



King County

Department of Natural Resources and Parks

Wastewater Treatment Division

Contract P00208P16

**Professional Services for Evaluation of Inflow and Infiltration
Reduction Concepts**

**Phase 2:
Definition of Three I/I Program Concepts**

**DRAFT
Task 7000
Inspector Training and Certification Program Development**

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Project 150258

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Abbreviations and Acronyms

APWA	American Public Works Association
ASTM	ASTM International (formerly known as American Society for Testing and Materials)
BMP	Best Management Practice
CESCL	Certified Erosion and Sediment Control Lead
CIPP	Cured-in-Place Pipe
CPII	(APWA) Certified Public Infrastructure Inspector
CSI	(WTD) Conveyance System Improvement (Program)
E&P	(MWPAAC) Engineering and Planning Subcommittee
EPA	Environmental Protection Agency
EPSC	Erosion Prevention and Sediment Control
ESJ	Equity and Social Justice
FTE	Full Time Equivalent
GMP	Green Management Practices
I/I	Inflow and Infiltration
ITCP	(NASSCO) Inspector Training Certification Program
KC	King County
KSA	Knowledge, Skills, and Abilities
LACP	(NASSCO) Lateral Assessment Certification Program
LMS	Learning Management System
LPA	(KC) Local Public Agency (Program)
MR	Maintenance Hole Rehabilitation
MWPAAC	Metropolitan Water Pollution Abatement Advisory Committee
MSD	(Louisville) Metropolitan Sewer District
NASSCO	National Association of Sewer Service Companies
NICET	National Institute for Certification in Engineering Technologies
NPDES	National Pollutant Discharge Elimination System
PACP	(NASSCO) Pipeline Assessment Certification Program
QPCI	(MSD) Qualified Post Construction Inspector
RWSP	(KC) Regional Wastewater Services Plan
SME	Subject Matter Expert
SPU	Seattle Public Utilities
SSO	Sanitary Sewer Overflow
TM	Technical Memorandum
WTD	Wastewater Treatment Division
WWPCA	Washington Wastewater Collection Personnel Association (WWCPA)
WWTP	Wastewater Treatment Plant

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1.0 Introduction

This technical memorandum (TM) presents considerations for elements of an Inspector Training and Certification Program to be developed by the King County Wastewater Treatment Division (WTD) under its Infiltration and Inflow (I/I) Control Program. This TM first describes then evaluates various program elements to determine the benefits and impacts the program would have on local agencies and communities. The TM also addresses additional considerations that may influence how the Inspector Training and Certification Program is formulated, as well as future work that needs to be completed to inform implementation of specific elements of the program.

This TM–Task 7000, Inspector Training and Certification Program Development—is part of a broader effort to reduce I/I entering the County's sewer system through the *Evaluation of Inflow and Infiltration Reduction Concepts* project. The task builds on work documented in the following TMs:

- Task 410 *Verify 2004 King County Final Draft Regional I/I Control Standards, Procedures, and Policies, October 2017*
- Task 420 *Assessment of Existing Local Agency Sewer and Side Sewer Standards, October 2017*
- Task 430 *Approach to Achieve Common Sewer and Side Sewer/Lateral Standards, February 2019*
- Task 510 *Evaluation of Current Inspection Programs at Cities and Sewer Districts, October 2017*
- Task 520 *Outline for a Standardized Regional Inspector Training Program, February 2019*
- Task 600 *Private Side Sewer Program Identification and Relevance to the King County Wastewater Service Area, April 2019*
- Task 600 *Evaluation Process, Findings, and Outcomes, April 2019*
- Task 4100 *Program Development Plan, April 2020*

1.1 Infiltration and Inflow Control Program Overview

Reducing I/I is an ongoing goal for most wastewater utilities to effectively manage the collection system and control rate payer costs. I/I is defined as rainwater, surface water, and groundwater that flows directly and indirectly into sanitary sewers. I/I may also originate from unauthorized connections to the sewer system. This additional flow takes up capacity that would otherwise be used to convey wastewater. The additional operating costs that result from the need for larger pipes, maintenance structures, and pump stations to accommodate higher flows are spread across all local agencies and their customers through WTD's utility rates, as well as fines, and cleanup costs associated with an increase in sanitary sewer overflow (SSO) events and annual wastewater treatment costs.

In 1999, as part of the Regional Wastewater Services Plan, WTD established the I/I Control Program. This program was designed to reduce the amount of peak wet weather flow entering the County's sewer system whenever such actions were determined to be cost-effective. Currently, the I/I Control Program focuses on portions of the conveyance system that have capacity deficiencies. Specifically, the I/I Control Program has developed methods to collect data to assess where localized I/I reduction might be a more cost-effective solution than increasing pipe and/or pump station capacity.

To date, the I/I Control Program has been effective in select areas of the regional system by addressing localized I/I with this method.

Working in tandem with the I/I Program, WTD's Conveyance System Improvement (CSI) Program functions to develop separated conveyance system projects to accommodate the projected flows from WTD-supported service populations. King County provides wholesale wastewater conveyance and treatment services for 17 cities, 16 local sewer utilities, and one Indian tribe in King, Snohomish, and Pierce counties (local agencies).¹ These local agencies own and operate independent collection systems that include pipelines and pump stations to collect and convey wastewater from their respective service areas to King County's regional conveyance system for treatment and disposal.

CSI Program planning has identified conveyance system needs in the separated system where the existing capacity does not meet the current or projected flows. These flows include assumptions for future population growth and future I/I deterioration rates. CSI Program projects are proposed to address each conveyance system capacity need. A timeline and estimated project cost have been established based on a set of nine prioritization criteria² that include such factors as available capacity (as defined by level of service), operations and maintenance issues, and local agency input.

Per King County's conveyance system policies (King County Code 28.86.060), WTD uses the 20-year peak wastewater flow as the design standard for the separated portion of the regional wastewater system to accommodate increased flows and protect against SSOs. To meet this standard, facilities are designed to convey the peak flow that can be expected on an average of once every 20 years (i.e., a 20-year return interval). Under peak flow conditions, as much as 75 percent of the peak flow in the separated sewer system is estimated to be the result of I/I flows in the conveyance system.³

Based on national I/I surveys and historic King County I/I reports, a significant source of that I/I originates on private property, particularly from side sewers. As service areas are built out, and as the local collection system ages and deteriorates, the WTD conveyance system can expect to see increased flow from I/I. Consequently, conveyance system rehabilitation may be required sooner than expected after combining the increased I/I flows with additional sanitary flows from population growth.

¹The Muckleshoot Indian Tribe owns all sewer mains and side sewers within its service area. See Phase 1 Task 420 TM for more information.

²King County Department of Natural Resources and Parks Wastewater Treatment Division. Conveyance System Improvement Program, Program Update. 2017.

³King County Metro. Wastewater 2020 Plus Infiltration/Inflow Existing Conditions. February 1994, pg. 13; and King County. Pilot Project Report. October 2004, pg. 1-3.

1.2 Project Background

In 2015, the Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC) I/I Task Force (I/I Task Force) was created to formulate ideas for I/I programs that could benefit the regional wastewater system by looking at long-term solutions to significantly reduce and remove I/I from the sewer system as a whole. The I/I Task Force developed a list of recommended options for future regional I/I Control Program actions. That list provided the framework for the current work being performed as part of the *Evaluation of Inflow and Infiltration Reduction Concepts* project. This project is expected to complement ongoing rehabilitation and repairs completed as part of normal operations and maintenance, as well as location-specific I/I reduction efforts completed by component agencies and the County.

The goal of the project is to identify implementable, long-term solutions to decrease future I/I throughout King County's regional wastewater collection system. The work, to date, has been divided into the following phases:

- Phase 1, conducted from 2017 to 2019, reviewed a wide variety of program concepts and identified three I/I reduction concepts for further consideration:
 - Regional sewer and side sewer best management practices (BMPs)
 - Regional Inspector Training and Certification Program
 - Private side sewer inspection program with financial assistance
- Phase 2, initiated in 2019 and continuing through 2021, builds on the Phase 1 work and provides descriptions and considerations for those three identified programs to support discussions on scope and implementation. Results are not yet known, but may include:
 - Recommendations on side sewer BMPs for a web-based regional toolkit
 - Recommendations on regional Inspector Training and Certification Program content and expectations
 - Options defined for private side sewer inspection programs

1.3 Purpose

This TM documents the approach taken during Phase 2 to define a regional Inspector Training and Certification Program that may result in limiting the increase and/or reduce the overall I/I levels in King County's regional wastewater service area.

An overview of the regional data for inspectors and inspection programs across the region was provided in the Phase 1 Task 510, *Evaluation of Current Inspection Programs at Cities and Sewer Districts* TM. While the local agencies generally employ experienced construction inspectors, many agencies indicated that training is provided on the job⁴. There is currently no regional inspection practice standard for sewer mains, laterals, and private side sewers. Regional standardization of inspector training and inspection practices would provide a basic level of assurance that sewer infrastructure is constructed and repaired at a consistent level of quality across the regional service area. Leveraging a regional inspector training program with an established industry association program may provide one option for ensuring that local best practices issues are adequately

⁴ Through many years of sewer construction and inspection work

covered, as well as provide an overall cost savings from using a well-developed training program so that basic core content is not necessarily developed from scratch.

The Phase 2, Task 4000, *Program Development Plan* TM provided an overview of the approach that would be taken under Task 7000 to develop this Inspector Training and Certification Program (Task 7000 TM). Concepts presented in the Task 4000 TM that helped define the Inspector Training and Certification Program include:

- Goals, Objectives, and Success Factors
- Implementation Risks and Barriers
- Outreach Plan
- Next Steps for Program Development and Implementation Planning
- As part of the Task 7000 Inspector Training and Certification Program planning process, the Consultant team worked closely with MWPAAC, primarily via the I/I Task Force, to develop the following program elements presented later in this TM:
 - General Program Scope Definitions (Section 3)
 - Requirements to Complete Training (Section 5)
 - Program-Related Roles and Responsibilities (Section 6)
 - Program Costs and Funding Options (Section 7)

2.0 Inspector Training and Certification Program

An overview of the regional data for inspectors and inspection programs across the region was provided in the Phase 1, *Task 510, Evaluation of Current Inspection Programs at Cities and Sewer Districts* TM. While the local agencies generally employ experienced construction inspectors, most have reported that training is obtained on-the-job. At present, there is no regional standardization for inspection practices.

Inspectors fill roles in sewer infrastructure construction and repair that include, but are not limited to, the following:

- Act as the onsite observer for the sewer agency.
- Enforce provisions of Contract Documents and Permits.
- Determine if materials and workmanship are in conformance with Contract Documents and Permits.
- Verify that the final field product meets the requirements of the sewer agency's Contract Documents and Permits.
- Interact with the public and other entities affected by the construction and/or repair work.

Standardization of inspector training and inspection practices would provide a basic level of assurance that sewer infrastructure is constructed and repaired at a consistent level of quality across the regional service area.

2.1 Program Goals

The goal of this program is to ensure, within reason, that all component agency sewer inspectors (staff or contractors) are consistently trained and certified to inspect all aspects of the sanitary sewer system and enforce proper installation, rehabilitation, and repairs to reduce I/I. Following discussion, consensus was reached among the I/I Task Force to include training on sewer connection inspection and side sewer inspections only. Mainline sewer inspections were not included as a topic because other entities (i.e., American Public Works Association [APWA]) already provide comprehensive training programs for mainline sewers.

By developing and implementing a regional Inspector Training and Certification Program, WTD, and its component agencies within the WTD service areas, are likely to realize various benefits over time. These benefits include reduced I/I in the regional and local sewer systems over time, improved confidence in the structural integrity of sanitary sewers within the WTD service area, as well as a uniform set of standards applied to these issues by WTD and its component agencies. Also, the program would set common expectations and grow transparency between local agencies and WTD around sewer inspector levels of experience, knowledge, skills, and abilities.

Anecdotal evidence through previous work completed by the consultant team, indicates that most regulators, when asked, are very supportive of, and have a higher level of confidence in, sewer agencies that have formalized training programs (of any type).

Additionally, King County National Pollutant Discharge Elimination System (NPDES) permits for wastewater conveyance and treatment include requirements for I/I reduction and control. The

implementation of this training program, along with other I/I reduction efforts, would show that progress is being made toward removing I/I from the regional system.

2.2 Objectives

The objectives of this program are as follows:

- Establish minimum qualifications for inspectors across the WTD service area.
- Establish an Inspector Training and Certification Program for inspectors to demonstrate minimum qualifications that include both academic and hands-on components.
- Establish the frequency and method of certification renewal (e.g., certification test every 5 years).
- Integrate Equity and Social Justice components as part of program development and implementation.

2.3 Success Factors

The following preliminary success factors have been defined for this program:

- Have 100% of inspectors trained and certified by a defined date.
- Reach agreement among all local agencies to participate in program development and meet training and certification requirements.

These success factors were developed by the I/I Task Force through early Phase 2 input prior to a recommendation on whether to implement the Inspector Training and Certification Program. Based on this recommendation, the success factors were revised as follows:

- [PLACEHOLDER TO BE UPDATED AFTER ADDITIONAL MWPAAC INPUT]

2.4 Regional Effectiveness of I/I Prevention or Reduction

As described in the Phase 1, Task 520 TM, a gradual reduction of I/I sources is anticipated over a period of many years where new sewer construction and repair-related inspections occur. It is not possible to estimate the magnitude of the decrease or the potential decline in the rate of I/I increase that could be attributed to improved inspections. KC's decennial flow monitoring, hydraulic modeling, and measured flows at the wastewater treatment plants (WWTPs) are sources of data that may be used to evaluate effectiveness of any programs adopted to address I/I in the years to come.

KC currently requires that agencies provide inspection test results to the County after new mainline construction has been completed. Consideration could be given to requiring that similar inspection documentation (e.g., test results or checklists) be submitted to KC whenever sewer systems are repaired or modified in the service area. With such documentation, KC can better determine in the future whether the inspection certification requirements are being followed.

In general, sewer construction and rehabilitation inspection training efforts advance the knowledge and practice of inspectors and provide a benefit to the community and public agencies by reinforcing basic industry-recognized best practices. Competently and thoroughly performed inspection services, which require technical expertise, knowledge of materials and methods, and sound judgement, are important components to achieve a high-quality end product.

3.0 Example Training and Certification Programs

This section presents an overview of three training and certification programs utilized by sewer utilities in the United States. The purpose, scope, eligibility requirements, application process (if applicable), and cost (as available) for each program is described below. The programs include:

- APWA Certified Public Infrastructure Inspection (CPII) Program
- National Association of Sewer Service Companies (NASSCO) Inspector Training Certification Program (ITCP)
- Louisville, Kentucky, Metropolitan Sewer District (MSD) Training Classes and Certification Programs

It may be possible to leverage one or more of these existing training and certification programs as a prerequisite to participation in a regional program, and/or to partner with an outside organization to develop content, provide training services, and administer certification programs.

3.1 APWA Public Infrastructure Inspector Certification

The purpose of the APWA's Certified Public Infrastructure Inspector (CPII) certification program is to promote quality infrastructure throughout the community by advancing the knowledge and practice of construction inspectors to benefit the community and public agencies. This certification program is intended for individuals who inspect the construction of public infrastructure (e.g., roadways, highways, utilities, bridges, dams) and facilities (e.g., pump stations, treatment plants, water storage facilities) and other types of construction work and materials to ensure compliance with plans and specifications. Duties may include observation, measurement, testing, and documentation.⁵ The APWA CPII Examination content outline is provided in **Appendix A**.



The CPII Program includes an eligibility application process, a multiple-choice test, and a recertification application process. Interested candidates must submit an application that documents compliance with the following requirements:⁶

- Minimum high school diploma or equivalent education certificate
- Minimum of 5 years of public infrastructure field experience⁷
- Continued agreement in writing to adhere to the APWA Standards of Professional Conduct and to affirm no history of felony convictions related to the practice of public infrastructure inspection

⁵https://www.apwa.net/MYAPWA/Events/Professional_Development/Certification/Public_Infrastructure_Inspector__CPII_/Apwa_Public/Education_and_Events/Certifications/CPII.aspx?hkey=6d59f32b-cfc9-4c03-b92c-1f8a2f33298b

⁶A copy of the CPII Eligibility Application can be downloaded using this link:
https://www.apwa.net/MYAPWA/MyApwa/Apwa_Public/Education_and_Events/Certifications/CPII__Applying.aspx

⁷Relevant work experience is defined as work performed in the construction of public infrastructure (e.g., roadways, highways, utilities, bridges, dams), facilities (e.g., pump stations, treatment plants, water storage facilities), or other types of construction work and materials to ensure compliance with plans and specifications.

- Payment of the current application fee
 - Eligibility application fee (non-refundable) (APWA member–\$95, Non-member–\$145)
 - Examination fee (Place of Employment–\$300) or Testing Center (\$350)
 - Recertification application fee (non-refundable) (APWA Member–\$95, Non-member–\$145)

The APWA CPII certification is valid for 5 years. Certificate holders are required to earn a minimum of 50 credits of continuing education units (CEUs) and/or contributions to the profession. A tracking sheet is submitted during the renewal period to document activities that meet recertification criteria, along with the recertification application fee.

3.2 NASSCO Inspector Training Certification Program

The NASSCO⁸ ITCP is a standard national training and certification program that provides field construction professionals (i.e., consulting and municipal engineers, inspectors, and contractors) with comprehensive training and tools to understand and inspect trenchless pipeline renewal technologies.⁹ The program currently has two focus areas for which separate certifications are available: cured-in-place pipe (ITCP–CIPP) and maintenance hole rehabilitation (ITCP–MR).



Participants who successfully complete the ITCP-CIPP training receive a certificate that is valid for 5 years. The cost of the initial certification is \$1,295 regardless of NASSCO membership status. Recertification for the ITCP-CIPP may be completed online; costs range from \$450/\$500 (members/non-members). Recertification may also be obtained by retaking the initial class (\$695/\$795).

Initial training for the ITCP-MR also costs \$1,295, and there are currently no requirements for recertification.

3.3 Louisville Metropolitan Sewer District Training Classes and Certification Programs

The Louisville Metropolitan Sewer District (MSD) has provided in-person and online training opportunities for its consultants, contractors, and customers for many years as described below.

⁸ It is important to note that NASSCO is a privately-held for-profit trade organization and its training and certification program content may or may not be peer reviewed by industry subject matter experts outside of NASSCO membership.

⁹ <https://www.nassco.org/content/inspector-training-itcp>

3.3.1 Stormwater and Wastewater System Inspector Training and Certification

As part of reorganizing its Inspection Program, MSD partnered with the National Institute for Certification in Engineering Technologies (NICET)¹⁰ to develop an MSD-specific training and certification program for Stormwater and Wastewater System Inspection (**Figure 3-1**).

Each MSD inspection supervisor and inspector was required to obtain NICET Certification within a given timeframe of employment (or promotion) to “incentivize” job knowledge enhancement and increase inspection proficiency. To increase staff retention, a progression path was created, and three levels of inspectors were (and are now) employed.

Incorporating the NICET Certification process into job classification requirements resulted in increased accountability, more consistent standards, improved communications, and cohesive practices undertaken by capital, development, and enforcement inspectors. The cost associated with this program are not available.

MSD partnered with the Jefferson County Public Schools to facilitate this training throughout the region and NICET managed the certificates for MSD. The program was discontinued at the end of 2017 as the need for this training was no longer justified. NICET may redevelop some or all of this program upon request.

Similarly, NICET discontinued its standard Water and Sewer Line Certification Program at the end of 2017. This program targeted engineers and technicians engaged in the construction and inspection of underground water and sewer lines and was applicable to both private and public sector technicians. Topics covered in the training course included specifications and contract plan interpretation, field construction and installation techniques, field inspection and testing procedures, record-keeping and reporting, and supervisory duties. NICET may redevelop some or all of this program upon request.

3.3.2 Online Qualified Post Construction Inspector Training and Certification (Green Infrastructure)

MSD currently provides online Qualified Post Construction Inspector (QPCI) training and a certification examination for owners or managers of commercial properties in MSD’s service area. The eligible properties must have long-term maintenance and operation agreements that require regular inspection reports on Green Management Practices (GMPs).¹¹

These reports can be submitted only by QPCI certified inspectors.

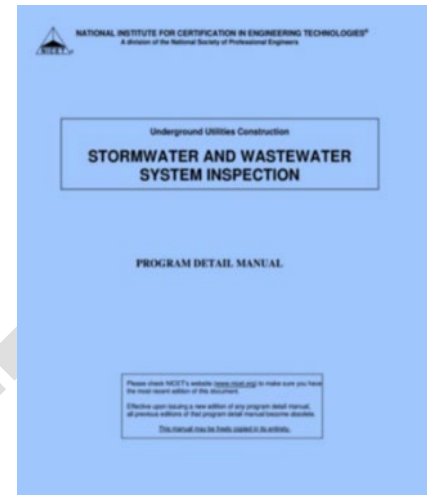


Figure 3-1. NICET Program Detail Manual for Louisville MSD Inspection Certification Program

¹⁰ NICET is an organization that was established in 1961 to create a recognized certification for engineering technicians and technologists within the United States.

¹¹ For more information on MSD’s QPCI training course, see <https://louisvillemsd.org/green/Qualified-Post-Construction-Inspector>

The online training module is free and provides information on common GMPs and their maintenance issues. The training includes quizzes and interactive exercises on completing sample inspection reports. (Figure 3-2). QPCI certification is earned by demonstrating an understanding of common GMPs and maintenance issues.

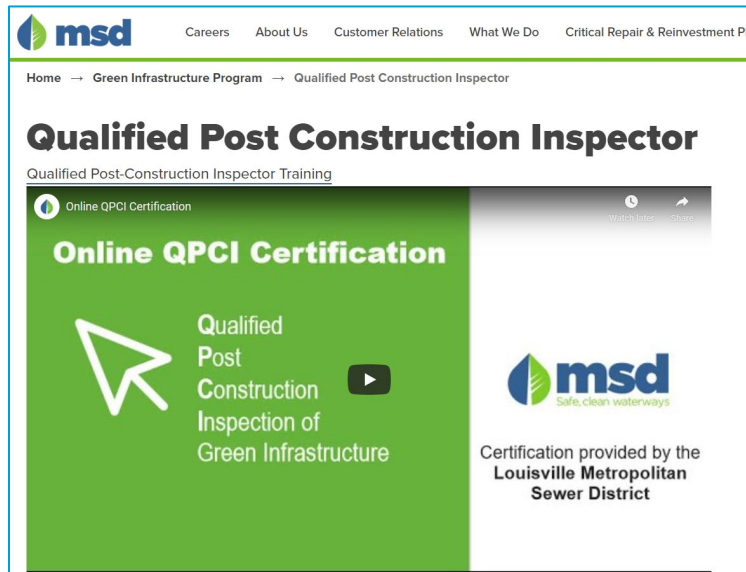


Figure 3-2. Louisville MSD Online QPCI Certification Website

3.3.3 Erosion Prevention and Sediment Control (EPSC) Certification

MSD prepares and conducts EPSC courses that provide training and certification relating to erosion control (EPSC Ordinance), as required by the Louisville and Jefferson County Metro Government Code of Ordinances. Certifications are provided single-lot residential construction demolition or Contractor. In addition, MSD provides training and certification for EPSC plan reviewers and preparers. Table 3-1 summarizes current online EPSC-related online training.

Table 3-1. MSD EPSC-Related Online Training

Training or Certification	Program Description	Program Fee
MSD–Contractor EPSC Training	- Explains the EPSC measures to be installed on construction sites, as well as the paperwork required to comply with the EPSC ordinance. - Designed for the Contractor and the on-site responsible person tasked with the installation, maintenance, and inspection of BMPs required to comply with the EPSC Ordinance. - Curriculum includes the EPSC process, maintenance and performance requirements, administration and enforcement information, and the education and training requirements.	\$95
MSD–Home Builder EPSC Training	- Designed for the home builder or person responsible for a land disturbance activity. - Addresses all land-disturbing activities associated with the construction or demolition of residential principle and accessory structures on individual lots. - Discusses the BMPs required to comply with the EPSC Ordinance.	\$89
MSD–Certified Plan Reviewer/Preparer EPSC Training	- Covers the requirements of MSD's EPSC Ordinance and explains how to use the design aids prepared by MSD. - Design aids allow the designer to accurately design EPSC measures that meet the 80% removal required by the ordinance. - Note: Licensed professional engineers and landscape architects are not required to take this class.	\$95

4.0 Training Program Scope Considerations

The following sections describe key program scope considerations and present some of the risks and barriers to implementation related to basic program elements, as well as mitigation approaches that may lessen or remove these risks or barriers. The Inspector Training Program is not intended to implement new inspection protocols that would increase the time required for inspectors to complete their work; rather, the training program is designed to 1) ensure inspectors are fully aware of issues that could lead to increased I/I in the sewer system and, 2) provide methods to mitigate these issues.

4.1 Voluntary versus Mandatory Program Adoption

An inspector training program could be set up as voluntary or mandatory for WTD's local agency inspectors. The most prevalent risk associated with the development of a voluntary inspector training program is that there is no guarantee that local agencies will employ inspectors certified by a regional inspector training program. A voluntary approach could also result in resources being spent to host trainings and exams that are then not attended by inspectors. A mandatory training program may mitigate this risk because local agencies would agree to or be required to participate. A voluntary approach is being recommended at this time. The labor union and legal implications of this recommendation are discussed below.

If a private side sewer inspection program is developed in the future, and if this inspector training program is refined to support that program, then the reasoning for considering a voluntary or mandatory approach may be different.

4.1.1 Labor Union Implications

Some inspectors are unionized, e.g., public employees, while others may not be, e.g., some private contractors. Also, existing labor contracts for unionized inspectors vary. Proposing either voluntary or mandatory training and certification for inspectors is expected to have implications for labor union bargaining. A voluntary approach will likely need participation from a majority of local agencies in order to achieve effective implementation. Ultimately, this is expected to lead to making the training mandatory. To support bargaining, the following will be needed:

- Standard learning objectives (knowledge, skills and abilities being asked for)
- A training curriculum (standards of inspection)
- Discussion on whether this training program is the only way to learn these skills

KC can evaluate the need and bargain with its unionized employees, as appropriate. Each component agency would need to evaluate whether the requirement of this training triggers bargaining within their affected employee unions. Some component agencies may have multiple unions, thereby increasing the level of effort.

4.1.2 Legal Implications

The County's authority to implement I&I projects and programs is defined by the intersection of five legal requirements:

- Provisions contained within KC's NPDES permits for operation of its wastewater collection and treatment system and discharges of effluent to state waters;
- Provisions contained within KC's contracts with component agencies to convey and treat wastewater;
- Provisions within KC codes describing the reasonable regulation of I&I;
- Provisions within KC codes requiring that the Water Quality Fund (representing moneys collected from component agencies and associated other sources) be spent in a manner described in the County's comprehensive sewer plan that benefits the agency and its ratepayers; and
- Provisions in state law, and an accompanying Attorney General's opinion, regarding gifting of public funds.

KC has the authority to enforce provisions of its sewer contracts with local agencies. Existing sewer contracts do not require component agencies to employ certified inspectors, to set minimum qualifications for inspectors, or to direct how local agencies regulate their local wastewater system. Existing sewer contracts do, however, require local agencies to invest in their infrastructure for the purpose of preventing, reducing, and eliminating the entry of extraneous water into such facilities.

The existing sewer contracts draw a distinction between the "Metropolitan Sewerage System" and "Local Sewerage Facilities." The Metropolitan Sewerage System is defined as the facilities and programs used by WTD to implement the Regional Wastewater Services Plan (RWSP). Local Sewerage Facilities are defined as facilities owned or operated by a Participant for the local collection of sewage to be delivered to the Metropolitan Sewerage System.

Under the sewer contracts, WTD's rates must be based on the cost of administration, operation, maintenance, and repair or replacement of the Metropolitan Sewerage System. The existing sewer contracts also require each local agency to be responsible for the construction, maintenance, and operation of its Local Sewerage Facilities. The Washington State Supreme Court has interpreted the existing sewer contracts and has stated that under Washington caselaw and the existing contracts, WTD's expenditures must primarily benefit WTD and its ratepayers and have a sufficient nexus to the goals of sewage treatment.

WTD would need to conduct an analysis of the governing legal provisions to identify the appropriate legal basis for implementing an Inspector Training and Certification Program. It appears that this program could potentially be justified as either a mandatory program or a voluntary program for the component agencies to implement. Different legal requirements would need to be satisfied to implement a mandatory program relative to a voluntary program. Until the legal analysis is completed, the County cannot commit to either a mandatory or voluntary program.

4.2 Minimum Inspection Requirements

Setting up minimum inspection requirements for the King County region was initially considered, however, this component was not pursued as the County cannot dictate how local agencies construct, maintain, and operate their Local Sewerage Facilities. This training can be focused on general inspector education (recognized industry and local best practices), and not on agency specific codes or enforcement, as those vary by agency.

In the future, if there is a need to link this training to a private side sewer inspection program, then the need for minimum inspection requirements may be revisited. These requirements could incorporate the minimum testing and inspection requirements from industry leaders (e.g., ASTM, APWA, Environmental Protection Agency (EPA), NASSCO), as appropriate.

4.3 Scope of Training and Certification Examination Topics

The list of duties performed by sewer utility construction inspectors charged with inspecting sanitary sewer installation, repairs, and replacement projects is extensive (**Appendix B**). While many of these duties do not have a direct correlation with the potential to prevent or reduce I/I from entering the sanitary sewer system, there are some duties that may have a direct correlation. These duties are shown in **Table 4-1** (see Appendix B for complete list of duties).

Table 4-1. Recommended Inspection Practices with Direct Correlation to I/I Prevention and Reduction

Core Duties	Related Component
Review the Plans, Specifications, Permits, Applicable Laws, Safety Regulation and Applicable Codes	• Special Provisions: unusual requirements, soil reports and boring data • Notes on the Plans: References to Standard Plans • Standard Specifications • Reference Specifications • Standard Plans • Applicable Codes • Submittals
Review Other Information	• Grade Sheets
Inspect the Work Site	• Utility Mark Outs • Assess Potential Inflow Sources to the Sanitary Sewer
Implement Project Controls (Sampling and Testing)	• Soil Compaction Testing • Concrete Testing • Pipeline Testing (air, vacuum, water, closed-circuit television (CCTV), mandrel, etc.

Careful consideration should be given to the topics related to inspector duties that will be covered in the training program and included on the certification examination. These topics should align directly with construction and inspection practices related to ensuring sewer systems are watertight. The time and effort associated with developing the training program and certification examination will be directly affected by the complexity of the topics included. Consequently, the time and effort required of those participating in the training will also be directly affected.

See **Section 3** for examples of topics used in several well-known Inspector Training and Certification Program programs.

The following list of potential training topics was presented to members of the I/I Task Force on February 1, 2021:

- Mainline sewers–inspections conducted on new installation, spot repairs, sewer and maintenance hole rehabilitation, and sewer and maintenance hole replacements
- Sewer connections–inspections conducted on new connections, spot repairs, connections associated with mainline rehabilitation, and connection replacements
- Side sewers–inspections conducted on new installations, spot repairs, and side sewer rehabilitation, replacement, abandonment, and repurposing
- Side sewers–visual condition assessment inspection (via a push camera)
- I/I sources on private property–inspections conducted on private property for unauthorized connections (i.e., roof leaders, sump pumps, foundation drains, surface drains, driveway drains, window well drains, etc.)

In addition to discussing each potential training topic, the I/I Task Force identified the targeted training program participants, and what type of inspection would apply to each. For example, it may not be appropriate to require plumbers and side sewer contractors to be trained and tested on mainline sewer inspection.

It was noted that training for inspection of I/I sources on private property could be added as a component if a regional Side Sewer Inspection Program moved forward and included source identification, disconnection, and/or redirection.

Following discussion, the Task Force consensus was reached to include only training on sewer connection inspection and side sewer inspections. Mainline sewer inspection was suggested not to be a topic because other entities (i.e., APWA) already provide comprehensive training programs for new mainline sewer construction. I/I source inspection was suggested not to be a topic because of the legal issues related to accessing private property, and because not all local agencies are experiencing peak rates of I/I within their collection systems that warrant investigating possible private property sources. It is recognized however, that local agencies experiencing high peak I/I rates could benefit from training on how to identify and quantify sources of I/I that are located on private property and could use that information when developing cost-effective approaches for localized I/I reduction. Inflow sources have a much bigger impact on peak wet weather flows than infiltration.

Table 4-2 presents a breakdown of proposed training modules and general topics based on the I/I Task Force discussions. A further breakdown of the topics would be developed during implementation. For example, as part of the Inspection Methods and Standards module, proper pipe installation and pipe laying methods could be presented, as well as approved versus non-approved materials.

Table 4-2. Proposed Inspector Training Module Topics

Module	Training Topics
1. Introduction to the Regional Inspection Certification Program	This module provides an overview of the inspector certification process and outlines what is required for each agency to submit to WTD under the Local Public Agency Program. This module covers: • Regional inspector training: what is the purpose and benefit of this program • WTD reporting requirements for inspection results • Standard drawings, details, record drawings, permit requirements, and other guidelines (including when there are no guidelines)
2. Inspection Methods and Standards	This module outlines the methods typically used to complete inspections, including: • Reviewing construction methods and materials • Understanding internal inspection results (via lateral launch and push cameras) • Knowing what to look for when inspecting a spot repair or lateral/side sewer modification • Conducting condition assessments: defect severity levels and what level of defect requires additional repair • Knowing other items to inspect on site: possible I/I sources • Identifying shortcuts taken by contractors that may increase I/I risk
3. Testing Standards	This module covers how an inspector properly completes/oversees testing of various sewer components, including: • How to properly complete a vacuum test • How to properly complete an air pressure test • How to properly complete a water leakage test • How to properly complete an internal visual inspection
4. Construction Best Management Practices (BMPs)	This module discusses various construction and repair methods for inspectors to be fully aware of the limitations of each method. Topics could include: • Cured-in-place pipe (CIPP) lining BMPs (mainline, laterals, and side sewer) • Pipe-bursting BMPs • Grouting BMPs • Spot repair BMPs • Lateral and side sewer repair BMPs • Adapting to recent changes to other industry BMPs and regulations • Lateral sewer connection BMPs
5. Safety Issues and Customer Service	This module focuses on safety considerations that inspectors must take into account. Topics could include: • Washington Dig Law (Call 811 Before You Dig) • Crossbores: how to address situations where gas lines, fiber-optic lines, and other utilities have bored through sewer mains, laterals, and/or side sewers • Worksite safety risks and mitigation methods • Confrontation training: what to do if a contractor pushes back • Effectively communicating with property owners/occupants with diverse backgrounds

5.0 Eligibility Requirements for Training and Certification

This section presents suggested eligibility requirements for attending training sessions and taking the certification exam.

5.1 Minimum Qualifications for Inspectors to be Eligible for Training and Certification

The purpose of considering minimum qualifications to be eligible for the training is ensure training program participants have the requisite knowledge and experience to fully understand and comprehend the training materials presented. Minimum qualifications will increase the effectiveness of the training and certification program and recognize the importance of the inspectors' role in ensuring high quality work products. Prior to attending a training program, the trainee should possess a minimum understanding of sewer construction and inspection standards. To establish a baseline for when personnel would start the formalized training program, the minimum knowledge, skills, and abilities (KSAs) required for sewer construction inspectors are proposed as follows:

- Knowledge of appropriate methods, technologies, and materials used in sewer installation and maintenance
- Knowledge of local, state, and federal building codes, construction principles, techniques and procedures, occupational hazards, and safety precautions
- Knowledge of sewer codes regulating installation and maintenance of sewers
- Ability to read and interpret plans and specifications of sewer lines and systems
- Individual physical capabilities commensurate with the demands of the job
- Strong organizational skills and understanding of task assignment and schedule; working knowledge of critical path method scheduling
- Excellent written and verbal communication skills

A simple eligibility application form should be available online for downloading and printing. The form should be developed so that it could be filled in and printed for mailing or completed and submitted online in its entirety. Further details on the specific content, mailing address, and any associated application fees will be considered as part of the program Implementation Plan.

5.1.1 Examples of Minimum Required Qualifications for Inspectors

While local agencies set inspector qualification requirements to address agency-specific issues and needs, (e.g., ensuring sewer systems are watertight), the following examples of recent job postings show that inspector positions are not entry-level, and a base level of inspection knowledge and/or related experience is required.

A recent Construction Inspector job posting by the City of Auburn, Wash., lists the following minimum qualifications:

- Possess an Associate Degree in Engineering Technology, or related field, and 1 year of field experience, or have 5 years of experience in a related construction field
- Possess and retain a valid state driver's license without impending loss at time of appointment
- Must be able to obtain a Certified Erosion and Sediment Control Lead (CESCL) certification from an authorized Washington State Department of Ecology course within 6 months of employment

The City of Tacoma, Wash., posted a job description for an Environmental Services Construction Inspector position within the Field Operations Group in the Environmental Services Science and Engineering Division on December 21, 2020. This position will provide inspection services for the capital improvement projects of the Tacoma's Wastewater, Surface Water and Solid Waste Utilities. Qualifications for this position require the following as a minimum:

- Graduation from high school supplemented by college-level courses related to inspection work, and
- Three years of experience in field or office engineering work involving construction phase reviews

Many construction inspector positions in the private sector typically require a technical degree, diploma, certificate, or equivalent in a related field, or equivalent combination of education and construction experience. A minimum requirement of 8 to 10 years of experience is common.

5.1.2 Recommended Minimum Required Qualifications

The initial proposed minimum qualifications for eligibility to take the KC Regional Certified Inspector examination are as follows:

- Graduation from high school supplemented by college-level courses related to inspection work, and
- Documented minimum of 5 years of experience in field or office engineering work involving sewer construction, repair and/or rehabilitation work

The I/I Task Force evaluated the initial recommendation of minimum required qualifications. Task Force members discussed what their local agency minimum requirements are currently, and what other qualifications could be evaluated. The Task Force considered the nature of the training and the impact of lowering the level of qualifications on the content that would have to be included for the training to make sense and be effectively delivered to the trainees. In general, the training time would be shorter if the trainees are held to higher minimum qualification requirements.

Based on the I/I Task Force input, the recommended minimum qualifications remain the same; however, during the implementation phase, the eligibility application will be crafted so that there is flexibility in how equivalent experience is gained and how knowledge and skills are demonstrated. (Also see Sections 5.2.2 Test Out Option and 5.2.3 Equivalent Experience for other ways in which the minimum required qualifications issue is addressed.)

5.2 Certification Examination and Recertification Requirements

This section describes the requirements for certifying and recertifying inspectors and provides possible methods for maintaining lists of certified inspectors. The purpose of including a certification element is to recognize the experience, knowledge, and education of inspectors based on an objective, third-party assessment of their skills and to enhance their professional credibility.

Some Task Force members indicated their inspection staff see value in certification, while inspectors with one local agency do not see value.

If the outcome of discussions with the I/I Task Force and MWPAAC Subcommittee indicate that a certification element is not desired or appropriate, then other methods of refreshing inspector knowledge on sewer connection and side sewers may be investigated. These methods may involve

developing and presenting initial training modules and half-day refresher training modules and providing participation certificates.

5.2.1 Certification Examination

Inspectors who complete the training program are anticipated to be eligible to take the certification examination. It is recommended that once the curriculum of the training course portion of the program and key content are identified, a certification examination could be drafted for review by various parties. Questions should be written in accordance with the examination *Items Writing Guidelines* provided by the Association of Boards of Certification.¹² These guidelines are commonly followed when developing examinations for water and wastewater professionals. They use multiple-choice test questions, cover a large amount of content, are easily scored, and can measure a wide amount of information.

A minimum passing grade should be identified that corresponds to the complexity and length of the examination. For example, a passing grade of 80% may be appropriate for a 10-question examination with simple and straightforward answers, but a lower overall score may be appropriate for one that is longer or more complex.

A hard-copy certificate could be presented to inspectors who successfully pass the examination. In addition, when appropriate, the inspector's employer could be notified so that they can track individuals who completed training and passed the examination. A master list of inspectors could be maintained by WTD in either a spreadsheet or database that includes contact information, employer, training completion and examination dates, locations, test scores, etc. Further details related to the inspector training and certification tracking system will be considered as part of the program Implementation Plan.

5.2.2 Test-Out Option

A process could be established to streamline the certification process for experienced (seasoned) inspectors. This process could include requiring the experienced inspector to provide documentation of both relevant work experience from their current (and/or previous) employer(s) and successful completion of the certification examination (with a set minimum passing grade). Care must be taken when establishing acceptable documentation of experience so that personal information outside the scope of each inspector's ability to perform the relevant job duties is not required. For that reason, an employment verification check can be used to confirm employment history, but references and subsequent checks should not be required.

5.2.3 Equivalent Certification

After the experience, knowledge, and education requirements for certification have been determined, KC should recognize equivalent certifications. For example, if certification requirements are based off of, or in line with those of the APWA CPII, then such equivalent certifications should be acknowledged for any inspectors who have earned these certifications. In turn, they could be exempted. This determination will be made during implementation planning, in parallel to the training module development.

¹² http://www.abccert.org/about_ABC/Publications.asp

Equivalent certifications, such as the APWA CPII, should be recognized, and inspectors who have earned these certifications could be exempted from certain training and examination topics for as long as their equivalent certifications are valid. However, training should still be required for regionally-specific topics not covered under the equivalent certification and completion of related examination questions. For example, regionally-specific topics may include certain construction and repair BMPs, testing methods, and internal inspections related to side sewers located on private property.

Training modules, provided either in-person or online, can be developed to address regionally-specific issues and local best practices. A regionally specific section of the certification exam may also be developed accordingly and could be offered as a stand-alone examination.

It is proposed that the following available training programs be reviewed for equivalency:

- APWA CPII
- NASSCO LACP

Other training and certifications may be identified and evaluated by a designated review committee in the future.

5.2.4 Recertification

Consideration should be given to the frequency of regional certification renewal for inspectors. The renewal period should be associated with the anticipated changes in regional inspection practices, noting that stand-alone training modules and examination questions could be developed to reflect these changes. The recertification process could require an inspector to complete only training modules that cover materials newly added since their initial certification or latest recertification period, rather than to complete the entire training program or take the complete certification examination multiple times. This issue should be further evaluated during the development of the Implementation Plan.

The initial recommendation for recertification period for inspectors is every 5 years. This is less restrictive than APWA CPII and NASSCO requirements, but is appropriate for the content included in the training program. Certified inspectors could be notified when training opportunities on new content is available should they chose to complete the training prior to their recertification period.

When the recertification issue was discussed with the I/I Task Force, members indicated that the 5 year timeframe is reasonable. Therefore, the Consultant Team's recommendation was not changed.

5.3 Equity and Social Justice Opportunities

The vision for Equity and Social Justice (ESJ) is a King County where all people have equitable opportunities to thrive. The strategies as One King County to advance ESJ are to invest upstream and where needs are greatest: in community partnerships, in employees, and with accountable and transparent leadership. There are opportunities for the Inspector Training and Certification Program to improve both access to and delivery of the program.

5.3.1 Increasing Accessibility

Sewer inspectors traditionally have numerous years of experience working in the industry before becoming an inspector. This experience includes both on-the-job training and technical education. Access to and participation in this career path could be increased within the Inspector Training and Certification Program framework by exploring an Inspector In-Training Program.

This type of entry-level training program could prepare participants to meet the minimum qualifications for inspectors to be eligible for the training. The program may take lessons from the County's Operator-In-Training program. If an Inspector-In-Training Program is intended for non-County employees, then a cost benefit review would need to be completed. The County could explore an Inspector In-training Program for future County employees particularly if there is a strong need for experienced hires.

Priority populations, as defined by the County, are low-income communities, communities of color, and those with Low English Proficiency. Inspector positions with local sewer agencies require English proficiency to read plans, communicate with property owners, and coordinate with work teams. To broaden the range of eligibility for inspector positions and for the Inspector In-Training Program, there should be a consideration of English language learning opportunities. Additionally, incentives or discounts could be provided to participants from low-income communities or communities of color to incentivize participation.

5.3.2 Program Delivery

Inspectors regularly interact with diverse communities through their work. Culturally responsive communication would support inspectors in these interactions. A training topic could be added to Module 5: Safety Issues and Customer Service that grows inspector's skills in effectively communicating with property owners and occupants from diverse backgrounds.

The program could also be delivered fully online. This would maximize participation from potential participants who face barriers related to transportation, childcare, or non-traditional working hours. Online participation could also minimize any disruption to an inspector's current workload and also lower the costs that local sewer agencies might bear to have their inspectors participate and become certified. Fully online delivery of the Inspector-In-Training Program would realize similar benefits.

5.4 Possible Training Methods

The purpose of considering training methods in program development rather than implementation planning is because it helps to better define ways that local agencies will interact with the training program. For example, if the training program consists of 80 hours of in-class instruction that is only offered once or twice a year, the training program may be less desirable than one that could be completed online at times that are most convenient to participants and their employers. By identifying training methods that would be least disruptive to local agencies, there is a greater opportunity to formulate a sustainable training program.

An integrated, holistic approach is recommended to establish an inspector training program that incorporates a diversity of knowledge and ability levels with required skills, current regional approaches, and industry best practices.

As demonstrated by the examples provided in Section 3, there are many ways in which the training program can be presented, and the examination can be administered. Factors that influence the selection of the training method may include target audiences, mobility issues, social distancing requirements, and other physical restraints. This section will describe considerations associated with the following training methods:

- In-person training
- Online training
- Hybrid online and in-person training

It is important to recognize the following preferred learning styles of adults when considering how to present the training program:

- **Visual** learners need to see simple, easily to process diagrams or written words.
- **Aural** learners need to hear something so that it can be processed.
- **Print** learners process information by writing it down.
- **Tactile** learners need to do a related task in order to learn the material.
- **Interactive** learners need to discuss learning concepts to gain a full understanding of an issue.
- **Kinesthetic** learners need to be moving in order to learn.

5.4.1 In-Person Training

In-person training enables training participants to interact more closely with their instructors. Such training should be provided by subject matter experts (SMEs) who are experienced with formal training in construction inspection best practices and knowledge of local issues. The instructors should foster a culture of learning, participation, and open and clear communication. In-person training programs typically require more time than online training due to many factors including instructor/student discussions, group activities, field exercises, breaks, and other distractions. It is estimated that the time to complete in-person training for the proposed curriculum is 20 to 24 hours.

An in-person training program that addresses the preferred learning styles of adults can be crafted by incorporating teaching methods shown in **Table 5-1**.

Table 5-1. Possible In-Person Training Methods

Teaching Method	Features
Case Study	Participants practice problem-solving with relevant examples. Participants use high-level cognitive skills (e.g., evaluation, analysis) and form arguments and counterarguments.
Coaching	Participants apply knowledge on the job, unlock participant potential, increase knowledge sharing, and reinforce other training methods.
Discussion	Participants evaluate two or more positions on an issue, practice critical thinking, draw on participants' own experiences and expertise, form arguments and defend positions. Some discussions consist of an expert panel, which allows learners to understand discipline nuances and areas of debate, relate knowledge to real world examples, and listen to multiple opinions on a topic.
Field Exercise	Participants receive and respond to immediate feedback, develop process skills, practice physical or manual skills and evaluate results of own work.
Lecture	Instructors convey information to supplement participant reading or self-study, respond to student misconceptions or difficulties, and stimulate interest in a new area.
Simulation	In-person or via technology, simulations demonstrate the application of participant knowledge to different scenarios (field setting or role plays). A field setting (real or simulated) would be required for an SME to facilitate the exercise and give feedback.
Small Group Activities	Group training provides hands-on skill building and problem-solving opportunities. Participants are divided into small groups and assigned a timed task to complete as a team. The output of these activities is shared with the larger group.
Table Top Exercise	A combination of other methods, table top exercises provide a simulated experience with a situation acted out. Gives opportunities for participants to develop solutions to unpredictable situations and conditions.

Table 5-2 presents common course materials that are often developed to support in-person training programs.

Table 5-2. In-Person Course Materials

Material Type	Material	Description
Learner	Activities and exercises	• Provide immediate practice opportunity for new skills • Allow instructor/facilitator to monitor transfer of learning and adjust pace
	Handouts and workbooks	• Support course instruction • Provide post-course reference
	Presentations	• Used to support verbal presentation and reach visual learners
	Visual aids	• Graphics, flow charts, process flows, checklists to be used for quick reference after the course
Instructor and Administrative	Course description/agenda	• May be two separate documents or one combined document and describes the course content • Sets expectations for the course • Includes duration, breaks, objectives, prerequisites
	Supplemental Instructor Materials	• Provides step-by-step directives on facilitating hands-on activities and field demonstrations
	Course Evaluations	• Measure participant's reaction to various aspects of the training including satisfaction with content, instructors, learning environment, as well as feeling of material appropriateness for learner group • Measure the achievement of learning objectives
	Record keeping instructions	• Ensures proper records are created and maintained in a secure environment
	Sign-in sheets	• Participants document training attendance

Logistical issues that must be considered for conducting in-person training sessions can be complex, and may include, but are not limited to the following:

- Where will the training be held? Will the training site move throughout the region? Will it be easily accessible via public transportation? Will there be available space for a field component/hands-on exercise (e.g., pipe pressure testing)?

- Who will set the training schedule and how often will it be held?
- Will interpreter(s) be needed? If so, who will coordinate?
- Who will coordinate with the training venue and notify interested parties?
- Who will train the SME trainers to ensure consistent messaging and content delivery?
- Who will coordinate with SME trainers and ensure their availability?
- What happens if an event must be canceled? Who will notify trainers, participants, and reschedule with the venue?
- If there is a field component (i.e., testing demonstration or related activity), who will ensure it is safely undertaken?
- Who will follow up with participants to ensure they receive official feedback about their training results, and/or provide a certificate?

5.4.2 Online Training

Online training allows geographically remote participants to learn through online technologies or delivery methods (e.g., videos, webinars, podcasts, etc.), often at their own pace and at convenient times. The benefits and necessity of this type of training opportunity has been demonstrated during the COVID-19 pandemic in ways that may not previously been imagined. Many government agencies use online learning management systems (LMSs) such as NeoGov™, MySuccess™, and KnowledgeCity™ to provide training opportunities to their staff.

Unlike in-person training, SMEs are used only to develop training materials, and opportunities for direct communication with participants are limited or non-existent. Online learning often provides adult learners with two types of learning interaction experiences: audible and visual. However, adults that excel through tactile and interactive learning experiences may not fully benefit from this training approach. The two applicable types of training methods afforded by basic online training programs (from **Table 5-1**) are: lecture and simulation.

Depending on the available funding to create an online training program, online training programs can range on a spectrum from basic in nature to complex and immersive. The actions associated with basic online programs (e.g., PowerPoint module with narration) such as turning pages, clicking “next” and watching videos are not considered to be interactive training activities. The interactive learning opportunities made available by immersive online programs involve real-life decision making and problem-solving, and often include animations, branching scenarios¹³, and digital stories¹⁴. The cost differential between the two level of complexities is significant.

While many of the training issues that can be challenging for in-person training programs do not exist with online training, other considerations should be made when establishing such a program, including:

- What platform will be used to host the training program?

¹³ A branching scenario is a way of placing a learner into the role of a decision-maker, allowing them to make their own choices and see how outcomes play out. It provides a safe way for learners to try out different approaches and see the consequences of their actions, preparing them for similar situations in the real world.

¹⁴ A digital story is a combination of various digital elements presented within a narrative structure, and may include text, images, video, audio, social media elements, and/or interactive elements.

- Is additional infrastructure needed to support the platform?
- What type of access rights are needed and who can provide access to trainees?
- How will questions arising from an online course be handled?
- Who will provide technical support?
- Who will proctor the examination?
- How can content be updated?
- What cybersecurity measures must be taken?

This type of training approach is not new to King County, which currently makes an eLearning platform available to County employees. This platform provides online learning courses related to personal and professional development, computer and technical skills, and other topics. The County also offers numerous virtual education programs, pre-taped video lessons, tours, and workshops that can be accessed online. It is estimated that the time to complete the proposed training curriculum via an online training platform is 12 hours, which includes 1 hour for the online examination.

5.4.3 Hybrid (In-Person and Online) Training

A hybrid training approach provides opportunities to leverage online instruction, in-person instruction and interaction, and hands-on type field exercises. Applying a hybrid approach to the sewer inspector training program may involve requiring training participants to complete prerequisite, online instruction before an in-person, field-focused training session facilitated by a SME. An example of training methods by proposed training topic is provided in **Table 5-3**.

Table 5-3. Proposed Inspector Training Module Topics

Module/Topic	Training Methods
1. Introduction to the Regional Inspection Certification Program	Online Instruction
2. Inspection Methods and Standards	Online Instruction
3. Testing Standards	Online Instruction followed by field focused training
4. Construction Best Management Practices (BMPs)	Online Instruction followed by field focused training
5. Safety Issues and Customer Service	Online Instruction

For this type of training approach, issues previously identified for both in-person and online training must be considered. The administration and overall cost of this type of program could be more challenging than an “in-person only” type program due to the need to monitor online instruction, the need to monitor completion of certain modules, and scheduling field focused training venues and SMEs. However, there is a higher degree of guarantee that training participants have understood the training content when they are able to demonstrate their achieved level of KSAs with an instructor present.

5.4.4 Recommended Training Method

An online approach is initially recommended for the inspector training program. This recommendation, which is supported by members of the I/I Task Force, involves online videos and interactive learning modules. It is tailored to inspectors who are assumed to already have a base level of inspection knowledge and experience. In the future, if a private side sewer inspection program is developed and if this inspector training program is refined to support that program, then the most appropriate training method may be different.

The I/I Task Force evaluated the initial recommendation of an online training method approach. Discussions revolved around time commitments, absences from work, travel requirements, and other convenience issues. Task Force members preferred the more flexible option (online) and provided suggestions for overcoming shortcomings of not being physically present for the training. For example, videos could be incorporated into the training modules and knowledge checks could be inserted into the modules. This example would be similar to those used in other online training programs offered by Task Force member agencies. Based on this input, the recommendation made by the Consultant Team was unchanged.

5.5 Possible Certification Examination Methods

Similar to the training program, there are numerous ways that the certification examination can be administered. The purpose of considering examination methods in program development rather than implementation planning is to ensure that the testing method adequately evaluates the materials presented during the training. It should also be considered whether the examination style or styles should complement the training, for example, if training is conducted fully in-person, the examination may mirror this style for the purpose of consistency in administering and accessing the training and testing. Additionally, developing the certification examination along with the training materials may reduce the costs of development and improve the quality of the examination if they are developed at the same time and by the same party, or by collaborating parties. The methods below will be further evaluated when developing the program Implementation Plan.

5.5.1 In-Person Examination

Offering the certification examination at the end of the in-person training sessions enables participants to answer questions on material that is fresh in their minds, especially if time is allowed for an instructor-driven course content review and for discussions.

5.5.2 Online Examination

In conjunction with an online training program, offering participants the opportunity to complete a certification examination online will allow them to refer to their notes and complete the course at a time that is convenient. It is beneficial to develop three to four times the number of questions for online examinations than those presented on examinations administered in written format. Many testing agencies will randomize the questions given online to minimize the risk of shared answers.

5.5.3 Recommended Certification Examination Administration Method

An online approach is initially recommended for the inspector certification examination.

When the certification examination issue was discussed with the I/I Task Force, most members agreed it would be beneficial to require some sort of assessment to verify the trainee acquired the necessary knowledge. Based on this input, the recommendation made by the Consultant Team was unchanged.

6.0 Proposed Roles and Responsibilities

This section describes proposed roles and responsibilities for the Inspector Training and Certification Program based on the training scope, content, and methods described in previous sections. The associated assumptions of time and cost to meet roles and responsibilities are included in Section 7.

The County is expected to have the following responsibilities prior to and during program implementation:

- Program administration: The County, or a third party acting on behalf of the County, would be responsible for a wide range of work related to hosting trainings and tracking certifications. In addition, this role would be responsible for completing implementation planning to develop training content, methods, etc. The County may also be responsible for covering the cost of program administration.
- Implementation planning: The County would be responsible for creating the implementation-ready training and certification content based on this TM.

Component agencies are expected to have the following responsibilities prior to and during program implementation.

- Participants to be trained are component agency inspectors, including both staff and contractors. The participants are responsible for registration, training, attendance, and certification examination. The cost of registration and/or examination fees may also be the responsibility of the participant.
- Also, prior to, or in parallel with implementation planning, each component agency would need to evaluate whether the requirement of this training triggers bargaining with their affected employee unions.

To implement a voluntary Inspector Training and Certification Program, the County expects to request commitments from component agencies to confirm funds are appropriately spent and result in intended benefits. Possible methods of commitment will be considered by the County and MWPAAC and may include:

- [PLACEHOLDER FOR METHODS e.g. 70% or better participation from 34 component agencies; Letter to WTD stating participation in all aspects of the Inspector Training and Certification Program; Council action by all 34 component agencies to agree to required inspector training and certification program.]

7.0 Program Costs

This section describes estimated program costs to complete program development and to administer and run the training and certification program.

7.1 Cost Assumptions

The costs assume an immersive on-line training program, that involves real-life decision making and problem-solving, and include animations, branching scenarios, and digital stories, see Section 5.4.2. Including time to complete the exam, it is assumed that the training will take 12 hours per inspector (11 hours of training and 1 hour for the exam). The certification exam is assumed to be 30 multiple choice questions.

A flat yearly rate of \$295,000 (2021 dollars, 1,700 hours/year) per full time employee (FTE) is used, regardless of role (administrative staff and inspectors), and is consistent with WTD labor cost assumptions for labor costs.

It is assumed that WTD will need to dedicate one FTE per year (\$295,000/yr) for the day-to-day management, trouble shooting, and coordination of the program in the beginning. This level of effort is expected to be lower after the program is established and the existing inspectors are initially trained.

The online training materials will be hosted on King County's system, with no additional internet hosting/management costs are required. Costs associated with this training and certification program are considered operational costs by the County.

Costs that are borne by component agencies include the time inspectors are completing the on-line training and administrative costs to schedule and monitor the training for the inspection staff. The number of inspectors, rates for inspectors, and rates for an administrative staff varies per each agency. For planning purposes, it is assumed that each component agency has four inspectors. It is estimated that administration of the inspector training program may take one, 8-hour day every month, thus a 0.05 FTE. Administrative duties may include review of current inspector's training status, scheduling training of new employees, verification that certified inspectors are being used on sewer construction/rehabilitation projects, and providing reporting (if required) to King County. This effort may be concentrated over a shorter time period, rather than evenly spaced throughout the year. It is not expected that this program will cause additional work for inspectors, outside of training events. Component agencies will need to calculate this cost for themselves based on their actual number of inspectors, administrative staff, and actual salaries.

7.2 Cost

Costs can generally be divided into three categories:

- Development of training materials
- WTD maintenance and management (administration) of the program
- Component agency training and management (administration) costs

7.2.1 Development Costs

To first develop online training, the content and framework must first be established. It is expected that this may cost may be around \$200,000. Online training costs can vary greatly depending upon the quality, length, and complexity of the module, with costs ranging from \$10,000 to \$50,000 per hour of on-line content. Using the upper end of that range and 11 hours of content, it will cost \$550,000 to develop online ready content. It is estimated to cost about \$20,000 to develop the certification test. These costs are a onetime cost.

7.2.2 WTD Costs

7.2.3 Component Agency Costs

The costs for each component agency consist of four inspectors completing 12 hours of training and 0.05 FTE administrative staff. The initial one-time training cost is \$8,330 per agency using the following equation:

$$4 \text{ inspectors} * 12 \text{ hours} * (\$295,000/1,700) \\ \text{or } \$283,220 \text{ for } 34 \text{ agencies}$$

The annual administrative cost is \$16,660 per agency or \$566,440 for 34 agencies.

7.2.4 Cost Summary

The costs for this program are shown in **Table 7-1**.

Table 7-1. Program Costs

Items	One Time Cost	Annual Cost
Content and framework	\$200,000	
Module and test development	\$570,000	
Component Agency Training and Certification	\$283,220 (\$8,330/agency)	
Component Agency Administration		\$566,440 (\$16,660/agency)
WTD Administration		\$295,000
Total	\$1,053,220	\$861,440

7.2.5 Cost Considerations and Implications to Effected Parties

The costs for developing, implementing, and managing the Inspector Training and Certification Program will have to be reviewed with respect to the Accountancy Act, as WTD cannot provide benefits to other local governments without receiving full and fair value; meaning that the component agencies may have to be charged in part or in whole for the training sessions to cover these initial costs.

Outside agencies or other third-party trainees, not component agencies, will be required to pay the full price (to be established) to receive the training and certification to avoid gift of public funds issues.

Costs will need to be reviewed, updated to be agency specific, and approved by component agencies. This would occur if MWPAAC recommends proceeding with planning and supports implementing the inspector training program.

7.3 Funding

The funding for the program costs is ultimately rate driven, either by WTD rates, component agency rates, or a combination of the two. The costs could be offset to some degree by charging the full price to outside agencies or other third-party trainees.

After a MWPAAC recommendation and WTD decision is made on whether to implement the program, the program is expected to go through the County budgeting process to secure funding.

DRAFT

8.0 Next Steps for Implementation

This section will describe next steps for implementation planning and implementation.

8.1 Planning

WTD actions:

- Coordinate with component agencies to get agreements in place and establish legal authorities
- Secure funding for implementation of the program
- Initiate a consultant contract to complete implementation planning and to result in a ready-to-implement training and certification program
- Implement the program

Local agency actions:

- Review the impact on each agency's resources and labor union agreements prior to, and in preparation for, program implementation.
- Acknowledge an interest in participation and formalize that commitment.

8.2 Implementation Schedule

The specific implementation schedule is dependent on recommendations by MWPAAC, subsequent decisions by WTD, and several other factors. It is estimated that setting up an inspector training program without any constraints could take between 18–24 months. This time frame includes coordination with member agencies and other industry associations, contracting with third-party content developers, setting up training tracking software, and development of training modules.

However, this schedule could be impacted based on early decisions made regarding mandatory/voluntary participation, minimum/regional inspection standards, and other issues.

During implementation planning, a stakeholder communication plan should be developed. This plan will include how stakeholders will be identified, contacted, and kept informed; what information and at what times stakeholders will be engaged; and what method will be used to obtain feedback.

Stakeholders may include:

- MWPAAC agencies
- Local entity building departments
- Side sewer inspectors–plumbers, public works inspectors, side sewer inspection companies
- Side sewer contractors
- Community at large
- Future side sewer inspector candidates
- Third parties, such as the Pacific Northwest Clean Water Association, Washington Wastewater Collection Personnel Association, and NASSCO

Appendix A: AWPACPII Examination Content Outline

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**PUBLIC INFRASTRUCTURE INSPECTOR CERTIFICATION
EXAMINATION**

CONTENT OUTLINE

I. TESTING, MEASUREMENT, and INSPECTION: 75 items (Recall: 28,
Application: 42, Analysis: 5)

A. Underground Construction: 20 items (Recall: 8, Application: 12,
Analysis: 0)

1. Inspect and ensure compliance with plans and specifications, and best construction methods for:
 - a. utility systems.
 - b. storm sewers.
 - c. water systems.
 - d. sanitary sewers.
2. Perform inspections on the following job site materials:
 - a. pipe.
 - b. shoring systems.
 - c. trench backfill.
3. Conduct right-of-way permit inspections for:
 - a. utility installation.
 - b. sewer caps for demolition.
 - c. utility taps.
 - d. trench backfill.
4. Observe and document results of the following tests on new sewer lines and manholes:
 - a. mandrel test.
 - b. air test.
 - c. vacuum test.
 - d. video inspection.
 - e. infiltration/exfiltration.
5. Monitor hydro-static pressure testing on sewer and water lines.
6. Obtain samples for laboratory testing of water systems for chlorine residual and bacteria.
7. Verify ties to valves.
8. Exercise proper safety procedures while entering confined spaces or dangerous areas.

B. At-Grade Construction: 22 items (Recall: 9, Application: 13, Analysis: 0)

1. Inspect and ensure compliance with plans and specifications, and best construction methods for:
 - a. curb and gutter construction.
 - b. paving.
 - c. sidewalk and driveway approach construction.
 - d. restoration work (e.g., fine grading, sod, or seedbed preparation work).
 - e. traffic striping.
 - f. traffic signal installations.
 - g. construction traffic control devices.
 - h. erosion and siltation control installations.
2. Perform inspections on job site materials - asphalt.
3. Conduct right-of-way permit inspections for:
 - a. driveways.
 - b. sidewalks.
 - c. curb and gutter.
 - d. alley construction.
 - e. street repair.
 - f. ADA ramps.
 - g. sign installation.
 - h. traffic control.
 - i. site development.
 - j. erosion and sediment control.
4. Inspect asphalt paving projects.
5. Inspect concrete paving projects.
6. Make minor field modifications of line and grade to:
 - a. match existing topographic features.
 - b. achieve positive drainage.
7. Verify ties to survey monuments.
8. Inspect traffic maintenance operations through construction zones.

C. Structural Construction: 8 items (Recall: 1, Application: 2, Analysis: 5)

1. Inspect and ensure compliance with plans and specifications, and best construction methods for:
 - a. bridges.
 - b. forming systems.
 - c. reinforcing steel.
 - d. reinforced concrete structures.

D. General Construction: 25 items (Recall: 10, Application: 15, Analysis: 0)

1. Inspect and ensure compliance with plans and specifications, and best construction methods for:
 - a. lines and grades.
 - b. construction materials.
 - c. construction safety precautions.
2. Perform inspections utilizing the following equipment:
 - a. survey instruments.
 - b. measuring devices.

- c. calculator.
- d. straight edge.
- e. computers and programs.
- f. safety devices.
- 3. Perform inspections on the following job site materials:
 - a. concrete.
 - b. soil retention systems.
 - c. aggregates.
 - d. soil.
- 4. Maintain inspection and testing equipment.
- 5. Perform mathematical calculations through geometry, algebra, and trigonometry (e.g., proportions, percentages, area circumference, volume):
 - a. percent of grade.
 - b. invert elevations.
 - c. cross slopes.
 - d. super elevations.
 - e. volume.
 - f. area.
 - g. stationing.
 - h. density.
 - i. conversions.
 - j. feet in inches vs. feet in tenths.
- 6. Verify that delivered materials meets mix designs.
- 7. Verify minimum requirements for compaction, moisture content, and stabilization quantity when accepting/rejecting soils.
- 8. Review geotechnical reports.

II. PROJECT PLANNING and MANAGEMENT: 37 items (Recall: 15,
Application: 22, Analysis: 0)

A. Planning: 13 items (Recall: 5, Application: 8, Analysis: 0)

- 1. Review plans and specifications.
- 2. Review shop drawings and submittals.
- 3. Verify contractor licenses and permits.
- 4. Estimate quantities of construction materials.
- 5. Disseminate right-of-way activities to various agencies.
- 6. Coordinate with inspection office regarding joint agency projects.
- 7. Inform management of variances in schedule or of any other problems.
- 8. Review consultant field check plans (constructability review) and specifications.
- 9. Participate in value-engineering sessions.
- 10. Participate in the evaluation of new materials and construction methods.
- 11. Conduct wage rate interviews with contractor's employees to ensure compliance with federal wage rates.

B. Management: 24 items (*Recall: 10, Application: 14, Analysis: 0*)

1. Review concrete placement schedule with contractor.
2. Recommend the acceptance of projects through the use of:
 - a. punch list items.
 - b. final walk-through inspections.
 - c. warranty inspections.
3. Recommend change orders.
4. Prepare change orders.
5. Negotiate change orders.
6. Compile as-built plans.
7. Review as-built plans.
8. Utilize various software programs for documentation (e.g., Access, Excel, Outlook, WORD).
9. Communicate clearly with contractors.
10. Recommend field modifications.
11. Assess current progress and adherence to schedule and duration limits.
12. Investigate and respond to contractor claims for additional payment extensions, and changed conditions.
13. Review and approve contractor's final invoices.
14. Compute monthly estimates of work completed, and approve payment for contractors.
15. Investigate and respond to citizen concerns.
16. Notify the community of construction schedule.
17. Attend inspection training seminars.
18. Adhere to professional standards of conduct.
19. Enforce ethical conduct for all employees.

III. PROJECT COMPLIANCE and DOCUMENTATION: 38 items (*Recall: 10, Application: 23, Analysis: 5*)**A. Compliance: 22 items** (*Recall: 4, Application: 13, Analysis: 5*)

1. Inspect and ensure compliance with plans and specifications, and best construction methods for ADA compliance.
2. Maintain knowledge of codes and specifications.
3. Review results from field tests.
4. Ensure compliance with documents regarding:
 - a. standards for construction.
 - b. regulatory agency permits.
 - c. quality assurance program for material sampling and testing.
5. Ensure compliance with agency contract documents regarding:
 - a. standards for construction.
 - b. regulatory agency permits.
 - c. measurement and payment.
 - d. quality assurance program for material sampling and testing.

6. Ensure compliance with OSHA regarding construction safety standards.
7. Ensure that prevention of damage to surrounding work areas and restoration of right-of-way.
8. Ensure the implementation of dust control measures.
9. Review materials testing reports.
10. Issue violation/non-compliance notices.
11. Issue stop-work orders.

B. Documentation: 16 items (*Recall: 6, Application: 10, Analysis: 0*)

1. Verify quantities of construction materials.
2. Write daily project diaries/reports covering at a minimum:
 - a. manpower.
 - b. equipment use.
 - c. type of work performed.
 - d. on-site discussions with contractor's staff.
 - e. weather.
3. Maintain a photographic record of each project.
4. Record activities on job sites by name, action, location, and performance in daily logs, and weekly summary reports.
5. Maintain a log regarding change orders.
6. Document field changes to the construction plans.
7. Record quantities of materials received or used during specified periods.
8. Maintain material testing log.
9. Maintain project information on construction materials on hand.
10. Interpret plans and specifications.
11. Verify the accuracy of dimensions of installations and layouts.
12. Prepare sketches of construction installations that deviate from plans.

Appendix B: Typical Inspector Duties List

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|--|--|--|--|
| <p>A. Review the Plans, Specifications, Permits, Applicable Laws, Safety Regulation, and Applicable Codes.</p> <ol style="list-style-type: none"> 1. Permits from Other Agencies: <ol style="list-style-type: none"> a. Time Restrictions b. Hauling Restrictions c. Local, State, and Federal 2. Special Provisions: <ol style="list-style-type: none"> a. Special Phasing and Sequencing b. Unusual Requirements c. Time Restrictions d. Hazardous Material Disposal e. Soil Reports and Boring Data f. Traffic Control Requirements 3. Notes on the Plans: <ol style="list-style-type: none"> a. Limits of Construction b. Obstructions c. Removals d. References to Standard Plans 4. Standard Specifications 5. Reference Specifications 6. Standard Plans 7. Safety Regulations 8. Applicable Codes 9. Call Before You Dig (Washington 811) 10. Traffic Control Handbook (MUTCD) 11. Submittals | <p>B. Review the Contract and Construction Schedule.</p> <ol style="list-style-type: none"> 1. Notice to Proceed 2. Working Days/Calendar Days 3. Mobilization Time 4. Schedule of Values / Payment Schedule 5. Bid-Listed Subcontractors 6. Liquidated Damages <p>C. Review Other Information.</p> <ol style="list-style-type: none"> 1. Grade Sheets 2. Correspondence 3. Permits from Other Agencies 4. Right-of-Way Limits 5. Right-of-Entry Agreements 6. Easements (Permanent and Temporary) <p>D. Inspect the Work Site.</p> <ol style="list-style-type: none"> 1. Traffic Requirements: <ol style="list-style-type: none"> a. On-Street Parking b. Business Access c. Residential / Pedestrian Access 2. Check Lay-Down Area 3. Preview Photos / Videos 4. Utility Mark Outs 5. Stock Pile Areas 6. Assess potential inflow sources to the sanitary sewer 7. Stormwater Inlets / Catch Basins | <p>E. Review Project with Contractor.</p> <ol style="list-style-type: none"> 1. Design Engineer 2. Liaison with Fire, Police, Utilities, and Others <ol style="list-style-type: none"> a. Notifications b. Emergency Numbers 3. Permit Requirements 4. Safety <ol style="list-style-type: none"> a. Injury and Illness Prevention Plan b. Competent Person c. Trench Shoring d. Confined Space 5. Insurance Requirements 6. Project Superintendent 7. Organization 8. Emergency / After Hours Contacts 9. Construction Schedule 10. Payments 11. Reports Required by Owner 12. Labor Requirements 13. Subcontractors <ol style="list-style-type: none"> a. Bid Listed Subcontractors b. Subcontractor Substitutions c. Additional Subcontractors 14. Lay-Down Area 15. Traffic Requirements 16. Noise Restrictions 17. Work Hours 18. Hazardous Materials Mitigation Plan 19. Sewer Spill Mitigation Plan 20. NPDES / MS4 Requirements | <ol style="list-style-type: none"> a. Erosion Protection and Sediment Control / Stormwater Pollution Prevention Plan <p>F. Implement Project Controls.</p> <ol style="list-style-type: none"> 1. Communication 2. Inspection Procedures 3. Sampling and Testing <ol style="list-style-type: none"> a. Soil Compaction Testing b. Concrete Testing c. Pipeline Testing (air, vacuum, water, CCTV, mandrel, etc.) d. CIPP Testing e. Other Testing 4. Safety Notification 5. Payments <p>G. Maintain Records and Reports.</p> <ol style="list-style-type: none"> 1. Daily Record of Construction Activities <ol style="list-style-type: none"> a. Personnel b. Equipment c. Work Completed d. Non-Conforming Work e. Conversations f. Problems g. Safety Incidents h. Site Visits by Others 2. Daily Project Status <ol style="list-style-type: none"> a. Work Days b. Rain Days c. Administrative Delays d. Contractor Caused Delays e. Delays in Arrears 3. Photos and Video Documentation |
|--|--|--|--|

Source: *Public Works Inspectors' Manual*, BNi Building News, 6th edition, 2010. Modified for applicability to this initiative