flushing in pipe.

P. Pan the camera to record the inside of each lateral or connecting pipe and the connection of lateral or connecting pipe to sewer pipeline.

Q. Recordings shall clearly show all defects and observations, and their severity in addition to obvious features, i.e., laterals and joints.

R. Immediately report to Program Manager any obstructions that restrict flow and cause inspection to be interrupted. Assure that the obstruction is documented in the inspection with the appropriate defect code. Document condition with still photographs, and begin a reverse inspection setup or inspections of other pipelines to the satisfaction of the Program Manager.

S. Televise pipe segments from manhole to manhole on same video in continuous run.

1. Video shall clearly show camera starting and ending at manhole, unless defects do not allow it.
2. Do not perform partial televising on one video and then complete run on another video.
3. If line is partially televised, due to excusable condition, i.e., collapsed line, televised length shall be viewed by the Program Manager.
4. If a portion of the Contractor's inspection is unacceptable to the Owner or Program Manager, the entire pipe segment shall be deemed unacceptable and the Contractor shall re-televise the entire pipe segment at the Contractor's sole expense.

T. The Program Manager may, on occasion, accept a physical inspection that does not adhere to minimum standards if adverse conditions are encountered and re-inspection is not advised.

U. At the end of each day, update the status of what sewer segments were inspected using the web-based mobile device. Refer to Section 01030 – Special Project Procedures.

3.02 CCTV/SONAR INSPECTION

A. **Data Transfer:** Upon completion of CCTV inspection, transfer inspection data to an external hard drive (HD) of sufficient capacity and compatibility with Owner's and Program Manager's equipment and available programs; include code required for proper playback of video file.

B. Labeling:

1. Provide printed label on outside of HD that indicates the following:
   a. Name of owner
   b. Project title
   c. Date of submittal
   d. Inspection company

e. Deliverable number
f. Project assignment area (provided by Program Manager)

C. Media:

1. Video:
   a. Inspections completed, with a unique filename per manhole to manhole pipe segment inspection.
   b. Continuous digital video recordings of the inspection view as it appears on the television monitor shall be taken. The recording shall also be used as a permanent record of defects.
   c. The recording shall be MPEG-4. Separate MPEG-4 files shall be created for each pipe segment inspection. In case of a reverse setup, such inspection shall be stored in a separate inspection record and MPEG file. MPEG files shall be written to External Hard Drive media for delivery to the Program Manager.
   d. MPEG files shall be named according to the following file specification:

      TV_[Upstream Manhole]_[DownstreamManhole]_[MMDDYYYY]_[Incremental Number].mpg

   e. The "IncrementalNumber" shall be used if multiple inspections are performed for the same line, such as a reverse inspection setup. IncrementalNumber is to ensure no two videos are the same. The number can be the video ID if the software doesn't already have a random number generator.
   f. The Owner, at its sole discretion, reserves the right to refuse any MPEG, on the basis of poor image quality, excessive bit rates, inconsistent frame rates or any other characteristics that may affect usability by the Owner.
   g. The digital video encoding shall include video information that can be reproduced with a video image equal or very close to the quality of the original picture on the television monitor. The replay of the recorded video information shall be free of electrical interference and shall produce a clear, stable image.
2. 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

D. Still Photographs:

1. Provide color digital photographs showing inspection image whenever observation or defect has a moderate or major severity; looking into a

lateral or connection pipe; or unless otherwise instructed by the Owner or Program Manager;

2. Each with a unique filename matching the asset ID with a random number;
3. Encoded in .JPEG format;
4. Minimum 1024 x 768 resolution; and
5. Provide label on front of photograph with structure identification number, footage (if not visible on photograph), and defect code (if applicable).

E. Database:

1. Include all inspections in a single consolidated PACP Version 6 or newer Access Standard Exchange database. Creating a database per inspection is not acceptable. Each submittal standard exchange database shall be cumulative containing all prior inspections as well as inspections conducted during interim period since previous submittal.
2. Provide PACP standard exchange database of collected data including anticipated inspection header field attribute information as shown in Attachment A to this Section.
3. File Type: MS Access, .MDB, .ACCDB
4. Database Format: PACP Version 6 or newer. NASSCO PACP data will be exported into Standard PACP Standard Exchange database.
5. List inspection media names in corresponding asset/inspection/defect information field within database.

F. 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 pipe diameter (physical measurement by Contractor), and verified pipe material. The relative positions of the two (2) center points will also be noted.
2. The Contractor shall use a suitable metering devise that enables the cable length to be accurately measured; this shall be accurate to 0.20 feet. The Contractor shall use the footage readings to identify location of defects to the nearest 0.10 feet. Measurement shall be zeroed after each segment inspected. The Contractor shall calibrate the footage meter on a regular basis and demonstrate that the tolerance is being achieved by tape measurement between manholes on the surface. This taped measurement must be included on a quality control form which will be completed and submitted by the Contractor depicting the level of accuracy achieved.

G. 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. Regardless, each set-up will be recorded as a separate inspection and the header and observed

defects recorded appropriately. 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 and finish manhole unless abandonment took place because of blockage.

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 and file must be created, 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 digitally generate and clearly display on the viewing monitor and subsequently on the video 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 asset ID number
    d. Date of survey
    e. Road name/location
    f. Direction of survey
    g. Time of start of survey
    h. Sewer use (SS - Sanitary Sewer)
    i. Material of construction of the pipe
    j. The size and position of the data display will be such as not to interfere with the main subject of the picture.
5. 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. Manhole or pipe asset ID number.
    c. Defect/observation code(s) (temporarily display when encountered)
    d. Date and Time
6. Before camera enters the pipe, inspection shall provide video of the manhole. Video recording shall begin by facing pipe segment to be televised and then pan/tilt/zoom as necessary to point camera up toward the manhole opening.

H. **Coding:** Defect Coding, as well as material, shape, and lining coding, and conventions used will comply with PACP formats and will be compatible with the Owner’s GIS.

3.03 DELIVERABLES

A. **Digital PACP Standard Exchange database** shall be submitted on external hard drive to the Program Manager. The database must contain all the data required by this specification.

B. **Final Television/Sonar Inspection Reports** shall be submitted to the Program Manager in PDF on the same external hard drive referenced above. Corresponding MPEG videos and photos shall also be submitted to the Program Manager as outlined by this specification.

3.04 PUBLIC NOTIFICATION – CCTV INSPECTION

A. Public notification is critical and compliance with the public notification criteria is a prerequisite for CCTV inspection, especially when conducting inspections on sewers in easements which pass through private property. Notification must be provided to all property occupiers/owners likely to be affected including residential, commercial and institutional (schools, hospitals, nursing homes, etc.). At a minimum, the following steps shall be taken:

1. The Contractor shall print and distribute pre-approved advance notice door hangers 72 hours before conducting CCTV inspection. The Contractor shall distribute the door hangers to the property owners (residential, commercial and institutional) in the affected area(s). The advance notice door hangers shall be customized by Public Outreach to suit this project and will be provided to the Contractor for printing prior to project commencement. If CCTV inspection is delayed, the Contractor must re-distribute door hangers.
    a. The Contractor is responsible for distributing pre-approved "Right-of-Entry" (ROE) forms and securing signatures from affected property owners on the ROE forms prior to conducting CCTV inspection.

B. The Contractor shall keep a daily log of the distribution of the door hangers. This shall be maintained and submitted to the Owner and/or Program Manager upon request.

C. The Contractor shall alert the appropriate Owner and Program Manager personnel of their work locations on a daily basis.

D. Contractor will provide and place "Right-of-Way" signs in prominent locations where CCTV is planned 24-hours in advance of commencing the inspection. Signs will be a minimum of 24 inches wide by 18 inches high with letters a minimum of 2 inches high. Signs will be supported a minimum of 12 inches above grade by integral metal frames. Wording on the signs shall be similar to the following:

CCTV INSPECTION WILL BE CONDUCTED ON "date" and "time." Contact "person" with "company" at "phone number" for additional information.

3.05 QUALITY ASSURANCE/QUALITY CONTROL

A. Prior to assessment data submission to the Program Manager, the Contractor shall perform a Quality Control (QC) check of the inspection documentation using the QC database provided by the Program Manager. The queries are developed by the

Program Manager and provided to help the Contractor locate data gaps and errors prior to submitting the respective assessment access database. The Program Manager will provide at minimum two hours of training on use of the QC database tool for the Contractor. The Contractor shall correct any data conflict, missing data, or other questionable entry identified by the QC reports prior to submitting the CCTV inspection data to the Program Manager.

B. The Program Manager will periodically request the Contractor to review the QC results with the Program Manager.

C. CCTV video of insufficient quality may result in the line segment being re-CCTV's at the Contractor's expense, depending upon circumstances. The video must be of sufficient quality to allow a review of the operator's assessment. The Contractor is directed to the initial approved CCTV submittal for quality check.

3.06 The Program Manager will perform random review checks of the Contractor's submitted data. Should accuracy or qualitative levels of any of the data fall below those deemed acceptable to the Program Manager; the data submittal will be refused and returned to the Contractor for correction. The Contractor will be required to correct or re-do inspections until the Program Manager is satisfied with the quality of the work."DOCUMENTATION

A. The Contractor shall complete work on each asset as described herein. Refer to the Measurement and Payment Section (Section 01025) on documentation requirements to be provided with each pay request.

B. **Measurement Units:** All dimensions will be in feet and tenths of a foot and/or feet and inches depending upon the technology performed. Measurement of sewers will be to the nearest tenth of a foot.

C. CCTV Photographs:

1. Photographs will be taken of all laterals or connecting pipes and moderate or severe 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.

D. The Contractor shall complete weekly and end of work television/inspection reports as described herein. These reports shall be per the format and defect codes of NASSCO's Pipeline Assessment and Certification Program (PACP). Prior to beginning work, the Contractor shall submit a digital sample of the television inspection report to the Program Manager for approval.

END OF SECTION

Attachment A - PACP Standard Exchange Database Anticipated Inspection Header Form Attribute Guidance Table (CCTV)

NOTE: All input to be as noted in the PACP Program description with the following additions as noted in the FIELD REQUIRED and Description columns.

NUMBER	FIELD	FIELD REQUIRED	DESCRIPTION/INSTRUCTIONS
1	Surveyed by	Y	
2	Certificate Number	Y	NASSCO PACP # of Surveyor – e.g. U-907-4396
3	Reviewed By	N	
4	Reviewer Certificate No	N	
5	Owner	N	DeKalb DWM
6	Customer	N	DeKalb DWM
7	P/O Number	Y	DeKalb DWM Contract number
8	Work Order Number	Y	DeKalb DWM Work Order number assigned
9	Media Label	Y	
10	Project	N	SSES OSARP_TIERED
11	Date	Y	
12	Time	Y	
13	Sheet Number	Y	
14	Weather	y	
15	Pre-Cleaning	Y	
16	Date Cleaned	Y	Date when sewer was cleaned prior to survey if applicable, YYYYMMDD
17	Flow Control	Y	
18	Purpose of Survey	N	
19	Direction of Survey	Y	
20	Inspection Technology Used	N	
21	Inspection Status	Y	
22	Consequence of Failure	N	
23	Pressure Value	N	
24	Drainage Area	Y	Ranking Area Name – e.g. TAZTEC3

NUMBER	FIELD	FIELD REQUIRED	DESCRIPTION/INSTRUCTIONS
25	Pipe Segment Ref	Y	USMH__DSMH - Pipe Facility ID
26	Street (Name & Number)	Y	
27	City	Y	
28	Location Code	N	
29	Location Details	N	
30	Pipe Use	Y	
31	Height (Diameter)	Y	
32	Width	Y	
33	Shape	Y	
34	Material	Y	
35	Lining Method	Y	
36	Coating Material	Y	
37	Pipe Joint Length	N	
38	Total Length	N	
39	Length Surveyed	Y	
40	Year Constructed	N	
41	Year Renewed	N	
42	Upstream MH Number	Y	Client provided designation for upstream manhole (e.g. 15-304-s122)
43	USMH Rim to Invert	Y	
44	USMH Rim to Grade	Y	
45	USMH Grade to Invert	Y	
46	USMH Northing	N	
47	USMH Easting	N	
48	USMH Elevation	N	
49	Downstream MH Number	Y	Client provided designation for downstream manhole (e.g. 18-325-s289)
50	DSMH Rim to Invert	N	
51	DSMH Rim to Grade	N	
52	DSMH Grade to Invert	N	
53	DSMH Northing	N	GPS Coordinate Northing - NAD83 State Plane Georgia West

NUMBER	FIELD	FIELD REQUIRED	DESCRIPTION/INSTRUCTIONS
54	DSMH Easting	N	GPS Coordinate Easting - NAD83 State Plane Georgia West
55	DSMH Elevation	N	
56	MH Coordinate System	N	
57	MH Vertical Datum	N	
58	GPS Accuracy	N	
	Video Location	Y	For digital recordings, path of video file relative to corresponding data file

Y - NASSCO required
Y- DeKalb County Required