City of Alexandria's Semi-Annual Report
ATG-Oronoco Site Summary
January 9, 2024, to June 30, 2024

This Semi-Annual Report summarizes site remedial activities for the former Alexandria Town Gas – Oronoco manufactured gas plant site (ATG-Oronoco) as described in Appendices A, B, and C of the Consent Decree between Potomac Riverkeeper Network and the City of Alexandria, Virginia, as filed January 9, 2024 in the U.S. District Court for the Eastern District of Virginia (Case No. 1:22-cv-00506-CMH-WEF).

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Acronyms / Abbreviations

ATG	Alexandria Town Gas
City	City of Alexandria
CIPP	Cured-in-Place Pipe
DEQ	Department of Environmental Quality
DNAPL	Dense non-aqueous phase liquid
ft	Feet
ft bgs	Feet below ground surface
LSS	Lee Street Square commercial/office townhouse complex
MGP	Manufactured Gas Plant
NAPL	Non-aqueous phase liquid
PAH	Polycyclic Aromatic Hydrocarbons
RTN	Robinson Terminal North
Site	Alexandria Town Gas (ATG)-Oronoco Site
TarGOST	Tar-specific Green Optical Screening Tool
USEPA	United States Environmental Protection Agency
VRP	Voluntary Remediation Program

1 Introduction

This Semi-Annual Report summarizes site activities at the former Alexandria Town Gas – Oronoco (ATG-Oronoco) Manufactured Gas Plant site (the "Site") in accordance with the Consent Decree between Potomac Riverkeeper, Inc. and the City of Alexandria, entered by the United States District Court for the Eastern District of Virginia on January 9, 2024. This summary covers the period from the effective date of the Consent Decree (January 9, 2024) to June 30, 2024, in addition to documenting actions completed by the City prior to this period in anticipation of the approval of the Consent Decree. The Site of the former manufactured gas plant (MGP) is in the Old Town section of the City of Alexandria, Virginia, at the southeast corner of North Lee and Oronoco Streets **(Figure 1)**. The Site boundaries also include the Oronoco Street right-of-way (R/W) from the North Lee/Oronoco Street intersection, eastward to the Potomac River. Since 2000, the City has been implementing a long-term remediation plan for the Site in coordination with the Virginia Department of Environmental Quality's Voluntary Remediation Program (VRP Site No. 00241). The actions documented in this Semi-Annual Report complement the City's long-standing remediation plan and, together, are intended to remediate the effects of historical pollution at the Site as soon as practicable.

1.1 Site Background

The ATG-Oronoco Voluntary Remediation Program (VRP) Site occupies an approximately 1-acre group of privately owned parcels at the corner of Oronoco and North Lee Streets in Old Town Alexandria (see **Figure 1**). The City operated the ATG MGP near the corner of North Lee and Oronoco Streets between 1851 and 1946. After closing, most of the ATG plant was demolished and the remaining buildings were repurposed by various businesses until the mid-1970s. In 1977, the former MGP property, including the last two remaining MGP buildings, was redeveloped into the Lee Street Square commercial/office townhouse complex (LSS), which now occupies the Site. In 1975, just prior to the redevelopment of the former MGP Site, a 44-inch x 72-inch-diameter stormwater pipeline was installed beneath the centerline of Oronoco Street adjacent to the former MGP Site to improve drainage and flood control in the area.

The surrounding urban area is occupied by a mixture of commercial and residential properties bordering the west bank of the Potomac River. The VRP Site boundaries also encompass the bordering City-owned public rights-of-way along Oronoco Street, from the intersection of North Lee Street to the end of Oronoco Street. However, in some cases, Site-related impacts extend beyond these boundaries to areas beneath adjoining private property and public rights-of-way, including the river bottom at the Oronoco Outfall. **Figure 2** presents a full site layout, including the VRP Site boundary and remedial activities and systems that have been installed.

Figure 1 - Site Location

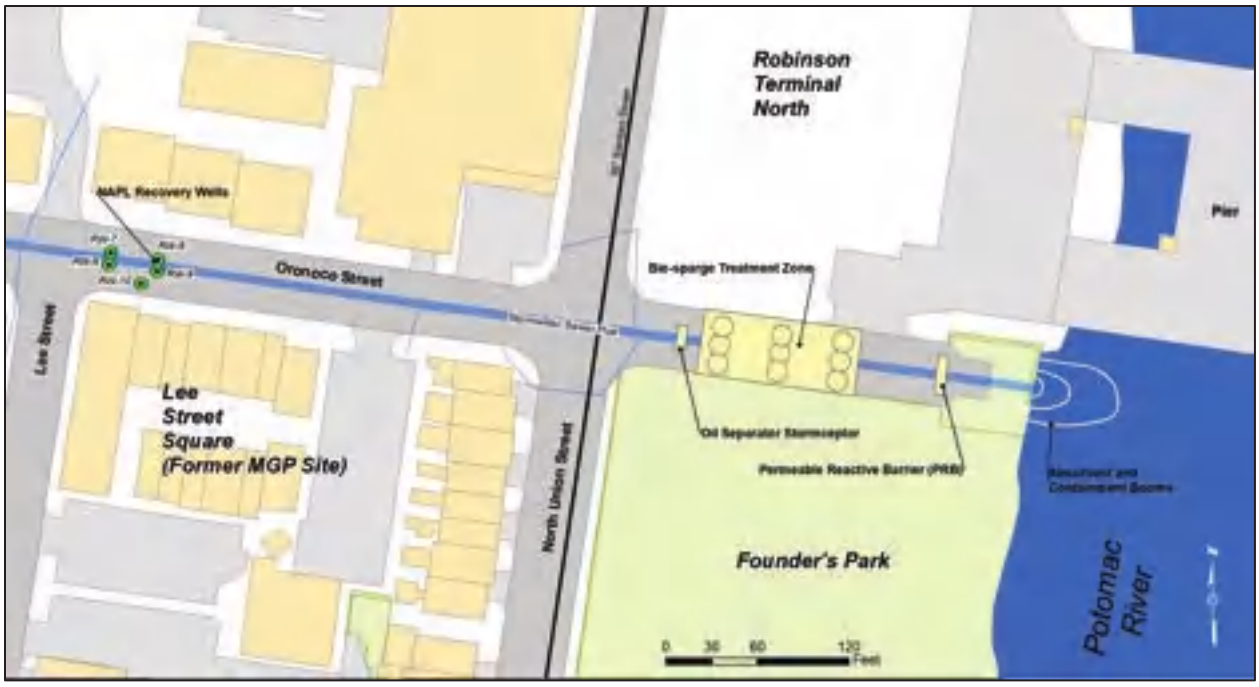

Figure 2 - Site Layout with Remedial Systems

1.2 Scope of Work

The City of Alexandria Office of Environmental Quality (OEQ) oversees ongoing remedial operations at the Site. The operations focus on reducing contaminant mass at the source area and reducing or eliminating off-site discharges through the stormwater outfall located at the foot of Oronoco Street.

The remedial activities discussed in this report include:

1. Implementation of an Upland Remediation Program, to include:
    a. Completion of an in-well heating study on two existing recovery wells
    b. Completion of a non-aqueous phase liquid (NAPL) mapping subsurface exploration program using the Tar-Specific Green Optical Scanning Tool (TarGOST) technology
    c. Using the TarGOST data, installation of additional NAPL recovery wells in the source area
    d. Completion of a recovery frequency study following the installation of new wells
    e. Summary of NAPL recovery from existing wells and new wells installed following the TarGOST survey
2. Implementation of a Pipe Integrity and Inspection Program, to include:
    a. Cured-In-Place (CIPP) rehabilitation of the existing storm sewer on Oronoco Street
    b. Pipe inspections and repairs (if required)

c. Ongoing outfall inspection and boom maintenance program

3. Implementation of a Pier Removal and Sediment Remediation Program, to include:
    a. Removal of the Robinson Terminal North (RTN) pier
    b. Sediment sampling for total Polycyclic Aromatic Hydrocarbons (PAHs) in the vicinity of the RTN pier
    c. Remediation of sediment underneath the RTN pier, if warranted

The following sections summarize activities pursuant to the above outlined scope completed during the first half of 2024 (January 9 through June 30), starting from the effective date of the Consent Decree, as well as preparatory actions taken prior to this period.

2 Upland Area Remediation Program Summary

The upland remediation program's goal is to recover legacy contaminants from the former MGP, commonly referred to as “free product” or NAPL, in the subsurface so that it does not reach the storm sewer pipe that discharges to the Potomac River. Prior to the Consent Decree and as part of the VRP, the City installed recovery wells to collect and remove free product from the subsurface. The Consent Decree requires the City to continue its efforts to recover free product in the upland area.

2.1 In-Well Heating Study

A pilot test was performed for in-well heating recovery of NAPL at the Site. The objectives of the in-well heating pilot test were as follows:

- Determine if in-well heating will increase the water temperature in the groundwater in and around recovery wells and thus decrease NAPL viscosity.
- Test the application and efficiency of in-well heating and vacuum truck recovery for the site-specific conditions.
- Assess if in-well heating and vacuum truck recovery can materially extend the productive life of recovery wells and expedite overall remedial efforts at the Site.

As a first step in determining the potential effectiveness of heating NAPL to improve recovery, a NAPL sample was collected and analyzed for the effect of temperature changes on viscosity. The NAPL laboratory analysis results indicated that heating the water/NAPL mixture from 70^{o}F to 90^{o}F will lower NAPL viscosity about 40%.

The pilot test was performed on October 3 through 5, 2023, during which time Oronoco Street was closed to traffic. The pilot test consisted of conducting in-well heating tests on two recovery wells, RW-7 and RW-10, which were no longer productive but exist where the 2021 Tar-specific Green Optical Screening Tool (TarGOST) survey indicated at least 2 feet of NAPL in the immediate vicinity. NAPL recovery had generally been strong in RW-10 until July 2023. NAPL recovery has generally been poor in RW-7. The in-well heating element was placed in RW-10 while nearby PMW-66 served as an observation well. The in-well heating element was placed in RW-7 while RW-6 served as an observation well. RW-6 is 12 feet from RW-7.

Based on the temperature data collected, the in-well heating test was successful at increasing the groundwater temperature in the well to over 100^{o}F. Based on the temperature gradient in RW-10, it appears that the heated water in the well rose and created a convection current which pulled colder formation water into the bottom of the well screen. However, this method of in-well heating was not sufficient to increase water temperature 9.1 feet away at PMW-66. Once the heating stopped, temperatures gradually returned to pre-test temperatures by the following morning.

As stated in Appendix A of the Consent Decree, the Well-Heating Study would be deemed successful if it enhanced NAPL recovery by at least 35 gallons per well during the test and two-month monitoring period. If the success criteria were met, the draft Well-Heating Study Report must include recommendations for future use of in-well heating in existing recovery wells. However, future in-well heating need not be recommended if the City's technical consultants determine it could compromise long-term recovery.

The pilot test demonstrated that it is possible to increase groundwater temperatures within a well to 100°F, which would create a convection current within the well and adjacent formation. However, this pilot test was not able to mobilize NAPL into the recovery wells during the test or in the three (3) months following this pilot test. The pilot test seems to have only resulted in about one gallon of supplemental NAPL recovery while in-well heating occurred. No changes in the rate of NAPL recovery have been observed since the conclusion of the pilot test, meaning a marginal benefit could be realized only while in-well heating activities are ongoing. However, continuous use of in-well heating is not feasible because it would require the closure of Oronoco Street until remediation is complete. Because the pilot test results do not satisfy the success criteria defined in the Consent Decree, further use or testing of in-well heating is not recommended to enhance NAPL recovery at the Site. Based on the NAPL quantities recovered via the recovery wells installed in April 2021, installing additional recovery wells at appropriate locations identified through a TarGOST survey is a significantly more effective measure to increase recovery rates. Accordingly, installing additional recovery wells using the 2023 TarGOST survey is recommended to further enhance and optimize NAPL recovery. A copy of the Well-Heating Study Report is included in **Appendix 1**.

2.2 TarGOST Survey

In November 2023 the City completed a subsurface investigation at the Site to provide updated information on in-situ dense non-aqueous phase liquid (DNAPL) saturation. This investigation was completed using a proprietary (Dakota Technologies, Inc.) engineered Laser-Induced Fluorescence (LIF) technology (specifically Tar-Specific Green Optical Screening Tool [TarGOST]) to delineate the DNAPL.

TarGOST is a LIF screening tool that is specifically designed to detect DNAPL in the subsurface. This screening tool configuration responds almost exclusively to DNAPL found at former manufactured gas plants (MGPs) and creosote/pentachlorophenol sites. It does this by sensing the fluorescence of large polycyclic aromatic hydrocarbons (PAHs) associated with the MGP and creosote DNAPL.

A total of 37 TarGOST borings were advanced at the Site. After reviewing the TarGOST logs, the most likely locations and depths for DNAPL recovery were identified from measured apparent thickness. The selected depth zones for NAPL recovery exhibited the highest signal response and thickness of NAPL.

As expected and consistent with prior investigations, an accumulation of DNAPL is present near the stormwater pipe. In-situ DNAPL apparent thickness exceeds four feet in one distinct area near the southern edge of the NAPL mass (near the southern curb of Oronoco Street, between the stormwater pipe and the former MGP Site). Three areas with apparent NAPL thickness greater than three feet are near the stormwater pipe. The remaining apparent thickness of potentially recoverable NAPL within the study area is less than three feet. NAPL apparent thickness is generally observed to have declined with

proximity to the recovery wells RW-6 through RW-10, although isopach modeling suggests that a significant apparent thickness of NAPL remains close to RW-9.

Based on the TarGOST results, five new NAPL recovery wells were proposed to be installed at the Site. In accordance with the criteria stated in Appendix A of the Consent Decree, these new recovery wells are located in areas anticipated to have greater than three feet of recoverable NAPL (see **Figure 3** below). Each of the wells was screened specifically in the depth range of NAPL saturation as evidenced in the TarGOST logs. A copy of the TarGOST survey report is included in **Appendix 2**.

Figure 3 - Proposed Locations of New NAPL Recovery Wells

2.3 Recovery Well Installation

The five new recovery wells (anticipated to be designated RW-11, RW-12, RW-13, RW-14, and RW-15) were installed the weeks of August 19th and 26th, 2024. Each of the wells is four inches in diameter with five-foot long stainless steel screens and a five-foot sump located below the screened interval. Each well is screened from about 17 feet to 22 feet below ground surface, corresponding to the depth zone of highest NAPL saturation. Additional details on the recovery well installation will be provided in a separate report and will be summarized in the next Semi-Annual Report covering activities in the second half of 2024.

2.4 Recovery Frequency Study

The City will start a NAPL recovery frequency study no later than 165 days after installation of the new recovery wells. The study's purpose will be to better understand NAPL infiltration rates and responses to recovery so that short-term recovery rates can be optimized without compromising long-term recovery. These results will be reported separately and will be summarized in future Semi-Annual Reports.

2.5 NAPL Recovery

Free product was gauged and/or collected from recovery wells RW-6 through RW-10 during the first half of 2024 on a bi-weekly basis. **Table 1** below summarizes recovery activity from the recovery wells. Product was not present in wells RW-7, RW-8, RW-9, or RW-10 during the first half of 2024. Product was intermittently present in well RW-6. Total recovered free product per event declined during the first half of 2024 as available free product in the recovery wells declined over time. Recovery is anticipated to increase in 2025 due to the new recovery wells installed in August 2024. Total Site product recovery from January 8th through the end of June 2024 is 10 gallons. Records of free product recovery activities are attached in the maintenance logs presented in **Appendix 3.**

Table 1 - Summary of Free Product Recovery - 1st Half 2024

Date	Product recovered from RW-6 (gallons)	RW-6 Product Thickness (ft)	Product recovered from RW-7 (gallons)	Product recovered from RW-8 (gallons)	Product recovered from RW-9 (gallons)	Product recovered from RW-10 (gallons)	Product recovered By Event (gallons)
1/8/2024	2	3.48	0	0	0	0	2
1/26/2024	1.5	2.37	0	0	0	0	1.5
2/8/2024	2	2.2	0	0	0	0	2
2/20/2024	0	1.7	0	0	0	0	0
3/5/2024	0	2.75	0	0	0	0	0
3/20/2024	1.5	3.62	0	0	0	0	1.5
4/1/2024	0	1.5	0	0	0	0	0
4/22/2024	0	0	0	0	0	0	0
5/1/2024	2	3.17	0	0	0	0	2
5/28/2024	0	1.41	0	0	0	0	0
6/13/2024	1	1.99	0	0	0	0	1
6/28/2024	0	1.45	0	0	0	0	0
Totals	**10**		**0**	**0**	**0**	**0**	**10**

3 Pipe Integrity and Inspection Program Summary

The pipe program is designed to rehabilitate the Oronoco Street storm sewer to prevent the intrusion of pollutants from the Site into the pipe. The Consent Decree requires that the pipe be rehabilitated by March 31, 2025. Rehabilitation will be done by installation using the cured-in-place pipe (CIPP) liner process. Following the installation of the CIPP liner, the City is required to do routine pipe inspections to ensure that CIPP liner is intact without defects that would allow intrusion of free or dissolved product into the pipe.

The Consent Decree also requires the City to implement an outfall monitoring and maintenance program, similar to the program the City follows under the VRP. The requirements include weekly or biweekly in-person inspections at the outfall, continuously available electronic monitoring of the outfall, and maintaining the existing containment system at the outfall. In addition, the Consent Decree requires routine water quality testing of the storm sewer and outfall following completion of the pipe rehabilitation.

3.1 Cured-in-Place Pipe Relining

The City has completed the design of 420 linear feet of CIPP for the 72”x44” arch pipe starting from manhole 92A (more than 50 feet upstream of manhole 92) and ending at manhole 93. This includes cleaning, pre- and post-construction CCTV, and grouting of the area where the product is entering the pipe. The design also calls for the cleaning of the downstream pipe between manhole 93 and the outfall that discharges into the Potomoc. The contract for construction has been procured with the notice to proceed issued on July 8, 2024. The CIPP is planned to be installed by the end of October 2024. The pipe design documents are included in **Appendix 4.**

3.2 Pipe Inspections

As part of the Consent Decree, the City must conduct annual inspections of the storm sewer pipe along Oronoco Street from the outfall to at least 25 feet upstream of the planned CIPP lining. Annual inspections must be conducted once per calendar year and may not be conducted less than 10 months apart or more than 14 months apart. The inspections must include the pipe, manholes and lateral connections and be performed by a licensed/certified professional. Separate from the annual inspections, inspections are also required if there is evidence of a potential new source of NAPL intrusion into the pipe.

The City’s contractor will be rehabilitating the storm pipe this fall, with completion of the lining scheduled for the end of October/early November 2024. The pipe inspection will be completed following the CIPP lining. Once completed, the CCTV footage will be sent to Potomac Riverkeeper Network (PRKN). A discussion of that inspection will be included in the future Semi-Annual Report covering July 1 – December 31, 2024.

As part of the weekly outfall monitoring being conducted, spotty sheens with an aged appearance and limited in size were observed at the outfall starting in January 2024. Initial sheens were of an aged/spotty nature and thought to be due to residual NAPL in the pipe. However, these sheens then became larger in appearance and indicated a possible new source of NAPL intrusion, prompting the City to have the pipe inspected by CCTV. CCTV of the pipe was conducted March 18, 2024, which revealed a small amount of active coal tar intrusion at Manhole 92. On May 14, 2024, the City provided its corrective action plan to address the intrusion, which called for pipe grouting at the area of NAPL intrusion prior to the lining. The grouting was completed by the CIPP lining contractor on August 12, 2024, about 8 weeks ahead of the pipe lining. Additional details about the City's monitoring and corrective actions are provided in Section 3.3, below.

3.3 Outfall Monitoring and Maintenance

The Consent Decree requires both in-person and electronic monitoring of the outfall. In-person monitoring is conducted weekly for visible sheens and to check on the containment system. Pictures are taken and notes are made as to observations and any work performed. Copies of these inspection reports are provided in Appendix A. The Consent Decree allows for a reduction in outfall monitoring from weekly to every two weeks if no sheens are observed for 12 consecutive weeks. The City will notify PRKN of any plan to move from weekly to biweekly inspections.

The City also installed a webcam that allows for electronic monitoring at the outfall site. The camera was installed and the link to the live feed was provided to PRKN on April 5, 2024, within 90 days of the Consent Decree effective date. City staff typically check the camera on weekdays and incidences of sheens are recorded. Notification of observed sheens are provided to PRKN within 10 days of observance. As stated in the above section, there is a crack at Manhole 92 allowing for NAPL intrusion. As a result, sheens are observed semi-regularly on the webcam and are being reported to PRKN.

The City is required to install a containment system at the outfall and implement a maintenance program. The booms are required to be repaired/replaced within 30-90 days of damage to the booms depending on the type of damage. The City's contractor provides maintenance including boom repairs and replacement of absorbents and in-pipe sweeps, as needed. A log of maintenance activities is appended to this report as **Appendix 3**. **Table 2** below summarizes in-person inspection and maintenance activities.

As noted above in Section 3.2d, spotty sheens with an aged appearance (low iridescence/grayish with high discontinuity, jagged edges) were observed at the outfall shortly after the effective date of the Consent Decree in January 2024. These sheens are attributed to residual NAPL in sediment in the pipe from earlier intrusion at MH-92. On March 6, 2024, the City observed a larger sheen with a fresh appearance (high iridescence, higher continuity). In response to this sheen, additional absorbent boom was added to the outfall mouth on March 8 and a CCTV inspection of the pipe was scheduled for March 18 (as discussed in Section 3.2). The CCTV inspection indicated new NAPL intrusion at the seam at Manhole 92. As a further mitigation measure, the City installed a large section of absorbent sweep in Manhole 92 on April 17, 2024. Sheens have continued to be observed at the outfall periodically during in-

person visits during the remainder of the first half of 2024, however, most have appeared aged and spotty since the fresher sheen was observed on March 6.

Table 2 - Summary of Outfall Inspection/Maintenance - 1st Half 2024

Date	Inspect	Repair/Replace	Comments
1/11/2024	X		No sheen
1/26/2024	X	X	Slight sheen
1/31/2024	X	X	Slight sheen, booms and sweep in MH-93 replaced
2/8/224	X		Spotty sheen
2/13/2024	X		No sheen
2/16/2024	X		Moderate spotty sheen, aged appearance
2/20/2024	X		Moderate spotty sheen, aged appearance
2/26/2024	X		No sheen
3/5/2024	X		Spotty sheen
3/6/2024	X		Large sheen, fresh appearance, high iridescence
3/8/2024	X	X	Slight sheen, replaced booms/sweep in MH-93
3/12/2024	X		No sheen
3/20/2024	X		Spotty sheen
3/28/2024	X		Spotty sheen
4/1/2024	X		Spotty sheen
4/10/2024	X		Spotty sheen
4/17/2024	X	X	No sheen, booms replaced, installed sweep in MH-92, replaced sweep in MH-93
4/22/2024	X		No sheen
5/1/2024	X		Spotty sheen
5/7/2024	X		Spotty sheen
5/10/2024	X	X	No sheen, re-anchored hard boom near pier
5/20/2024	X		Slight sheen
5/24/2024	X	X	No sheen, replaced sweep in MH-93
5/28/2024	X		No sheen
6/3/2024	X	X	Spotty sheen, replaced booms/sweep, re-anchored hard boom
6/13/2024	X		Spotty sheen
6/17/2024	X		Spotty sheen
6/28/2024	X		Moderate sheen, accumulation of storm debris at outfall

After the CIPP liner is installed as described above in Section 3.1, the City shall conduct quarterly sampling at Manhole 93 and at the outfall for the following constituents: naphthalene, benzene and total

petroleum hydrocarbons within detection limits low enough to detect exceedances as stated in the Consent Decree. Field parameters including temperature, pH and total dissolved solids will also be collected and a description of each sample recorded, noting any NAPL sheen.

Based on the CIPP lining schedule, it is anticipated the first sample will be collected in late 2024/early 2025.

4 Robinson Terminal North Pier Removal and Sediment Remediation Program Summary

The goal of the pier removal and sediment remediation program is to quantify and remediate, if warranted, contaminated Potomac River sediments. To achieve these goals, a series of steps need to take place including (and in order): removal and/or stabilization of the Robinson Terminal North (RTN) pier, development of a sediment sampling plan, application of and receipt of necessary permits, completion of sediment sampling in accordance with the sampling plan, and development of a sediment sampling report and sediment remediation plan, and implementation of the sediment remediation plan. While the Consent Decree includes dates and milestones for achieving the relevant goals, these dates and timelines may need to be adjusted dependent on factors outside the City's control, primarily the work to be done by others and approvals from outside third parties.

4.1 Pier Removal

The Consent Decree requires the City to ensure that the RTN pier is removed and/or stabilized so that the area around and under the pier is ready for sampling by September 25, 2025. This requirement is consistent with the City's preexisting actions to ensure the owner implements appropriate measures to secure the hazardous pier structure. The RTN pier is privately owned. The site is currently occupied by AlexRenew as part of the RiverRenew combined sewer tunnel construction. The City has executed an agreement with the RTN pier owner that obligates the owner to commence the pier removal/stabilization project as soon as practicable after February 28, 2025. Along with removing/stabilizing the pier, the owner is also required to remove the debris accumulated under the pier within 30 days of the completion of the removal/stabilization.

4.2 Sediment Sampling

The City has agreed in the Consent Decree to collect sediment samples at 68 locations as shown on Figure 1 of the Consent Decree. The sediment samples shall be analyzed for total polycyclic aromatic hydrocarbons (PAHs) as defined by the Wisconsin Department of Natural Resources Guidance with the sum of the 18 PAHs normalized to 1% total organic carbon.

In accordance with the VRP program, the City will submit a sampling plan to VDEQ in early 2025 for approval. In addition, the City is required to submit any applications for necessary approvals or permits no later than March 28, 2025. The sediment sampling shall be completed as soon as practicable, but no later

than 45 days after removal/stabilization of the pier or from the date the City receives all necessary permits/approvals to conduct the sampling, whichever is later.

Once the sampling is completed, the City will prepare a report with the sampling data. The report shall be submitted to the PRKN within 30 days of the receipt of the sampling data by the City.

4.3 Sediment Remediation

If the sediment sampling discussed above reveals probable effect concentrations exceeding 22.8 mg/kg total PAHs as defined in the Wisconsin Department of Natural Resources guidance, then the City will prepare a sediment remediation plan. The plan will include an analysis of and selection among various remedial alternatives, including a dredging and capping alternative. The plan would be due to PRKN and to VDEQ within 60 days of finalization of the sampling report. Once VDEQ approves the plan, the City would submit applications for permits within 45 days of approval. In terms of schedule, the City must initiate any remediation actions required by the finalized plan by July 1, 2026, and a completion report shall be submitted within 90 days of completion of any remedial action(s).

Appendix 1 - In Well Heating Study Report

IN-WELL HEATING PILOT TEST
FINAL REPORT
ATG-ORONOCO STREET

Prepared for

The City of Alexandria
Department of Project Implementation
301 King Street, Suite 3200
Alexandria, VA 22314

February 20, 2024

URS Corporation
12420 Milestone Center Drive,
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Germantown, MD 20876
Project No. 60611993

Disclaimer

This pilot test is part of an evaluation to optimize the performance of the Non-Aqueous Phase Liquid recovery approach at the City's Alexandria Town Gas (ATG)-Oronoco location. This test does not indicate that the City is in non-compliance with any federal or State regulatory requirement. In particular, neither federal nor State law precludes the infiltration of ground water-borne pollutants into a public MS4 storm sewer line. The test simply provides recommendations which may be available to the City to go above and beyond regulatory requirements.

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ACRONYMS AND ABBREVIATIONS

ASTM	ASTM International
ATG	Alexandria Town Gas
City	City of Alexandria
DEQ	Department of Environmental Quality
DNAPL	dense non-aqueous phase liquid
^{o}F	Fahrenheit
ft	feet
ft bgs	feet below ground surface
LIF	Laser-Induced Fluorescence
LSS	Lee Street Square commercial/office townhouse complex
MGP	manufactured gas plant
NAPL	non-aqueous phase liquid
PID	photoionization detector
Site	Alexandria Town Gas (ATG)-Oronoco site
TarGOST	Tar-specific Green Optical Screening Tool
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
VRP	Voluntary Remediation Program

EXECUTIVE SUMMARY

On behalf of the City of Alexandria (City), a pilot test was performed for in-well heating recovery of Non-Aqueous Phase Liquid (NAPL) at the Alexandria Town Gas (ATG)-Oronoco site (Site). The objectives of the in-well heating pilot test were as follows:

- Determine if in-well heating will increase the water temperature in the groundwater in and around recovery wells and thus decrease NAPL viscosity.
- Test the application and efficiency of in-well heating and vacuum truck recovery for the site-specific conditions.
- Assess if in-well heating and vacuum truck recovery can materially extend the productive life of recovery wells and expedite overall remedial efforts at the Site.

As a first step in determining the potential effectiveness of heating NAPL to improve recovery, a NAPL sample was collected and analyzed for viscosity versus temperature. The NAPL laboratory analysis results indicated that heating the water/NAPL mixture from 70ºF to 90 ºF will lower NAPL viscosity about 40%.

The pilot test was performed on October 3 through 5, 2023. The pilot test consisted of conducting in-well heating tests on two recovery wells, RW-7 and RW-10, which were no longer productive but where the 2021 Tar-specific Green Optical Screening Tool (TarGOST) survey indicated at least 2 feet of NAPL in the immediate vicinity. NAPL recovery had generally been strong in RW-10 until July 2023. NAPL recovery has generally been poor in RW-7. The in-well heating element was placed in RW-10 while nearby PMW-66 served as an observation well. The in-well heating element was placed in RW-7 while RW-6 served as an observation well. RW-6 is 12 feet from RW-7.

The method of in-well heating consisted of inserting a copper loop into the well and recirculating hot water in a closed-loop system to increase the temperature of the in-well water and surrounding groundwater. The water within the recirculating loop was heated aboveground using a Hydro-Quip Pure Heat PH101-15UP-S Heater. On Days 1 and 2, in-well heating was performed on RW-10. A short in-well heating test was performed on RW-7 on Day 3. Photoionization detector (PID) measurements, depth to NAPL/water, and temperature data were collected during the pilot test.

On the last day of heating (Day 3), all liquids were removed from each well (RW-7 through RW-10) via vacuum truck. A stinger was placed into the bottom of each well to draw liquid from the well and surrounding formation via a high vacuum. Although RW-8 and RW-9 were not heated, vacuum-truck recovery was performed because of the general lack of product in these wells since July. RW-6 continues to have NAPL and vacuum recovery was not performed because it could alter the hydraulic connectivity between the well and the surrounding formation. Approximately 165 gallons of liquids were removed from the wells in total.

Based on the temperature data collected, the in-well heating test was successful at increasing the groundwater temperature in the well to over 100 ºF. Based on the temperature gradient in RW-

10, it appears that the heated water in the well rose and created a convection current which pulled colder formation water into the bottom of the well screen. However, this method of in-well heating was not sufficient to increase water temperature 9.1 feet away at PMW-66. Once heating stopped, temperatures gradually returned to pre-test temperatures by the following morning.

As stated in the Appendix A of the Consent Decree, if the Well-Heating Study is successful at enhancing NAPL recovery by at least 35 gallons per well during the test and two-month monitoring period, the draft Well-Heating Study Report shall include recommendations for future use of in-well heating in existing recovery wells. However, future in-well heating may not be recommended if the City's project team determines that it could compromise long-term recovery.

The pilot test demonstrated that it is possible to increase groundwater temperatures within a well to 100^{o}F, which would create a convection current within the well and adjacent formation. However, this pilot test was not able to mobilize NAPL into the recovery wells during the test or in the three (3) months following this pilot test. The pilot test appears to have only resulted in approximately one gallon of supplemental NAPL recovery while in-well heating was occurring. No changes in the rate of NAPL recovery have been observed since the conclusion of the pilot test. Because Oronoco Street cannot be closed until remediation is complete, continuous use of in-well heating is not feasible. Based on these results, further use or testing of in-well heating is not recommended to enhance NAPL recovery at this site. Based on the NAPL quantities recovered via the recovery wells installed in April 2021, installing additional recovery wells at appropriate locations identified through a TarGOST survey is a significantly more effective measure to increase recovery rates. Accordingly, installing additional recovery wells using the 2023 TarGOST survey is recommended to further enhance and optimize NAPL recovery.

SECTION ONE: INTRODUCTION

On behalf of the City of Alexandria (City), URS has prepared this report to describe the field activities, results, and conclusions of the pilot test for in-well heating recovery of Non-Aqueous Phase Liquid (NAPL) at the Alexandria Town Gas (ATG)-Oronoco site (Site). The purpose of this pilot test was to evaluate the potential effectiveness of in-well heating with vacuum truck well recovery to enhance NAPL recovery.

The in-well heating pilot test was performed using the technical approaches and procedures described in the In-Well Heating Pilot Test Work Plan (WP) dated September 25, 2023 (URS, 2023)

This report is organized as follows:

- Section 1: Introduction
- Section 2: Background Information
- Section 3: Field Activities
- Section 4: Results and Conclusions
- Section 5: References

Figures and Tables are located after Section 5. **Appendix A** presents referenced figures from the Follow-Up Site Characterization Report (Cardno, 2019a). **Appendix B** presents select figures from the 2021 TarGOST Survey and NAPL Recovery Well Installation Report (Cardo, 2021). **Appendix C** provides graphical representations of the ATG-Oronoco historical NAPL recovery and **Appendix D** presents boring logs for the wells included in the pilot test. **Appendix E** presents the photo log and **Appendix F** presents the waste manifest.

The objectives of the in-well heating pilot test were as follows:

- Determine if in-well heating will increase the water temperature in the groundwater in and around recovery wells and thus decrease NAPL viscosity.
- Test the application and efficiency of in-well heating and vacuum truck recovery for the site-specific conditions.
- Assess if in-well heating and vacuum truck recovery can materially extend the productive life of recovery wells and expedite overall remedial efforts at the Site.

1.1 SITE DESCRIPTION

The ATG-Oronoco Voluntary Remediation Program (VRP) site occupies an approximately 1-acre group of privately owned parcels at the corner of Oronoco and North Lee Streets in Old Town Alexandria (see **Figure 1**).

The City operated the ATG manufactured gas plant (MGP) near the corner of North Lee and Oronoco Streets between 1851 and 1946. After closing, most of the ATG plant was demolished

and the remaining buildings were re-used by various businesses until the mid-1970s. In 1977, the former MGP property, including the last two remaining MGP buildings, was redeveloped into the Lee Street Square commercial/office townhouse complex (LSS), which now occupies the Site. In 1975, just prior to the redevelopment of the former MGP site, a 44-inch x 72-inch-diameter stormwater pipeline was installed beneath the centerline of Oronoco Street adjacent to the former MGP site.

The surrounding urban area is occupied by a mixture of commercial and residential properties bordering the west bank of the Potomac River. **Figure 2** presents the existing site conditions. **Figure 3** presents the Oronoco Street storm drain. The VRP site boundaries also encompass the bordering City-owned public rights-of-way along Oronoco Street, from the intersection of North Lee Street to the end of Oronoco Street. However, in some cases, Site-related impacts extend off-site beyond these boundaries to affect areas beneath adjoining private property and public rights-of-way, including the river bottom at the Oronoco Outfall. Refer to the figures included in **Appendix A** for a full site layout (including the VRP site boundary and remediation system).

During the 1990s, several government agencies conducted site studies to better understand the impacts from the releases and evaluate the potential threat to human health and the environment. Participating agencies have included the United States Environmental Protection Agency (USEPA), the United States Coast Guard – Marine Safety Office (USCG-MSO), and the Virginia Department of Environmental Quality (DEQ).

Collectively, these studies concluded that because humans do not normally come in contact with site-related substances, there is no immediate threat to human health. Nevertheless, further study was recommended to determine the entire extent of impact and more fully evaluate human and ecological impacts from the Site (MM&A, 2010).

SECTION TWO: BACKGROUND INFORMATION

This section describes the information that was needed to develop the pilot test approach including NAPL analysis, NAPL footprint, and NAPL recovery performance.

2.1 SITE GEOLOGY AND HYDROGEOLOGY

The former MGP site is situated on the edge of a riverine terrace at elevations of 14 to 19 feet above mean sea level. The near surface site soils consist of a heterogeneous mixture of fill (gravel/soil), clayey sand/silt, and debris. A clay layer sits below this mixture and is believed to be relatively continuous within the former MGP footprint, except where storage holders penetrated the clay, but less so beneath Oronoco Street. The decreased presence of the clay beneath the street is partly because the Oronoco Street storm sewer excavation penetrated the clay. Below the clay layer sits sand, silty sand, silt, and sandy clay. The Oronoco Street storm sewer reportedly has approximately 2 feet of gravel bedding that sits directly beneath the pipe with very little gravel extending beyond the pipe edges (URS, 2020a).

Based on the May 2017 and January 2018 gauging events, groundwater flow radiates outward from the west-central area of the former MGP (beneath LSS) but deflects strongly towards the storm-drain axis beneath Oronoco Street where the water table surface descends sharply. Flow lines generated from these contours indicate a strong influence imposed by the storm-drain permeable pipeline backfill and bedding so that shallow groundwater flows from beneath LSS towards the storm-drain. Towards the east, the water table surface slopes more gently towards North Union Street and beyond to Founders Park and the Potomac River (Cardno 2019a).

The depth to water is presented in **Table 1** for recovery wells RW-6 through RW-10. The average depth to groundwater ranged from 9.8 feet (ft) below ground surface (bgs) in RW-7 to 11.7 ft bgs in RW-8. The average minimum and maximum depth to groundwater across these five wells was 9.3 ft bgs and 12.23 ft bgs, respectively.

2.2 NAPL SAMPLE ANALYSIS

As a first step in determining the potential effectiveness of heating NAPL to improve recovery, a NAPL sample was collected and analyzed for viscosity versus temperature. Cardno collected a NAPL sample from PMW-15 on August 12, 2020 and shipped the sample to Integrated Geosciences Laboratories, LLC in Houston, Texas. The sample was analyzed for specific gravity/density and 3-point viscosity using ASTM International (ASTM) D1481 and ASTM D445 standards, respectively. The results are summarized in the table below.

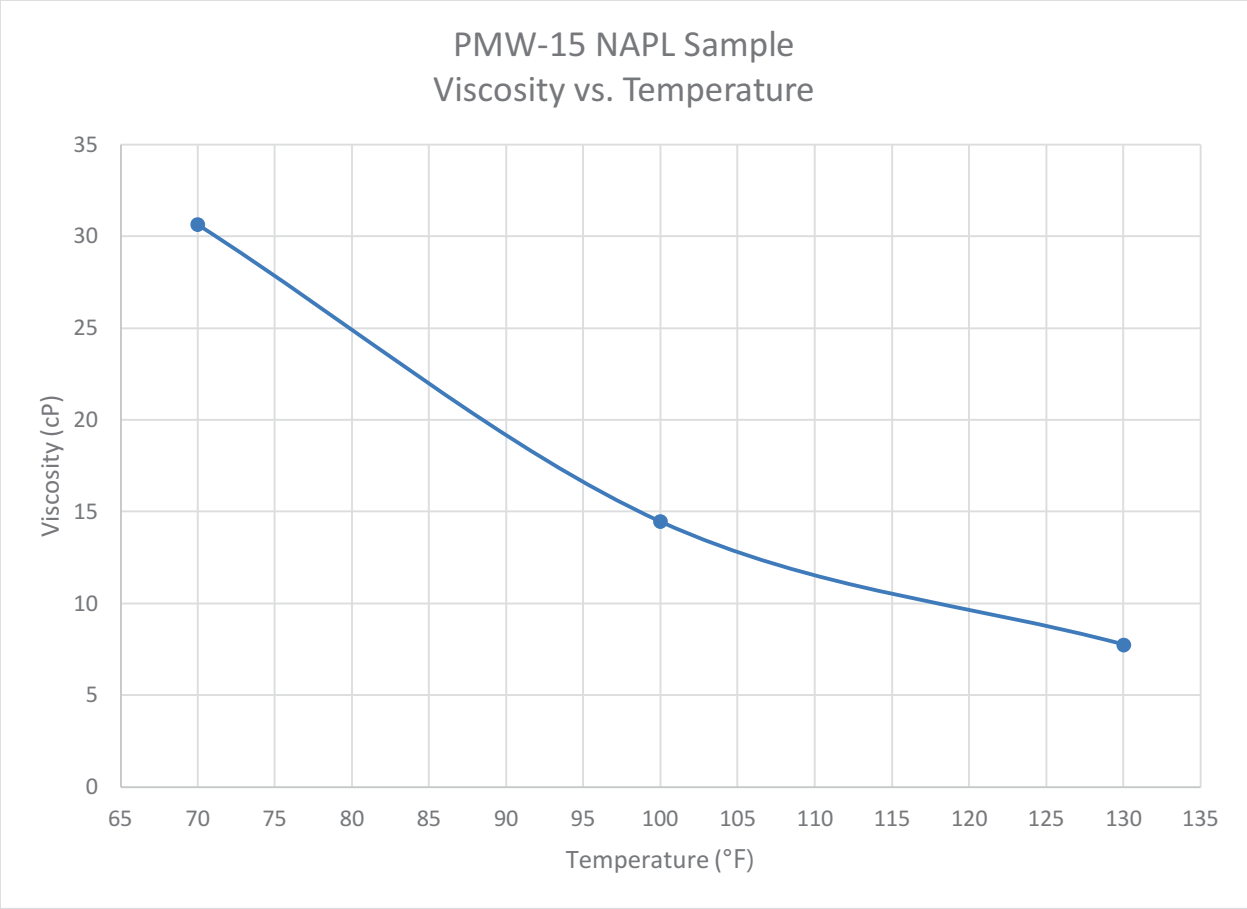
PMW-15 NAPL Analysis Results

SAMPLE ID	TEMPERATURE °F	SPECIFIC GRAVITY	DENSITY g/cc	VISCOSITY	
				centistokes	centipoise
PMW-15	70	1.0585	1.0583	28.97	30.66
	100	1.0544	1.0470	13.82	14.48
	130	1.0497	1.0349	7.50	7.76

g/cc = grams per cubic centimeter

The specific gravity of 1.06 at 70 degrees Fahrenheit (^{o}F) is consistent with dense NAPL results found at similar MGP sites (URS, 2020b). The slight decrease in specific gravity with rising temperature is also consistent with results found at similar MGP sites. The 70 ^{o}F viscosity of 28.97 centistokes is lower than found at another MGP site in the Washington DC region and within the lower viscosity range. The NAPL viscosities at the ATG-Oronoco site appear to vary significantly based on the 2017 NAPL survey. This survey identified three types of NAPL: 1) brown liquid coal tar, 2) black viscous asphalt, and 3) free product sheens. Of these, only the brown coal tar accumulates in wells at measurable thicknesses. The black viscous asphalt-like substance, while still a pure non-aqueous phase product, is only measurable in cores, as it is too viscous to accumulate in wells. The sheen is detectable in wells and cores but not in measurable thicknesses.

The graph below presents the viscosity versus temperature curve. The water temperature at the start of the test was 70 ^{o}F. The viscosity test results indicate that a rise in temperature from 70^{o}F to 100^{o}F will reduce viscosity (or increase the mobility) of the NAPL by slightly more than half. The NAPL laboratory analysis results indicate that heating the water/NAPL mixture from 70^{o}F to 90 ^{o}F will lower NAPL viscosity about 40%. The lowering of NAPL viscosity may increase transmissivity and mobility, which may then have the effect of improving recoverability in the field.



2.3 TARGOST

In March 2021, Cardno performed a NAPL survey using Laser-Induced Fluorescence (LIF) technology (specifically Tar-Specific Green Optical Screening Tool [TarGOST®]) to assess and delineate the dense non-aqueous phase liquid (DNAPL). The TarGOST data collection used a Geoprobe direct-push drill rig. Cardno advanced 34 TarGOST borings within the study area. The survey results were presented in the September 2021 TarGOST Survey and NAPL Recovery Well Installation report (Cardno, 2021). The survey results are summarized in the figures provided in **Appendix B**. A second TarGOST survey was performed in November 2023 using 38 borings within the study area (Cardno, 2023).

2.4 NAPL RECOVERY DATA

2.4.1 Years 2002 Through May 2021

Between 2002 and 2018, recovery events were typically performed every 2 weeks. NAPL recovery events were performed from RW-1, -2, -3, and -4 through 2006 (see **Figure 2** for well locations). Between 2006 and 2016, recovery was mostly from RW-2 and PMW-15.

Figure C-1 in **Appendix C** presents the graph created by Cardno with the estimated NAPL recovered from recovery wells between 2002 and 2022. As shown on **Figure C-1**, RW-1, -2, -3, and -4 collectively recovered approximately 50 gallons a year on average from 2003 to 2006. Annual recovery volumes slowly declined as these wells and PMW-15 yielded less NAPL. The annual NAPL recovery had decreased to only 2 and 5 gallons per year in 2015 and 2016, respectively.

In early April 2017, a recovery well was installed below MH-92, which significantly improved recovery rates. This suggested that more active NAPL recovery from wells screened directly within the pipe bed can improve recovery rates. Starting in November 2018, NAPL was also recovered from DIW-1, located 5 feet south of MH-92.

During August and September 2018, Cardno conducted a series of timed pumping and recovery tests at MH-92 to optimize the existing free product recovery system (Cardno, 2018). Based on this study, more frequent recovery events (i.e., weekly) were performed from wells MH-92, PMW-15, and DIW-1. Weekly events occurred on average from August 2018 through May 2019. During the second half of May 2019, the recovery volume per event began to decrease. Recovery events were changed to twice a month but the recovery volume did not significantly improve.

MH-92 was abandoned in October 2019 after the October pipeline grouting. Recovery was performed twice a month from PMW-15 and DIW-1 from October 2019 through April 2021, but recovery volumes were significantly lower than 2017 through the summer 2019.

2.4.2 New Recovery Wells Starting May 2021

New recovery wells RW-6, -7, -8, -9, and 10 were installed in April 2021. Details on well installation and construction are summarized in the September 2021 TarGOST Survey and NAPL Recovery Well Installation Report (Cardo, 2021). The five vertical recovery wells were installed within the area of identified measurable free product at locations selected using the TarGOST survey and as close to the storm sewer as could be safely constructed. **Figure 2** shows the installation locations of the recovery wells.

Cardno initiated data collection and NAPL recovery from recovery wells RW-6 through RW-10 on May 10, 2021. Since May 2021, NAPL has been gauged and then recovered from the five new recovery wells approximately every two weeks. During recovery events, Cardno measures depth to water and depth to free-phase product (if present) in each well. Personnel also estimated the total gallons of DNAPL recovered from each well per event.

The recovery well gauge data (based on data provided by Cardno) is summarized in **Table 1** for May 2021 through December 13, 2023. **Figure C-2** of **Appendix C** presents graphs of product recovery, product elevation, and water table elevation for May 2021 through January 1, 2023.

During the 24 months between May 2021 and April 2023, an estimated 491 gallons of NAPL have been recovered with an average of 9.81 gallons per event and 20.44 gallons per month. The average volume recovered during that time period remained relatively consistent. Following April 2023, a decreasing trend becomes more apparent. From May through December 2023 an additional 35

gallons were recovered, bringing the 32-month averages to 8.21 gallons per event and 16.43 gallons per month. **Table 2** presents the NAPL recovery amounts per event and per well, based on data provided by Cardno. A per well summary of NAPL recovery during this period is shown below.

Recovery Well	Estimated NAPL Gallons Recovered			Average per Month of Estimated NAPL Gallons Recovered		
	May 21 – April 23	May 23 – Dec 23	May 21 – Dec 23	May 21 – April 23	May 23 – Dec 23	May 21 – Dec 23
RW-6	37.75	16.70	54.45	1.57	2.09	1.7
RW-7	26.5	0	26.5	1.10	0	0.83
RW-8	143.75	7.75	151.5	5.99	0.97	4.73
RW-9	130.25	4.5	134.75	5.43	0.56	4.21
RW-10	152.25	6.25	158.5	6.34	0.78	4.95
Total	**490.5**	**35.20**	**525.7**	**20.44**	**4.4**	**16.43**
Average per event	**9.81**	**2.51**	**8.21**	--	--	--

Notes: 1) Number of events between May 21 and April 23 = 50
2) Number of events between May 23 and Dec 23 = 14.
3) Total number of events between May 21 and Dec 23 = 64

The recovery rate significantly increased following installation of the new recovery wells in May 2021 when compared to any previous recovery period. As shown in **Table 2** and summarized above, most of the recovery has occurred in RW-8, RW-9, and RW-10. The NAPL thickness measured in these wells stayed relatively consistent between May 2021 through April 2023.

To assess why RW-6 and RW-7 have not recovered more NAPL compared to the other three wells during the period of May 2021 through April 2023, the water table elevation was compared to recovered NAPL (see **Figure C-2** of **Appendix C**). RW-6 had an estimated NAPL recovery of 8 gallons from May to July 1, 2021 and then no further recovery until April 8, 2022 when inconsistent NAPL recovery resumed and continued into 2023. The period of no recovery roughly coincides with a one-foot water table rise in late summer 2021. All 26.5 gallons of NAPL from RW-7 were recovered between July 28, 2021 and March 25, 2022. As shown on **Figure C-2**, the RW-7 NAPL recovery matches consistently with lower water tables except that no NAPL was recovered during the lower water table in summer 2022. As a general rule, NAPL is more available for recovery with depressed water levels. It is possible that the significant localized water table increase at RW-7 in February 2022 disrupted the connectivity of NAPL to the well screen. Over

time this connectivity may reestablish itself such as at RW-6 but the subsequent RW-7 water level rise in late 2022 may have prevented such connectivity.

A review of the TarGOST data found that in general the NAPL was primarily present several feet below the storm drain west of MH-92 and more in-line with the storm drain bottom at MH-92 and east of the manhole. Therefore, another reason for the poorer recovery from RW-6 and RW-7 is that this NAPL is partly or mostly residing within the silty clay soils beneath the storm drain bedding. In contrast, the NAPL near MW-92, RW-8, RW-9, and RW-10 appears to be primarily within the higher permeability sand lenses and storm drain bedding. **Figure 4** and the TarGOST figures in **Appendix B** present the 2021 TarGOST NAPL survey elevation results. **Figure 4** presents these results relative to the storm drain location.

The use of the TarGOST survey results for location and screen intervals (refer to **Appendix D** for well construction drawings) for RW-8, RW-9, and RW-10 was successful in significantly increasing NAPL recovery rates. Based on recovery rates between May 2021 and April 2023, RW-8 and RW-9 appear to have effective hydraulic connectivity with the storm drain bedding. The per-event recovery rate from RW-8 and RW-9 is/was consistently larger than the rate from the former MH-92 recovery well, which was installed directly into the storm drain bedding.

A decreasing trend in NAPL recovery and thickness in most of the new recovery wells appears to have begun in late February 2023. Between August and December 2023, only RW-6 has provided recoverable NAPL. Note that the increased NAPL recovery from RW-6 during the July through December 2023 period coincides with the lowest recorded water table elevations for this site.

A follow-up TarGOST survey was conducted in November 2023. Based on the latest TarGOST preliminary survey data, RW-6 is still within the recoverable NAPL plume, whereas survey results indicate no recoverable NAPL is present in the immediate area of RW-7.

SECTION THREE: IN-WELL HEATING PILOT TEST FIELD PRGRAM

This section discusses the tasks involved with the execution of the pilot test.

The pilot test was performed on October 3 through 5, 2023. The pilot test consisted of conducting in-well heating tests on two recovery wells, RW-7 and RW-10.

3.1 PILOT TEST LOCATIONS

RW-7 and RW-10 were used as the pilot test wells designated for heating and vacuum truck recovery. NAPL recovery had generally been strong in RW-10 until July 2023. NAPL recovery has generally been poor in RW-7 even though it was installed in an area with strong DNAPL fluorescence as identified in the 2021 TarGOST survey. These locations were chosen to represent formerly higher relative recovery rates and lower relative recovery rates. In addition, RW-7 was used for testing the area near the storm-drain while RW-10 provided testing for the area closer to the former MGP. Placing the two test wells in different locations was also done because of the varied viscosity of the NAPL across the site.

Figure 5 shows the locations for the pilot test wells. **Appendix D** presents the well construction logs for the pilot test wells. Most of the work took place along the sidewalk and south side of Oronoco Street. However, work on day 3 took place in the middle of the street at RW-7. All testing equipment was brought to the site in a cargo van. All equipment and NAPL containers were removed from the site at the end of each work day and stored in the cargo van.

RW-10 was installed as a 4-inch diameter well with a screened interval from 17 to 22 feet below ground surface (bgs) and with a five-foot long sump section below the well screen. The in-well heating element was placed in RW-10 while nearby PMW-66 served as an observation well. PMW-66 is a 1-inch diameter well screened from 10 to 20 feet bgs. PMW-66 is 9.1 feet from RW-10.

RW-6 and RW-7 were both installed with a screened interval from 18 to 23 feet below ground surface. Both wells include a five-foot long sump section below the well screen. The in-well heating element was placed in RW-7 while RW-6 served as an observation well. RW-6 is 12 feet from RW-7.

3.2 WATER HEATING EQUIPMENT SET-UP

The method of in-well heating consisted of inserting a copper loop (in-well heating element, see (Photo No. 1 of **Appendix E**) into the well and recirculating hot water in a closed-loop system to increase the temperature of the in-well water and surrounding groundwater. The wells selected for heating both 4-inches in diameter to accommodate the 1-inch diameter copper tube loop.

The water within the recirculating loop was heated above-ground next to each well tested. The water heater used was a Hydro-Quip Pure Heat PH101-15UP-S Heater. The heater has 1-1/2 x 2" inlet and outlet connections that are compatible with PVC pipe. The heater required a minimum

flow velocity of 20 gallons per minute to prevent overheating. The **Appendix E** photos show the equipment set-up.

Potable water was brought to the site in 5-gallon buckets. Prior to mobilization, a 1.5-inch PVC pipe was installed into a plastic 15-gallon potable drum which was connected to the recirculation pump. The pump discharge end was piped to the heater inlet. The heater outlet connected to a 1.5-inch diameter poly pipe which was connected to 1-inch diameter copper piping via transition connector. The copper piping consisted of two 10-foot lengths connected by a U-bend. The discharge end of the copper piping was connected back to a 1-inch diameter poly hose that ran back to the 15-gallon water drum.

All pipe/tube/hose connections were via fittings as recommended by the pump and heater manufacturers. The pipe/hose/tube was labeled as "HOT WATER" and when hot was handled, personnel donned work gloves for protection.

The pump and the water heater were both 110 Volt (V) with plugs (not hard wired) and were powered by a fuel supplied generator brough to the site. GFCI extension cords were used to connect each device to the generator. The generator was transported to a nearby service station when filling was required, therefore no fuel storage containers were used at the site.

3.3 FIELD MEASUREMENTS DURING PILOT TEST

After opening each well, a hand-held photoionization detector (PID) was used to screen each well head for volatile vapors. PID readings, depth to NAPL/water, and temperature were collected as per the schedule described in Section 3.5.

The depth to groundwater and NAPL were measured using a Solinst Oil/Water Interface Probe. The interface probe was used across multiple wells and decontaminated after each data collection point.

Water temperature and water level for RW-10 during heated was continuously logged at 10-minute intervals using a dedicated Solinst Level Logger water level data logger. Water temperature of all wells and the heating system was also measured with a liquid thermometer in order to obtain approximate readings. For the wells, the liquid thermometer readings were taken from dedicated bailers.

3.4 LIQUID AND NAPL RECOVERY

Transport and handling of recovered NAPL was performed using proper personal protective equipment (PPE) as detailed in the Site Safety and Health Plan (SSHP).

Product recovered by manual bailing was stored in a plastic 5-gallon bucket with air-tight lid. On the final day of the test, approximately one gallon of NAPL was contained within the bucket, all of which was recovered from RW-10 over the 3-day test duration.

On the last day of heating, all liquids were removed from each well (RW-7 through RW-10) via vacuum truck. A stinger was placed into the bottom of each well to draw liquid from the well and

surrounding formation via a high vacuum. Although RW-8 and RW-9 were not heated, vacuum-truck recovery was performed because of the general lack of product in these wells since July. RW-6 continues to have NAPL and vacuum recovery was not performed because it could alter the hydraulic connectivity between the well and the surrounding formation. Approximately 165 gallons of liquids were removed from the wells in total. The manually-bailed NAPL contained within the 5-gallon bucket was also removed by the vacuum truck.

3.5 DAILY ACTIVITIES

The following presents activities performed during each day of the pilot test.

Because of the expected noise of the heating system operation and safety concerns (i.e. roadway work), heating intervals were limited to daytime hours.

Day 1

Set-up equipment and lower datalogger into RW-10 liquid column.

Heat water in RW-10 for approximately 8 hours (10:30 am to 6:30 pm).

Screen for volatile vapors using a photo-ionization detector (PID) once wells opened.

Measure depth to water and product in PMW-66 and RW-10 prior to start.

Measure water temperature in PMW-66 and RW-10 prior to start and every 60 minutes.

Measure water drum temperature prior to start and every 60 minutes.

Screen for volatile vapors using a PID every 60 minutes.

Measure water temperature and product in PMW-66 and RW-10 once heating finished for the day and 30 minutes after heating ended.

Recover any measurable product at end of day.

Day 2

Set-up equipment.

Heat water in RW-10 for approximately 12 hours (8:30 am to 8:30 pm).

Screen for volatile vapors using a PID once wells opened.

Measure depth to water and product in PMW-66 and RW-10 prior to start.

Measure water temperature in PMW-66 and RW-10 prior to start and every 60 minutes.

Measure water drum temperature prior to start and every 60 minutes.

Screen for volatile vapors using a PID every 60 minutes.

Measure water temperature and product in PMW-66 and RW-10 once heating finished for the day and 30 minutes after heating ended.

Recover any measurable product at end of day.

As sufficient heat was not retained in the overnight hours, the heating test on Day 2 was continued for a total of 12 hours rather than the originally proposed 9 hours. This was to determine whether longer heating intervals have a significant impact on groundwater temperatures and NAPL recovery.

Day 3

Set-up equipment and lower datalogger into RW-7 liquid column.

Heat water in RW-7 for approximately 2 hours (8:30 am to 10:30 am). This heating period was significant less than proposed in the Work Plan for Day 3 due to vacuum truck availability which had to arrive in late morning instead of in late afternoon.

Screen for volatile vapors using a PID once wells opened.

Measure depth to water and product in RW-7 (3 times) and RW-6 (twice) during morning . Manual measurements from RW-7 could not be collected after start of heating due to heating system hoses blocking interface probe from reaching the well liquid column.

Measure depth to water and product in RW-8, RW-9, RW-10, and PMW-66 twice each during the morning.

Screen wells RW-6, RW-7, RW-8, RW-9, RW-10, and PMW-66 for volatile vapors using a PID.

Measure water temperature in RW-6, RW-10, and PMW-66.

Measure water drum temperature every 60 minutes. Perform vacuum extraction at RW-7, RW-8, RW-9, and RW-10.

3.6 POST PILOT TEST MONITORING

After the pilot test, monitoring continued to be performed every two weeks by Cardno including on October 9, November 13, November 27, and December 13, 2023. During this time, NAPL was only recovered from RW-6. A maximum of 2 gallons and average of 1.25 gallons were recovered from RW-6 during these events. These recovery volumes are consistent with those encountered prior to the pilot test.

Approximately six weeks after completion of the heating test, field measurements were be collected from the following wells on November 17, 2023: PMW-66, RW-10, RW-6, and RW-7.

After opening the wells, a hand-held PID was used to screen for volatile vapors.

The depth to groundwater was measured using an oil/water interface probe. Depth to water varied between 11.50 ft (RW-7) to 13.44 ft (RW-6). Groundwater temperatures in the wells were approximately 70 ^{o}F. No measurable NAPL was detected.

3.7 SITE MANAGEMENT

3.7.1 Mobilization

The in-well heating pilot test mobilization and day 1 of testing took place on October 3, 2023. The scheduling and location of the pilot test field activities were coordinated with the City to limit traffic disruption to nearby property owners and visitors. The dedicated pumps in the recovery wells included in this test were pulled prior to the test by Cardno.

URS applied for and received a T& ES permit No. TES2023-00820 because work was performed on public roads and sidewalks. Work was performed in accordance with the permit conditions. Traffic cones and traffic work signs were placed at the site in accordance with the traffic management plan submitted to the City as part of the permit application. URS worked with the City to ensure that no cars were parked on the north and south sides of Oronoco Street between 6am and 7pm each day of the pilot test. In addition, "sidewalk closed" signage was placed on the sidewalk nearest to RW-10 during the RW-10 test.

3.7.2 Health and Safety

A site-specific HASP was developed for field tasks associated with this project. The HASP addressed hazards associated with the pilot test activities and specified necessary procedures to ensure safety of workers during the set-up and implementation of the in-well heating and NAPL recovery. This included the groundwater field measurement activities. The HASP included the specific roles, responsibilities, authority, and requirements as they pertain to the safety of employees and the scope of services. The document identified known potential hazards and facilitated communication and control measures to prevent injury or harm. Additionally, provisions to control the potential for environmental impact from these activities were included where applicable. Hazards for workers and associated mitigations that were addressed included:

- Physical hazards related to set-up of the in-well heating system
- Utilizing hand and power tools
- Contaminants in the groundwater
- Generation of hot water
- Traffic and pedestrians
- Common physical hazards (e.g. slip, trip, fall, manual lifting, housekeeping, etc.)
- Spill prevention
- Noise exposure
- Equipment operation

3.7.3 VOC and Noise Monitoring

The pump and generator were not expected to be a significantly greater noise volume compared to the bi-weekly activities performed by Cardno. However, because work would potentially continue after 5pm, URS applied for and received a noise variance permit No. TES2023-00821. Work was performed in accordance with the permit conditions.

Field measurement of volatile organic compounds (VOCs) using a PID in the worker breathing zone was conducted at each open well.

3.7.4 Spill Control and Containment

All equipment, pipe, and connections were checked every morning prior to use and observed throughout testing operations. No equipment damage or malfunctions (e.g. cracks or leaks) occurred during testing and stopping work was at no point necessary.

Removal of NAPL using a bailer was carefully performed with continuous attention to prevent spillage of NAPL or water during the removal. A spill kit was also maintained at the work site in case of a spill. The NAPL storage container was checked every morning prior to use and observed throughout the day to confirm there were no leaks. Only small amounts (few ounces) of NAPL were recovered during each bailing, therefore overfills of the NAPL container were not a concern.

Absorbent pads were placed around the recovery well head to contain any potential drips or minor releases during gauging or NAPL recovery. Five-gallon buckets were maintained at the work area to store any potential recovered spillage and/or absorbent material.

3.7.5 Demobilization and Waste Management

After the pilot test was complete on day 3, all equipment and investigation-derived wastes (IDW) was removed from the site. The pump, in-well heater, hose, and copper tubing is being maintained in storage by URS for potential future use.

IDW generated during the investigation activities included disposable materials such as PPE (nitrile gloves), bailers, and paper towels with cleaning solution (for equipment decontamination). These minimally-contaminated disposable materials were bagged and disposed of as ordinary solid waste. The recovered NAPL/water mixture was removed by vacuum truck along with the liquid content of recovery wells RW-7 through RW-10.

The recovered coal tar product and water were disposed as non-hazardous waste liquids. The waste manifest from the vacuum extraction event is presented in **Appendix F**.

3.8 QUALITY ASSURANCE / QUALITY CONTROL

Proper equipment preparation, cleaning, and field decontamination procedures were performed in accordance with the Work Plan to prevent cross-contamination of the down-well equipment and field measuring equipment.

Field personnel performing the field measurement procedures donned a new pair of nitrile rubber latex gloves prior to handling any field measuring equipment between measurement locations.

The equipment in contact with NAPL or groundwater was cleaned using a standard brand industrial cleaning solution (Simple Green) to remove visual contamination followed by a final tap water rinse.

SECTION FOUR: RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

Pilot test results, conclusions and recommendations are discussed in this Section. The in-well heating pilot test took place October 3 through 5, 2023 as described in **Section 3**. Subsequent monitoring and recovery events were conducted from October 9 through December 19, 2023.

4.1 GROUNDWATER TEMPERATURE INCREASE

During the first two days of operation, heating was applied to RW-10. Heating of RW-10 took place 10:30 am through 6:30 pm on October 3, 2023 (Day 1). As stated previously in **Section 3.3**, temperature measurements were taken both manually (**Table 3**) and using in-well dataloggers (**Table 4**). The water supply drum temperature reached 104.9º F after 2.75 hours. Manual temperature measurements indicate that within approximately 4.5 hours, the water temperature measured near the top of the water column in RW-10 had reached approximately 100º F. Day 1 temperature measurements from an in-well datalogger remained stable, only varying between 64.3º F and 65.6º F. The temperature data logger was located at the bottom of the well liquid column during Day 1 of the test. It was discovered on the second day of heating that there was significant variation in water temperature vertically throughout the well.

The Day 1 water temperature measured manually at PMW-66 varied from 69.8º F to 74.5º F. As the temperature readings (see **Table 3**) for PMW-66 did not show a linear increase, it is believed that these temperatures in this well were likely not impacted by the heating at RW-10 and temperature variations are likely attributed to the influence of ambient temperatures on the small sample volume used to collect temperature readings.

Heating of RW-10 took place from 8:30 am to 8:30 pm on October 4, 2023 (Day 2). The water drum temperature reached over 100º F after 1.5 hours of heating. Prior to the start of heating, a manual reading of the well water temperature indicated that the temperature had decreased to baseline level. As heat was not retained through the overnight hours, the heating test on Day 2 was continued for a total of 12 hours rather than the originally proposed 9 hours. This was to determine whether longer heating intervals have a significant impact on groundwater temperatures and NAPL recovery. During Day 2, the location of the datalogger was adjusted to a height that was midway in the liquid column.

Similar to the results of the manual temperature measurements of the previous day, temperatures recorded by the datalogger reached over 100º F after approximately 2.5 hours of heating. This temperature would have likely been reached earlier, but the heating system was shut down for approximately 30 minutes due to the generator running out of fuel. After removal of the heating system at 8:30 pm, groundwater temperature in the well remained over 100º F for approximately 50 minutes, fluctuated for 40 minutes (data logger was likely moved while pulling out heating element), then decreased from 90º F to 80º F over the next 3 hours (10:00 pm to 1:00 am). Subsequently, the temperature continued to gradually decrease, reaching a minimum of 74.0º F at 8:30 am on October 5, 2023 when the datalogger was removed.

Similar to Day 1, PMW-66 temperature varied from 65.3º F to 73.2º F with no linear increase throughout the course of the Day 2 heating test. Based on this data, the in-well heating of well RW-10 did not have a notable impact on groundwater temperatures in well PMW-66, which is 9.1 feet away.

Approximately 2 hours of heating was applied to well RW-7 on Day 3. Activities on Day 3 were dependent on the availability of a vacuum truck, which limited the amount of time that in-well heating could be performed. Due to an equipment malfunction, in-well temperature data via the data-logger for RW-7 was not recorded. However, based on water temperature measurements from the 15-gallon water supply drum observed on Day 3 compared to water supply drum temperatures observed on Days 1 and 2 while heating well RW-10, it is likely that the in-well water temperature at RW-7 reached over 90º F.

4.2 NAPL RECOVERY

As shown in **Table 1**, NAPL recovery had generally been strong in RW-10 until July 2023. The in-well heating element was placed in RW-10, while nearby PMW-66 served as an observation well. PMW-66 is 9.1 feet from RW-10. No measurable NAPL was observed in PMW-66 during the pilot test. A small amount of NAPL was observed in the bailer used prior starting the in-well heating at RW-10 (see Photo 3 in **Appendix E**).

As discussed in Section 2.4.2, NAPL recovery has generally been poor in RW-7 even though it was installed in an area with strong DNAPL fluorescence as identified in the 2021 TarGOST survey. The in-well heating element was placed in RW-7 while RW-6 served as an observation well, approximately 12 feet away No measurable NAPL was observed in RW-6 or RW-7 during the heating test.

Product recovered by manual bailing was stored in a plastic 5-gallon bucket with air-tight lid. On the final day of the test, approximately one gallon of manually bailed NAPL were contained within the bucket, all of which was recovered from RW-10 over the 3-day test duration. On the last day of the pilot test, all liquids were removed from each in-well heating test well (RW-7 through RW-10) via vacuum truck. Although RW-8 and RW-9 were not heated, vacuum-truck recovery was performed because of the general lack of product in these wells since July. Approximately 165 gallons of liquids were removed from all wells. NAPL was not observed in the liquids recovered by the vacuum truck, but the dense emulsified nature of the NAPL can often limit the ability to observe NAPL in recovered liquids. However, based on the lack of measurable NAPL in the wells prior to the vacuum recovery, it is unlikely that any appreciable quantity of NAPL was recovered. The 165 gallons of water recovered was lower than expected and might reflect a relatively low permeability of the soils surrounding the recovery wells.

After the pilot test, NAPL monitoring/recovery continued to be performed every two weeks. RW-6 was the only recovery well with measurable NAPL and the only well with NAPL recovered during the post-heating monitoring events.

4.3 CONCLUSIONS

The pilot test consisted of conducting in-well heating tests on two recovery wells, RW-7 and RW-10, which were no longer productive but where the 2021 TarGOST survey indicated at least 2 feet of NAPL in the immediate vicinity. One of the test wells, RW-10, had been productive for NAPL recovery until recently, while RW-7 was never very productive compared to RW-8, RW-9, and RW-10. RW-7 is located along the storm drain where NAPL was identified during the 2021 TarGOST survey, but within the silty clay soils beneath the storm drain bedding. RW-10 is located near the former MGP, with NAPL primarily within the higher permeability sand lenses.

Along with monitoring of the test well, during each day of the pilot test, at least one nearby well was monitored for depth to water, NAPL, temperature, and well headspace VOCs with a PID.

As discussed in Section 2.2, the analysis of a NAPL sample from PMW-15 was used to create a viscosity versus temperature curve. The viscosity test results indicate that a rise in temperature from 70^{o}F to 100^{o}F would reduce viscosity (increase the mobility and recoverability) of the NAPL by slightly more than 50%. The NAPL laboratory analysis results indicate that heating the water/NAPL mixture from 70^{o}F to 90^{o}F would lower NAPL viscosity about 40%.

Based on the data discussed in Sections 3 and 4.1, the in-well heating test was successful at increasing the groundwater temperature in the well to over 100^{o} F. Based on the temperature gradient in RW-10, it appears that the heated water in the well rose and created a convection current which pulled colder formation water into the bottom of the well screen. However, this method of in-well heating was not sufficient to increase groundwater temperature 9.1 feet away at PMW-66. It is unclear what the radius of temperature influence was during this in-well heating pilot test, but it does not appear to be very significant given the observations from nearby wells and significant temperature differential observed at the bottom of the heated well.

The two days of in-well heating at RW-10 were not successful at mobilizing NAPL to RW-10. The November 2023 TARGOST preliminary results have identified NAPL within the immediate vicinity of RW-10. Because of the relatively larger quantity of NAPL already recovered from RW-10 since May 2021, it would be expected that the remaining NAPL near RW-10 is of low mobility. It is possible that a long term, continuous (24-hours/day) in-well heating event could improve NAPL mobility, but such a long-term effort within Oronoco Street would be overly disruptive to the local community and may not result in significantly increased NAPL mobility.

4.4 RECOMMENDATIONS

As stated in the Appendix A of the Consent Decree, if the Well-Heating Study is successful at enhancing NAPL recovery by at least 35 gallons per well during the test and two-month monitoring period, the draft Well-Heating Study Report shall include recommendations for future use of in-well heating in existing recovery wells. However, future in-well heating may not be recommended if the City's project team determines that it could compromise long-term recovery.

The pilot test demonstrated that it is possible to increase groundwater temperatures within a well to 100^{o} F, which would create a convection current within the well and adjacent formation. However, this pilot test was not able to mobilize NAPL into the recovery wells during the test or in the three (3) months following this pilot test.

The pilot test appears to have only resulted in approximately one gallon of supplemental NAPL recovery while in-well heating was occurring. No changes in the rate of NAPL recovery have been observed since the conclusion of the pilot test. Because Oronoco Street cannot be closed until remediation is complete, continuous use of in-well heating is not feasible. Based on these results, further use or testing of in-well heating is not recommended to enhance NAPL recovery at this site. Based on the NAPL quantities recovered via the recovery wells installed in April 2021, installing additional recovery wells at appropriate locations identified though a TarGOST survey is a significantly more effective measure to increase recovery rates. Accordingly, installing additional recovery wells using the 2023 TarGOST survey is recommended to further enhance and optimize NAPL recovery.

SECTION FIVE: REFERENCES

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Cardno, 2022a. Site Operations and Groundwater Monitoring Report – 2021; prepared for City of Alexandria; prepared by Cardno; February 3, 2022.

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URS, 2020b. Oronoco Street NAPL Recovery Assessment, Review of NAPL Laboratory Analysis and Recommendations; prepared for City of Alexandria; prepared by URS; February 2021.

URS, 2023. In-Well Heating Pilot Test Work Plan, ATG-Oronoco Street; prepared for City of Alexandria; prepared by URS; September 25, 2023.

Figures

N

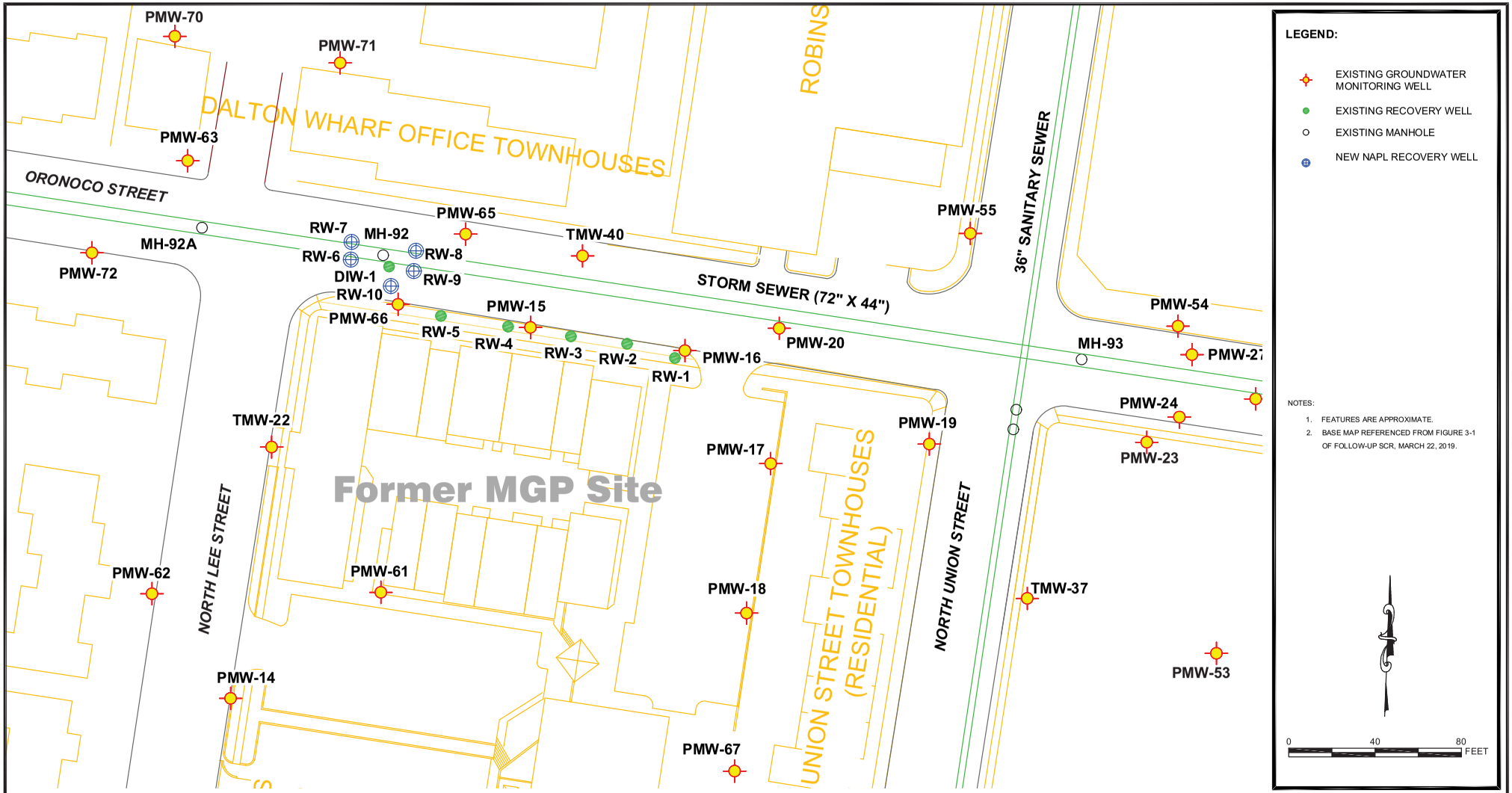
BASE MAP SOURCE: USGS topographic quadrangle map Relay. Virginia 2022.

Figure 1
Location Map
Alexandria Town Gas-Oronoco
City of Alexandria, Virginia

0 1000 2000 4000 FEET

Project Number:	Date:
60667100	04/01/2022

AECOM
430 National Business Pkwy
Suite 190
Annapolis Junction, MD 20701
Phone: (301) 289-3900
Website: http://aecom.com



NAPL RECOVERY WELLS

ALEXANDRIA TOWN GAS-ORONOCO
CITY OF ALEXANDRIA, VIRGINIA

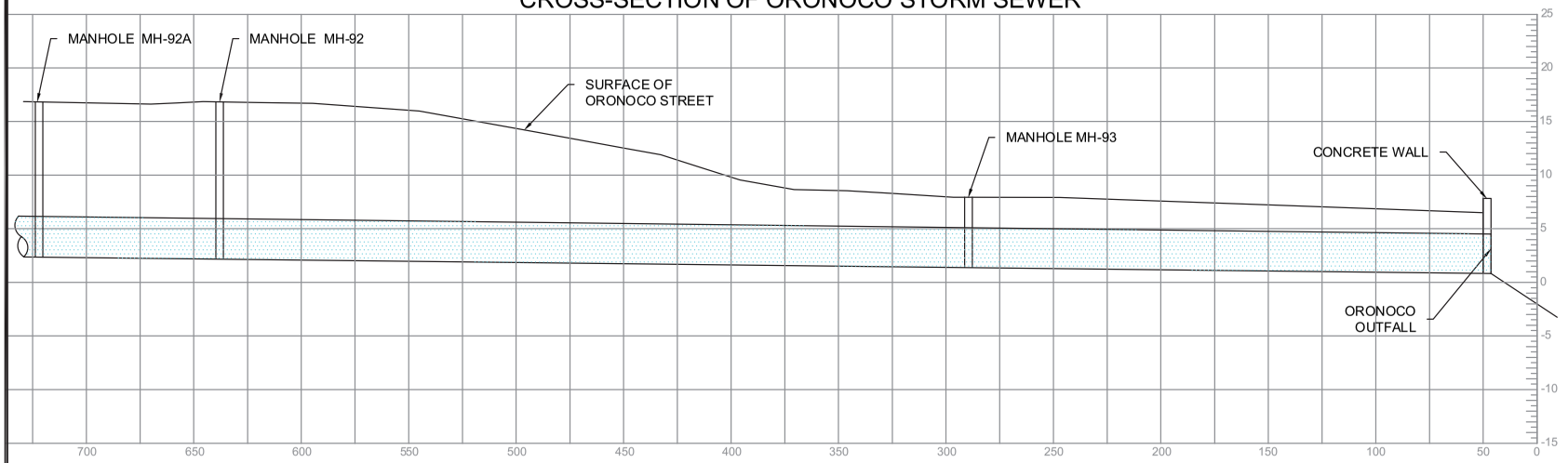
SCALE:	DATE:	PROJECT NUMBER:
AS SHOWN	12/07/2022	60611993

AECOM
8000 VIRGINIA MANOR ROAD, SUITE 110
BELTSVILLE, MD 20705
PHONE: (301) 289-3900
WEB: HTTP://WWW.AECOM.COM

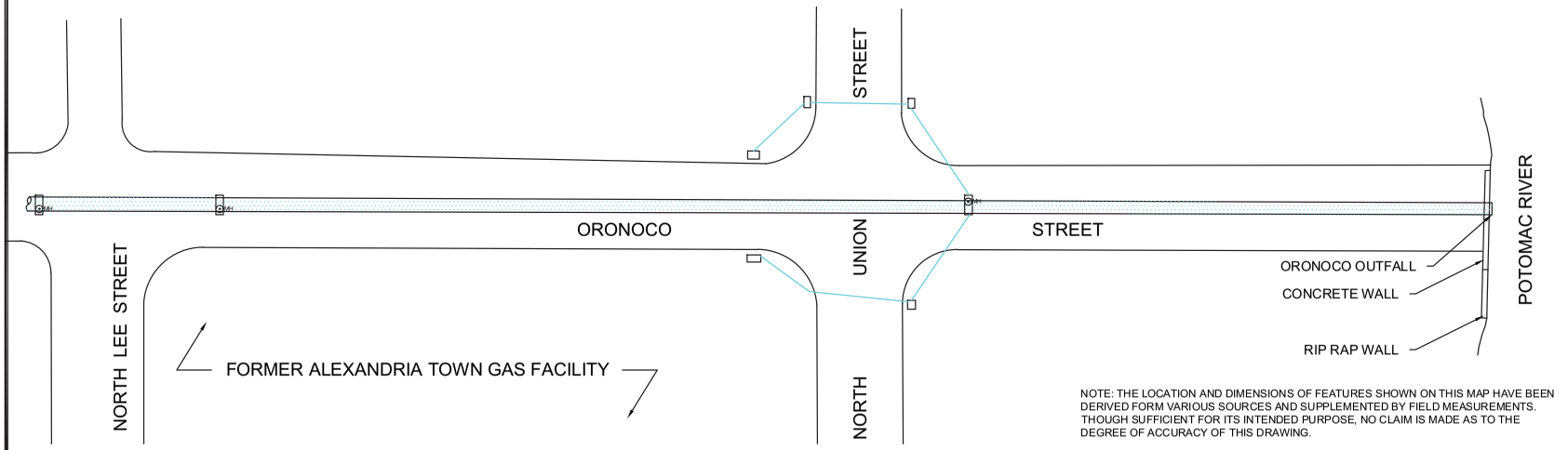
DESIGNED BY:	REVISIONS			
QH	NO.:	DESCRIPTION:	DATE:	BY:
DRAWN BY:				
QH				
CHECKED BY:				
EF				
APPROVED BY:				
EF				

FIGURE NUMBER:
2
SHEET NUMBER:
1 of 1

CROSS-SECTION OF ORONOCO STORM SEWER



AERIAL VIEW OF ORONOCO OUTFALL



NOTE: THE LOCATION AND DIMENSIONS OF FEATURES SHOWN ON THIS MAP HAVE BEEN DERIVED FORM VARIOUS SOURCES AND SUPPLEMENTED BY FIELD MEASUREMENTS. THOUGH SUFFICIENT FOR ITS INTENDED PURPOSE, NO CLAIM IS MADE AS TO THE DEGREE OF ACCURACY OF THIS DRAWING.

LEGEND:

- DROP INLET
- MH MANHOLE COVER
- ORONOCO STORM SEWER
- STORM SEWER LINE

NOTE: DETAILS ON THIS SHEET REFERENCED FROM FIGURE 2-2 OF PSI ATG 2001

PROFILE SCALE
HORIZONTAL
1" = 50'
VERTICAL
1" = 10'

10
5
0
25
50

PLAN AND PROFILE VIEW OF ORONOCO STREET STORM SEWER PIPE

ALEXANDRIA TOWN GAS-ORONOCO
CITY OF ALEXANDRIA, VIRGINIA

SCALE:	DATE:	PROJECT NUMBER:
AS SHOWN	2/6/2023	60611993

AECOM
430 NATIONAL BUSINESS PARKWAY
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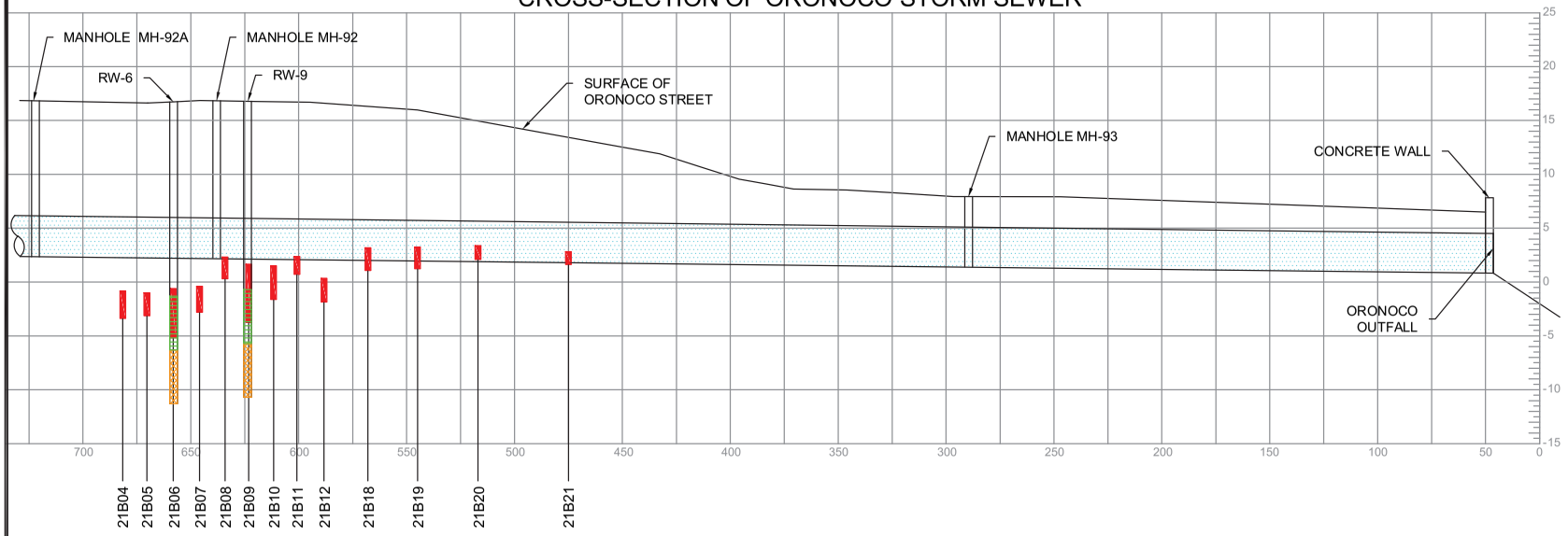
BELTSVILLE, MD 20701
WEB: HTTP://WWW.AECOM.COM

DESIGNED BY:	REVISIONS			
QH	NO.:	DESCRIPTION:	DATE:	BY:
DRAWN BY:				
QH				
CHECKED BY:				
EF				
APPROVED BY:				
EF				

FIGURE NUMBER:
3

SHEET NUMBER:
1 of 1

CROSS-SECTION OF ORONOCO STORM SEWER



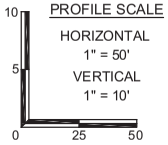
SURVEY POINT ID	21B04	21B05	21B06	21B07	21B08	21B09	21B10	21B11	21B12	21B16	21B19	21B20	21B21
ELEVATION OF TOP OF NAPL (FT)	-0.79	-0.99	-0.51	-0.41	2.32	1.65	1.5	2.42	0.37	3.21	3.32	3.42	2.85
THICKNESS OF NAPL (FT)	2.61	2.1	4.65	2.4	1.99	5.41	3.08	1.78	2.18	2.13	2.1	1.37	1.28

LEGEND:

- NAPL
- ORONOCO STORM SEWER
- WELL SCREEN
- WELL SUMP

NOTE:

- DETAILS ON THIS SHEET REFERENCED FROM FIGURE 2-2 OF PSI ATG 2001.
- NAPL AND RW-6 AND RW-9 DATA REFERENCED FROM TARGOST SURVEY AND DNAPL RECOVERY WELL INSTALLATION ATG-ORONOCO SITE, SEPT. 17, 2021.



PROFILE SCALE
HORIZONTAL
1" = 50'
VERTICAL
1" = 10'

2021 TARGOST NAPL SURVEY COMPARED TO STORM SEWER

ALEXANDRIA TOWN GAS-ORONOCO
CITY OF ALEXANDRIA, VIRGINIA

SCALE:	DATE:	PROJECT NUMBER:
AS SHOWN	2/6/2023	60611993

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WEB: HTTP://WWW.AECOM.COM

DESIGNED BY:	REVISIONS			
QH	NO.:	DESCRIPTION:	DATE:	BY:
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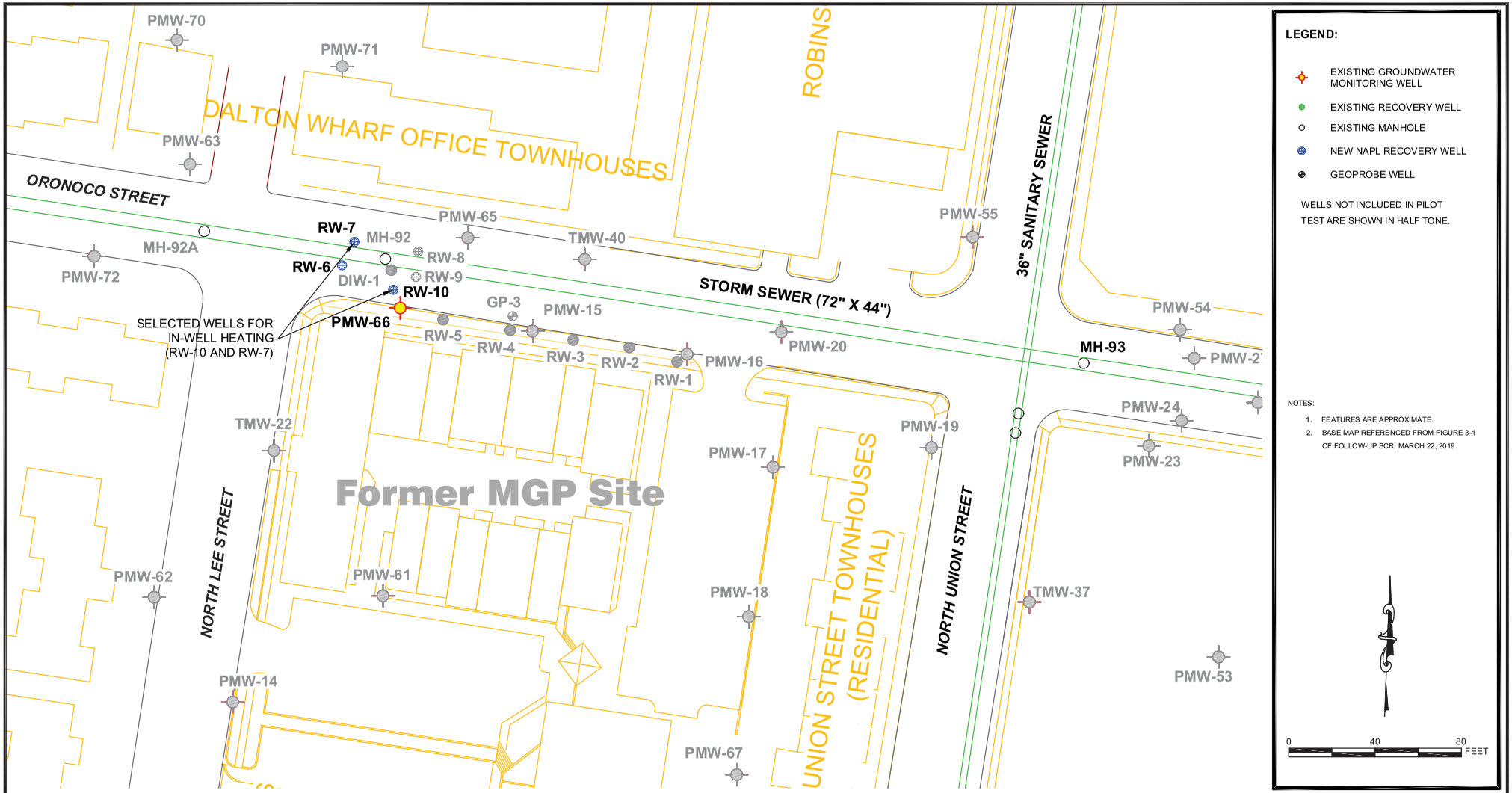
FIGURE NUMBER:
4
SHEET NUMBER:
1 of 1



WELLS INCLUDED IN THE IN-WELL HEATING PILOT TEST

ALEXANDRIA TOWN GAS-ORONOCO
CITY OF ALEXANDRIA, VIRGINIA

SCALE:	DATE:	PROJECT NUMBER:
AS SHOWN	09/18/2023	60611993

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DRAWN BY:				
QH				
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APPROVED BY:				
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FIGURE NUMBER:
5

SHEET NUMBER:
1 of 1

Tables

TABLE 1 - MEASURED DEPTH TO WATER AND PRODUCT (MAY 2021 TO DECEMBER 2023)
ATG-Oronoco, City of Alexandria

Date	RW6 Depth to Water (ft)	RW6 Depth to Product (ft)	RW6 Product Thickness (ft)	RW7 Depth to Water (ft)	RW7 Depth to Product (ft)	RW7 Product Thickness (ft)	RW8 Depth to Water (ft)	RW8 Depth to Product (ft)	RW8 Product Thickness (ft)	RW9 Depth to Water (ft)	RW9 Depth to Product (ft)	RW9 Product Thickness (ft)	RW10 Depth to Water (ft)	RW10 Depth to Product (ft)	RW10 Product Thickness (ft)
5/12/2021	10.27	25.88	1.52	10.88	27.3	0	12	25.9	2.1	11.7	22.05	5.95	13.4	19.29	7.41
5/19/2021	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
5/24/2021	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
6/3/2021	9.84	26.6	0.8	10.2	27.3	0	11.56	23.62	4.38	11.38	19.45	8.55	NM	NM	NM
6/15/2021	9.59	26.6	0.8	9.64	27.3	0	11.18	23.41	4.59	11.08	19.39	8.61	NM	NM	NM
6/19/2021	9.75	26.92	0.48	10.63	27.3	0	11.41	22.69	5.31	11.31	18.86	9.14	14.29	16.18	10.52
6/29/2021	9.98	27.4	0	11.18	27.3	0	11.61	24.8	3.2	11.58	18.15	9.85	10.23	16.95	9.75
7/1/2021	9.8	27.4	0	11.2	27.3	0	11.6	23.4	4.6	11.3	22.2	5.8	10.2	18.6	8.1
7/14/2021	9.67	27.4	0	11.21	27.3	0	11.53	22.79	5.21	11.4	18.49	9.51	10.3	17.6	9.1
7/28/2021	9.69	27.4	0	11.36	23.6	3.7	11.47	21.39	6.61	11.5	19.61	8.39	10.35	16.97	9.73
8/4/2021	9.85	27.4	0	11.32	22.37	4.93	11.59	23.33	4.67	11.67	21.4	6.6	10.76	16.85	9.85
8/10/2021	10.09	27.4	0	11.35	22.8	4.5	11.59	22.48	5.52	11.67	19.24	8.76	10.54	17.48	9.22
8/31/2021	9.48	27.4	0	11.22	21.7	5.6	11.63	20.25	7.75	10.97	17.3	10.7	10.31	17	9.7
9/23/2021	9.15	27.4	0	9.94	18.97	8.33	11.47	17.78	10.22	11.12	17.38	10.62	10.44	16.85	9.85
9/28/2021	9.4	27.4	0	11.18	19.46	7.84	11.52	18.58	9.42	11.18	17.28	10.72	10.04	16.24	10.46
10/11/2021	9.6	27.4	0	11.4	24.7	2.6	11.8	18.3	9.7	11.02	19.06	8.94	10.18	17.5	9.2
10/28/2021	9.53	27.4	0	11.15	19.1	8.2	11.53	17.9	10.1	11.02	18.3	9.7	10.2	17.18	9.52
11/8/2021	9.49	27.4	0	11.24	18.83	8.47	11.91	17.89	10.11	11.65	17.35	10.65	10.39	16.89	9.81
11/29/2021	9.81	27.4	0	11.08	19.46	7.84	12.13	17.95	10.05	11.51	17.6	10.4	10.5	16.96	9.74
12/15/2021	10.12	27.4	0	11.08	19.25	8.05	12.22	17.85	10.15	11.81	17.59	10.41	10.8	17.08	9.62
1/7/2022	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
1/27/2022	10.96	27.4	0	7.8	22.35	4.95	12.2	21.42	6.58	11.97	18.194	9.806	10.95	16.89	9.81
2/11/2022	10.58	27.4	0	6.19	23.92	3.38	11.73	19.8	8.2	11.55	18.35	9.65	10.6	18.95	7.75
2/23/2022	10.83	27.4	0	6.83	23.95	3.35	12.15	20.34	7.66	11.78	19.11	8.89	10.6	18.95	7.75
3/11/2022	11.3	27.4	0	7.81	24.49	2.81	11.83	18.95	9.05	10.1	18.1	9.9	10.74	20.05	6.65
3/25/2022	10.93	25.35	2.05	8.07	24.92	2.38	11.57	19.87	8.13	11.44	19.66	8.34	NM	NM	NM
4/8/2022	11.05	24.79	2.61	7.81	27.3	0	11.44	20.45	7.55	11.24	20.78	7.22	10.21	19.06	7.64
5/5/2022	11.11	24.95	2.45	9.75	27.3	0	11.69	20.35	7.65	11.55	20.45	7.55	10.64	18	8.7
5/23/2022	11.1	25.15	2.25	9.65	27.3	0	11.6	22.25	5.75	11.58	20.55	7.45	10.74	18.34	8.36
6/9/2022	10.85	NM	NM	9.91	NM	NM	11.9	23.3	4.7	11.38	20.7	7.3	10.63	18.12	8.58
7/18/2022	10.68	23.41	3.99	9.92	27.3	0	11.37	21.52	6.48	11.24	21.21	6.79	10.46	18.35	8.35
8/4/2022	11	23.25	4.15	10.55	27.3	0	11.65	21.87	6.13	11.53	21.4	6.6	10.85	17.6	9.1
8/19/2022	10.9	22.18	5.22	10.66	27.3	0	11.98	22.57	5.43	11.5	20.35	7.65	10.82	18.4	8.3
9/2/2022	11	21.9	5.5	10.64	27.3	0	11.69	23.51	4.49	11.53	20.3	7.7	11.88	18.6	8.1
9/15/2022	NM	NM	NM	10.64	27.3	0	11.62	23.2	4.8	11.49	20.2	7.8	10.85	18.8	7.9
10/7/2022	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
10/24/2022	10.71	22.34	5.06	9.68	27.3	0	11.9	22.24	5.76	11.74	19.53	8.47	11.12	16.85	9.85
11/9/2022	11.02	23.69	3.71	10.2	27.3	0	12	23	5	11.92	20.45	7.55	11.19	16.9	9.8
11/18/2022	10.75	23.45	3.95	9.7	27.3	0	11.96	23.97	4.03	11.64	22.99	5.01	10.89	17.93	8.77
12/7/2022	10.6	23.49	3.91	9.24	27.3	NP	11.83	22.25	5.75	11.65	20.86	7.14	10.95	16.94	9.76
12/19/2022	10.69	23.67	3.73	9.28	27.3	NP	11.56	24.8	3.2	11.45	20.52	7.48	10.73	17.63	9.07
1/11/2023	10.35	21.64	5.76	8.24	27.3	NP	11.79	21.38	6.62	11.65	19.62	8.38	10.7	16.85	9.85
1/30/2023	9.81	22.08	5.32	7.49	27.3	NP	11.57	21.79	6.21	11.37	19.21	8.79	10.34	17.24	9.46
2/14/2023	10.01	22.07	5.33	7.49	NP	NP	11.66	23.05	4.95	10.37	18.72	9.28	11.43	20.35	6.35
2/27/2023	10.26	22.09	5.31	8.19	NP	NP	11.54	23.69	4.31	11.37	21.99	6.01	10.32	19.78	6.92
3/13/2023	10.29	21.96	5.44	8.45	NP	NP	11.59	23.37	4.63	11.33	22.61	5.39	10.43	20.4	6.3
3/27/2023	10.55	21.97	5.43	8.91	NP	NP	11.58	23.48	4.52	11.43	22.78	5.22	10.5	20.64	6.06
4/10/2023	11.09	21.92	5.48	9.92	NP	NP	11.79	23.72	4.28	11.65	22.59	5.41	10.88	20.62	6.08
4/24/2023	11.1	22.21	5.19	10.2	NP	NP	10.98	25.5	2.5	11.57	24.2	3.8	10.87	20.76	5.94
7/13/2023	12.89	21.97	5.43	10.78	NP	NP	11.93	26.79	1.21	11.91	NP	NP	11.28	NP	NP
7/26/2023	13.01	23.833	3.567	11.36	NP	NP	13.76	NP	NP	11.89	NP	NP	11.29	NP	NP
8/7/2023	12.69	21.79	5.61	10.58	NP	NP	11.85	26.45	1.55	11.9	NP	NP	11.23	NP	NP
8/21/2023	13.41	25.2	2.2	11.52	NP	NP	11.95	NP	NP	11.97	NP	NP	11.51	NP	NP
9/5/2023	13.39	22.5	4.9	11.74	NP	NP	12.37	NP	NP	12.41	NP	NP	11.88	NP	NP
9/20/2023	13.65	23.3	4.1	11.77	NP	NP	12.44	26.42	1.58	12.52	NP	NP	12.03	NP	NP
10/9/2023	13.44	24.8	2.6	11.75	NP	NP	12.53	NP	NP	12.77	NP	NP	12.09	NP	NP
11/13/2023	13.64	24.3	3.1	11.49	NP	NP	12.78	NP	NP	12.86	NP	NP	12.51	NP	NP
11/27/2023	13.59	26.05	1.35	11.65	NP	NP	12.62	NP	NP	12.81	NP	NP	12.39	NP	NP
12/13/2023	13.59	26.05	1.35	11.12	NP	NP	12.39	NP	NP	12.4	NP	NP	12.04	NP	NP

NM - Not Measured
NP - No Product
Data provided by Cardno

TABLE 2 - PRODUCT RECOVERY VOLUMES (MAY 2021 TO DECEMBER 2023)
ATG-Oronoco, City of Alexandria

Date	Product recovered from RW-6 (gallons)	Product recovered from RW-7 (gallons)	Product recovered from RW-8 (gallons)	Product recovered from RW-9 (gallons)	Product recovered from RW-10 (gallons)	Product Recovered By Event (gallons)
5/10/2021	0.25	0	0.75	1	1	3
5/12/2021	0.25	0	0.75	1	1	3
5/19/2021	0.25	0	1.25	1.5	0	3
5/24/2021	0.25	0	0.75	0.25	0.75	2
6/3/2021	0.5	0	1	1	0	2.5
6/15/2021	3	0	2	3	3	11
6/19/2021	3	0	3	3	3	12
6/29/2021	0	0	0.5	0.5	0.5	1.5
7/1/2021	0.5	0	3	3	3	9.5
7/14/2021	0	0	3	3	4	10
7/28/2021	0	2	3.5	2	5	12.5
8/4/2021	0	2	1.5	0	8	11.5
8/10/2021	0	1.5	2	0	2	5.5
8/31/2021	0	1	2	0	0	3
9/23/2021	0	2	3	2.5	2	9.5
9/28/2021	0	1.5	2.5	1.5	1	6.5
10/11/2021	0	3	0	4	4	11
10/28/2021	0	0	5	5	5	15
11/8/2021	0	2	3	3	3	11
11/29/2021	0	2	4	4	0	10
12/15/2021	0	1	9	5	5	20
1/7/2022	0	1	3	3	3	10
1/27/2022	0	2	3	3	3	11
2/11/2022	0	1	3	3	3	10
2/23/2022	0	2	3	3	3	11
3/11/2022	0	0.5	3	3	3	9.5
3/25/2022	0	2	4	4	0	10
4/8/2022	2	0	5	3.5	0	10.5
5/5/2022	1	0	4	3	4	12
5/23/2022	1	0	3	3	3	10
6/9/2022	0	0	4	3	4	11
7/18/2022	0	0	4	3	3	10
8/4/2022	0	0	3	1.5	4	8.5
8/19/2022	0	0	3	4	3	10
9/2/2022	3	0	3	0	5	11
9/15/2022	0	0	2.5	3	3.5	9
10/7/2022	0	0	3	3	4	10
10/24/2022	2	0	3.5	3.5	4	13
11/9/2022	0	0	4	4	5	13
11/18/2022	2.5	0	2.5	2.5	3.5	11
12/7/2022	2	0	3.5	2.5	5	13
12/19/2022	2	0	3.5	4	3	12.5
1/11/2023	1.5	0	4	3	5	13.5
1/30/2023	0	0	4	4	6	14
2/14/2023	3	0	3	5	6	17
2/27/2023	1.25	0	2.25	3	4.5	11
3/13/2023	2.5	0	2.5	2.5	3.5	11
3/27/2023	2	0	3	2	2	9
4/10/2023	1.5	0	2	2.5	2.5	8.5
4/24/2023	2.5	0	1	1.5	2.5	7.5
5/15/2023	1.5	0	3	1	1.5	7
5/31/2023	0	0	2	2	2.25	6.25
6/12/2023	1	0	1	1	1.5	4.5
6/29/2023	0.5	0	1	0.5	1	3
7/13/2023	0	0	0.5	0	0	0.5
7/26/2023	2	0	0	0	0	2
8/7/2023	2	0	0.25	0	0	2.25
8/21/2023	0.2	0	0	0	0	0.2
9/5/2023	2.5	0	0	0	0	2.5
9/20/2023	2	0	0	0	0	2
10/9/2023	1.5	0	0	0	0	1.5
11/13/2023	2	0	0	0	0	2
11/27/2023	0.5	0	0	0	0	0.5
12/13/2023	1	0	0	0	0	1
Totals	**54.45**	**26.5**	**151.5**	**134.75**	**158.5**	**525.7**
Average per Month (32 months)	**1.70**	**0.83**	**4.73**	**4.21**	**4.95**	**16.43**

TABLE 3 - HEATING TEST MANUAL READINGS
ATG-Oronoco, City of Alexandria

Time	Date	RW-10 Temp (°F)	RW-10 PID (ppm)	PMW-66 Temp (°F)	PMW-66 PID (ppm)	Circulating Water Temp (°F)
1315	10/3/2023	99.50	--	72.90	--	104.90
1400	10/3/2023	98.80	--	74.10	--	102.70
1500	10/3/2023	100.80	23.00	74.50	10.20	104.90
1600	10/3/2023	90.10	21.00	72.40	10.20	104.40
1700	10/3/2023	95.20	32.10	69.80	13.30	103.80
1800	10/3/2023	82.80	25.00	72.70	13.40	104.00
1900	10/3/2023	100.60	--	71.40	--	104.40
830	10/4/2023	72.70	--	68.90	--	73.20
900	10/4/2023	82.00	116.00	68.90	8.20	87.60
1000	10/4/2023	84.70	--	--	--	102.90
1100	10/4/2023	74.30	64.80	68.50	7.50	104.40
1200	10/4/2023	90.70	32.10	70.10	7.50	106.20
1300	10/4/2023	94.70	220.00	68.90	8.40	104.50
1400	10/4/2023	100.60	51.30	70.00	9.00	104.90
1500	10/4/2023	101.70	54.70	71.40	12.70	105.10
1600	10/4/2023	93.90	49.60	73.20	9.70	105.80
1700	10/4/2023	92.80	61.20	68.90	8.10	105.30
1800	10/4/2023	99.30	79.20	68.70	12.10	105.80
1900	10/4/2023	97.90	59.60	69.40	12.90	105.60
2000	10/4/2023	93.60	121.60	68.50	14.20	106.70
2100	10/4/2023	98.20	54.30	65.30	9.80	104.70

TABLE 4 - RW-10 IN-WELL DATALOGGER TEMPERATURE READINGS
ATG-Oronoco, City of Alexandria

Date	Time	Temp (°F)
10/3/2023	10:30:00 AM	65.601
10/3/2023	10:40:00 AM	65.067
10/3/2023	10:50:00 AM	64.949
10/3/2023	11:00:00 AM	64.891
10/3/2023	11:10:00 AM	64.83
10/3/2023	11:20:00 AM	64.78
10/3/2023	11:30:00 AM	64.742
10/3/2023	11:40:00 AM	64.708
10/3/2023	11:50:00 AM	64.675
10/3/2023	12:00:00 PM	64.642
10/3/2023	12:10:00 PM	64.609
10/3/2023	12:20:00 PM	64.594
10/3/2023	12:30:00 PM	64.574
10/3/2023	12:40:00 PM	64.558
10/3/2023	12:50:00 PM	64.541
10/3/2023	1:00:00 PM	64.527
10/3/2023	1:10:00 PM	64.516
10/3/2023	1:20:00 PM	64.498
10/3/2023	1:30:00 PM	64.52
10/3/2023	1:40:00 PM	64.533
10/3/2023	1:50:00 PM	64.522
10/3/2023	2:00:00 PM	64.504
10/3/2023	2:10:00 PM	64.747
10/3/2023	2:20:00 PM	64.741
10/3/2023	2:30:00 PM	64.731
10/3/2023	2:40:00 PM	64.73
10/3/2023	2:50:00 PM	64.723
10/3/2023	3:00:00 PM	64.727
10/3/2023	3:10:00 PM	64.772
10/3/2023	3:20:00 PM	64.762
10/3/2023	3:30:00 PM	64.755
10/3/2023	3:40:00 PM	64.751
10/3/2023	3:50:00 PM	64.751
10/3/2023	4:00:00 PM	64.745
10/3/2023	4:10:00 PM	64.768
10/3/2023	4:20:00 PM	64.786
10/3/2023	4:30:00 PM	64.781
10/3/2023	4:40:00 PM	64.778
10/3/2023	4:50:00 PM	64.768
10/3/2023	5:00:00 PM	64.763
10/3/2023	5:10:00 PM	64.756
10/3/2023	5:20:00 PM	64.75
10/3/2023	5:30:00 PM	64.749
10/3/2023	5:40:00 PM	64.749
10/3/2023	5:50:00 PM	64.742
10/3/2023	6:00:00 PM	64.744

TABLE 4 - RW-10 IN-WELL DATALOGGER TEMPERATURE READINGS
ATG-Oronoco, City of Alexandria

Date	Time	Temp (°F)
10/3/2023	6:10:00 PM	64.754
10/3/2023	6:20:00 PM	64.756
10/3/2023	6:30:00 PM	64.749
10/3/2023	6:40:00 PM	64.747
10/3/2023	6:50:00 PM	64.746
10/3/2023	7:00:00 PM	64.742
10/3/2023	7:10:00 PM	64.737
10/3/2023	7:20:00 PM	64.958
10/3/2023	7:30:00 PM	64.551
10/3/2023	7:40:00 PM	64.466
10/3/2023	7:50:00 PM	64.43
10/3/2023	8:00:00 PM	64.411
10/3/2023	8:10:00 PM	64.398
10/3/2023	8:20:00 PM	64.387
10/3/2023	8:30:00 PM	64.379
10/3/2023	8:40:00 PM	64.373
10/3/2023	8:50:00 PM	64.366
10/3/2023	9:00:00 PM	64.361
10/3/2023	9:10:00 PM	64.356
10/3/2023	9:20:00 PM	64.351
10/3/2023	9:30:00 PM	64.349
10/3/2023	9:40:00 PM	64.342
10/3/2023	9:50:00 PM	64.337
10/3/2023	10:00:00 PM	64.333
10/3/2023	10:10:00 PM	64.332
10/3/2023	10:20:00 PM	64.329
10/3/2023	10:30:00 PM	64.324
10/3/2023	10:40:00 PM	64.324
10/3/2023	10:50:00 PM	64.319
10/3/2023	11:00:00 PM	64.318
10/3/2023	11:10:00 PM	64.313
10/3/2023	11:20:00 PM	64.311
10/3/2023	11:30:00 PM	64.311
10/3/2023	11:40:00 PM	64.311
10/3/2023	11:50:00 PM	64.307
10/4/2023	12:00:00 AM	64.303
10/4/2023	12:10:00 AM	64.302
10/4/2023	12:20:00 AM	64.306
10/4/2023	12:30:00 AM	64.301
10/4/2023	12:40:00 AM	64.3
10/4/2023	12:50:00 AM	64.298
10/4/2023	1:00:00 AM	64.299
10/4/2023	1:10:00 AM	64.295
10/4/2023	1:20:00 AM	64.291
10/4/2023	1:30:00 AM	64.293
10/4/2023	1:40:00 AM	64.292

TABLE 4 - RW-10 IN-WELL DATALOGGER TEMPERATURE READINGS
ATG-Oronoco, City of Alexandria

Date	Time	Temp (°F)
10/4/2023	1:50:00 AM	64.289
10/4/2023	2:00:00 AM	64.291
10/4/2023	2:10:00 AM	64.29
10/4/2023	2:20:00 AM	64.289
10/4/2023	2:30:00 AM	64.285
10/4/2023	2:40:00 AM	64.289
10/4/2023	2:50:00 AM	64.287
10/4/2023	3:00:00 AM	64.287
10/4/2023	3:10:00 AM	64.284
10/4/2023	3:20:00 AM	64.284
10/4/2023	3:30:00 AM	64.288
10/4/2023	3:40:00 AM	64.285
10/4/2023	3:50:00 AM	64.286
10/4/2023	4:00:00 AM	64.287
10/4/2023	4:10:00 AM	64.286
10/4/2023	4:20:00 AM	64.283
10/4/2023	4:30:00 AM	64.284
10/4/2023	4:40:00 AM	64.281
10/4/2023	4:50:00 AM	64.282
10/4/2023	5:00:00 AM	64.283
10/4/2023	5:10:00 AM	64.279
10/4/2023	5:20:00 AM	64.279
10/4/2023	5:30:00 AM	64.279
10/4/2023	5:40:00 AM	64.285
10/4/2023	5:50:00 AM	64.279
10/4/2023	6:00:00 AM	64.282
10/4/2023	6:10:00 AM	64.28
10/4/2023	6:20:00 AM	64.282
10/4/2023	6:30:00 AM	64.283
10/4/2023	6:40:00 AM	64.282
10/4/2023	6:50:00 AM	64.284
10/4/2023	7:00:00 AM	64.278
10/4/2023	7:10:00 AM	69.31
10/4/2023	7:20:00 AM	73.637
10/4/2023	8:20:00 AM	65.43
10/4/2023	8:30:00 AM	64.727
10/4/2023	8:40:00 AM	64.517
10/4/2023	8:50:00 AM	64.413
10/4/2023	9:00:00 AM	64.354
10/4/2023	9:10:00 AM	83.655
10/4/2023	9:20:00 AM	90.03
10/4/2023	9:30:00 AM	94.325
10/4/2023	9:40:00 AM	96.839
10/4/2023	9:50:00 AM	98.746
10/4/2023	10:00:00 AM	99.179
10/4/2023	10:10:00 AM	96.703

TABLE 4 - RW-10 IN-WELL DATALOGGER TEMPERATURE READINGS
ATG-Oronoco, City of Alexandria

Date	Time	Temp (°F)
10/4/2023	10:20:00 AM	93.941
10/4/2023	10:30:00 AM	92.511
10/4/2023	10:40:00 AM	96.411
10/4/2023	10:50:00 AM	98.775
10/4/2023	11:00:00 AM	100.334
10/4/2023	11:10:00 AM	101.393
10/4/2023	11:20:00 AM	101.823
10/4/2023	11:30:00 AM	102.167
10/4/2023	11:40:00 AM	102.131
10/4/2023	11:50:00 AM	102.327
10/4/2023	12:00:00 PM	101.884
10/4/2023	12:10:00 PM	101.763
10/4/2023	12:20:00 PM	101.359
10/4/2023	12:30:00 PM	101.328
10/4/2023	12:40:00 PM	101.745
10/4/2023	12:50:00 PM	101.54
10/4/2023	1:00:00 PM	101.931
10/4/2023	1:10:00 PM	101.642
10/4/2023	1:20:00 PM	101.615
10/4/2023	1:30:00 PM	101.877
10/4/2023	1:40:00 PM	101.591
10/4/2023	1:50:00 PM	101.721
10/4/2023	2:00:00 PM	101.99
10/4/2023	2:10:00 PM	101.566
10/4/2023	2:20:00 PM	101.831
10/4/2023	2:30:00 PM	101.737
10/4/2023	2:40:00 PM	101.983
10/4/2023	2:50:00 PM	101.734
10/4/2023	3:00:00 PM	101.602
10/4/2023	3:10:00 PM	101.658
10/4/2023	3:20:00 PM	101.6
10/4/2023	3:30:00 PM	101.861
10/4/2023	3:40:00 PM	101.716
10/4/2023	3:50:00 PM	102.373
10/4/2023	4:00:00 PM	102.376
10/4/2023	4:10:00 PM	101.798
10/4/2023	4:20:00 PM	102.029
10/4/2023	4:30:00 PM	101.952
10/4/2023	4:40:00 PM	102.146
10/4/2023	4:50:00 PM	101.945
10/4/2023	5:00:00 PM	101.713
10/4/2023	5:10:00 PM	102.218
10/4/2023	5:20:00 PM	102.087
10/4/2023	5:30:00 PM	102.501
10/4/2023	5:40:00 PM	102.543
10/4/2023	5:50:00 PM	102.247

TABLE 4 - RW-10 IN-WELL DATALOGGER TEMPERATURE READINGS
ATG-Oronoco, City of Alexandria

Date	Time	Temp (°F)
10/4/2023	6:00:00 PM	102.611
10/4/2023	6:10:00 PM	102.194
10/4/2023	6:20:00 PM	102.409
10/4/2023	6:30:00 PM	102.289
10/4/2023	6:40:00 PM	102.374
10/4/2023	6:50:00 PM	102.351
10/4/2023	7:00:00 PM	102.422
10/4/2023	7:10:00 PM	102.318
10/4/2023	7:20:00 PM	102.269
10/4/2023	7:30:00 PM	102.304
10/4/2023	7:40:00 PM	102.305
10/4/2023	7:50:00 PM	102.633
10/4/2023	8:00:00 PM	103.057
10/4/2023	8:10:00 PM	102.914
10/4/2023	8:20:00 PM	102.67
10/4/2023	8:30:00 PM	102.836
10/4/2023	8:40:00 PM	102.931
10/4/2023	8:50:00 PM	102.934
10/4/2023	9:00:00 PM	102.904
10/4/2023	9:10:00 PM	102.519
10/4/2023	9:20:00 PM	100.138
10/4/2023	9:30:00 PM	81.106
10/4/2023	9:40:00 PM	72.357
10/4/2023	9:50:00 PM	91.624
10/4/2023	10:00:00 PM	90.986
10/4/2023	10:10:00 PM	89.776
10/4/2023	10:20:00 PM	88.697
10/4/2023	10:30:00 PM	87.74
10/4/2023	10:40:00 PM	86.896
10/4/2023	10:50:00 PM	86.122
10/4/2023	11:00:00 PM	85.426
10/4/2023	11:10:00 PM	84.795
10/4/2023	11:20:00 PM	84.223
10/4/2023	11:30:00 PM	83.694
10/4/2023	11:40:00 PM	83.206
10/4/2023	11:50:00 PM	82.759
10/5/2023	12:00:00 AM	82.346
10/5/2023	12:10:00 AM	81.955
10/5/2023	12:20:00 AM	81.596
10/5/2023	12:30:00 AM	81.256
10/5/2023	12:40:00 AM	80.939
10/5/2023	12:50:00 AM	80.646
10/5/2023	1:00:00 AM	80.363
10/5/2023	1:10:00 AM	80.095
10/5/2023	1:20:00 AM	79.843
10/5/2023	1:30:00 AM	79.606

TABLE 4 - RW-10 IN-WELL DATALOGGER TEMPERATURE READINGS
ATG-Oronoco, City of Alexandria

Date	Time	Temp (°F)
10/5/2023	1:40:00 AM	79.374
10/5/2023	1:50:00 AM	79.159
10/5/2023	2:00:00 AM	78.952
10/5/2023	2:10:00 AM	78.759
10/5/2023	2:20:00 AM	78.567
10/5/2023	2:30:00 AM	78.393
10/5/2023	2:40:00 AM	78.218
10/5/2023	2:50:00 AM	78.054
10/5/2023	3:00:00 AM	77.896
10/5/2023	3:10:00 AM	77.742
10/5/2023	3:20:00 AM	77.592
10/5/2023	3:30:00 AM	77.449
10/5/2023	3:40:00 AM	77.315
10/5/2023	3:50:00 AM	77.18
10/5/2023	4:00:00 AM	77.053
10/5/2023	4:10:00 AM	76.928
10/5/2023	4:20:00 AM	76.807
10/5/2023	4:30:00 AM	76.692
10/5/2023	4:40:00 AM	76.576
10/5/2023	4:50:00 AM	76.466
10/5/2023	5:00:00 AM	76.357
10/5/2023	5:10:00 AM	76.253
10/5/2023	5:20:00 AM	76.149
10/5/2023	5:30:00 AM	76.048
10/5/2023	5:40:00 AM	75.95
10/5/2023	5:50:00 AM	75.857
10/5/2023	6:00:00 AM	75.766
10/5/2023	6:10:00 AM	75.674
10/5/2023	6:20:00 AM	75.589
10/5/2023	6:30:00 AM	75.501
10/5/2023	6:40:00 AM	75.418
10/5/2023	6:50:00 AM	75.337
10/5/2023	7:00:00 AM	75.256
10/5/2023	7:10:00 AM	75.18
10/5/2023	7:20:00 AM	75.102
10/5/2023	7:30:00 AM	75.03
10/5/2023	7:40:00 AM	74.956
10/5/2023	7:50:00 AM	74.884
10/5/2023	8:00:00 AM	74.814
10/5/2023	8:10:00 AM	74.749
10/5/2023	8:20:00 AM	74.639
10/5/2023	8:30:00 AM	74.044
10/5/2023	8:40:00 AM	68.632
10/5/2023	8:50:00 AM	67.532
10/5/2023	9:00:00 AM	67.493
10/5/2023	9:10:00 AM	67.431

TABLE 4 - RW-10 IN-WELL DATALOGGER TEMPERATURE READINGS
ATG-Oronoco, City of Alexandria

Date	Time	Temp (°F)
10/5/2023	9:20:00 AM	66.878
10/5/2023	9:30:00 AM	66.757
10/5/2023	9:40:00 AM	67.682
10/5/2023	9:50:00 AM	69.004
10/5/2023	10:00:00 AM	70.531

Notes

Yellow highlighting indicates:

9:00 - Data logger moved within well.

10:00 - Heating stopped, generator out of fuel

10:30 - Heating re-started

Datalogger type: Solinst 3001 Levelogger

Appendix A

Selected Figures from the Follow-Up Site Characterization Report, Alexandria Town Gas – Oronoco Outfall Site – Upland Areas (Cardno, 2019a)

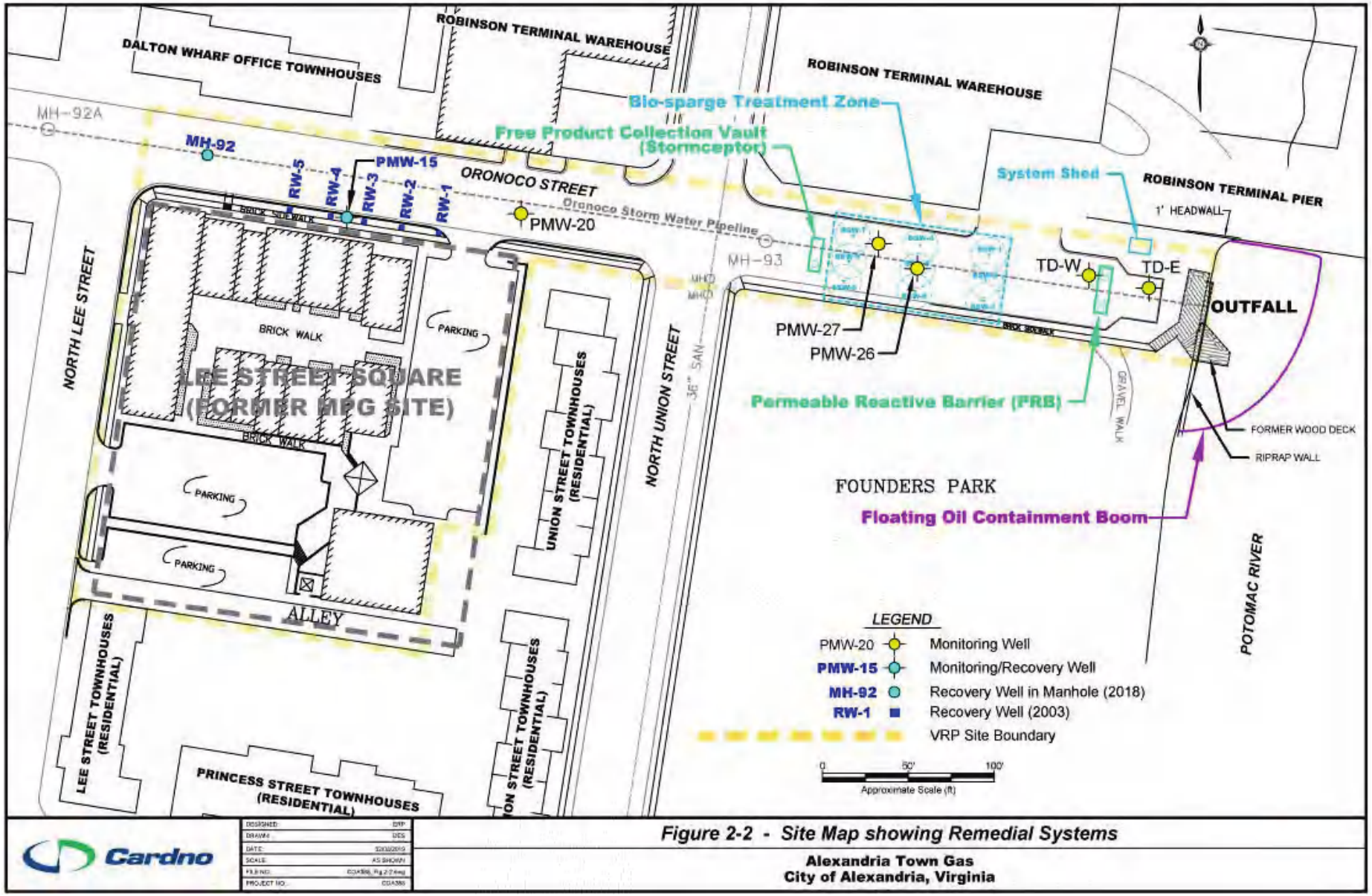
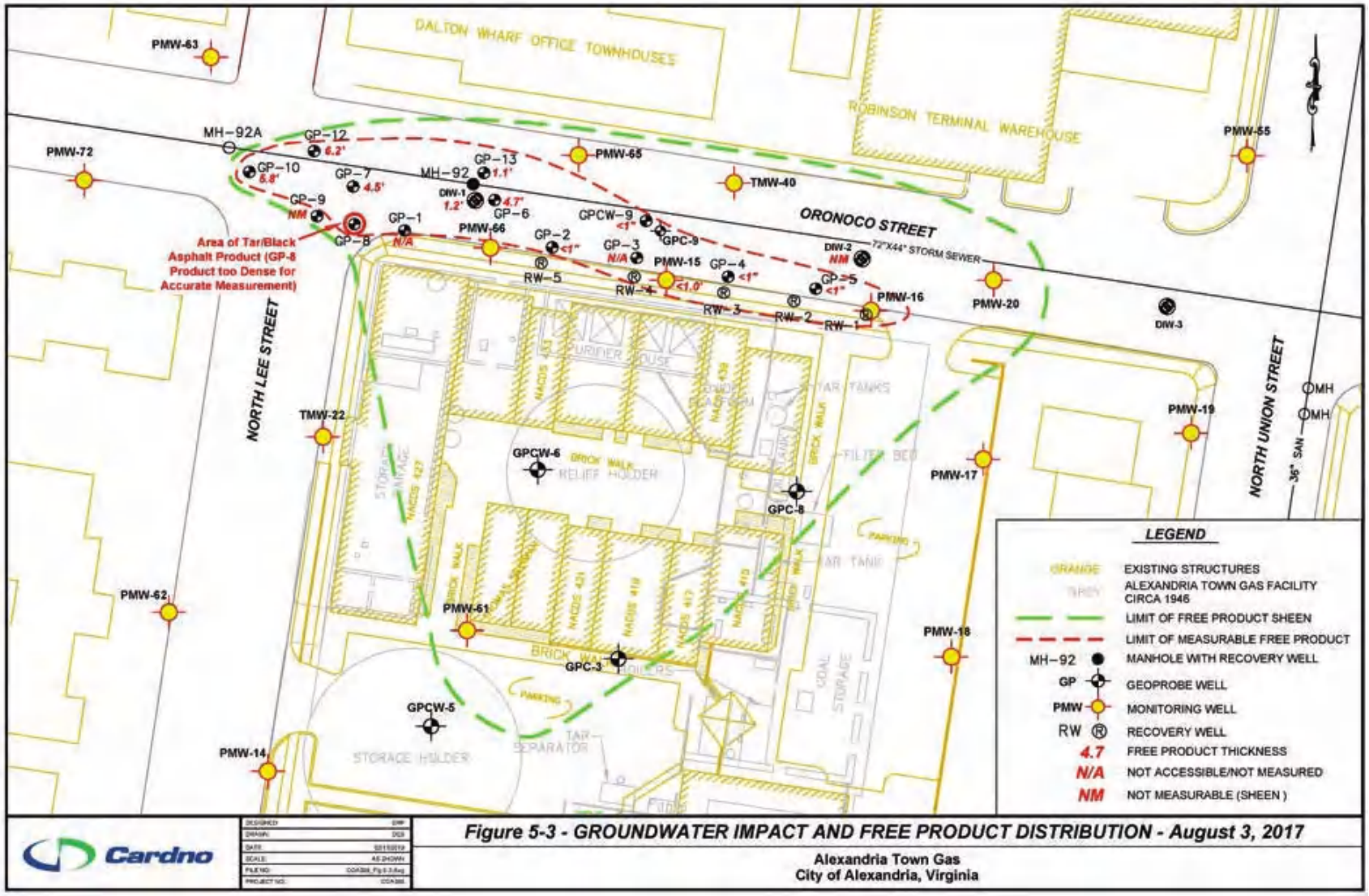


Figure 2-2 - Site Map showing Remedial Systems

Alexandria Town Gas
City of Alexandria, Virginia


DALTON WHARF OFFICE TOWNHOUSES
ROBINSON TERMINAL WAREHOUSE
ORONOCO STREET
NORTH LEE STREET
NORTH UNION STREET
PMW-63
PMW-72
PMW-65
TMW-40
PMW-55
MH-92A
GP-12 6.2'
GP-10 5.8'
GP-7 4.5'
MH-92
GP-13 1.1'
DW-1 1.2'
4.7'
GP-9 NM
GP-6
GP-1 N/A
GP-8
PMW-66
GP-2 <1"
GPCW-9 <1"
GPC-9
GP-3 N/A
PMW-15
GP-4 <1"
GP-5 <1"
DW-2 NM
72"X44" STORM SEWER
RW-5
RW-4 <1.0'
RW-3
RW-2
RW-1
PMW-16
PMW-20
DW-3
Area of Tar/Black Asphalt Product (GP-8 Product too Dense for Accurate Measurement)
TMW-22
GPCW-6
GPC-8
PMW-19
PMW-17
PMW-62
PMW-61
GPC-3
PMW-18
GPCW-5
PMW-14
STORAGE HOLDER
TAR SEPARATOR
COAL STORAGE
PURIFIER HOUSE
TAR TANKS
FILTER BED
RELIEF HOLDER
BRICK WALK
PARKING
MH
MH
36" SAN
LEGEND
EXISTING STRUCTURES
ALEXANDRIA TOWN GAS FACILITY CIRCA 1946
LIMIT OF FREE PRODUCT SHEEN
LIMIT OF MEASURABLE FREE PRODUCT
MH-92 MANHOLE WITH RECOVERY WELL
GP GEOPROBE WELL
PMW MONITORING WELL
RW RECOVERY WELL
4.7 FREE PRODUCT THICKNESS
N/A NOT ACCESSIBLE/NOT MEASURED
NM NOT MEASURABLE (SHEEN)
Cardno
Figure 5-3 - GROUNDWATER IMPACT AND FREE PRODUCT DISTRIBUTION - August 3, 2017
Alexandria Town Gas
City of Alexandria, Virginia

Appendix B

2021 TarGOST Survey Selected Figures (Cardno, 2021)

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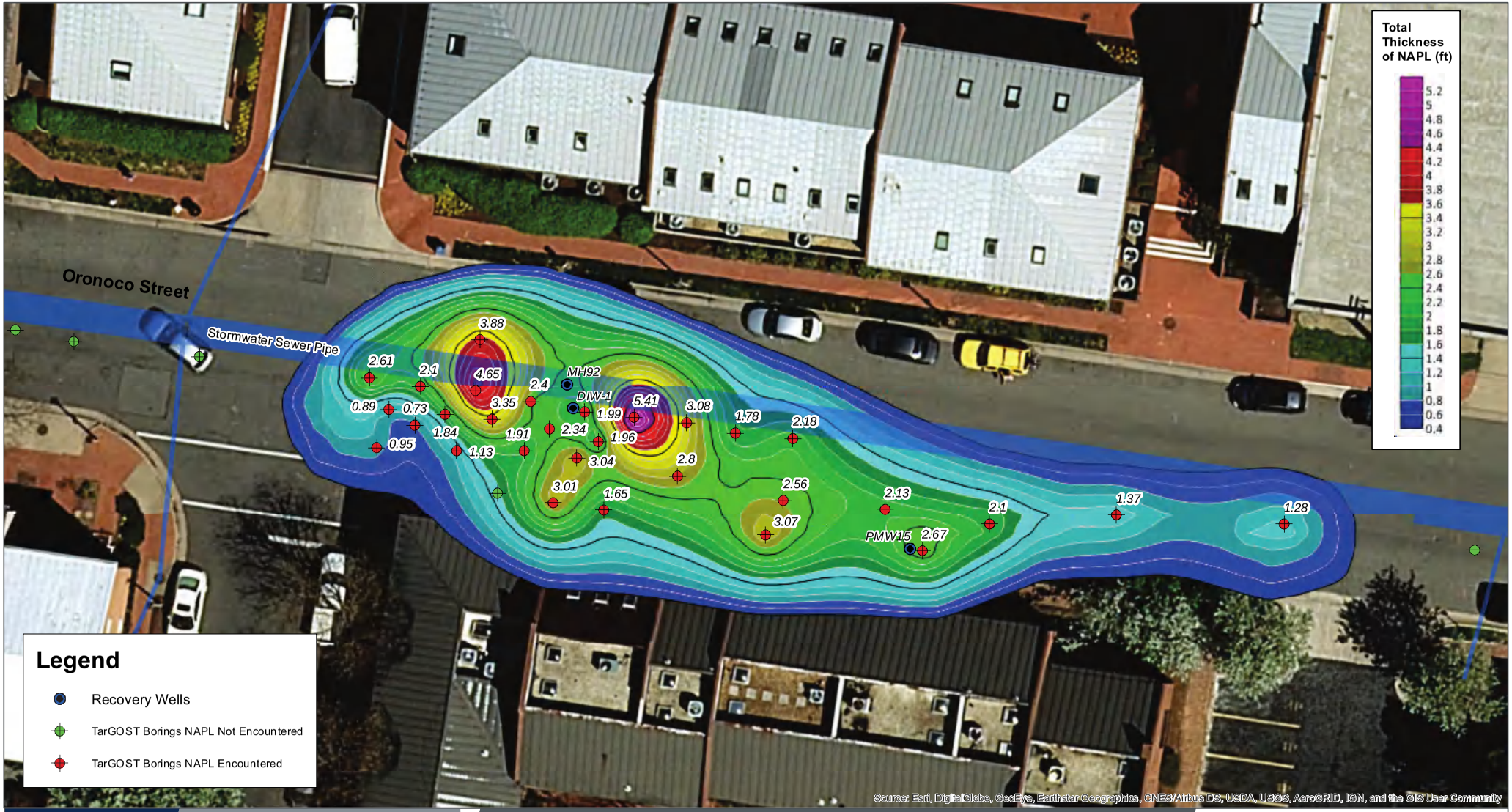
0 18 36 Feet
0 5 10 Meters

ATG-Oronoco
TarGOST Survey
Figure 1 - Boring Locations

City of Alexandria, Virginia

Cardno
10988 Richardson Road, Ashland, VA 23005 USA
Phone (+1) 804-798-6525
www.cardno.com

Date Created: 3/16/2021 Date Revised: 3/18/2021 File Path: C:\Users\john.voorhees\Documents\GIS\COA\Oronoco\TarGOST Boring Locations.mxd
GIS Analyst: john.voorhees



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0 18 36 Feet
0 5 10 Meters

ATG-Oronoco
TarGOST Survey
Figure 2 - NAPL Isopach (feet)

City of Alexandria, Virginia

Cardno
10988 Richardson Road, Ashland, VA 23005 USA
Phone (+1) 804-798-6525
www.cardno.com

Date Created: 3/18/2021 Date Revised: 3/18/2021 File Path: C:\Users\john.voorhees\Documents\GIS\COA\OronocoTarGOSTIsopach.mxd
GIS Analyst: john.voorhees

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0 18 36 Feet
0 5 10 Meters

ATG-Oronoco
TarGOST Survey
Figure 3 - Top of NAPL Surface

City of Alexandria, Virginia

Cardno
10988 Richardson Road, Ashland, VA 23005 USA
Phone (+1) 804-798-6525
www.cardno.com

Date Created: 3/18/2021 Date Revised: 3/18/2021 File Path: C:\Users\john.voorhees\Documents\GIS\COA\Oronoco\TarGOST Top of NAPL.mxd
GIS Analyst: john.voorhees

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0 12 24 Feet

0 5 10 Meters

ATG-Oronoco
TarGOST Survey
Figure 4 - Peak TarGOST NAPL Signal

City of Alexandria, Virginia

Cardno

10988 Richardson Road, Ashland, VA 23005 USA
Phone (+1) 804-798-6525
www.cardno.com

Date Created: 3/18/2021 Date Revised: 3/18/2021 File Path: C:\Users\john.voorhees\Documents\GIS\COA\Oronoco\TarGOST Peak Signal.mxd
GIS Analyst: john.voorhees

This map and all data contained within are supplied as is with no warranty. Cardno Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

0 18 36 Feet
0 5 10 Meters

ATG-Oronoco
TarGOST Survey
Figure 5 - New Recovery Well Locations

City of Alexandria, Virginia

Cardno
10988 Richardson Road, Ashland, VA 23005 USA
Phone (+1) 804-798-6525
www.cardno.com

Date Created: 6/24/2021 Date Revised: 6/24/2021 File Path: C:\Users\john.voorhees\OneDrive - Cardno USA Inc\Documents\GIS\COA\Oronoco\New Recovery Well Locations.mxd
GIS Analyst: john.voorhees

Appendix C
NAPL Recovery Results

Figure C-1
ATG-Oronoco

Figure provided by Cardno,November 2022

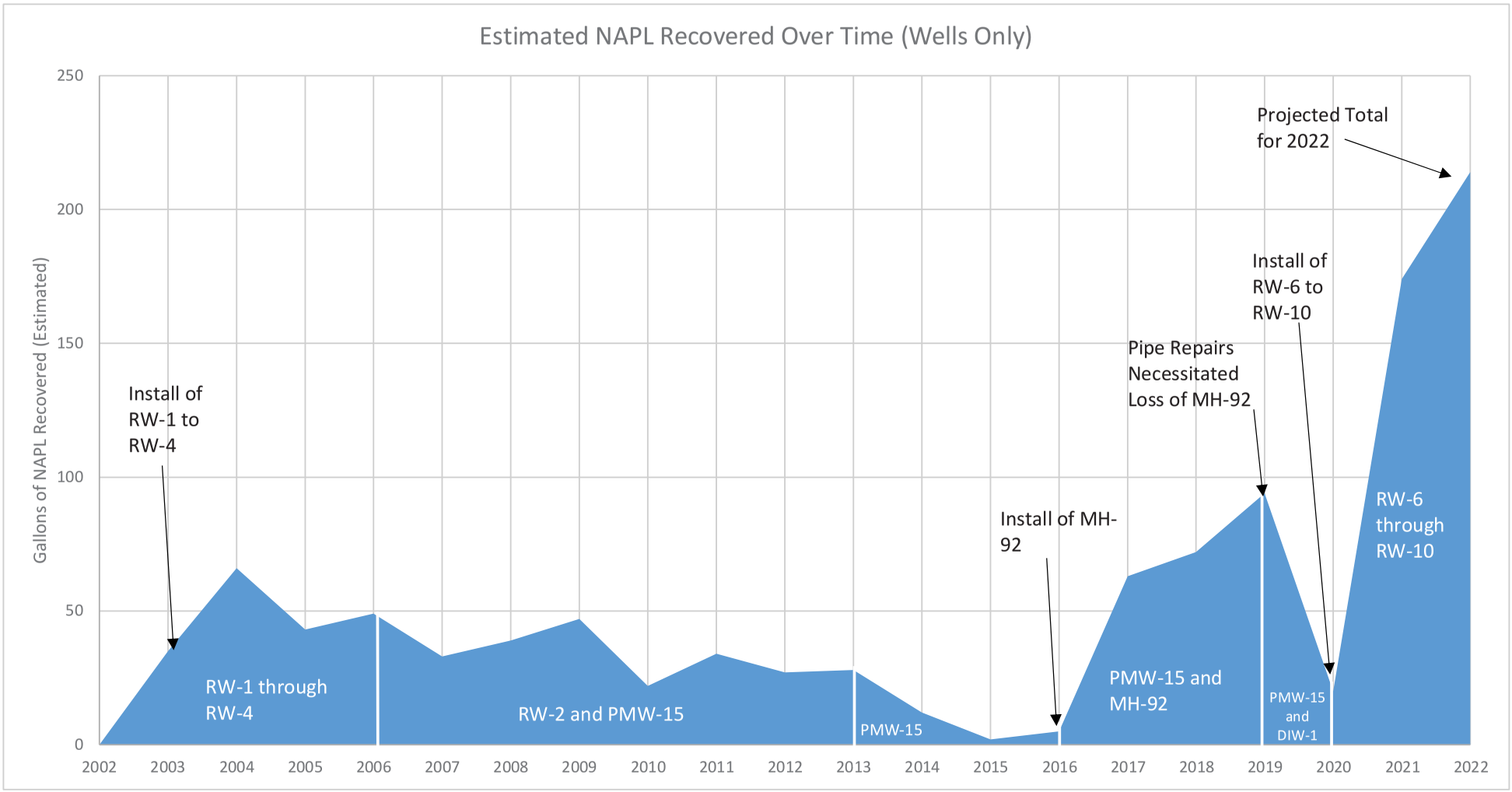
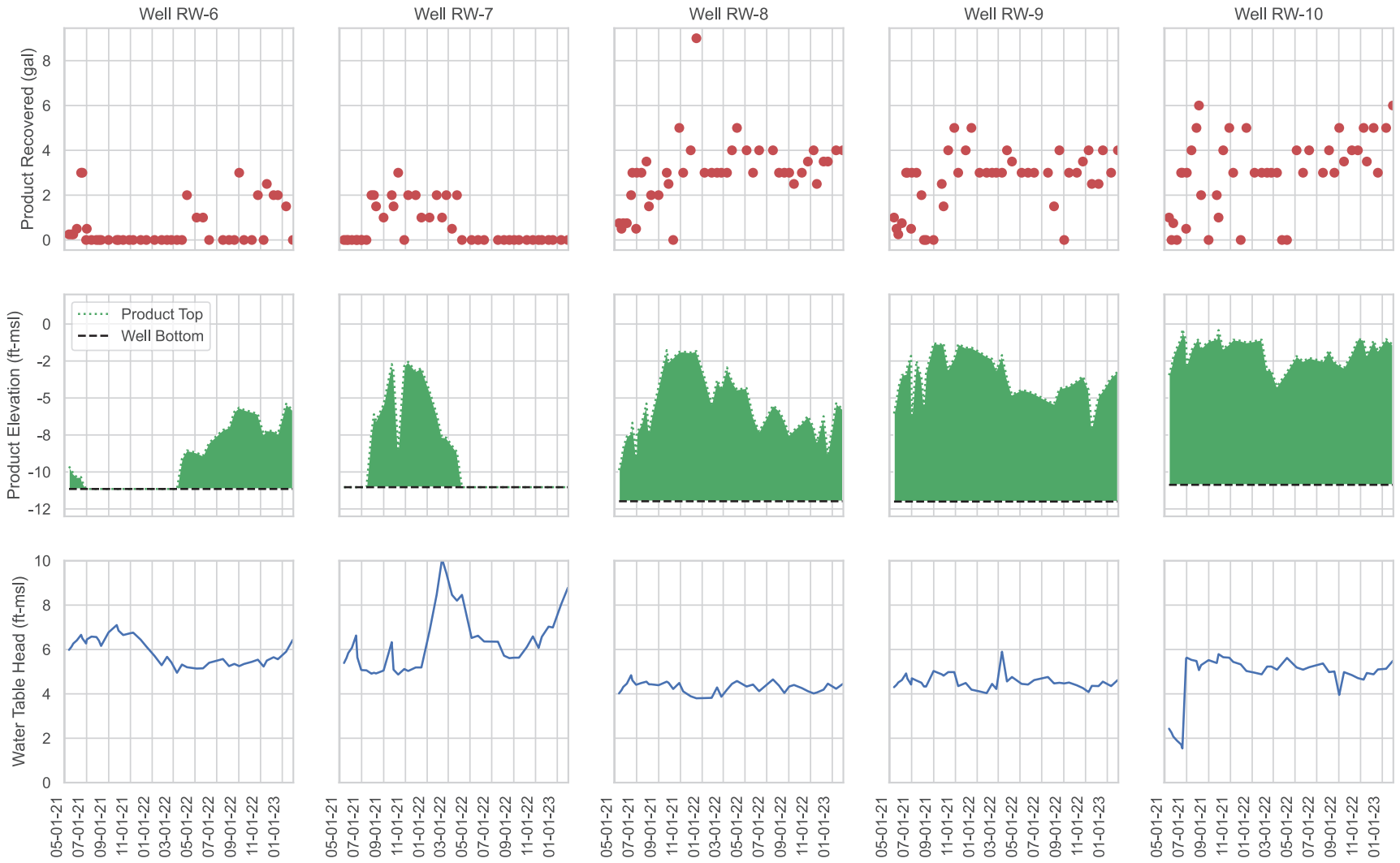


Figure C-2
ATG-Oronoco

PRODUCT RECOVERY DATA
ORONOCO ST. - CITY OF ALEXANDRIA, VIRGINIA

Figure provided by
Cardno, April 2023



Appendix D
Boring Logs for Wells Included in Pilot Test

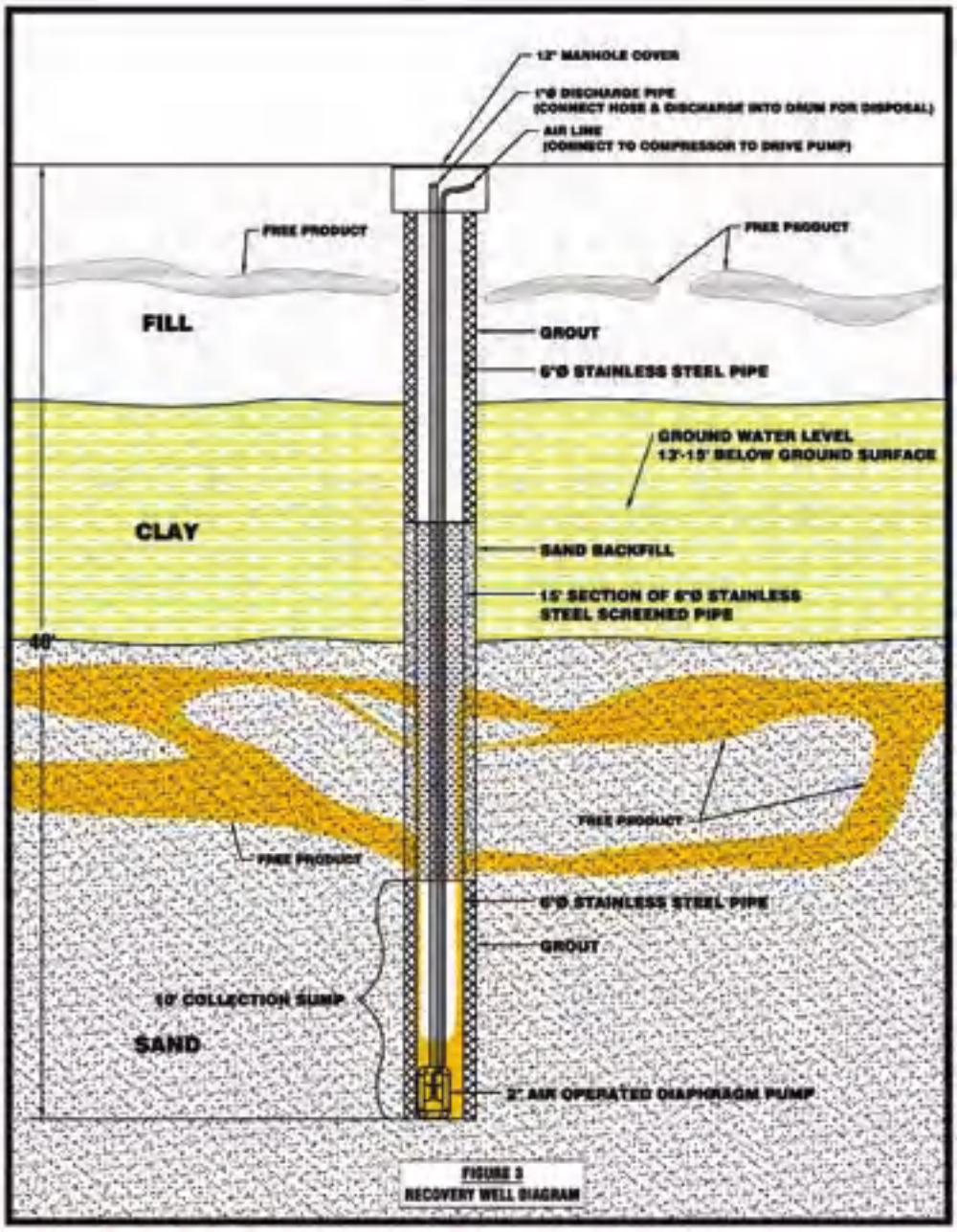


Figure 3 – Construction of product recovery wells

LOG OF BORING PMW-15

(Page 1 of 1)

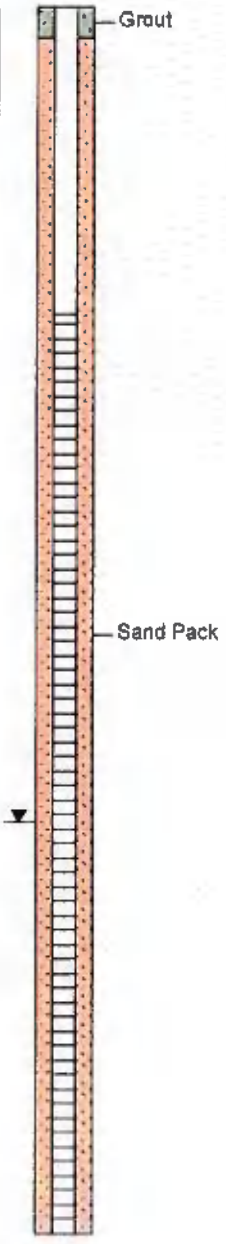
MARSHALL MILLER & ASSOCIATES

City of Alexandria
Site Characterization Report
Oronoco Street

Project No.	: COA106
Logged By	: Ty Querry
Checked By	: Eric Powers
Drill Method	: 8" Hollow Stem Auger
Drill Date	: 2/15/02

Stick Up	: 13.29 Feet
Well Head Elevation	: 17.25 Feet
Water Table Elevation	: 3.96 Feet
Static Water Level	: 13.29 Feet
Date Measured	: 2/25/02

Depth in Feet	Surf. Elev. 17.50	DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	Recover Rate (%)	FID (ppm)
0	17	Dark tan clayey silt, firm, slightly friable, trace rounded quartz pebbles, rich with organics.		MH/GP			
1	16	Orangish-red clay with some roots, stiff, dry to slightly moist, traces of rounded quartz pebbles.			0-4	75%	0.0
2	15	Tan clayey sand with gray striations, friable, dry. 2" layer of black debris at 2 feet.		SC			
3	14	Dark tan silty clay with gray striations, stiff, plastic, dry, no odor.		CH			
4	13	Reddish-tan clay, stiff, plastic, tightly packed, dry. slight odor.		CL	4-8	100%	20
5	12						
6	11						
7	10						
8	9	Reddish-tan clay, stiff, plastic, tightly packed, dry, slight odor.		CL			
9	8						
10	7	Greenish gray clay, soft to fir, plastic, friable, moist, slight odor, free phase product.		CL	8-12	90%	25
11	6						
12	5	Greenish gray silty sand with black staining, fine grained sand, friable, moist, strong odor.		SM	12-16	75%	300
13	4						
14	3						
15	2						
16	1	Greenish gray silty sand with black staining, fine grained sand, friable, moist, strong odor.		SM	16-20	50%	400
17	0						
18	-1						
19	-2						
20	-3	Terminated borehole. Set temporary well at 10 feet.					
21							



2" PVC Well

Riser 0-5 feet

(0.010) Screen 5-20 feet

06-04-2002 T:\MM&A\CLIENTS\CITY OF ALEXANDRIA\COA106 BOREHOLE LOGS\2 INCH PVC WELLS\PMW-15.BOR

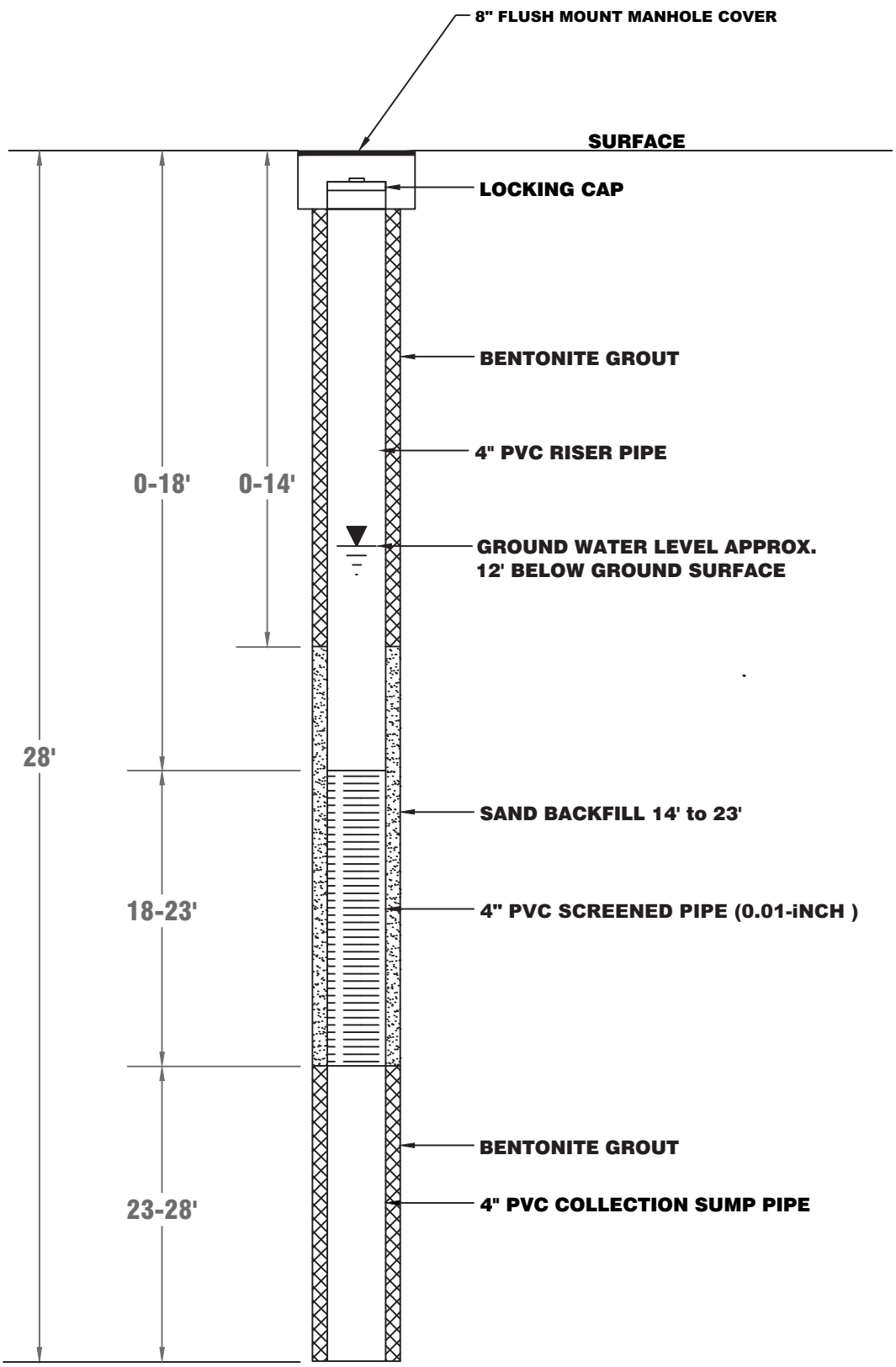


FIGURE 6
RW-6 AS-BUILT

CITY OF ALEXANDRIA
ORONOCO DNAPL RECOVERY

DATE:	6/2/2021
SCALE:	NOT TO SCALE
DESIGNED:	JV
DRAWN:	DES

Prepared by:
Cardno
COA411 mw.dwg

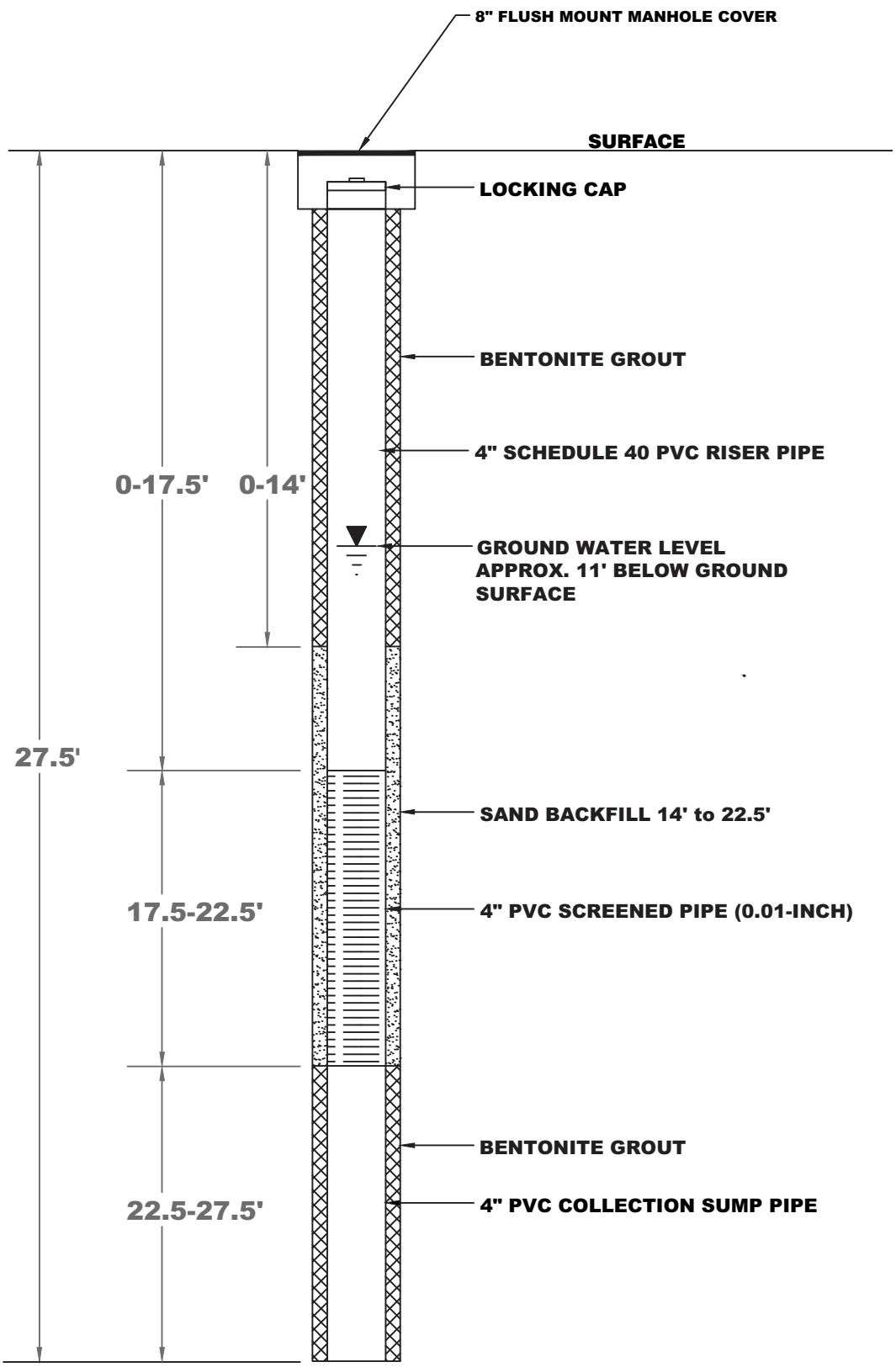


FIGURE 6
RW-7 AS-BUILT

CITY OF ALEXANDRIA
ORONOCO DNAPL RECOVERY

DATE:	6/2/2021
SCALE:	NOT TO SCALE
DESIGNED:	JV
DRAWN:	DES

Prepared by:
Cardno
COA411 mw.dwg

Project Name:	City of Alexandria	Geologist:	Eric Powers	Boring No.:	PMW-65
Project No.:	COA335	Drilling Co.:	Cardno	Drilling Method:	Direct Push
Date:	5/16/2016	Registration:	N/A	Sample Method:	Macrocorer
Boring Diam.:	2.25"	Total Depth:	16'	Abandonment:	Converted to 1" well

GW well 15' SG well 11'

Sample No.	Depth (ft)	Blow Count	%Recovery	OVA/PID	Lithologic Description		
1	0.0-2.0	N/A	80%		Asphalt pavement		
2	2.0-4.0	N/A	80%	5.8	Black sand and GRAVEL -coal tar odor	5 feet riser	9 ft riser
3	4.0-6.0	N/A	75%		Reddish brown SAND		
4	6.0-8.0	N/A	75%	0.9	Reddish brown SAND		
5	8.0-10.0	N/A	95%		Redddish gray dense CLAY		2 ft screen
6	10.0-12.0	N/A	95%	1.0	Redddish gray dense CLAY	WL = 12'	
7	12.0-14.0	N/A	100%		Yellow brown CLAY with strong coal tar odor	10 ft screen	
8	14.0-16.0	N/A	100%	150	Yellow brown CLAY with strong coal tar odor		

Project Name:	City of Alexandria	Geologist:	Eric Powers	Boring No.:	PMW-66
Project No.:	COA335	Drilling Co.:	Cardno	Drilling Method:	Direct Push
Date:	5/17/2016	Registration:	N/A	Sample Method:	Macrocorer
Boring Diam.:	2.25"	Total Depth:	20'	Abandonment:	Converted to 1" well

GW well 20' SG well 11.7'

Sample No.	Depth (ft)	Blow Count	%Recovery	OVA/PID	Lithologic Description		
1	0.0-2.0	N/A	80%		Yellowish rusty brown motteld CLAY		
2	2.0-4.0	N/A	80%	1.0			9.7 ft riser
3	4.0-6.0	N/A	75%		Yellowish brown mottled CLAY		
4	6.0-8.0	N/A	75%	2.5	strong coal tar odor	10 feet riser	
5	8.0-10.0	N/A	95%		Gray CLAY - strong odor		
6	10.0-12.0	N/A	95%	16.7	Gray silty SAND		2 ft screen
7	12.0-14.0	N/A	100%		Gray silty SAND	WL = 12.6'	
8	14.0-16.0	N/A	100%	25.7		10 ft screen	
9	16.0-18.0	N/A	100%		Dark gray loose sand - coal tar odor - free product		
10	18.0-20.0	N/A	100%				

Project Name:	City of Alexandria	Geologist:	Eric Powers	Boring No.:	PMW-67
Project No.:	COA335	Drilling Co.:	Cardno	Drilling Method:	Direct Push
Date:	5/18/2016	Registration:	N/A	Sample Method:	Macrocorer
Boring Diam.:	2.25"	Total Depth:	16'	Abandonment:	Converted to 1" well

GW well 15' SG well 4'

Sample No.	Depth (ft)	Blow Count	%Recovery	OVA/PID	Lithologic Description		
1	0.0-2.0	N/A	60		Yellow-brown SAND and GRAVEL		2 ft riser
2	2.0-4.0	N/A	60	2.2		5 feet riser	2 ft screen
3	4.0-6.0	N/A	70		Brown silty SAND	WL = 5'	
4	6.0-8.0	N/A	70	1.0			
5	8.0-10.0	N/A	80		Dark brown silty SAND - wet	10 ft screen	
6	10.0-12.0	N/A	80	3.9			
7	12.0-14.0	N/A	60		Brown coarse SAND with coal tar odor		
8	14.0-16.0	N/A	60	22.9	Gray silty fine SAND - strong odor		

Project Name:	City of Alexandria	Geologist:	Eric Powers	Boring No.:	PMW-68
Project No.:	COA335	Drilling Co.:	Cardno	Drilling Method:	Direct Push
Date:	5/23/2017	Registration:	N/A	Sample Method:	Macrocorer
Boring Diam.:	2.25"	Total Depth:	20'	Abandonment:	Converted to 1" well

GW well 19'

Sample No.	Depth (ft)	Blow Count	%Recovery	OVA/PID	Lithologic Description	
1	0.0-2.0	N/A	50	0	Mulch	
2	2.0-4.0	N/A	100		Red dense sandy CLAY	
3	4.0-6.0	N/A	100	0	Reddish brown sandy CLAY	
4	6.0-8.0	N/A	100		Reddish brown sandy CLAY	14 feet riser
5	8.0-10.0	N/A	90	0	Dark brown SILT	
6	10.0-12.0	N/A	90		Very fine dark borwn silty SAND	
7	12.0-14.0	N/A	30	0	Fine brown SAND	WL = 13'
8	14.0-16.0	N/A	30			5 ft screen
9	16.0-18.0	N/A	90	0.6	Fine wet brown SAND with dark organic	
10	18.0-20.0	N/A	90		peaty horizon	

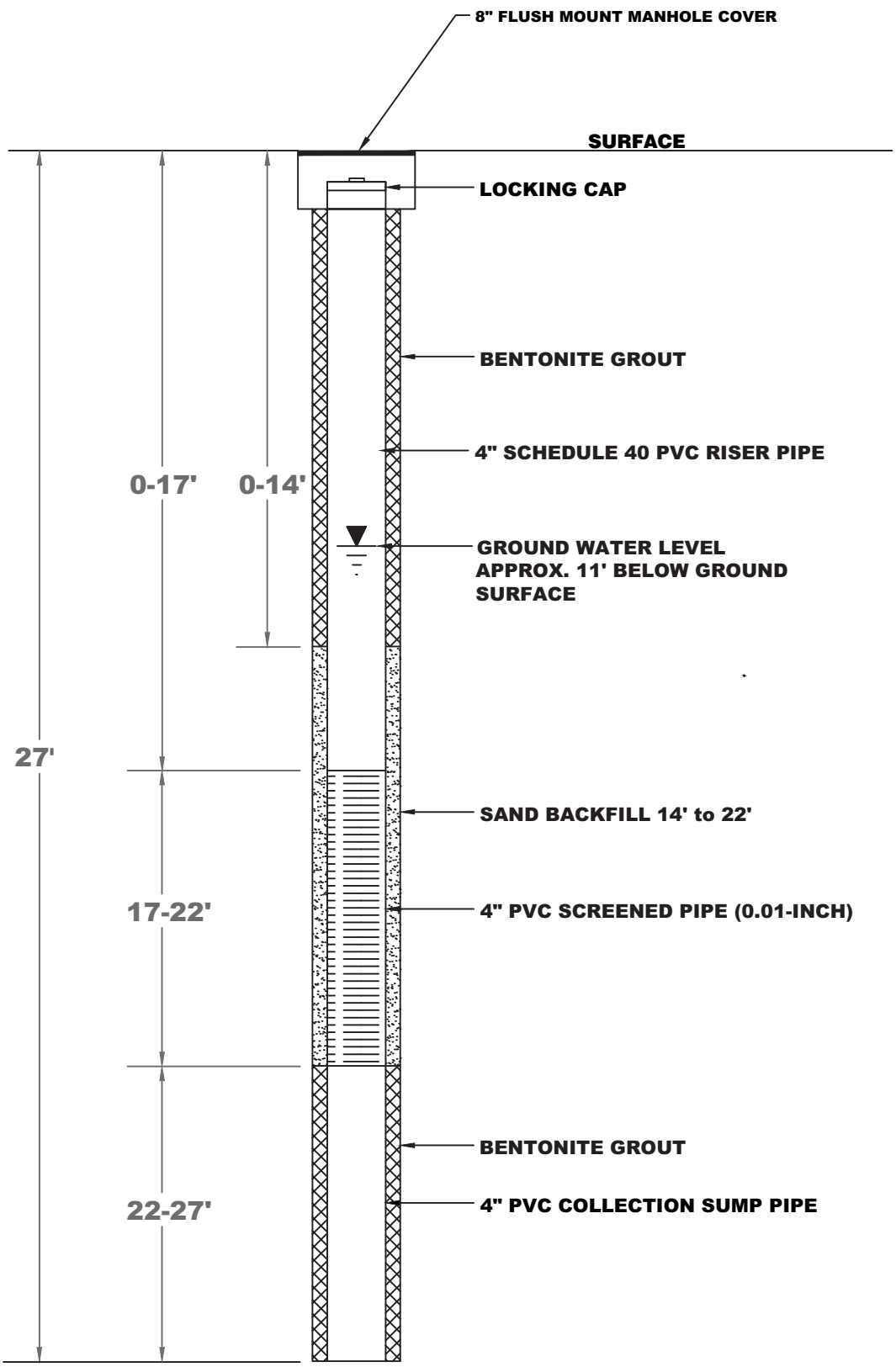


FIGURE 6
RW-10 AS-BUILT

CITY OF ALEXANDRIA
ORONOCO DNAPL RECOVERY

DATE:	6/2/2021
SCALE:	NOT TO SCALE
DESIGNED:	JV
DRAWN:	DES

Prepared by:
Cardno
COA411 mw.dwg

Appendix E
Photolog

URS

PHOTOGRAPHIC LOG
IN-WELL HEATING PILOT TEST

Site:	Site Location:	Project No.
ATG-Oronoco Street	Near N. Lee St. and Oronoco St. Alexandria, VA 22314	60611993

Photo No.	Date:
1	10/03/2023

Direction Photo Taken:

Facing east on Oronoco St.

Description:

Field crew setting up heating system on RW-10. In-well heating device shown in foreground.

Photo No.	Date:
2	10/03/2023

Direction Photo Taken:

Facing northeast on Oronoco St.

Description:

Close-up of water drum, pump, and in-line water heater while setting up at RW-10.

URS

PHOTOGRAPHIC LOG
IN-WELL HEATING PILOT TEST

Site:	Site Location:	Project No.
ATG-Oronoco Street	Near N. Lee St. and Oronoco St. Alexandria, VA 22314	60611993

Photo No.	Date:
3	10/03/2023

Direction Photo Taken:

Facing downwards

Description:

Bailing product from RW-10.

Photo No.	Date:
4	10/03/2023

Direction Photo Taken:

Facing downwards.

Description:

Water/NAPL mixture collected from RW-10.

URS

PHOTOGRAPHIC LOG
IN-WELL HEATING PILOT TEST

Site:	Site Location:	Project No.
ATG-Oronoco Street	Near N. Lee St. and Oronoco St. Alexandria, VA 22314	60611993

Photo No.	Date:
5	10/05/2023

Direction Photo Taken:

Facing east on Oronoco St.

Description:

Vacuum truck used for well fluids recovery.

Appendix F
Waste Manifest

GEC Environmental

13880 Berlin Turnpike, Lovettsville, VA 20180

(540) 882-3802

SHIPPING DOCUMENT

DATE:

DOCUMENT #: 3736

Generator/Shipper: AECOM

US EPA ID#:

Address: 430 National Business Pkwy, Ste 190

City: Annapolis Junction | State: MD | ZIP: 20701

Contact: Ed Fahline | Phone: 202 597 9839

Site: 1

Address: 427 N Lee Street

City: Alexandria | State: VA | ZIP: 22314

Transport No. 1: GEC Environmental

US EPA ID#: | Phone: 540 8823802

Transport No. 2:

US EPA ID#: | Phone:

Facility:

X GEC Environmental Contracting Corp -
13880 Berlin Tnpke, Lovettsville, VA 20180

___ Other

Additional Information:

24-Hr Emergency Phone Number (540) 882-3802

Non RCRA/Non DOT Regulated Materials, Liquids

Line	Material
X	Petroleum Impacted Water/Commercial Contact Water
	Diesel and Water for Recycling
	Glycols for Recycling
	Kerosene and Water for Recycling
	Mineral Oil for Recycling
	Oil for Recycling
	Oil, Water for Recycling
	Wastewaters

Non RCRA/Non DOT Regulated Materials, Solids

Line	Material
	Ash, Fly
	Debris, C&D related
	Debris, Petroleum Impact, Specify:
	Drums, Empty
	Filters for Recycling, Petroleum Impacted
	Sludge, Industrial
	Sludge, Oil
	Sludge, Tank Bottom
	Soil, Petroleum Impacted, Specify:
	Soil, Oil
	Sorbents, Diesel Fuel
	Sorbents, Oil
	Other

DOT Regulated/Non RCRA Materials-Liquids

Line	Material
	Gasoline Mixture 3, UN1203, PGII ERG #128 for Recycling
	Gasoline 3, UN1203, PGII ERG #128 for Recycling
	Fuel Oil (No. 1, 2, 4, 5, or 6) 3, NA1993, PGII ERG #128
	Diesel Fuel 3, 1993 PGIII ERG #128
	Fuel, Aviation, Turbine Engine 3, UN1863, PGII ERG #128
	Kerosene, 3, UN 1223, PGIII, ERG #128
	Other

Line	Containers No.	Containers Type	Total Quantity	Unit Wt./Vol.	Quantity Liquid	Quantity Solid	Quantity Sludge	Notes
1	1	TT	330	Gallons	1/330			
2								
3								
4								

Generator's Certification: I certify the materials described above on this document are not subject to federal regulations for disposal of Hazardous Waste as defined by RCRA. I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable federal, state, and local regulations.

Type/Print Name:	Signature:	Month/Day/Year
David Smith	D. Smith	10/5/23

Transporter 1 Acknowledgement of Receipt of Materials

Type/Print Name:	Signature:	Month/Day/Year
Mike Tucker	M	10/5/23

Transporter 2 Acknowledgement of Receipt of Materials

Type/Print Name:	Signature:	Month/Day/Year

Discrepancy Indication Space

Facility Owner or Operator: Certification of receipt of materials covered by this manifest except as noted in Discrepancy area above

Type/Print Name:	Signature:	Month/Day/Year

White: Generator Yellow: Facility Pink: Transporter

Appendix 2 – TarGOST Survey Report

Stantec Consulting Services Inc.
10988 Richardson Road
Ashland VA 23005-3502

Stantec

ATG - ORONOCO SITE

SUMMARY OF 2023 TARGOST INVESTIGATION RESULTS

April 17, 2024
Revised June 20, 2024

Prepared for:
City of Alexandria, Virginia

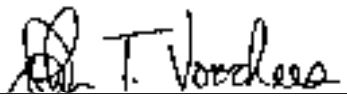
Prepared by:
Stantec Consulting Services, Inc.

Project Number:
203402203

The conclusions in the Report titled SUMMARY OF 2023 TARGOST INVESTIGATION RESULTS are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from City of Alexandria, Virginia (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided by the Client to applicable authorities having jurisdiction and to other third parties in connection with the project, Stantec disclaims any legal duty based upon warranty, reliance or any other theory to any third party, and will not be liable to such third party for any damages or losses of any kind that may result.

Prepared by: 

Signature

John T. Voorhees, P.G.

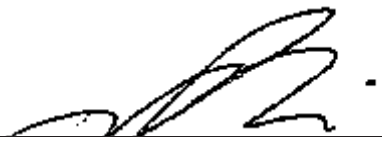
Printed Name

Reviewed by: 

Signature

Joe Morici P.E.

Printed Name

Approved by: 

Signature

Vince Alaimo

Printed Name

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APPENDIX B TARGOST LOGS .

1 Background

1.1 Site Description and History

The ATG-Oronoco Voluntary Remediation Program (VRP) site occupies an approximately 1-acre group of privately owned parcels at the corner of Oronoco and North Lee Streets in Old Town Alexandria (see **Figure 1**). The City operated the ATG manufactured gas plant (MGP) near the corner of North Lee and Oronoco Streets between 1851 and 1946. After closing, most of the ATG plant was demolished, and the remaining buildings were re-used by various businesses until the mid-1970s. In 1977, the former MGP property, including the last two remaining MGP buildings, was redeveloped into the Lee Street Square (LSS) commercial/office townhouse complex, which now occupies the Site. In 1975, just prior to the redevelopment of the former MGP site, a 44-inch x 72-inch-diameter stormwater pipeline was installed beneath the centerline of Oronoco Street adjacent to the former MGP site.

The surrounding urban area is occupied by a mixture of commercial and residential properties bordering the west bank of the Potomac River. The VRP site boundaries also encompass the bordering City-owned public rights-of-way along Oronoco Street, from the intersection of North Lee Street to the end of Oronoco Street. However, in some cases, Site-related impacts extend offsite beyond these boundaries to affect areas beneath adjoining private property and public rights-of-way, including the river bottom at the Oronoco Outfall.

During the 1990s, several government agencies conducted site studies to better understand the impacts from the releases and evaluate the potential threat to human health and the environment. Participating agencies have included the United States Environmental Protection Agency (USEPA), the United States Coast Guard – Marine Safety Office (USCG-MSO), and the Virginia Department of Environmental Quality (DEQ). Collectively, these studies concluded that because humans do not normally come in contact with site-related substances, there was no immediate threat to human health. Nevertheless, further study was recommended to determine the entire extent of impact and more fully evaluate human and ecological impacts from the Site. Currently, site characterization and risk assessment phases have been completed with the VRP and remedial efforts are focused on non-aqueous phase liquid (NAPL) recovery, operation and maintenance of existing remedial systems, and pipe rehabilitation.

1.2 Prior DNAPL Recovery Efforts

A 2003 subsurface survey conducted by Marshall Miller and Associates (MM&A) identified an area of dense, non-aqueous phase liquid (DNAPL) in soils beneath the northern edge of the MGP site along the Oronoco Street right of way. Based on the survey, MM&A installed five recovery wells (RWs) to access the coal tar product accumulations. Each six-inch diameter well was screened with continuous slot screen and equipped with a stainless steel, bottom-loading pneumatic pump set in a five-foot sump at the bottom of the well. The recovery wells were intermittently purged of coal tar by operating the pumps with a portable air compressor brought to the site for bi-weekly recovery events. MM&A began regular product recovery events following the RW well installations in 2003.

The quantity of recoverable DNAPL from wells RW1 through RW-5 declined over a period of years to effectively zero. Additional site wells (not designed or originally intended as recovery wells) with detectable product thicknesses (1" up to 3 feet) have also included monitoring wells PMW-15, PMW-16, PMW-20 and DIW-1. An additional recovery well, MH-92, was installed directly through the stormwater pipe under manhole 92. These wells were subsequently added to the recovery program and recovery efforts shifted to these wells as the original RW-1 to RW-5 recovery wells became non-productive.

During 2021, the City completed a subsurface exploration program using the Tar-Specific Green Optical Scanning Tool (TarGOST) to locate and assess NAPL presence in-situ at the site and subsequently locate and design five new recovery wells. These wells (RW-6, RW-7, RW-8, RW-9, and RW-10) were installed in March 2021 and became the largest well producers of recovered NAPL to date at the site. Recovery in these wells began to taper off slowly in July 2023, initiating the second TarGOST investigation completed in November 2023 and summarized in this report. **Figure 2** shows the 2003 recovery wells, the 2021 recovery wells and the extent of NAPL saturated soils as estimated from the 2021 TarGOST investigation.

1.3 Free Product Properties

Free product originating from the ATG-Oronoco site mostly consists of a dark brown, somewhat viscous liquid coal tar with a density slightly heavier than water. Initial testing of the product reported in the 2004 *ATG-Oronoco Site Characterization Report* profiled the entire chemical composition of the pure phase product, detecting a wide array of polycyclic aromatic hydrocarbons (PAHs, such as naphthalene, benzo(a)pyrene and anthracene), phenols, a large proportion of benzene, toluene, ethylbenzene and xylenes (BTEX) and many unnamed organic carbon compounds.

The properties of coal tar are readily altered through mechanical agitation and disturbance during the investigation and recovery process. Although DNAPL product accumulates in mostly immiscible puddles and in wells, any mechanical disturbance, such as through mechanical pumping or vacuum extraction, causes the emergence of an odorous floating layer. This mixture is observable as product is recovered in drums during bi-weekly pumping events and in vacuum boxes after pipeline cleanouts and repairs are completed. Allowing this mixture to settle over a period of days or even weeks partially restores separation between the aqueous and DNAPL phases. The coal tar DNAPL is highly viscous and dense and often migrates independently of groundwater.

Based on extensive direct observation, the commonly-occurring coal tar found beneath the ATG-Oronoco site is observed in subsurface soil samples as droplets or ganglia, puddles and sheens. Dark brown droplets and ganglia are sometimes observed in cores recovered from borings advanced into site soils. In the presence of water, droplets observed in cores generally separate into sheens that spread over the entire sediment horizon, imparting characteristic "peacock blue and red" colors.

Based on the past studies, there is no evidence for a single point of origin for coal tar at the site such as a buried tank or vault. A geophysical survey conducted in 2015 along the northern border of the site beneath Oronoco Street found no indication of a vault, tank or other buried vessel. Although sheens were encountered in borings that penetrated the former gas holder footprints beneath the Lee Street Square

buildings and parking lots, no recoverable product was found in these potential source areas. The current conceptual site model assumes that product beneath Oronoco Street originates from widely disseminated droplets and ganglia which migrate and accumulate in larger masses through the coalescing process. Over time, NAPL has accumulated in proximity to the Oronoco Street stormwater pipe within more permeable layers of the subsurface and migrated downwards until encountering a relatively impermeable clay layer at depth. Depth to the clay layer varies across the site but is generally 18 to 22 feet below the ground surface in the area most impacted with NAPL.

2 2023 TarGOST Survey

2.1 TarGOST Data Collection

Stantec contracted with Dakota Technologies, Inc. of Fargo, North Dakota, to provide equipment and technical assistance in using their proprietary engineered Laser-Induced Fluorescence (LIF) technology (specifically Tar-Specific Green Optical Screening Tool [TarGOST®]) to assess and delineate the DNAPL.

The TarGOST is a LIF screening tool that is specifically designed to detect DNAPL in the subsurface. This particular screening tool configuration responds almost exclusively to DNAPL found at former manufactured gas plants (MGPs) and creosote/pentachlorophenol sites. It does this by sensing the fluorescence of large polycyclic aromatic hydrocarbons (PAHs) that are associated with MGP and creosote DNAPL.

The TarGOST system features a front-face fluorometer that is coupled via fiber optics to a sapphire-windowed probe that is advanced in the subsurface. This fluorometer shines excitation light onto, and collects emission from the same surface, thereby making near continuous fluorescence measurements of the soil matrix as the windowed probe is steadily advanced into the subsurface.

Each measurement begins with a pulse of laser excitation light being emitted into one of two fiber optic cables that are strung through the direct push drill rods. While much of the laser light is reflected by the soil matrix, the large PAHs that exist within the DNAPL absorb some of the light and are driven into an electronically excited state. Upon returning to their ground state, a portion of the PAHs emit yellow to red light, which is collected by a mirror and focused into the second collection fiber optic line for return to the TarGOST instrument for detection. Once the light data are collected, four optical fibers located at the system spectrometer evaluate the photons that are emitted at time delayed intervals, converting them into a transient voltage signal, which is subsequently converted to a digitized waveform that is presented in graphical format. The fluorescence response is measured in four channels: laser reflectance and three fluorescence bands.

The total fluorescence (the cross section of the observed waveform) is presented relative to a known fluorescence emitting reference (RE) material, and is presented as “% RE”. It should be noted that high %RE readings are caused exclusively by DNAPL substances or naturally occurring fluorescent materials and will not occur even at high concentrations of dissolved-phase contaminants. The TarGOST

equipment is calibrated to the reference emitter prior to every log. 100% RE reading means that a measured material has a fluorescence/scatter signal identical to RE. A 200% RE means a substance has a fluorescence/scatter signal twice that of RE, etc. The TarGOST RE replicates a moderately fluorescent tar/oil – most pure coal tars and creosotes fluoresce at multiples of the RE. Based on the previous TarGOST investigation, the coal tar at the Oronoco site is highly fluorescent, often exhibiting peak signals that are 2000-3000% RE.

In addition to measuring fluorescence signal response and waveforms, Dakota also used a hydraulic profiling tool (HPT) on the TarGOST probe during the November 2023 investigation. The HPT response is measured by injecting water out of a port on the side of the instrumentation tooling. Dynamic injection pressure is measured as a function of formation permeability. Static dissipation tests were also completed to calculate a potentiometric level. Hydraulic conductivity values (k) are estimated based on down pressure, corrected hydrostatic pressure (if a dissipation test was completed), and flow.

Stantec and Dakota Technologies mobilized to the site on November 6, 2023 and conducted TarGOST data collection with the use of a geoprobe direct-push drill rig during November 7 through November 9, 2023, advancing 37 TarGOST borings within the study area. Boring locations are shown on the attached **Figure 3** in Appendix A. TarGOST data logs are included in Appendix B. Holes were abandoned with hydrated bentonite to the surface and drill locations that were in the street were capped with cold-patch asphalt. Boring elevations were surveyed on November 10, 2023.

2.2 TarGOST Results and Discussion

There are many potential sources of fluorescence in the environment beyond coal tar NAPL, both natural and anthropogenic, including other petroleum hydrocarbon NAPLs such as fuels and oils, but also peat, crushed limestone, shell hash, and wood. The TarGOST system can distinguish fluorescent responses of differing waveforms. The cluster plots (wavelength vs wavelength lifetime average) shown on the logs are useful in determining the presence of multiple sources of fluorescence and potential false positives. In general, there were no recurring false positive waveforms observed at the Oronoco site, and the waveforms observed were consistent with coal tar NAPLs (and consistent with waveform data from the 2021 TarGOST survey). Only one dominant waveform was observed across the site indicating a generally consistent NAPL profile; however, small variations were present likely due to minor variations in weathering or chemistry.

Boring locations were identified as 23B-01 through 23B-38 and are shown on **Figure 3**. Boring 23B-01 (located in the middle of the intersection with Lee Street and Oronoco Street) was not completed due to traffic control conflicts that would have prevented access to nearby buildings and due to limited signal response observed in nearby location 23B-02. Borings 23B-24 and 23B-27 encountered shallow refusal and were offset in order to achieve design depths (the offset boring data is identified as 23B-24B and 23B-27B on the TarGOST log). Most borings were completed to an approximate depth of 25 feet below ground surface. Stantec terminated each boring several feet below the deepest significant accumulation of NAPL, if present.

Based on past TarGOST data from the site, the coal tar NAPL at the Oronoco site is highly fluorescent with peak signal responses often between 2000% to 3000% of the reference emitter standard (% RE). While signal response may not be directly correlated with NAPL saturation, it is a qualitative measure of saturation and potential recoverability. Consistent with methodology completed in 2021, thicknesses of potentially recoverable NAPL are estimated based in part on signal responses greater than 500% RE. Many borings displayed a distinct zone of DNAPL generally ranging from approximately one to four feet thick with a waveform and cluster plot consistent with coal NAPL and consistent with the 2021 TarGOST data. In most cases, the bottom of the DNAPL zone characteristically ended abruptly with a steep decline of signal response to near zero and without additional underlying DNAPL detected within multiple feet.

In addition, the HPT indicated an abrupt drop in estimated hydraulic conductivity concurrent with the decline in fluorescent signal response. This is interpreted as being consistent with the NAPL occurrence primarily in silty sands and sandy silts and underlain by a low permeability clay layer. Located above this DNAPL zone was occasionally a zone of relatively lesser fluorescence response and with a differing waveform. This zone likely represents an area of historical DNAPL saturation with a relatively smaller amount of DNAPL remaining adsorbed to the soil matrix or held by capillary forces (residual NAPL). Based on the limited signal response, these zones are not believed to be productive with respect to NAPL recovery.

After reviewing the TarGOST logs, Stantec identified the most likely zone for DNAPL recovery and measured observed thickness and depth from the logs. The selected zone exhibited the highest signal response (with peak signals exceeding 500%RE) and a waveform consistent with previously recovered DNAPL. In a few borings, NAPL was observed in two distinct and separate lenses, although separation between the lenses was less than two feet. Using the NAPL thickness data selected from the logs, Stantec modelled the thickness of the potentially recoverable NAPL within the study area. Contouring was completed using Surfer software package, version 23.3, using the Kriging gridding method with an autofit variogram. The modelled NAPL thickness is shown as an isopach map in **Figure 4**, Appendix A.

As expected and consistent with prior investigations, an accumulation of DNAPL is present in the vicinity of the stormwater pipe. In-situ DNAPL apparent thickness exceeds four feet in one distinct area near the southern edge of the NAPL mass (near the southern curb of Oronoco Street, between the stormwater pipe and the former MGP site). Three areas with apparent NAPL thickness greater than three feet are located near the stormwater pipe. The remaining apparent thickness of potentially recoverable NAPL within the study area is less than three feet. NAPL apparent thickness is generally observed to have declined with proximity to the recovery wells RW-6 through RW-10, although isopach modeling suggests that a significant apparent thickness of NAPL remains close to RW-9.

While minor NAPL occurrence with smaller signal response are observed at higher elevations, the highest elevations of the potentially recoverable NAPL zone are generally one to four feet below the stormwater pipe and the underlying bedding (assumed as up to two feet thick based on prior site data). It is likely that the dense NAPL has continued to migrate downwards over time until encountering the relatively impermeable clay layer, then spread laterally as a “pancake”, exhibiting typical NAPL migration behavior. This clay layer was observed in each boring and is typified by a HPT response of a decline in estimated hydraulic conductivity and flow to nearly zero, and a sharp increase in downhole pressure (and with a

corresponding sharp decline in NAPL presence/signal response). The top of the clay layer is generally four to eight feet below the bottom of the pipe underbedding in the vicinity of the pipe. While the clay layer is present throughout the site and acts as a barrier to deeper NAPL migration and causes lateral spreading, the uppermost surface of the clay layer is irregular and results in varying thickness of overlying NAPL.

2.3 TarGOST Conclusions

Based on our review of the TarGOST data, Stantec proposes installing 5 four-inch diameter recovery wells. The recovery wells will be located in zones with greater than three feet of apparent NAPL and spaced at least 10 feet apart. The proposed location of the wells are shown on **Figure 5**, Appendix A. Each well will be constructed with five feet well screen lengths that correspond to the depth interval of identified DNAPL (17 feet to 22 feet bgs for each proposed well). Stantec proposes that each well will include a five-foot-long sump section below the well screen. This proposed design is consistent with the recovery wells installed in 2021 that demonstrated high productivity for two years. The following table summarizes the proposed well screen intervals.

Proposed Well Identification	Closest TarGOST Boring	Screen Interval (Depth below ground surface in feet)	Screen Interval Elevations (ft msl)
RW-11	23B-18	17-22	-0.8 to -5.8
RW-12	23B-31	17-22	-1.0 to -6.0
RW-13	23B-09	17-22	-0.7 to -5.7
RW-14	23B-25	17-22	-0.8 to -5.8
RW-15	23B-35	17-22	-1.0 to -6.0

Each well will be completed with a surface flush manhole. Subsequent to this report, Stantec will submit a workplan for proposed recovery well installation with additional details on proposed construction, drilling methods, operational logistics and safety procedures. The proposed recovery wells will be installed no later than the agreed upon schedule in the January 9, 2024, dated Consent Decree between the City and the Potomac River Keeper Network (by November 20, 2024).

Continued aggressive NAPL recovery in these locations will reduce potential for intrusion into the stormwater pipe, reduce the source area free-phase product, and improve groundwater quality at the project site.

APPENDIX A

FIGURES

This map and all data contained within are supplied as is with no warranty. Cardno Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

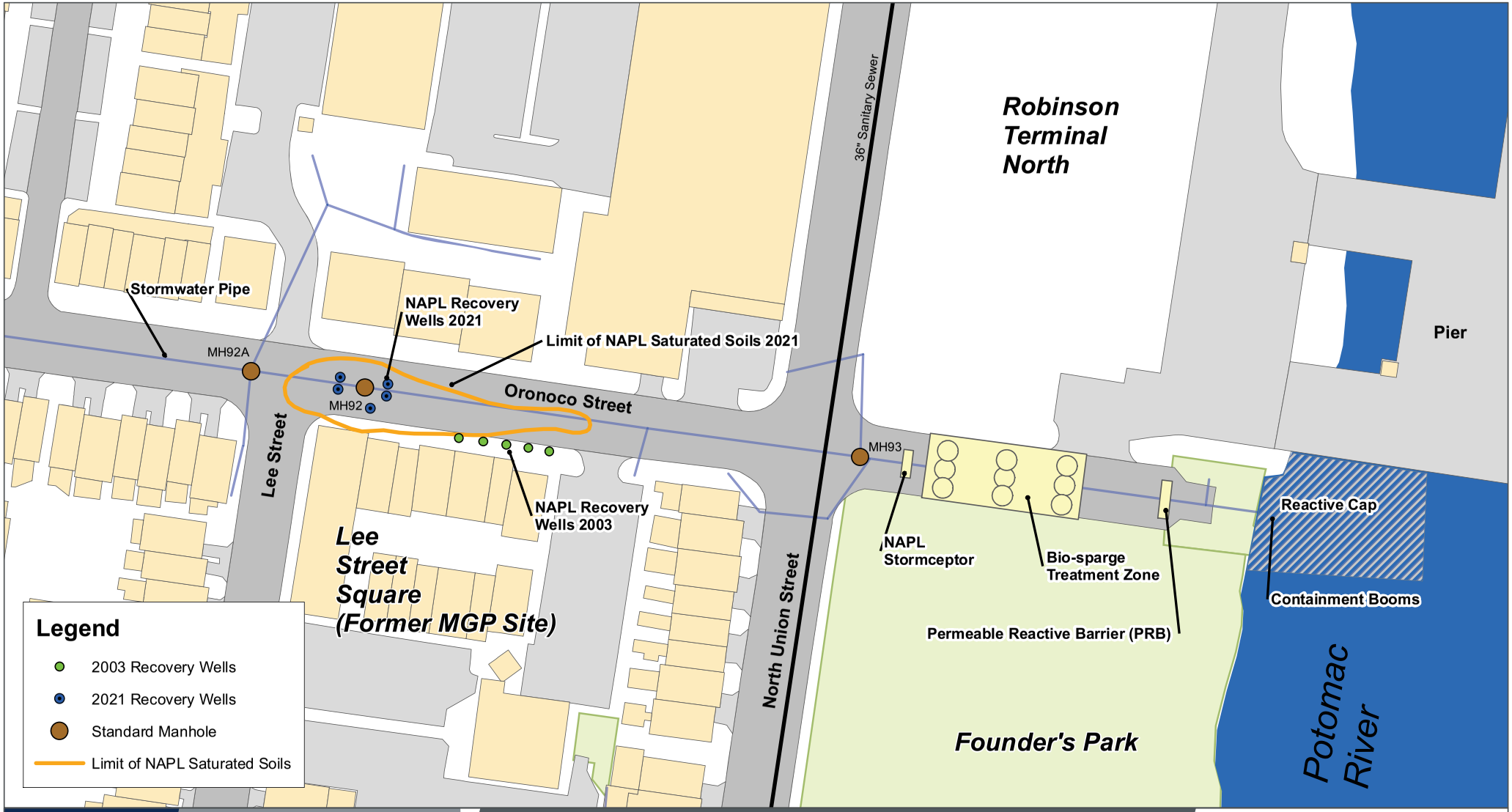
Figure 1 - Site Location Map

ATG - Oronoco Former MGP Site
Alexandria, Virginia

0 1,000 2,000 Feet
0 400 800 Meters

Stantec

10988 Richardson Road, Ashland, VA 23005
Phone (+1) 804-798-6525
www.cardno.com



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0 60 120 Feet
0 10 20 Meters

Figure 2
ATG-Oronoco
Site Map with Remedial Systems and Recovery Wells
City of Alexandria, Virginia

Stantec
10988 Richardson Road, Ashland, VA 23005 USA
Phone (+1) 804-798-6525
www.cardno.com

Date Created: 3/15/2024 Date Revised: 3/15/2024 File Path: C:\Users\JVOORH~1\AppData\Local\Temp\arcBAE5\Prior Recovery.mxd
GIS Analyst: jvoorhees

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0 12 24 Feet

0 4.5 9 Meters

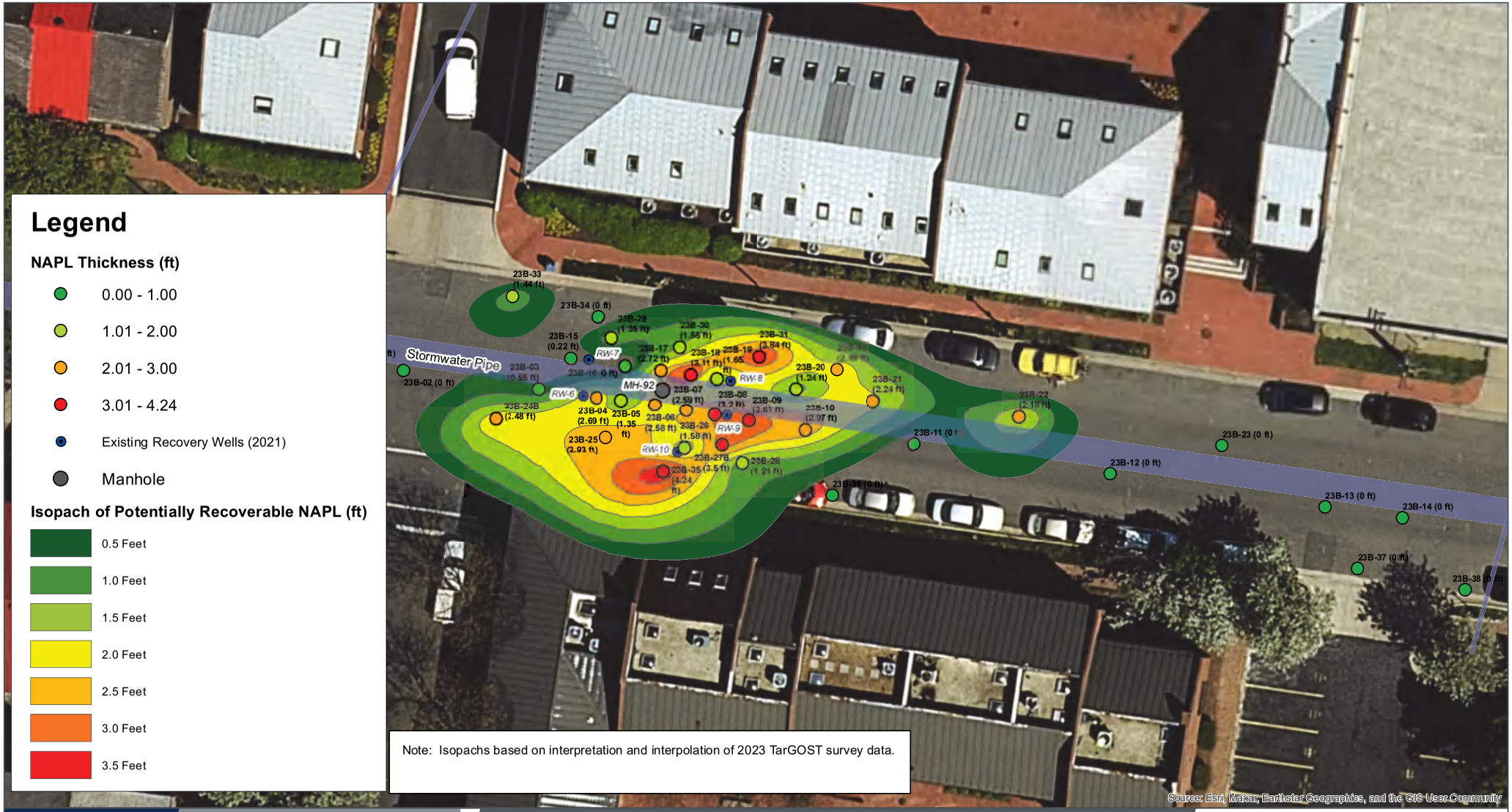
Figure 3
ATG-Oronoco
TarGOST Boring Location Plan

City of Alexandria, Virginia

Stantec

10988 Richardson Road, Ashland, VA 23005 USA
Phone (+1) 804-798-6525
www.stantec.com

Date Created: 3/15/2024 Date Revised: 3/15/2024 File Path: C:\Users\JVOORH~1\AppData\Local\Temp\arcED0E\Fig 2 - Oronoco Targost Locations.mxd
GIS Analyst: jvoorhees



Note: Isopachs based on interpretation and interpolation of 2023 TarGOST survey data.

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0 12 24 Feet

0 6 12 Meters

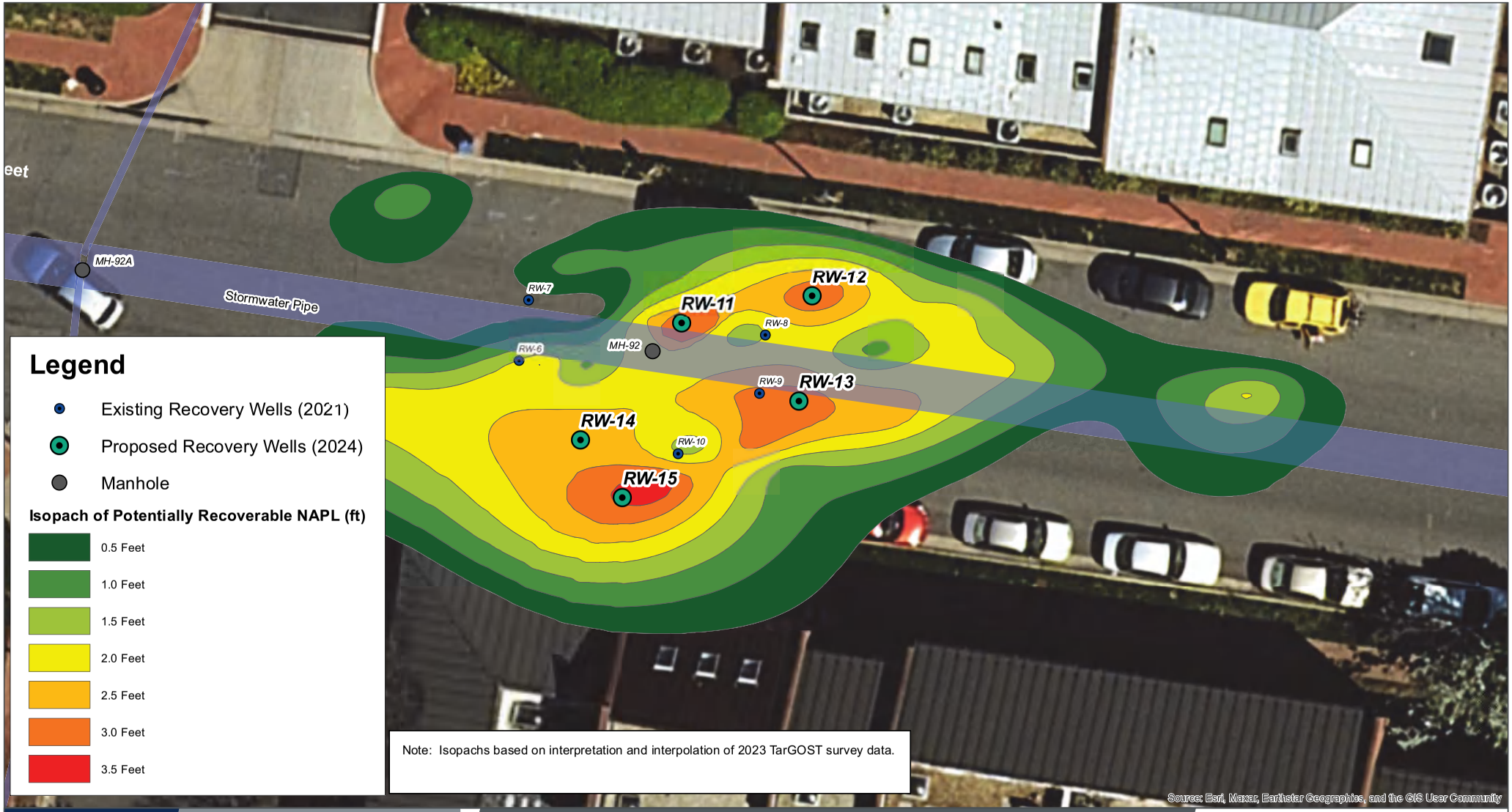
Figure 4
ATG-Oronoco
Isopach (ft) of Potentially Recoverable NAPL

City of Alexandria, Virginia

Stantec

10988 Richardson Road, Ashland, VA 23005 USA
Phone (+1) 804-798-6525
www.stantec.com

Date Created: 6/21/2024 Date Revised: 6/21/2024 File Path: C:\Users\JVOORH~1\AppData\Local\Temp\arc4888\Fig 3 - Oronoco Targost NAPL Isopach.mxd
GIS Analyst: jvoorhees



This map and all data contained within are supplied as is with no warranty. Stantec expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

0 12 24 Feet
0 3.5 7 Meters

Figure 5
ATG-Oronoco
Proposed Locations of 2024 NAPL Recovery Wells

City of Alexandria, Virginia

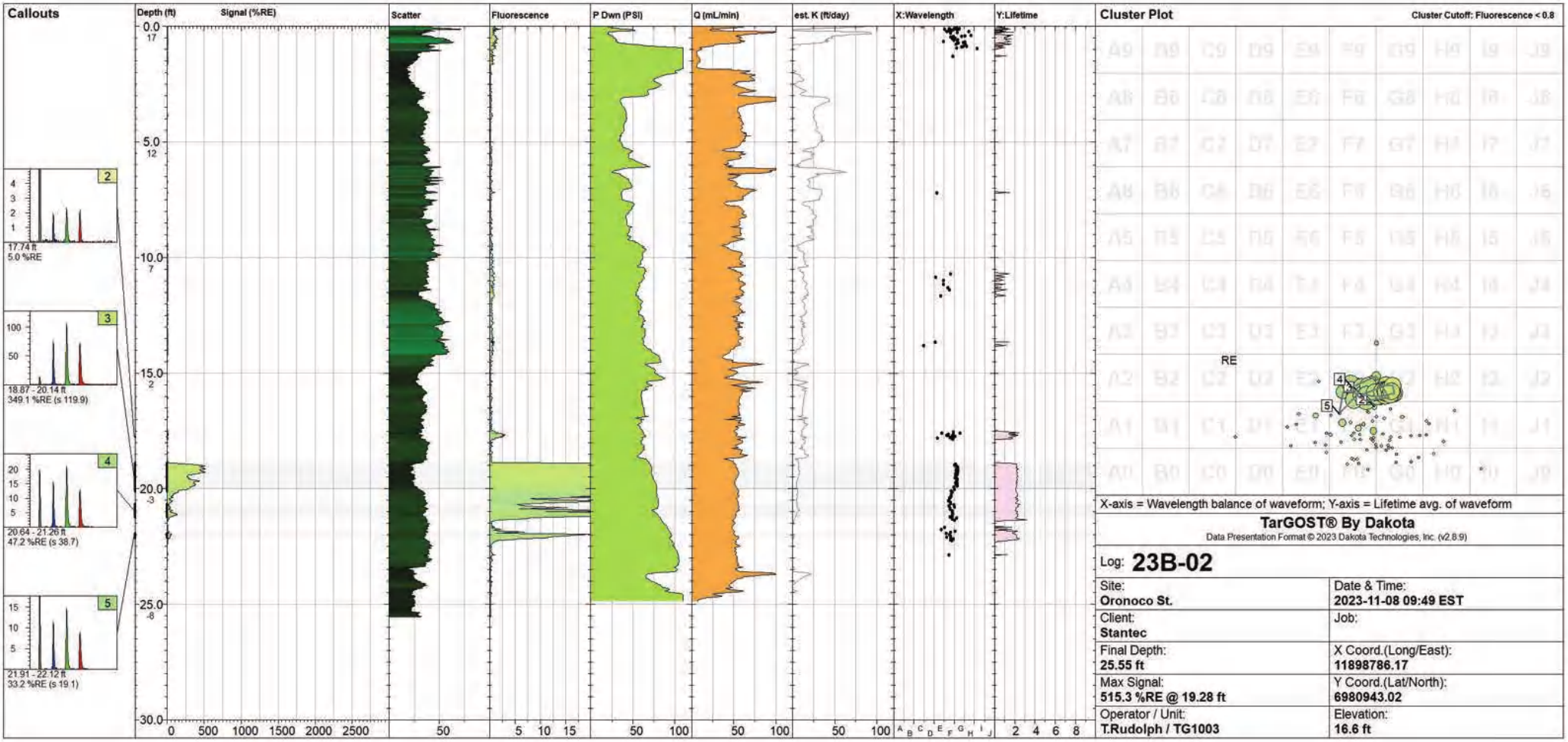
Stantec
10988 Richardson Road, Ashland, VA 23005 USA
Phone (+1) 804-798-6525
www.stantec.com

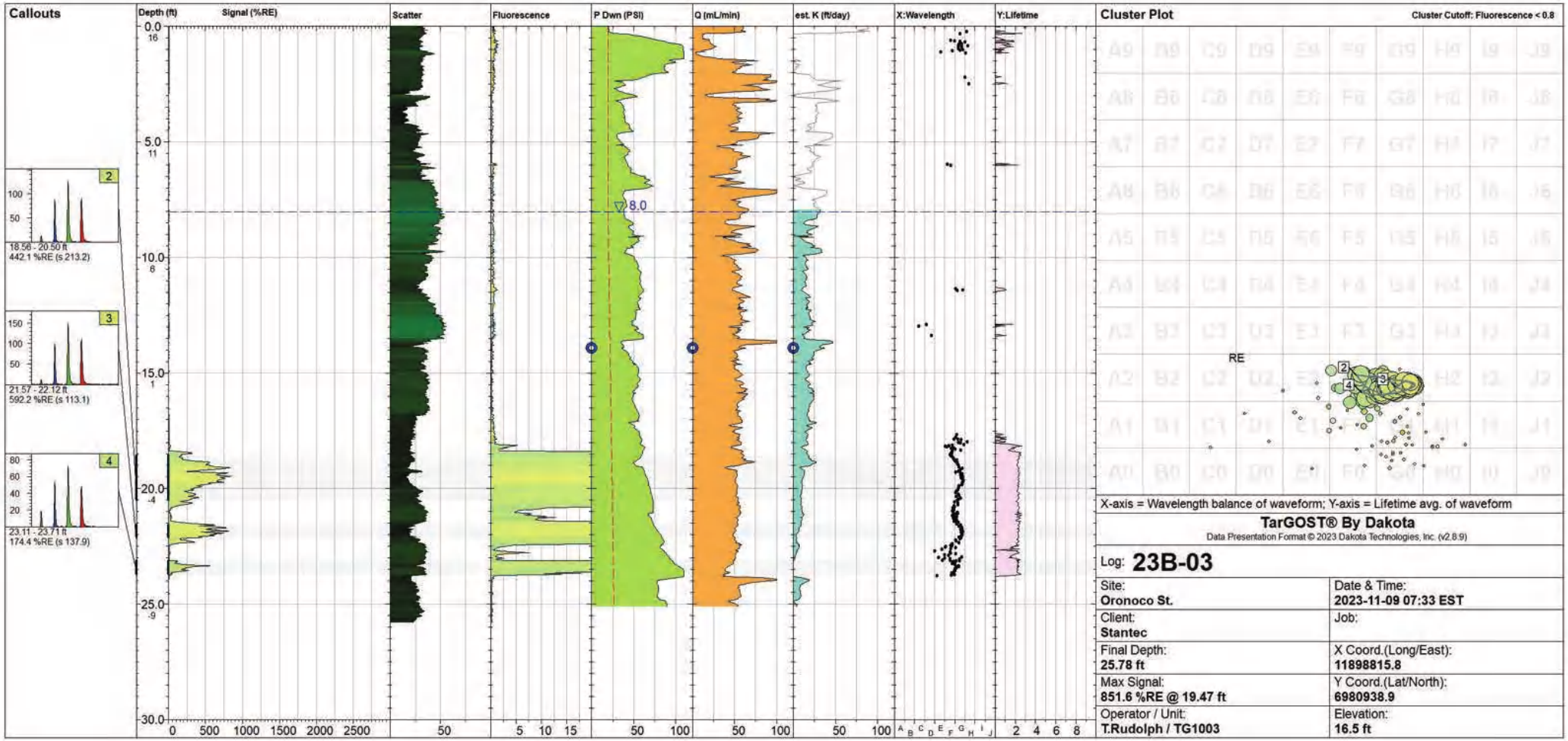
Date Created: 4/17/2024 Date Revised: 4/17/2024 File Path: C:\Users\JVOORH~1\AppData\Local\Temp\arcF8EB\Oronoco Targost Proposed Recovery Wells rev.mxd
GIS Analyst: jvoorhees

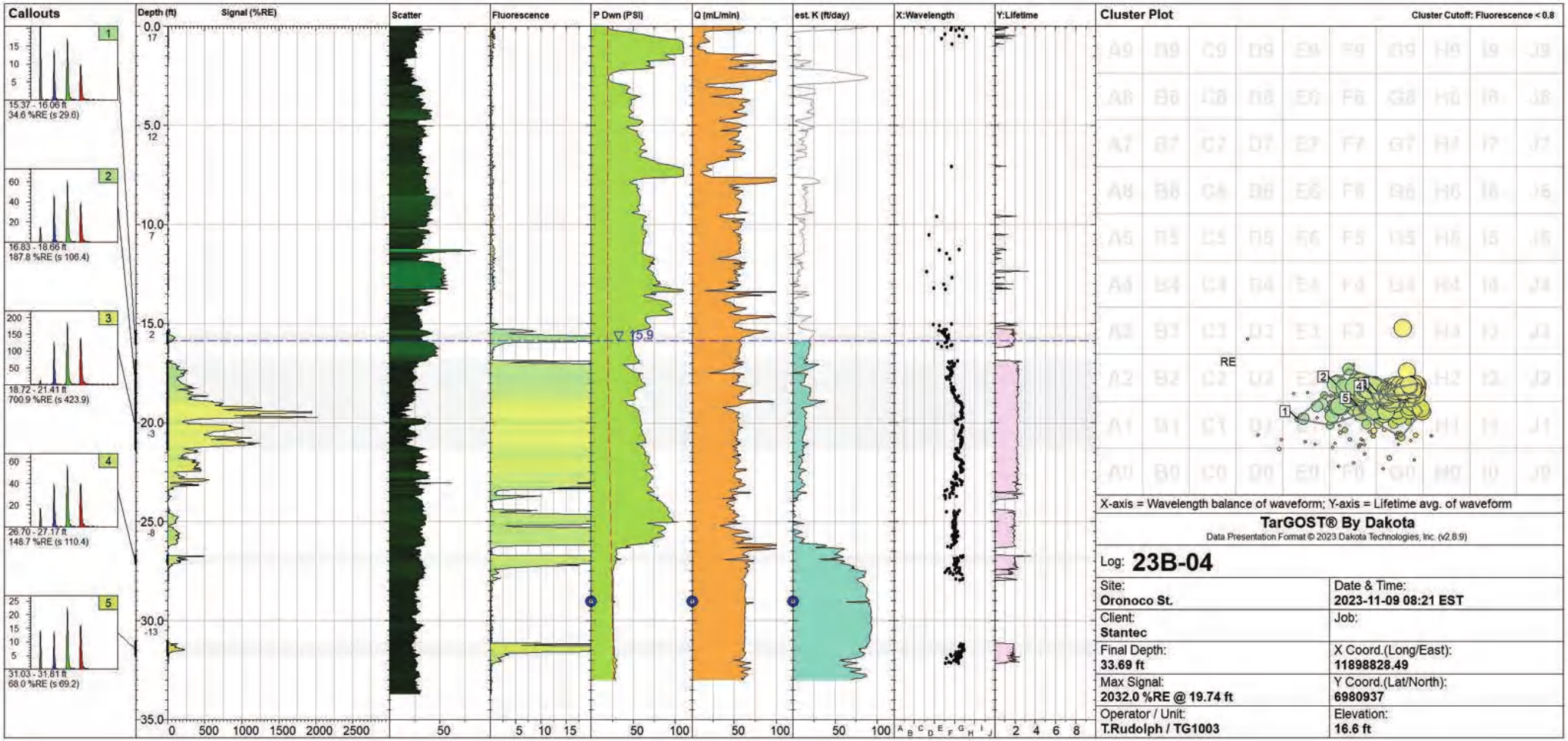
ATG-Oronoco Site

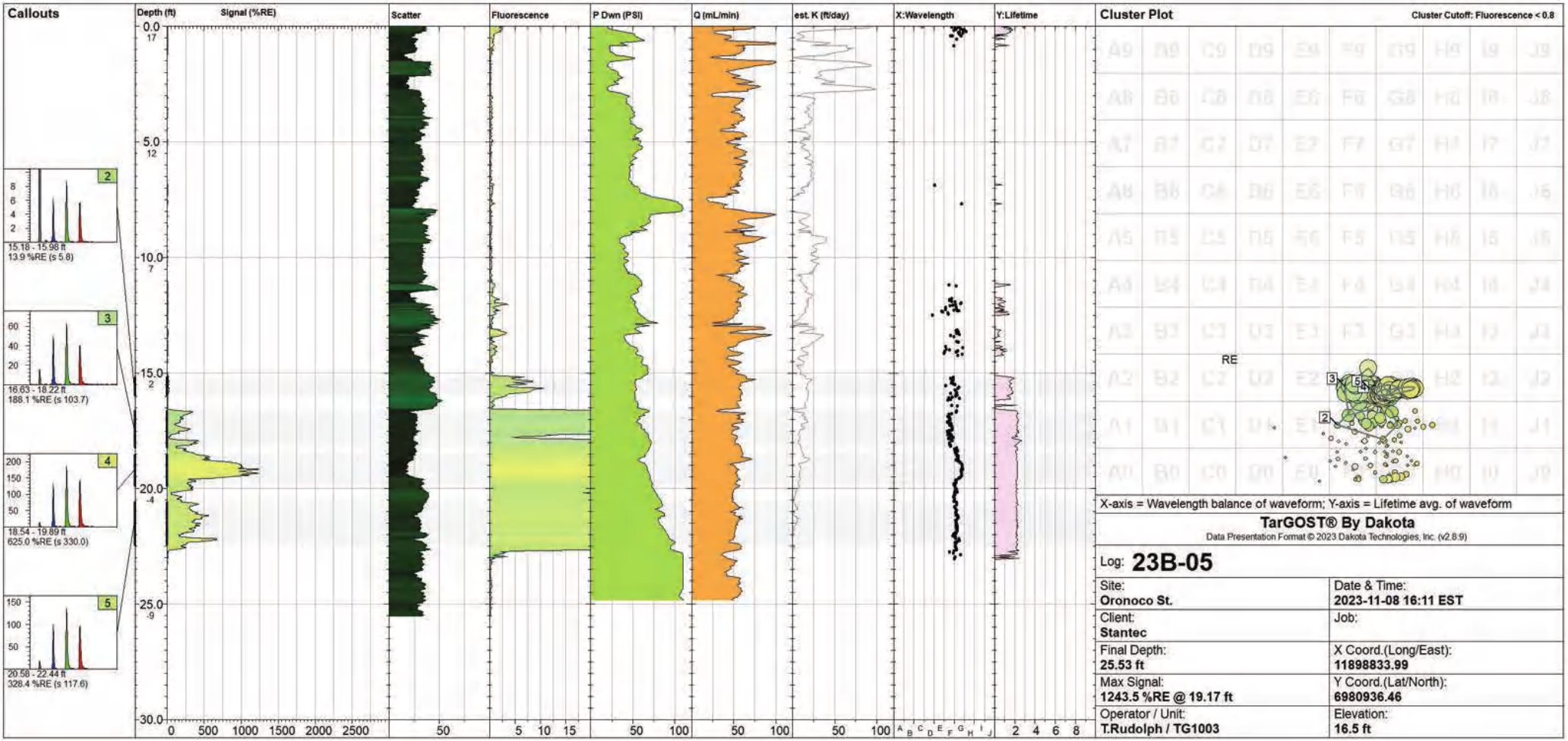
APPENDIX B

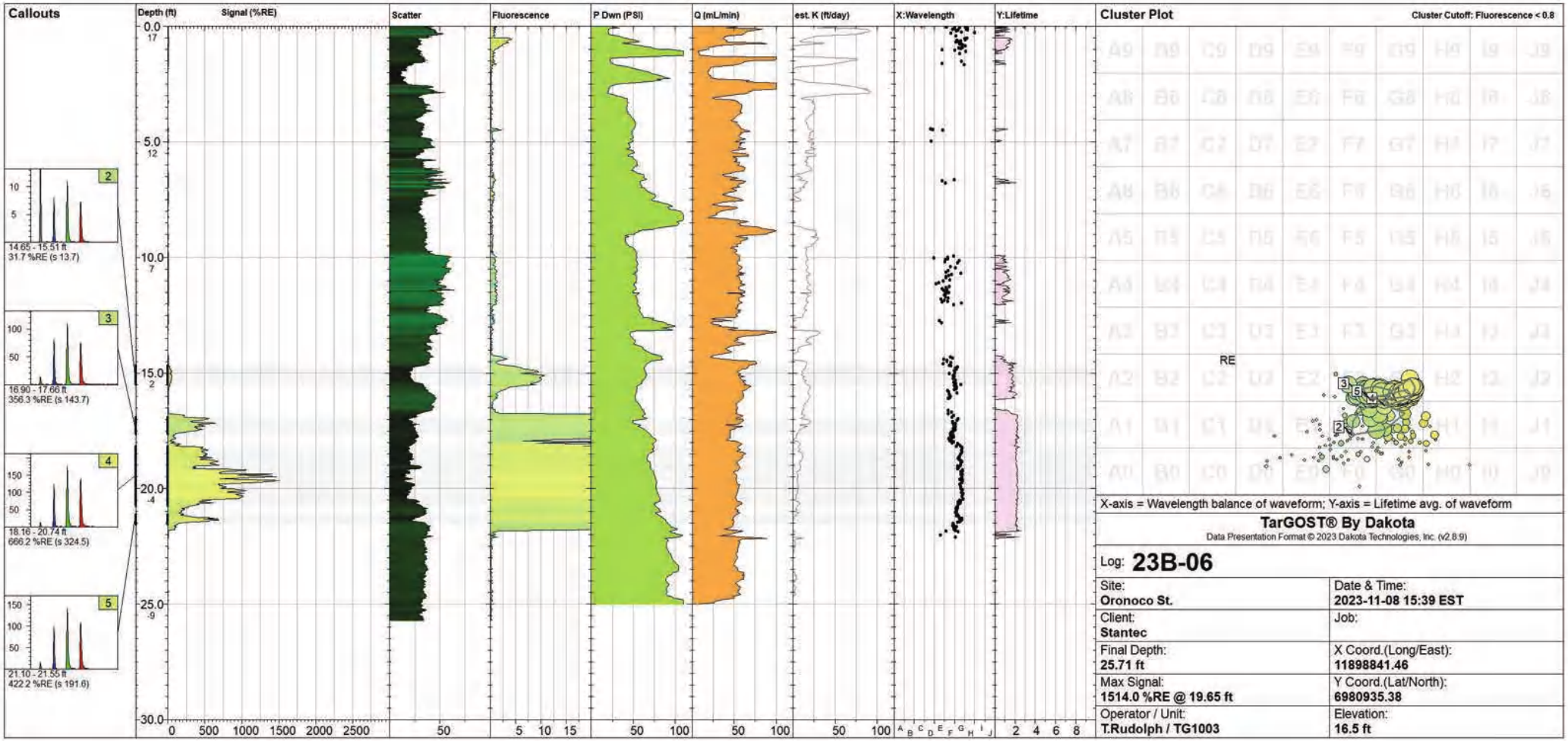
TARGOST DATA LOGS

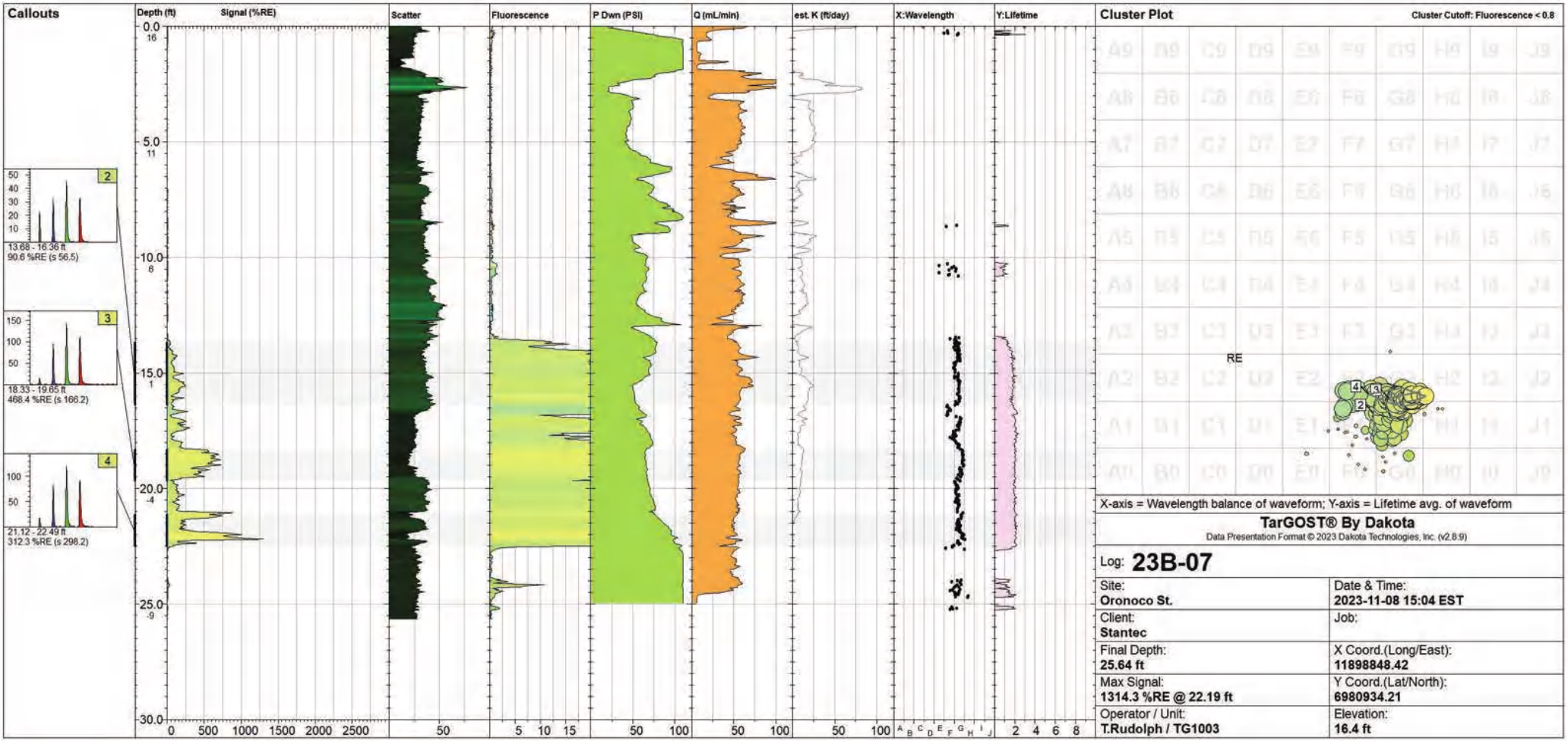

Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
17.74 ft
5.0 %RE
3
18.87 - 20.14 ft
349.1 %RE (s 119.9)
4
20.64 - 21.26 ft
47.2 %RE (s 38.7)
5
21.91 - 22.12 ft
33.2 %RE (s 19.1)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-02
Site: Oronoco St.
Date & Time: 2023-11-08 09:49 EST
Client: Stantec
Job:
Final Depth: 25.55 ft
X Coord.(Long/East): 11898786.17
Max Signal: 515.3 %RE @ 19.28 ft
Y Coord.(Lat/North): 6980943.02
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.6 ft


Callouts
2
18.56 - 20.50 ft
442.1 %RE (s 213.2)
3
21.57 - 22.12 ft
592.2 %RE (s 113.1)
4
23.11 - 23.71 ft
174.4 %RE (s 137.9)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
8.0
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-03
Site: Oronoco St.
Date & Time: 2023-11-09 07:33 EST
Client: Stantec
Job:
Final Depth: 25.78 ft
X Coord.(Long/East): 11898815.8
Max Signal: 851.6 %RE @ 19.47 ft
Y Coord.(Lat/North): 6980938.9
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.5 ft


Callouts
1
15.37 - 16.06 ft
34.6 %RE (s 29.6)
2
16.83 - 18.66 ft
187.8 %RE (s 106.4)
3
18.72 - 21.41 ft
700.9 %RE (s 423.9)
4
26.70 - 27.17 ft
148.7 %RE (s 110.4)
5
31.03 - 31.81 ft
68.0 %RE (s 69.2)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
15.9
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-04
Site: Oronoco St.
Date & Time: 2023-11-09 08:21 EST
Client: Stantec
Job:
Final Depth: 33.69 ft
X Coord.(Long/East): 11898828.49
Max Signal: 2032.0 %RE @ 19.74 ft
Y Coord.(Lat/North): 6980937
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.6 ft


Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
15.18 - 15.98 ft
13.9 %RE (s 5.8)
3
16.63 - 18.22 ft
188.1 %RE (s 103.7)
4
18.54 - 19.89 ft
625.0 %RE (s 330.0)
5
20.58 - 22.44 ft
328.4 %RE (s 117.6)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-05
Site: Oronoco St.
Date & Time: 2023-11-08 16:11 EST
Client: Stantec
Job:
Final Depth: 25.53 ft
X Coord.(Long/East): 11898833.99
Max Signal: 1243.5 %RE @ 19.17 ft
Y Coord.(Lat/North): 6980936.46
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.5 ft


Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
14.65 - 15.51 ft
31.7 %RE (s 13.7)
3
16.90 - 17.66 ft
356.3 %RE (s 143.7)
4
18.16 - 20.74 ft
666.2 %RE (s 324.5)
5
21.10 - 21.55 ft
422.2 %RE (s 191.6)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-06
Site: Oronoco St.
Date & Time: 2023-11-08 15:39 EST
Client: Stantec
Job:
Final Depth: 25.71 ft
X Coord.(Long/East): 11898841.46
Max Signal: 1514.0 %RE @ 19.65 ft
Y Coord.(Lat/North): 6980935.38
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.5 ft



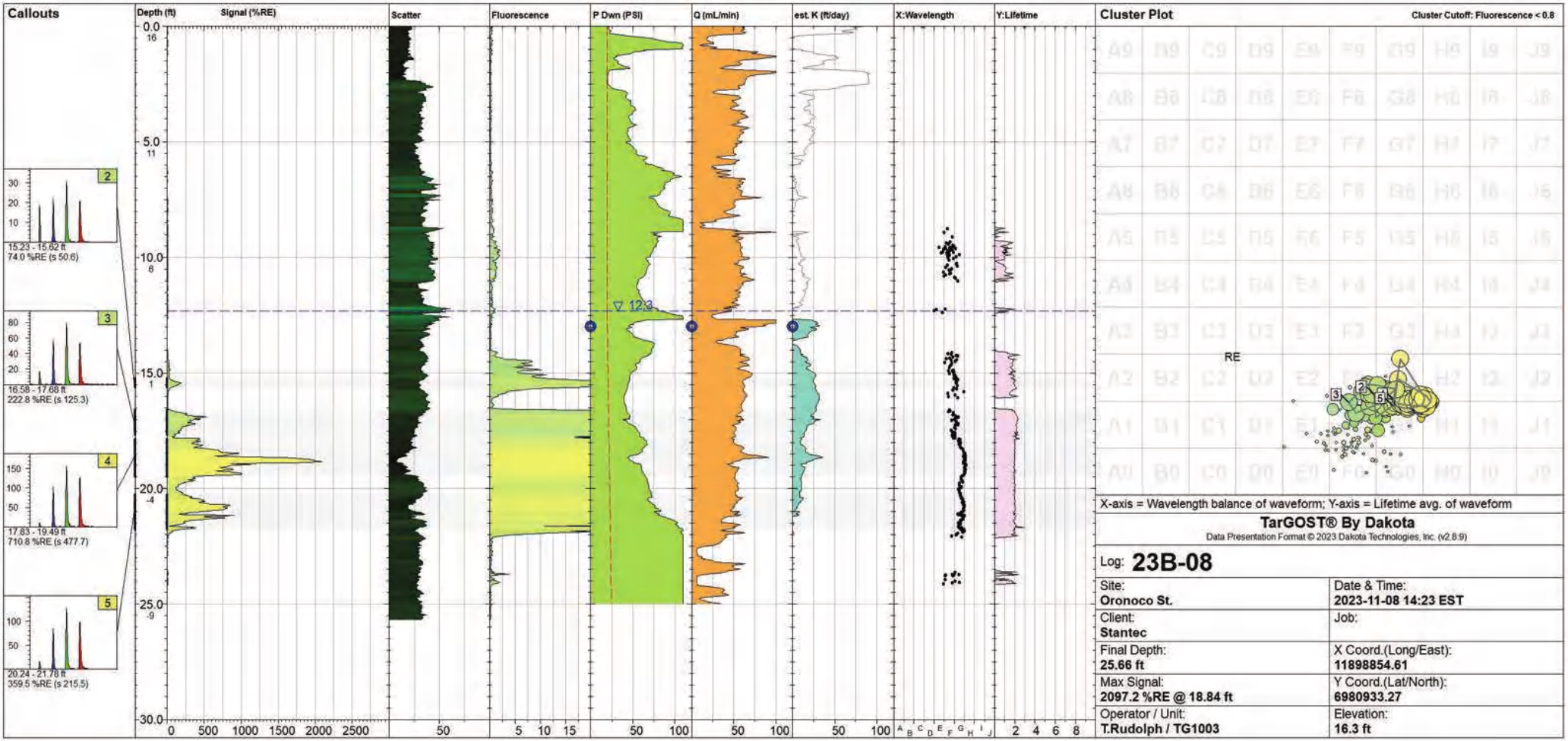
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform

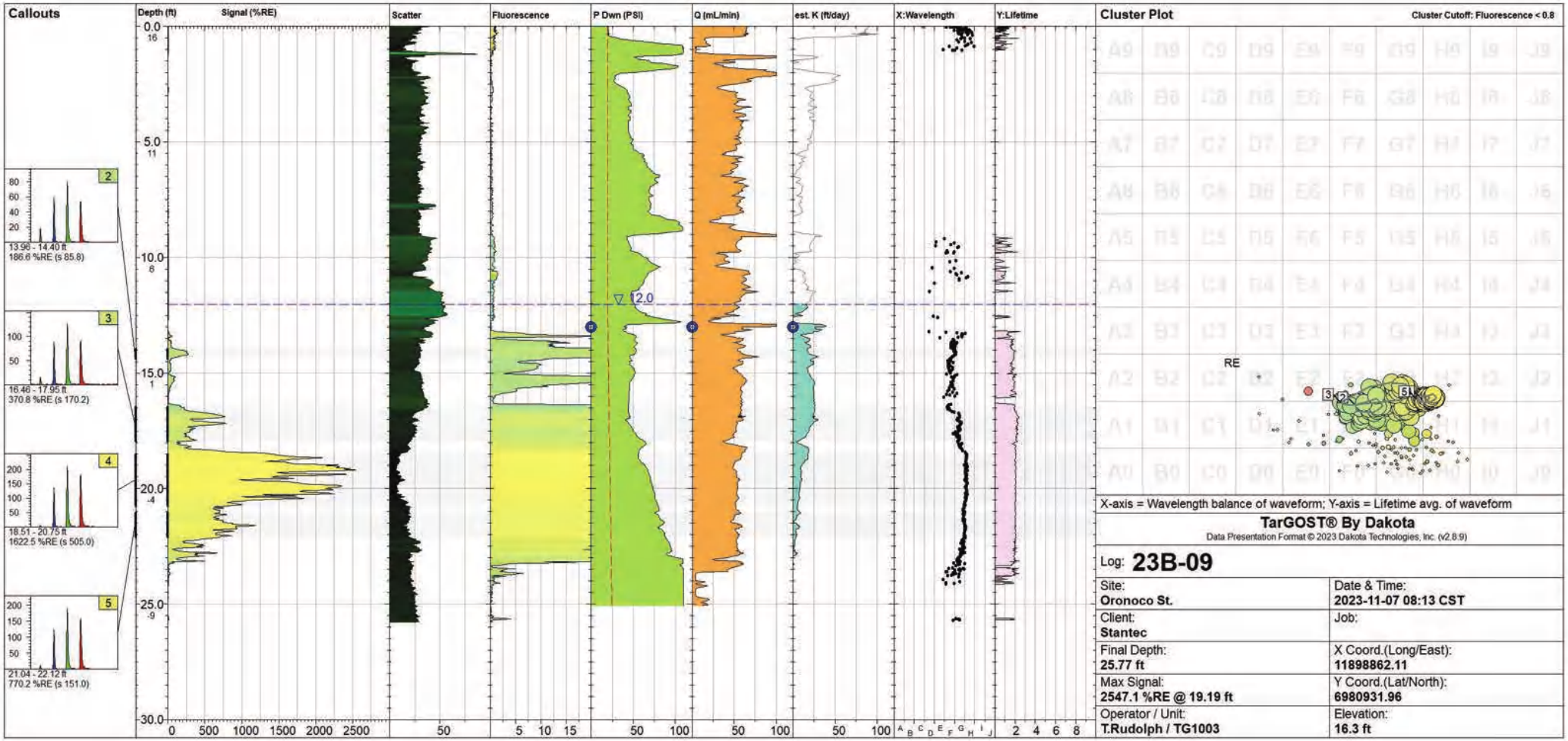
TarGOST® By Dakota

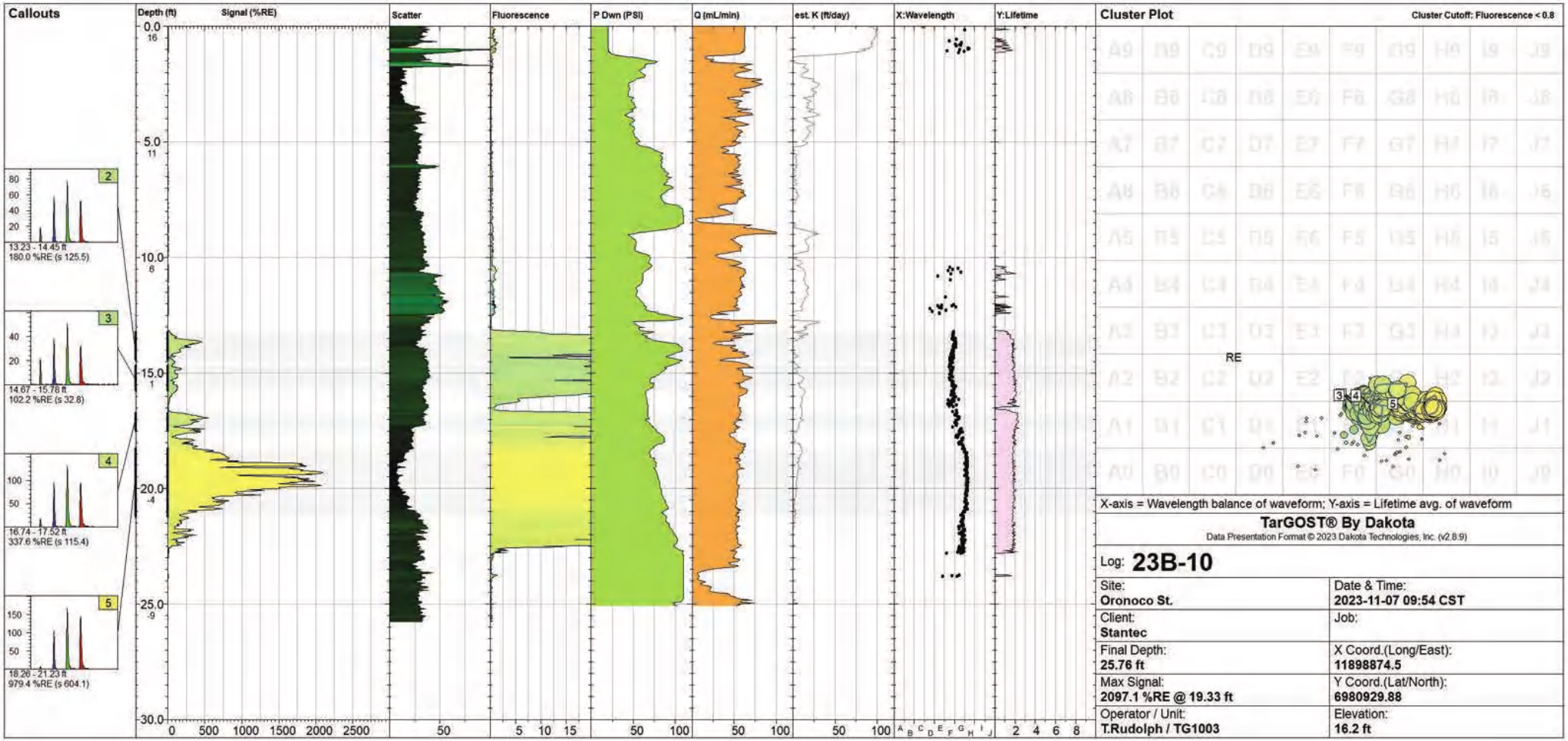
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)

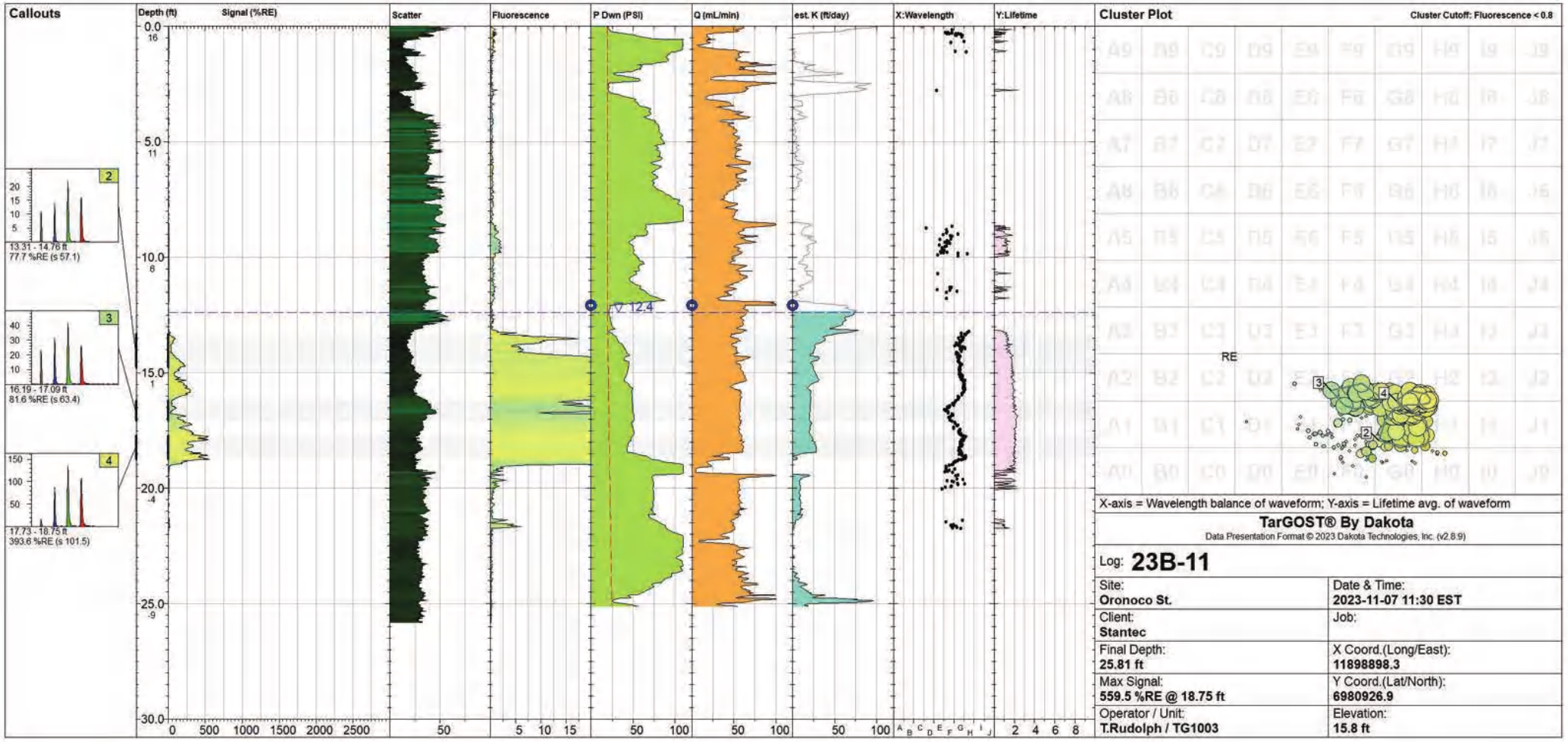
Log: **23B-07**

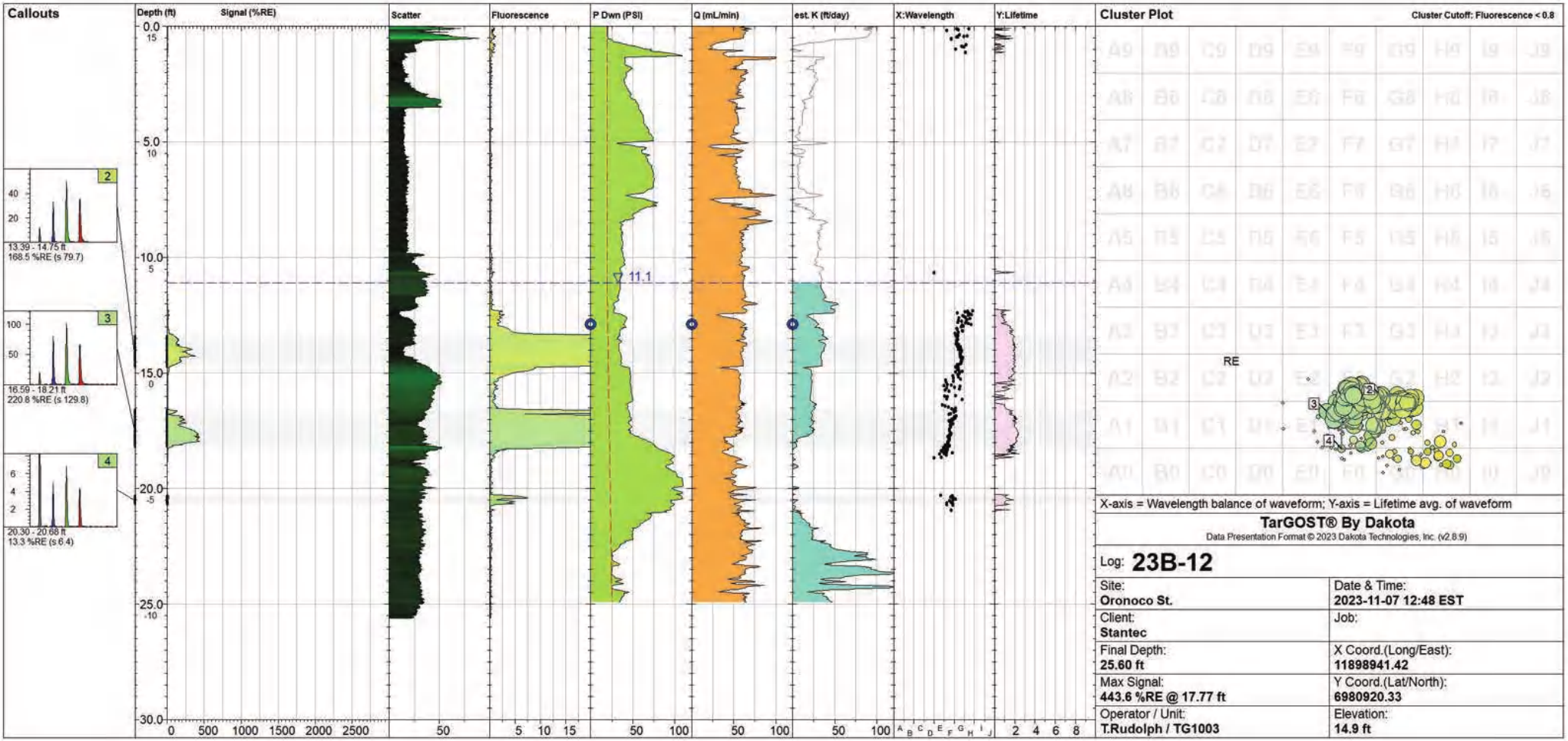
Site: **Oronoco St.**	Date & Time: **2023-11-08 15:04 EST**
Client: **Stantec**	Job:
Final Depth: **25.64 ft**	X Coord.(Long/East): **11898848.42**
Max Signal: **1314.3 %RE @ 22.19 ft**	Y Coord.(Lat/North): **6980934.21**
Operator / Unit: **T.Rudolph / TG1003**	Elevation: **16.4 ft**

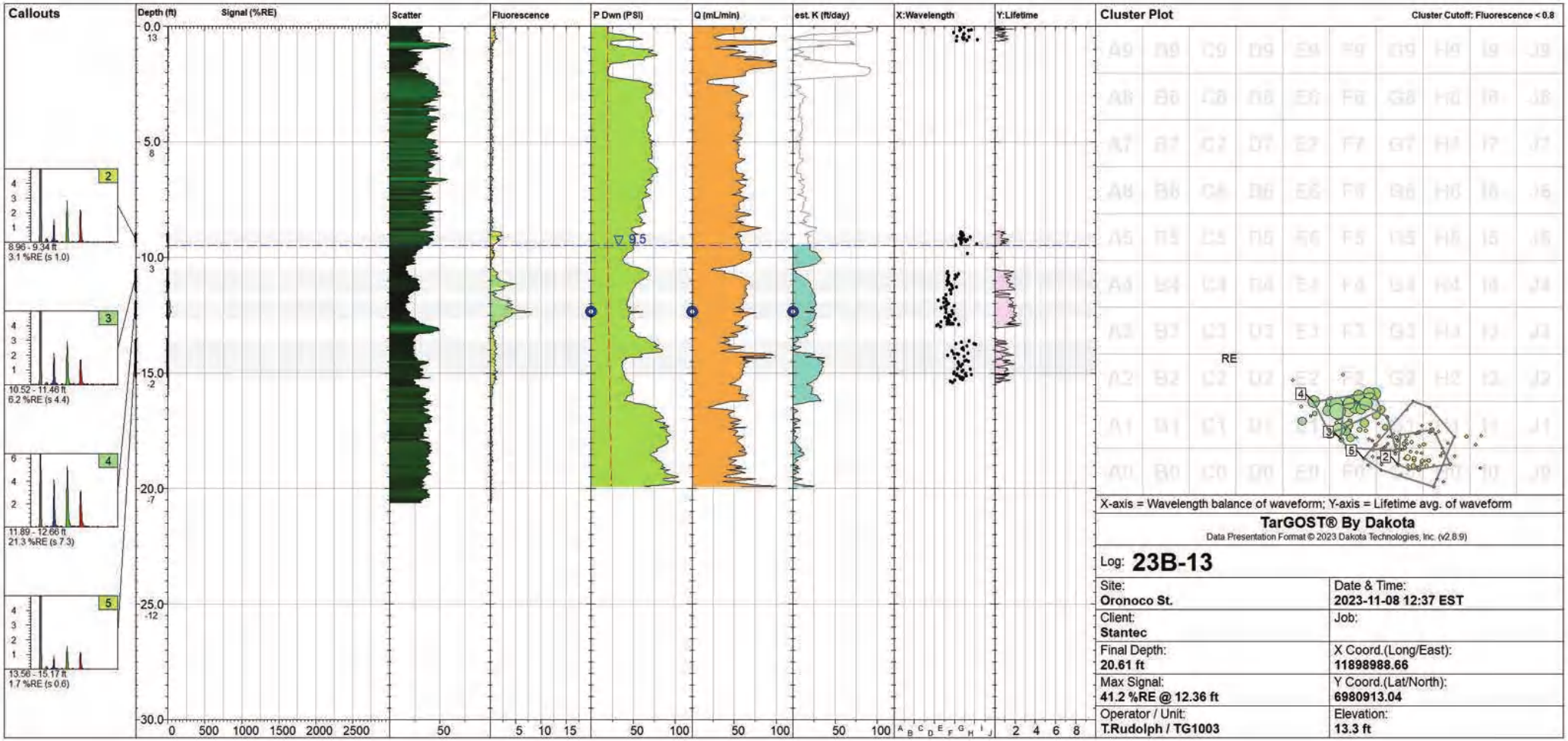

Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
15.23 - 15.62 ft
74.0 %RE (s 50.6)
3
16.58 - 17.68 ft
222.8 %RE (s 125.3)
4
17.83 - 19.49 ft
710.8 %RE (s 477.7)
5
20.24 - 21.78 ft
359.5 %RE (s 215.5)
12.3
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-08
Site: Oronoco St.
Date & Time: 2023-11-08 14:23 EST
Client: Stantec
Job:
Final Depth: 25.66 ft
X Coord.(Long/East): 11898854.61
Max Signal: 2097.2 %RE @ 18.84 ft
Y Coord.(Lat/North): 6980933.27
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.3 ft

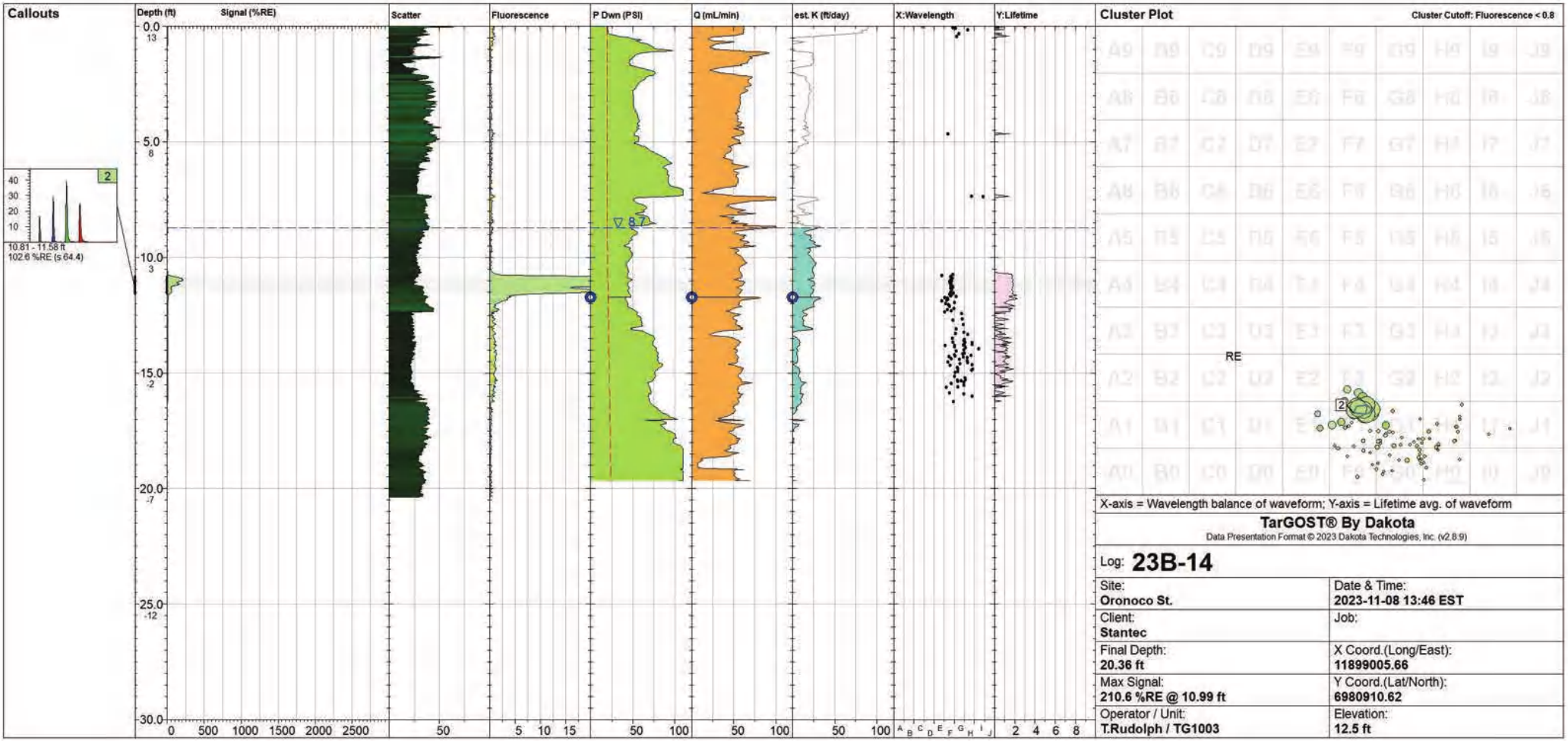

Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
12.0
2
13.96 - 14.40 ft
186.6 %RE (s 85.8)
3
16.46 - 17.95 ft
370.8 %RE (s 170.2)
4
18.51 - 20.75 ft
1622.5 %RE (s 505.0)
5
21.04 - 22.12 ft
770.2 %RE (s 151.0)
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-09
Site: Oronoco St.
Date & Time: 2023-11-07 08:13 CST
Client: Stantec
Job:
Final Depth: 25.77 ft
X Coord.(Long/East): 11898862.11
Max Signal: 2547.1 %RE @ 19.19 ft
Y Coord.(Lat/North): 6980931.96
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.3 ft

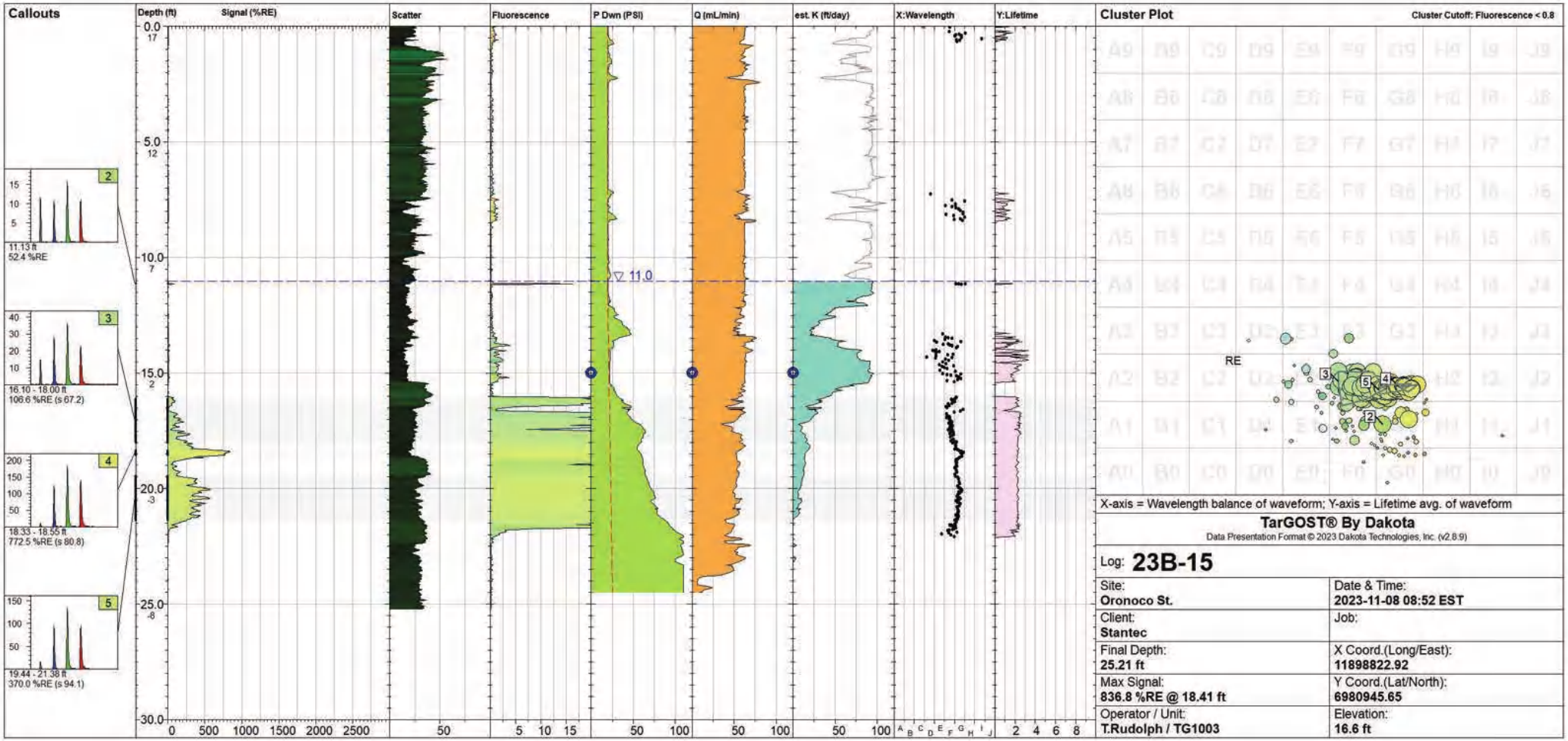

Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
13.23 - 14.45 ft
180.0 %RE (s 125.5)
3
14.67 - 15.78 ft
102.2 %RE (s 32.8)
4
16.74 - 17.52 ft
337.6 %RE (s 115.4)
5
18.26 - 21.23 ft
979.4 %RE (s 604.1)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-10
Site: Oronoco St.
Date & Time: 2023-11-07 09:54 CST
Client: Stantec
Job:
Final Depth: 25.76 ft
X Coord.(Long/East): 11898874.5
Max Signal: 2097.1 %RE @ 19.33 ft
Y Coord.(Lat/North): 6980929.88
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.2 ft

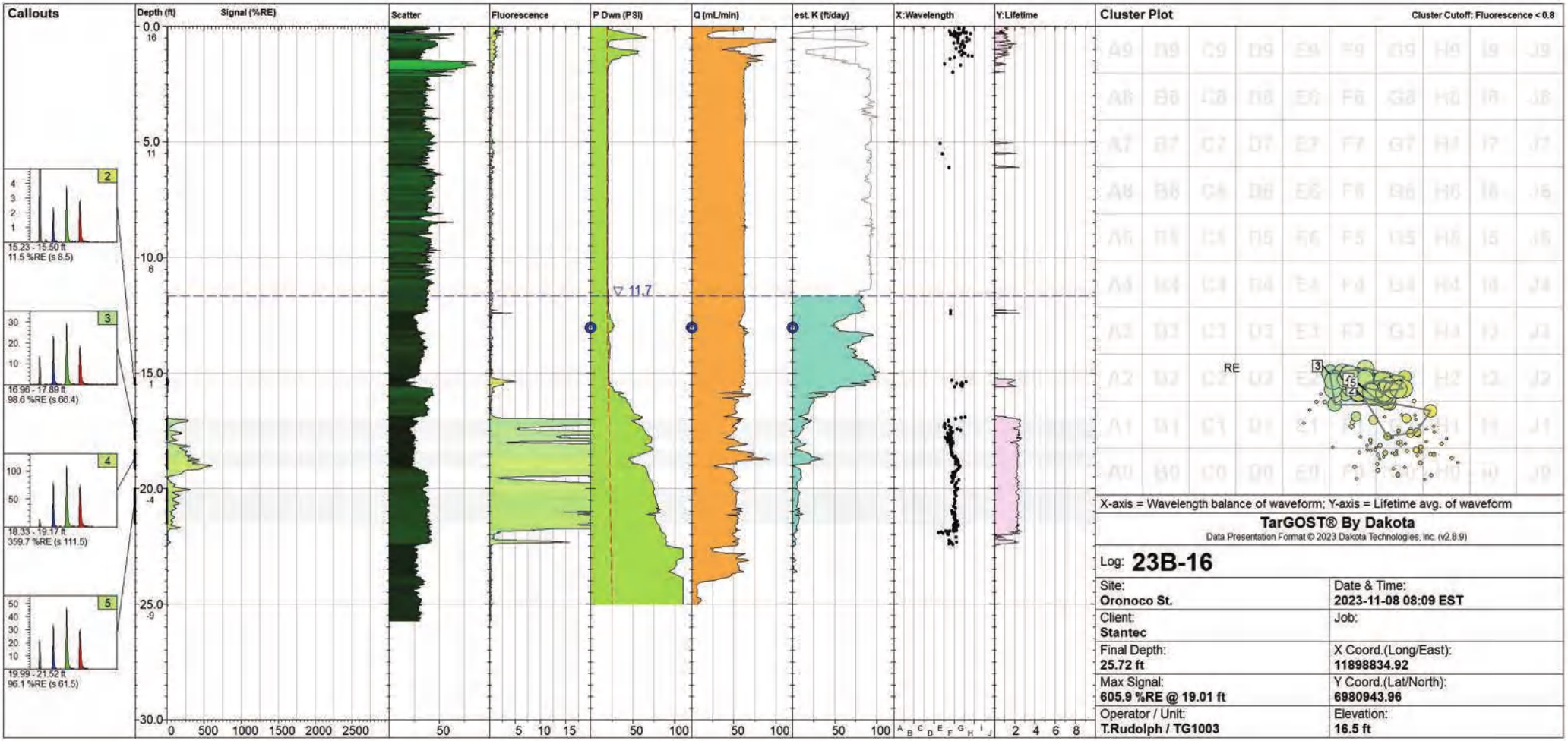

Callouts
2
13.31 - 14.76 ft
77.7 %RE (s 57.1)
3
16.19 - 17.09 ft
81.6 %RE (s 63.4)
4
17.73 - 18.75 ft
393.6 %RE (s 101.5)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
12.4
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-11
Site: Oronoco St.
Date & Time: 2023-11-07 11:30 EST
Client: Stantec
Job:
Final Depth: 25.81 ft
X Coord.(Long/East): 11898898.3
Max Signal: 559.5 %RE @ 18.75 ft
Y Coord.(Lat/North): 6980926.9
Operator / Unit: T.Rudolph / TG1003
Elevation: 15.8 ft

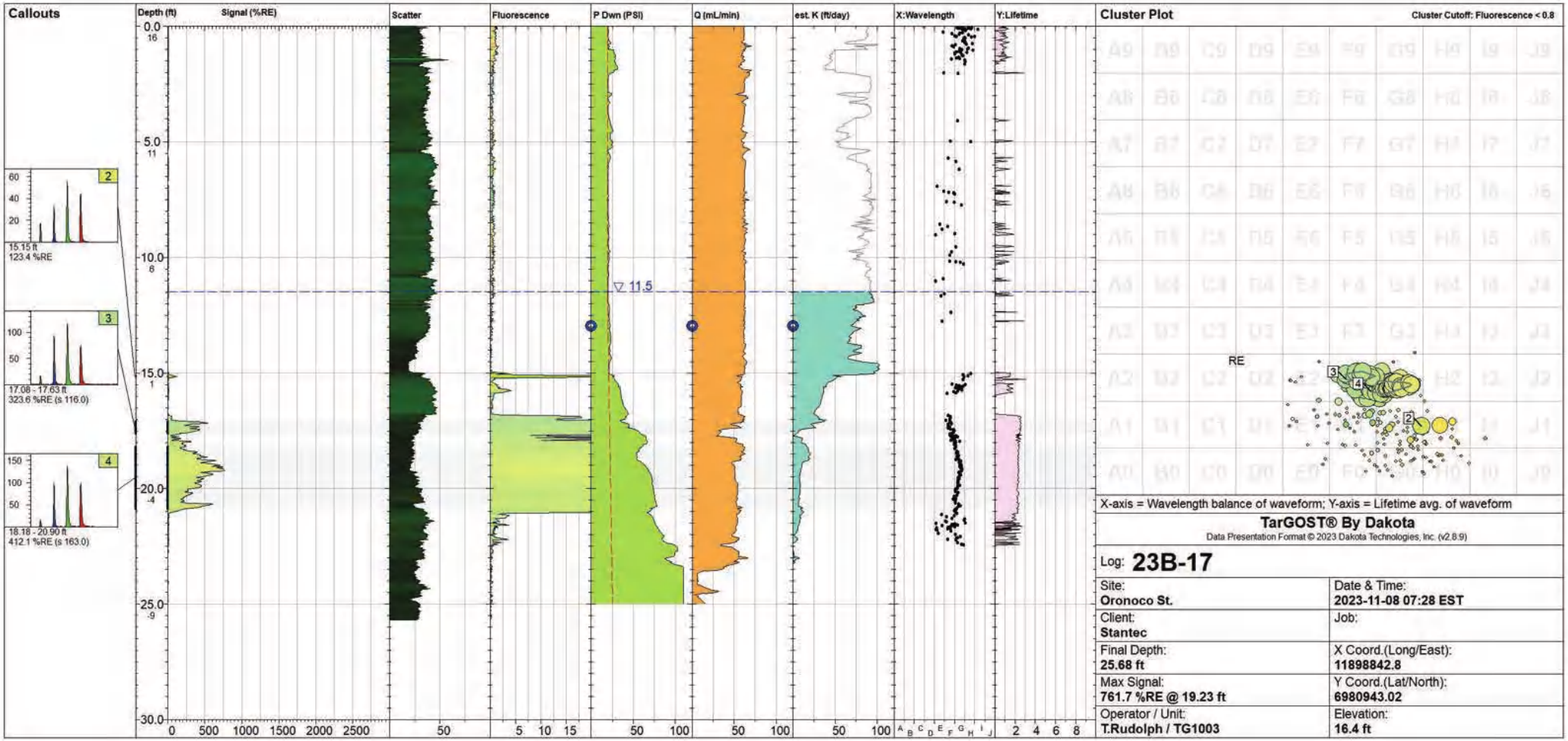

Callouts
2
13.39 - 14.75 ft
168.5 %RE (s 79.7)
3
16.59 - 18.21 ft
220.8 %RE (s 129.8)
4
20.30 - 20.68 ft
13.3 %RE (s 6.4)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
11.1
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-12
Site: Oronoco St.
Date & Time: 2023-11-07 12:48 EST
Client: Stantec
Job:
Final Depth: 25.60 ft
X Coord.(Long/East): 11898941.42
Max Signal: 443.6 %RE @ 17.77 ft
Y Coord.(Lat/North): 6980920.33
Operator / Unit: T.Rudolph / TG1003
Elevation: 14.9 ft

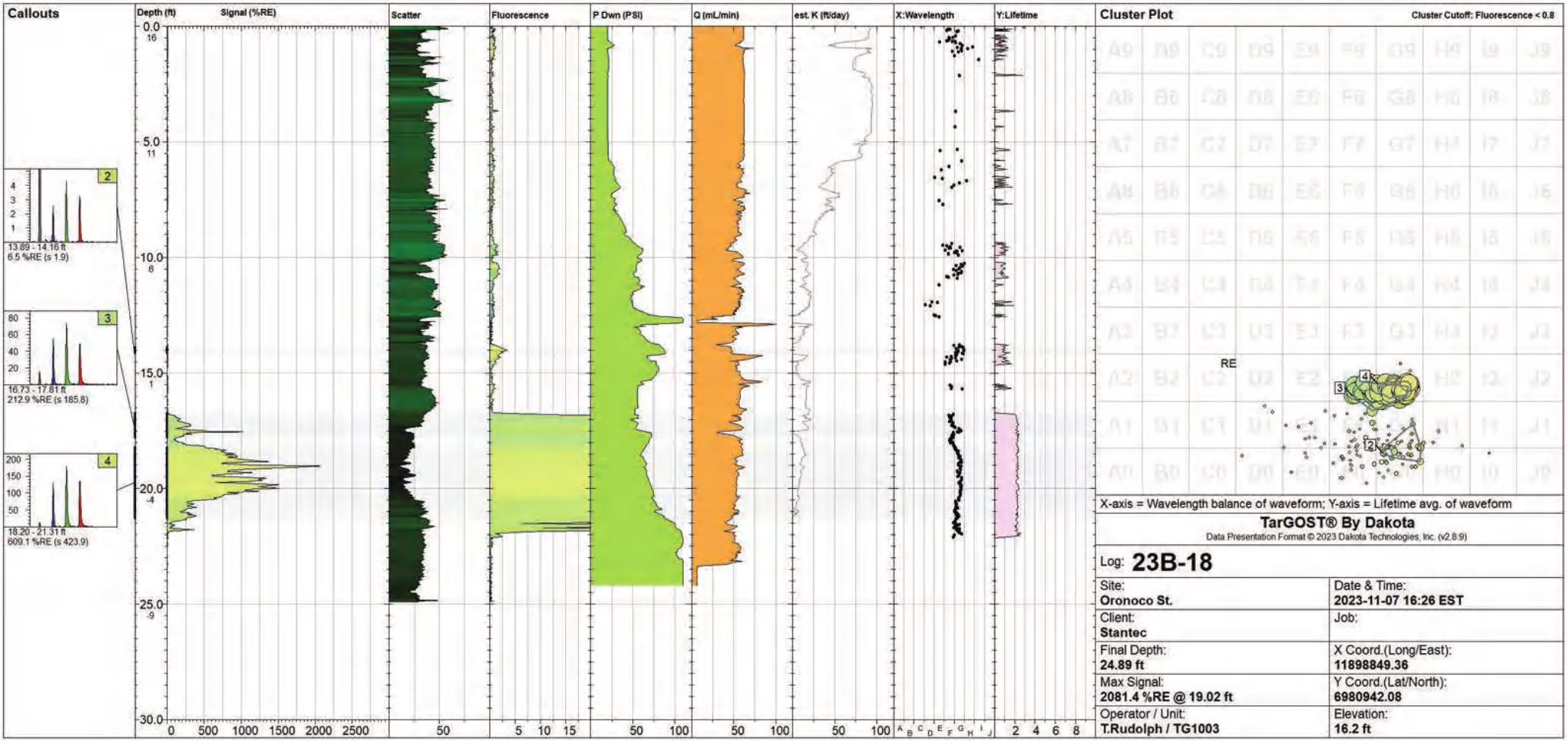

Callouts
2
8.98 - 9.34 ft
3.1 %RE (s 1.0)
3
10.52 - 11.46 ft
6.2 %RE (s 4.4)
4
11.89 - 12.66 ft
21.3 %RE (s 7.3)
5
13.56 - 15.17 ft
1.7 %RE (s 0.6)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
0.0
5.0
10.0
15.0
20.0
25.0
30.0
9.5
0 500 1000 1500 2000 2500
50
5 10 15
50 100
50 100
50 100
A B C D E F G H I J
2 4 6 8
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-13
Site: Oronoco St.
Date & Time: 2023-11-08 12:37 EST
Client: Stantec
Job:
Final Depth: 20.61 ft
X Coord.(Long/East): 11898988.66
Max Signal: 41.2 %RE @ 12.36 ft
Y Coord.(Lat/North): 6980913.04
Operator / Unit: T.Rudolph / TG1003
Elevation: 13.3 ft


Callouts
2
10.81 - 11.58 ft
102.6 %RE (s 64.4)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
0.0
5.0
10.0
15.0
20.0
25.0
30.0
0 500 1000 1500 2000 2500
50
5 10 15
50 100
50 100
50 100
A B C D E F G H I J
2 4 6 8
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-14
Site: Oronoco St.
Date & Time: 2023-11-08 13:46 EST
Client: Stantec
Job:
Final Depth: 20.36 ft
X Coord.(Long/East): 11899005.66
Max Signal: 210.6 %RE @ 10.99 ft
Y Coord.(Lat/North): 6980910.62
Operator / Unit: T.Rudolph / TG1003
Elevation: 12.5 ft


Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
11.0
2
11.13 ft
52.4 %RE
3
16.10 - 18.00 ft
106.6 %RE (s 67.2)
4
18.33 - 18.55 ft
772.5 %RE (s 80.8)
5
19.44 - 21.38 ft
370.0 %RE (s 94.1)
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-15
Site: Oronoco St.
Date & Time: 2023-11-08 08:52 EST
Client: Stantec
Job:
Final Depth: 25.21 ft
X Coord.(Long/East): 11898822.92
Max Signal: 836.8 %RE @ 18.41 ft
Y Coord.(Lat/North): 6980945.65
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.6 ft


Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
15.23 - 15.50 ft
11.5 %RE (s 8.5)
3
16.96 - 17.89 ft
98.6 %RE (s 66.4)
4
18.33 - 19.17 ft
359.7 %RE (s 111.5)
5
19.99 - 21.52 ft
96.1 %RE (s 61.5)
▽ 11.7
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-16
Site: Oronoco St.
Date & Time: 2023-11-08 08:09 EST
Client: Stantec
Job:
Final Depth: 25.72 ft
X Coord.(Long/East): 11898834.92
Max Signal: 605.9 %RE @ 19.01 ft
Y Coord.(Lat/North): 6980943.96
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.5 ft


Callouts
2
15.15 ft
123.4 %RE
3
17.08 - 17.63 ft
323.6 %RE (s 116.0)
4
18.18 - 20.90 ft
412.1 %RE (s 163.0)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
11.5
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-17
Site: Oronoco St.
Date & Time: 2023-11-08 07:28 EST
Client: Stantec
Job:
Final Depth: 25.68 ft
X Coord.(Long/East): 11898842.8
Max Signal: 761.7 %RE @ 19.23 ft
Y Coord.(Lat/North): 6980943.02
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.4 ft



X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform

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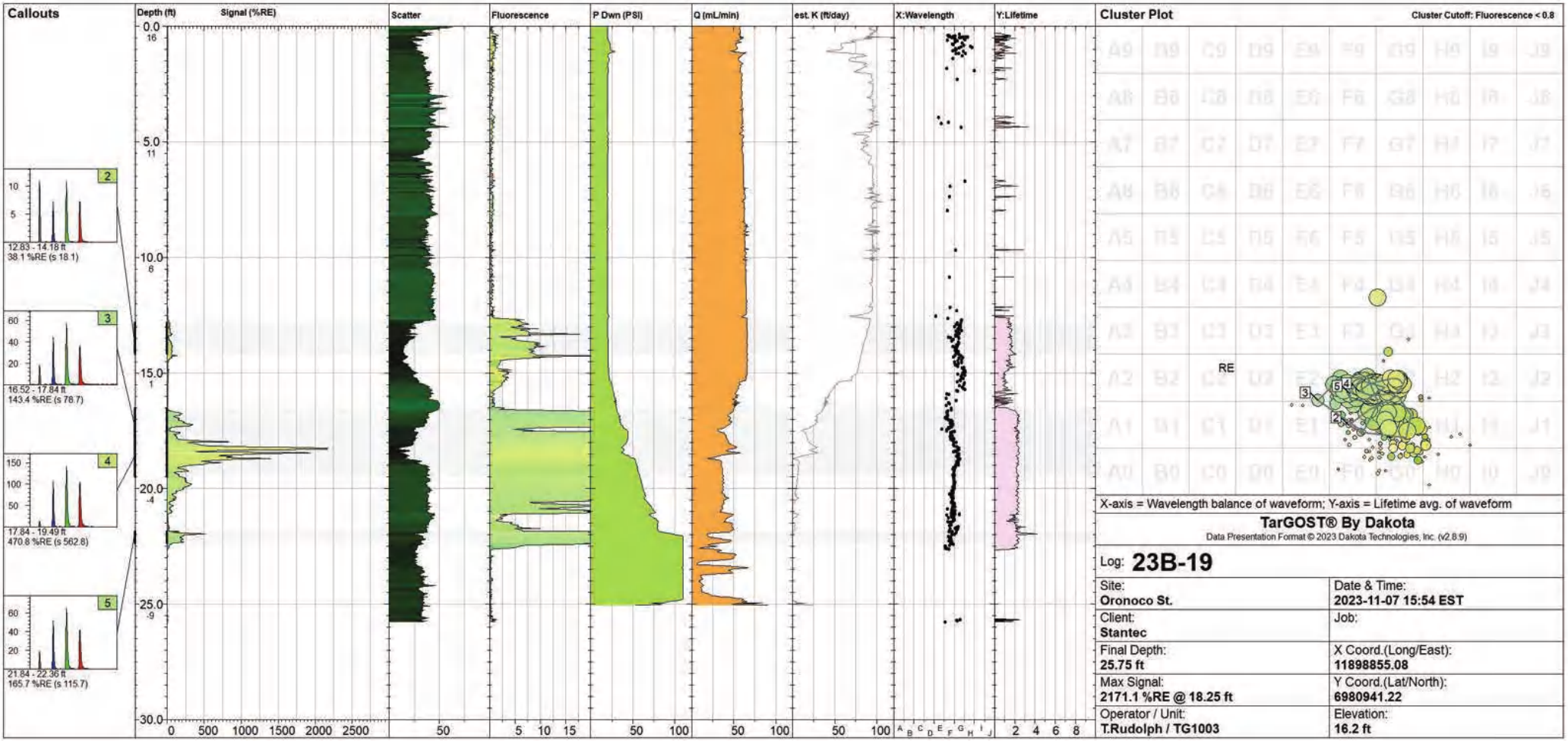
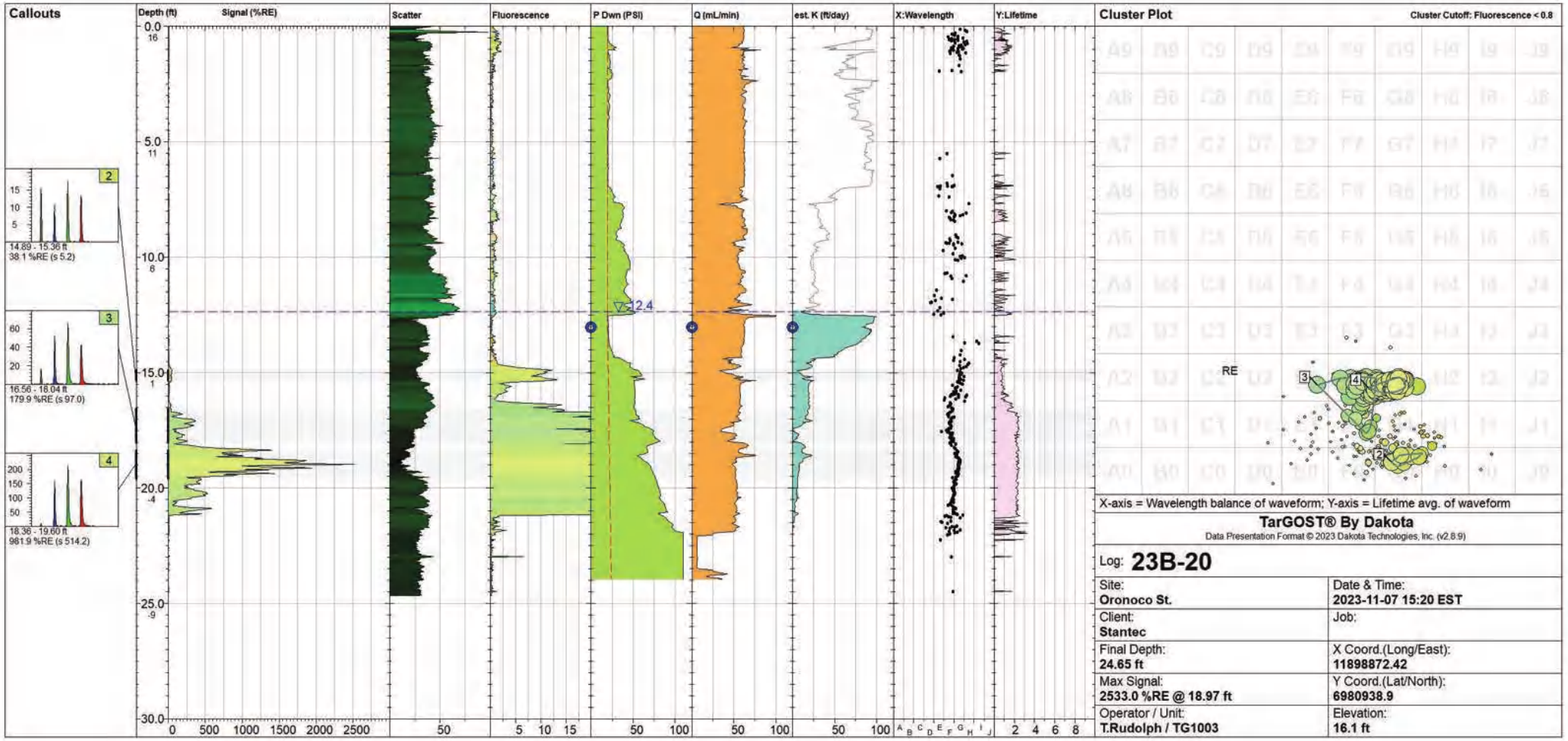
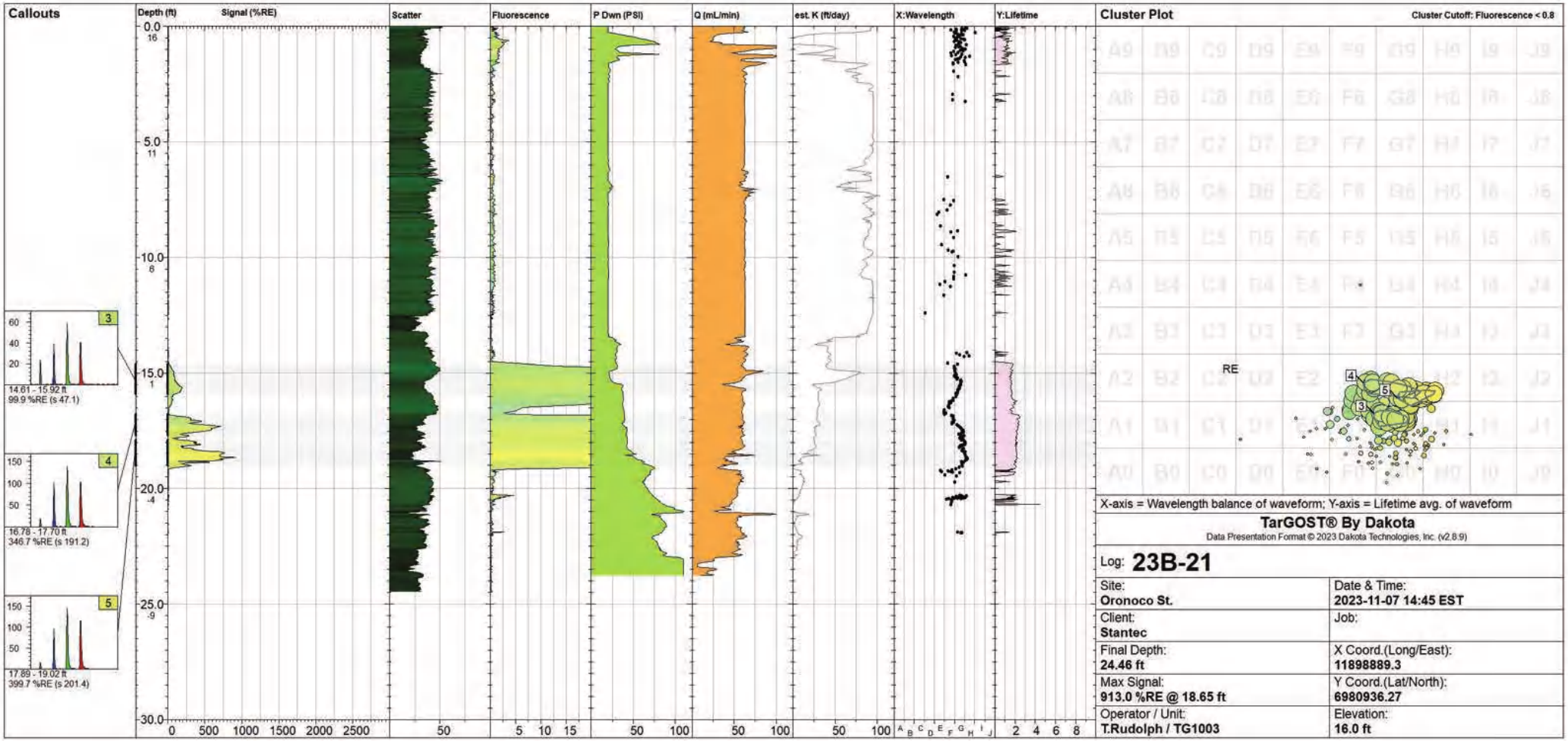
Log: **23B-18**

Site: **Oronoco St.**	Date & Time: **2023-11-07 16:26 EST**
Client: **Stantec**	Job:
Final Depth: **24.89 ft**	X Coord.(Long/East): **11898849.36**
Max Signal: **2081.4 %RE @ 19.02 ft**	Y Coord.(Lat/North): **6980942.08**
Operator / Unit: **T.Rudolph / TG1003**	Elevation: **16.2 ft**


Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
12.83 - 14.18 ft
38.1 %RE (s 18.1)
3
16.52 - 17.84 ft
143.4 %RE (s 76.7)
4
17.84 - 19.49 ft
470.8 %RE (s 562.8)
5
21.84 - 22.36 ft
165.7 %RE (s 115.7)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-19
Site: Oronoco St.
Date & Time: 2023-11-07 15:54 EST
Client: Stantec
Job:
Final Depth: 25.75 ft
X Coord.(Long/East): 11898855.08
Max Signal: 2171.1 %RE @ 18.25 ft
Y Coord.(Lat/North): 6980941.22
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.2 ft


Callouts
2
14.89 - 15.36 ft
38.1 %RE (s 5.2)
3
16.56 - 18.04 ft
179.9 %RE (s 97.0)
4
18.36 - 19.60 ft
981.9 %RE (s 514.2)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
2.4
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-20
Site: Oronoco St.
Date & Time: 2023-11-07 15:20 EST
Client: Stantec
Job:
Final Depth: 24.65 ft
X Coord.(Long/East): 11898872.42
Max Signal: 2533.0 %RE @ 18.97 ft
Y Coord.(Lat/North): 6980938.9
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.1 ft



X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform

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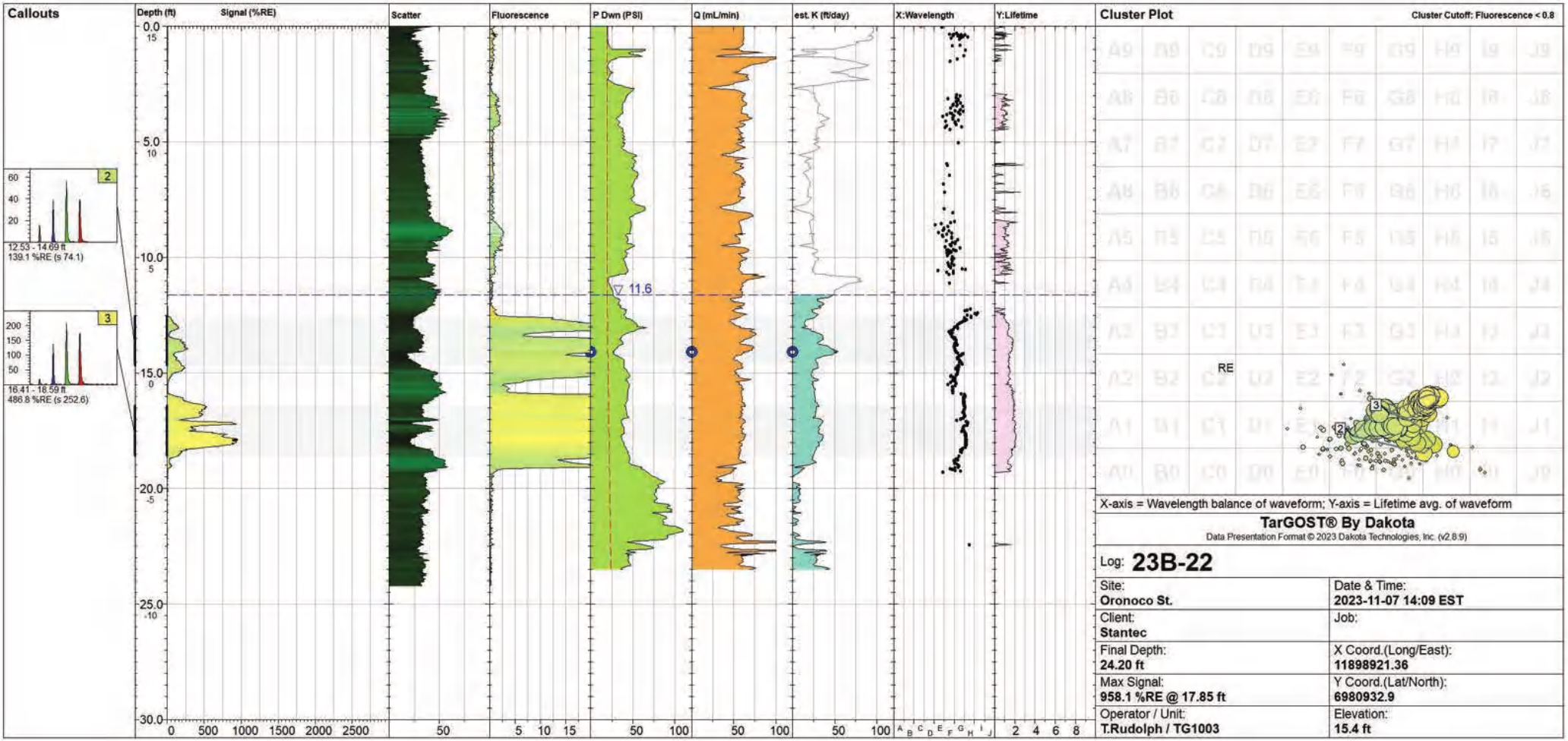
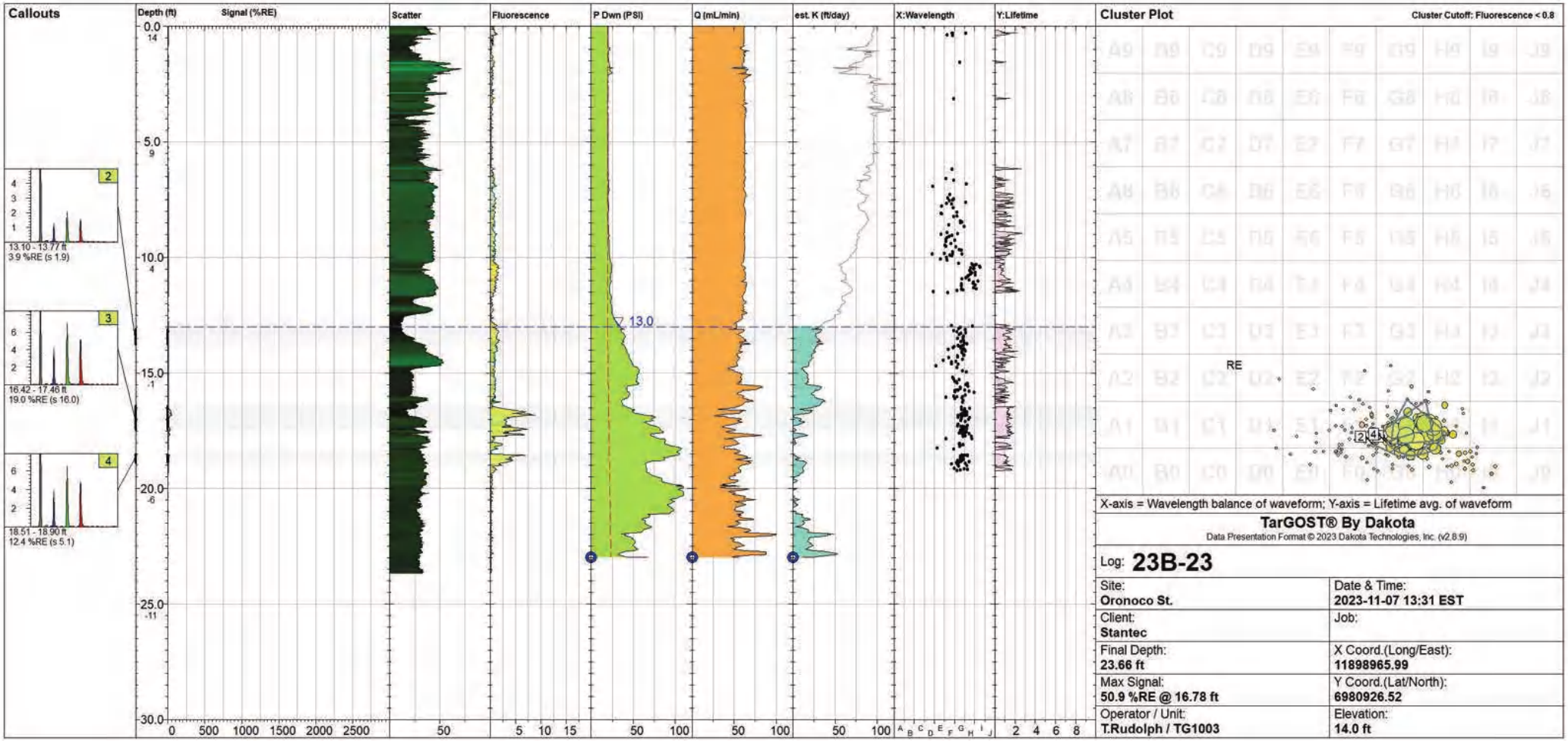
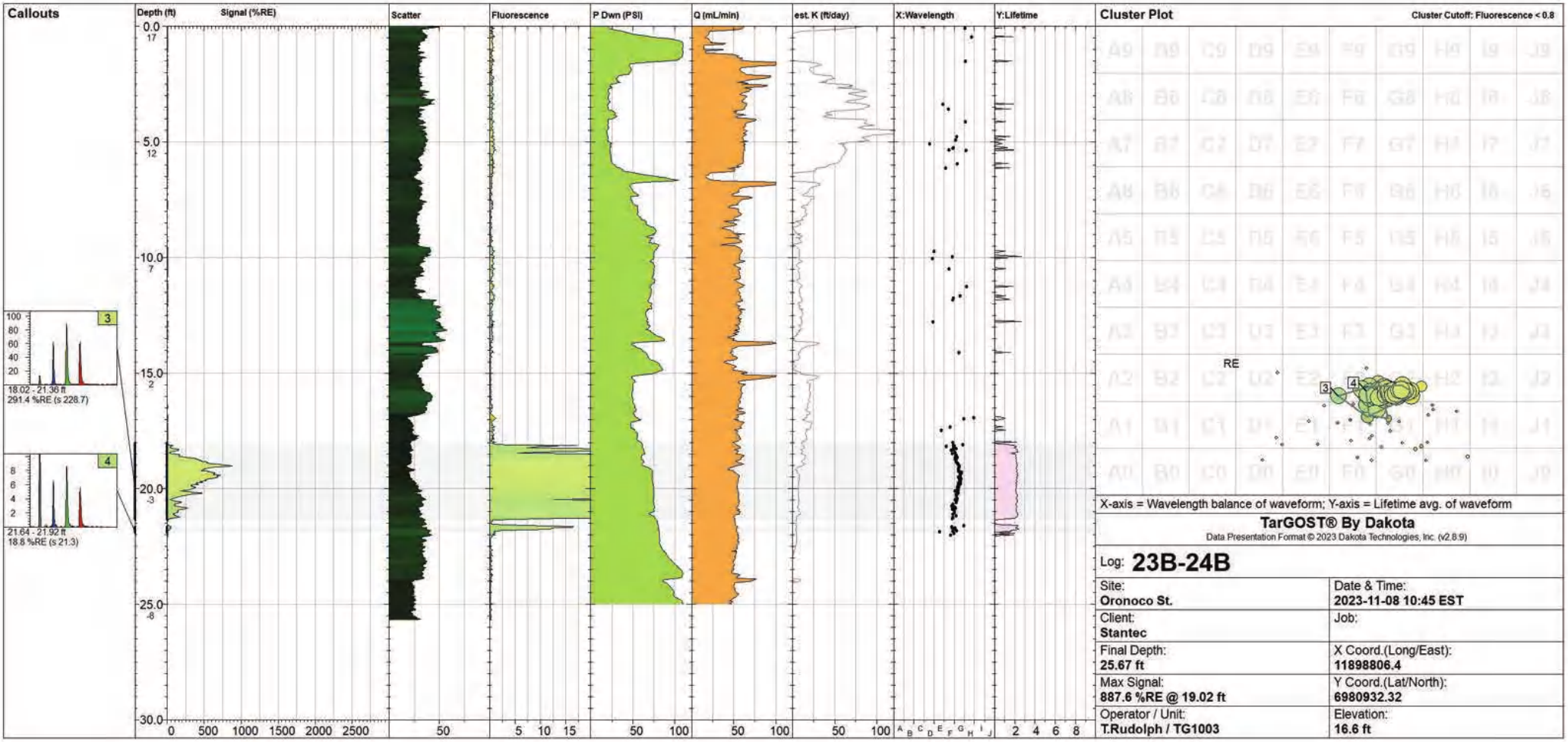
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)

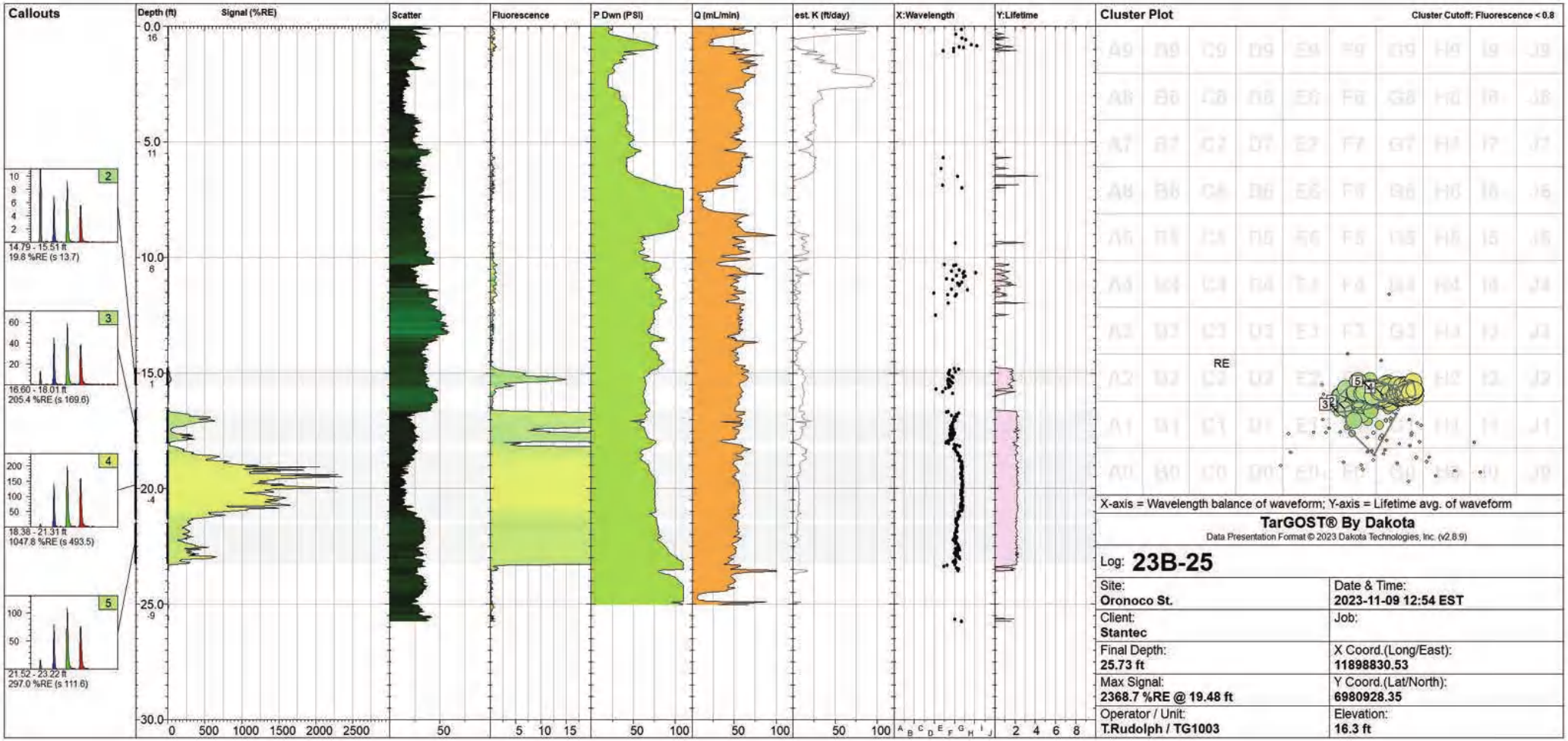
Log: **23B-21**

Site: **Oronoco St.**	Date & Time: **2023-11-07 14:45 EST**
Client: **Stantec**	Job:
Final Depth: **24.46 ft**	X Coord.(Long/East): **11898889.3**
Max Signal: **913.0 %RE @ 18.65 ft**	Y Coord.(Lat/North): **6980936.27**
Operator / Unit: **T.Rudolph / TG1003**	Elevation: **16.0 ft**


Callouts
2
12.53 - 14.69 ft
139.1 %RE (s 74.1)
3
16.41 - 16.59 ft
486.8 %RE (s 252.6)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
11.6
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-22
Site: Oronoco St.
Date & Time: 2023-11-07 14:09 EST
Client: Stantec
Job:
Final Depth: 24.20 ft
X Coord.(Long/East): 11898921.36
Max Signal: 958.1 %RE @ 17.85 ft
Y Coord.(Lat/North): 6980932.9
Operator / Unit: T.Rudolph / TG1003
Elevation: 15.4 ft


Callouts
2
13.10 - 13.77 ft
3.9 %RE (s 1.9)
3
16.42 - 17.46 ft
19.0 %RE (s 16.0)
4
18.51 - 18.90 ft
12.4 %RE (s 5.1)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
13.0
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-23
Site: Oronoco St.
Date & Time: 2023-11-07 13:31 EST
Client: Stantec
Job:
Final Depth: 23.66 ft
X Coord.(Long/East): 11898965.99
Max Signal: 50.9 %RE @ 16.78 ft
Y Coord.(Lat/North): 6980926.52
Operator / Unit: T.Rudolph / TG1003
Elevation: 14.0 ft


Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
3
18.02 - 21.36 ft
291.4 %RE (s 228.7)
4
21.64 - 21.92 ft
18.8 %RE (s 21.3)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-24B
Site: Oronoco St.
Date & Time: 2023-11-08 10:45 EST
Client: Stantec
Job:
Final Depth: 25.67 ft
X Coord.(Long/East): 11898806.4
Max Signal: 887.6 %RE @ 19.02 ft
Y Coord.(Lat/North): 6980932.32
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.6 ft



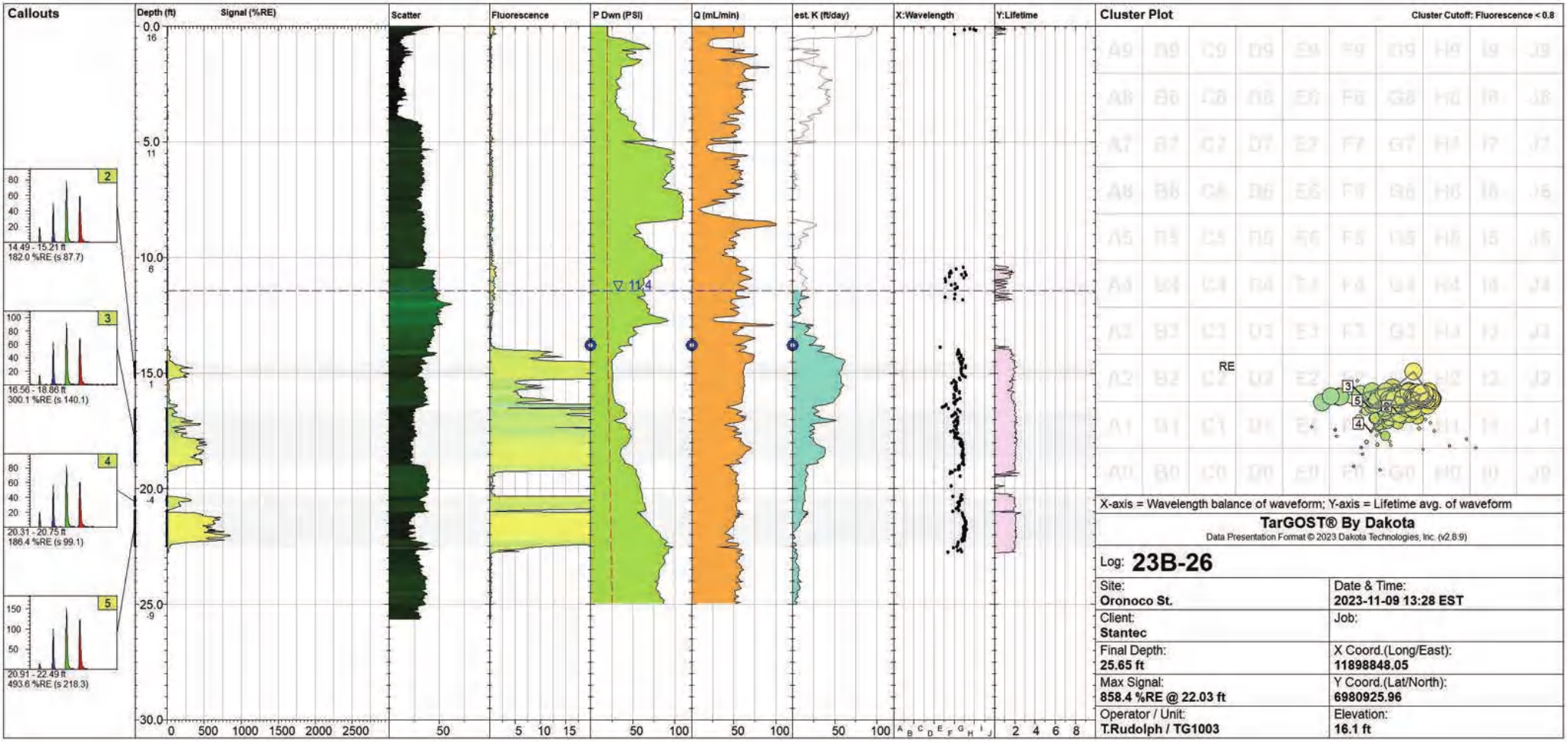
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform

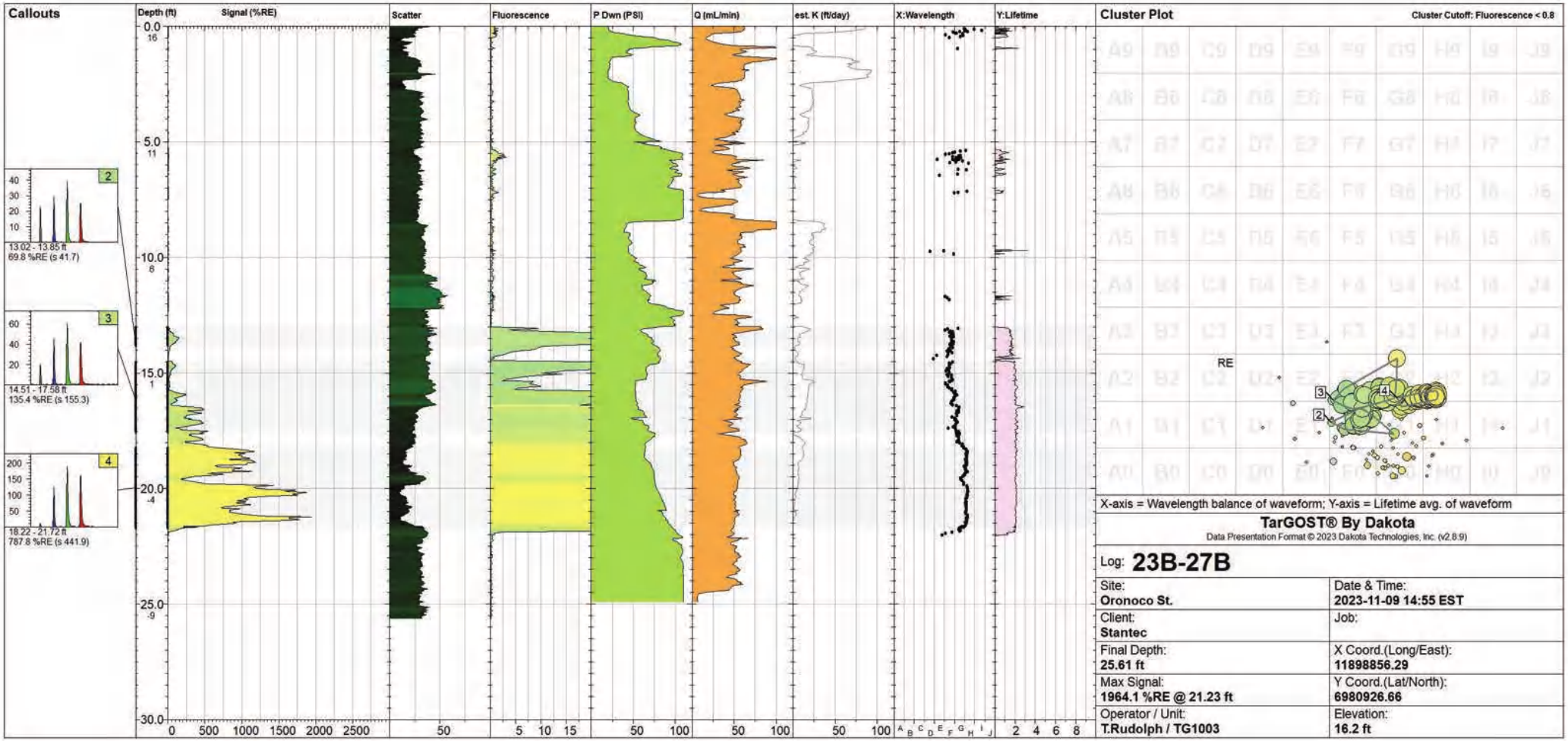
TarGOST® By Dakota

Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)

Log: **23B-25**

Site: **Oronoco St.**	Date & Time: **2023-11-09 12:54 EST**
Client: **Stantec**	Job:
Final Depth: **25.73 ft**	X Coord.(Long/East): **11898830.53**
Max Signal: **2368.7 %RE @ 19.48 ft**	Y Coord.(Lat/North): **6980928.35**
Operator / Unit: **T.Rudolph / TG1003**	Elevation: **16.3 ft**


Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
14.49 - 15.21 ft
182.0 %RE (s 87.7)
3
16.56 - 18.86 ft
300.1 %RE (s 140.1)
4
20.31 - 20.75 ft
186.4 %RE (s 99.1)
5
20.91 - 22.49 ft
493.6 %RE (s 218.3)
11.4
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-26
Site: Oronoco St.
Date & Time: 2023-11-09 13:28 EST
Client: Stantec
Job:
Final Depth: 25.65 ft
X Coord.(Long/East): 11898848.05
Max Signal: 858.4 %RE @ 22.03 ft
Y Coord.(Lat/North): 6980925.96
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.1 ft



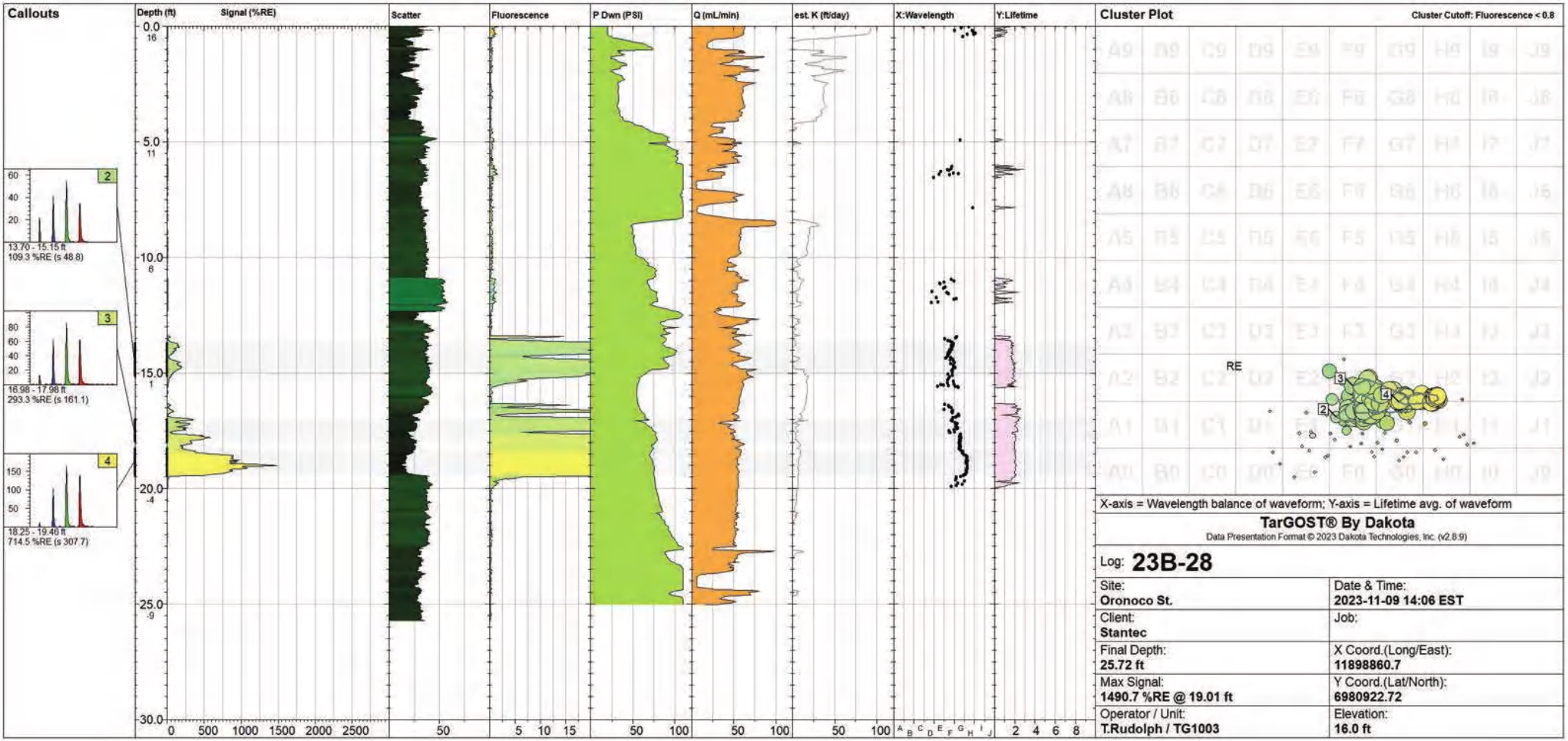
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform

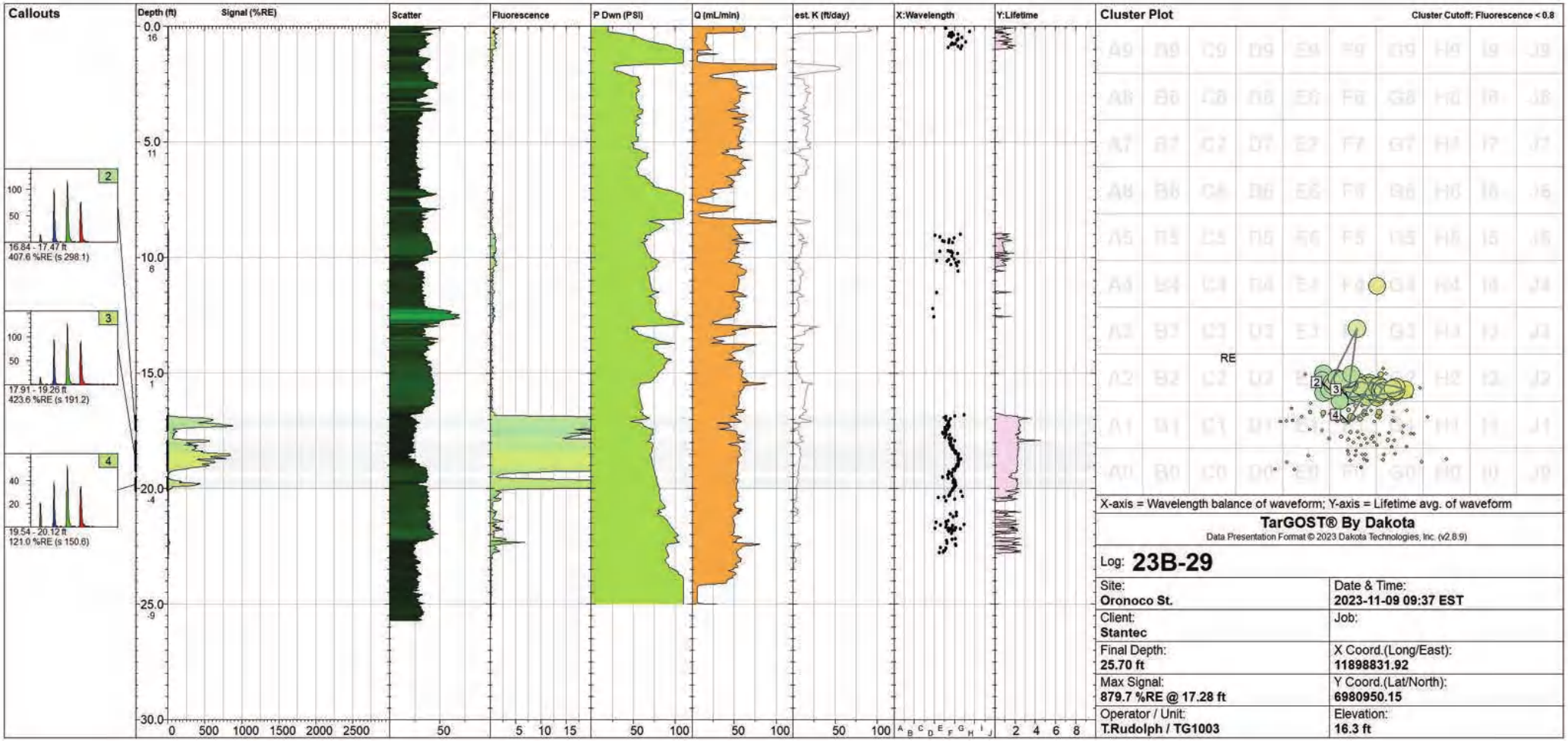
TarGOST® By Dakota

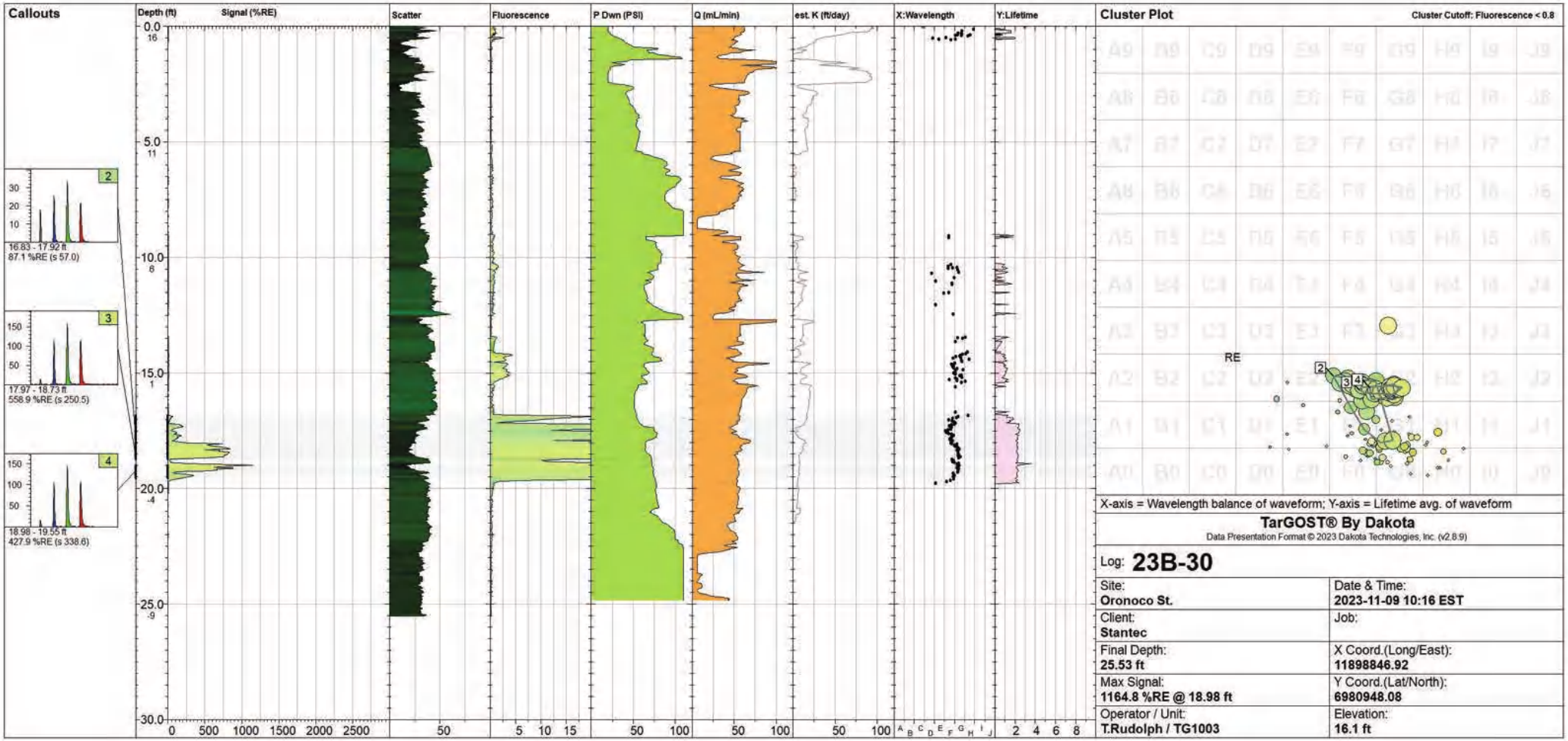
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)

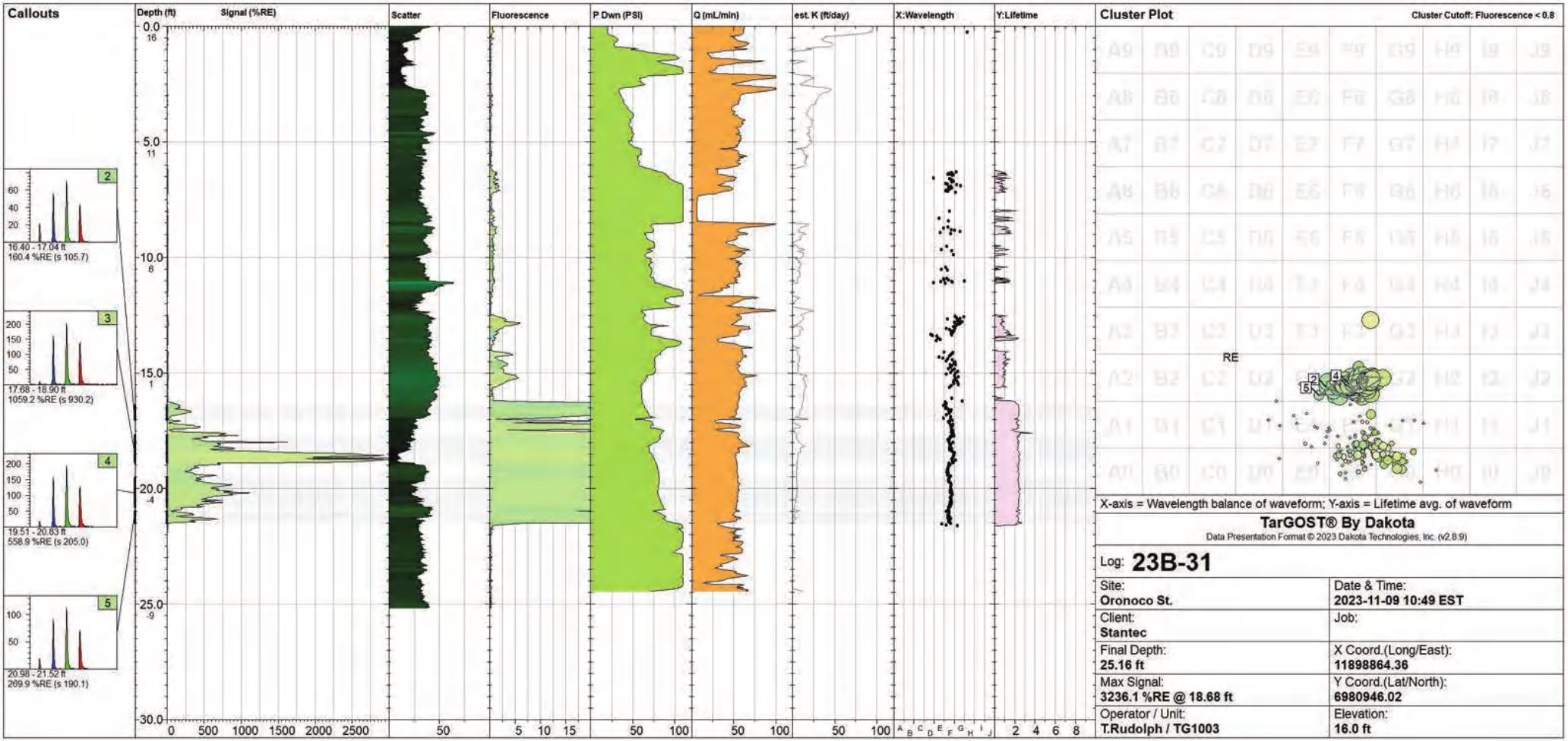
Log: **23B-27B**

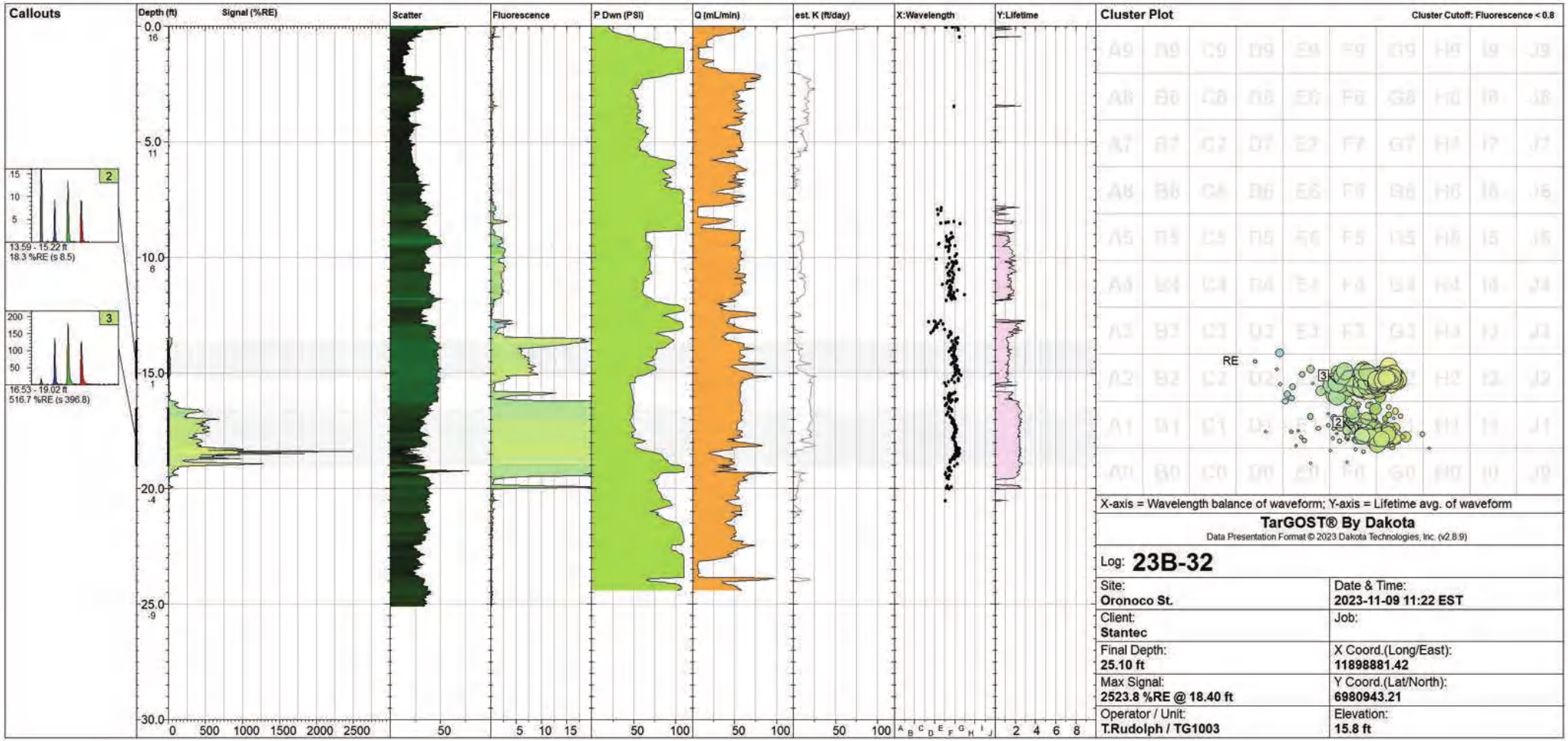
Site: **Oronoco St.**	Date & Time: **2023-11-09 14:55 EST**
Client: **Stantec**	Job:
Final Depth: **25.61 ft**	X Coord.(Long/East): **11898856.29**
Max Signal: **1964.1 %RE @ 21.23 ft**	Y Coord.(Lat/North): **6980926.66**
Operator / Unit: **T.Rudolph / TG1003**	Elevation: **16.2 ft**

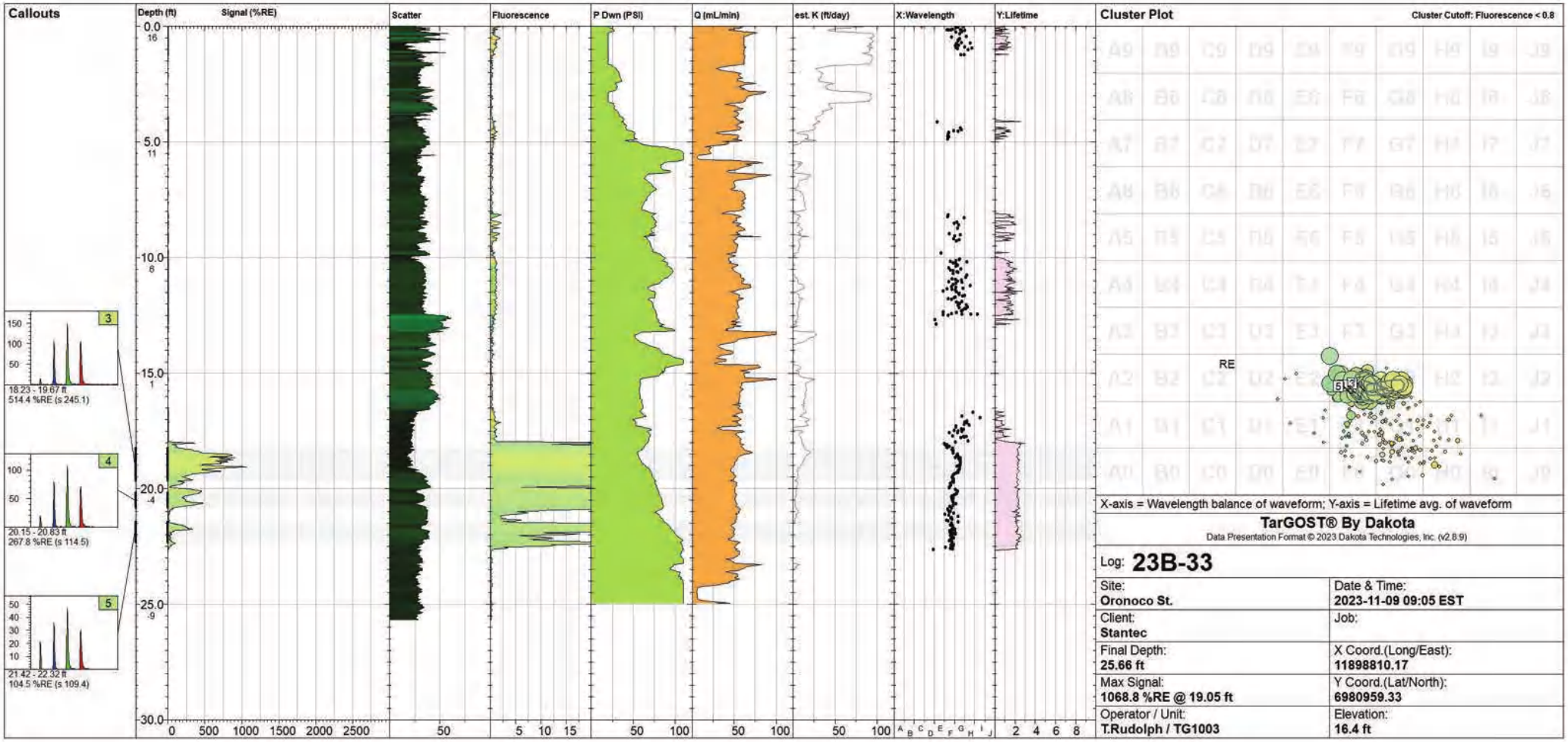

Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
13.70 - 15.15 ft
109.3 %RE (s 48.8)
3
16.98 - 17.98 ft
293.3 %RE (s 161.1)
4
18.25 - 19.46 ft
714.5 %RE (s 307.7)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-28
Site: Oronoco St.
Date & Time: 2023-11-09 14:06 EST
Client: Stantec
Job:
Final Depth: 25.72 ft
X Coord.(Long/East): 11898860.7
Max Signal: 1490.7 %RE @ 19.01 ft
Y Coord.(Lat/North): 6980922.72
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.0 ft

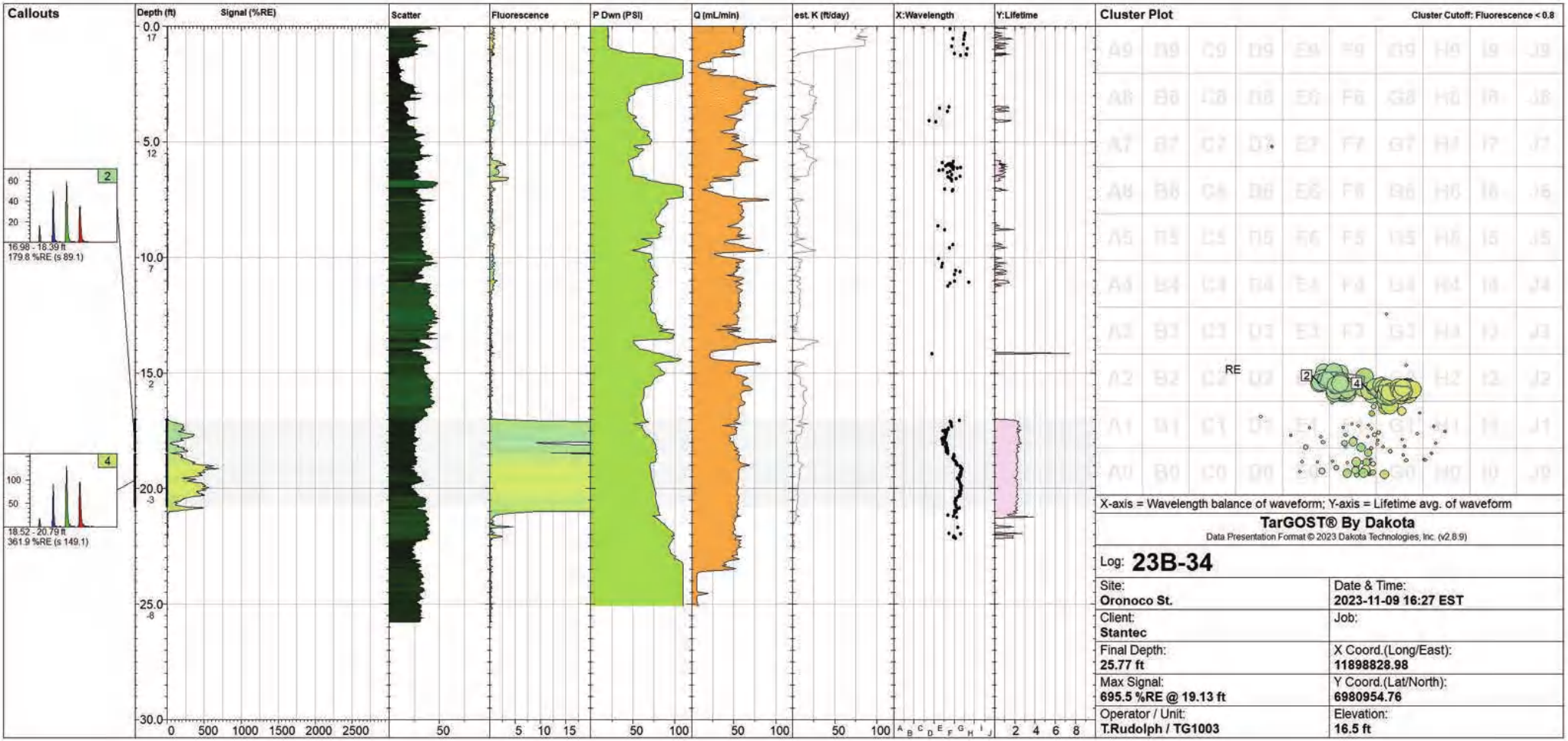

Callouts
2
16.84 - 17.47 ft
407.6 %RE (s 298.1)
3
17.91 - 19.26 ft
423.6 %RE (s 191.2)
4
19.54 - 20.12 ft
121.0 %RE (s 150.6)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
0.0
5.0
10.0
15.0
20.0
25.0
30.0
0 500 1000 1500 2000 2500
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-29
Site: Oronoco St.
Date & Time: 2023-11-09 09:37 EST
Client: Stantec
Job:
Final Depth: 25.70 ft
X Coord.(Long/East): 11898831.92
Max Signal: 879.7 %RE @ 17.28 ft
Y Coord.(Lat/North): 6980950.15
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.3 ft

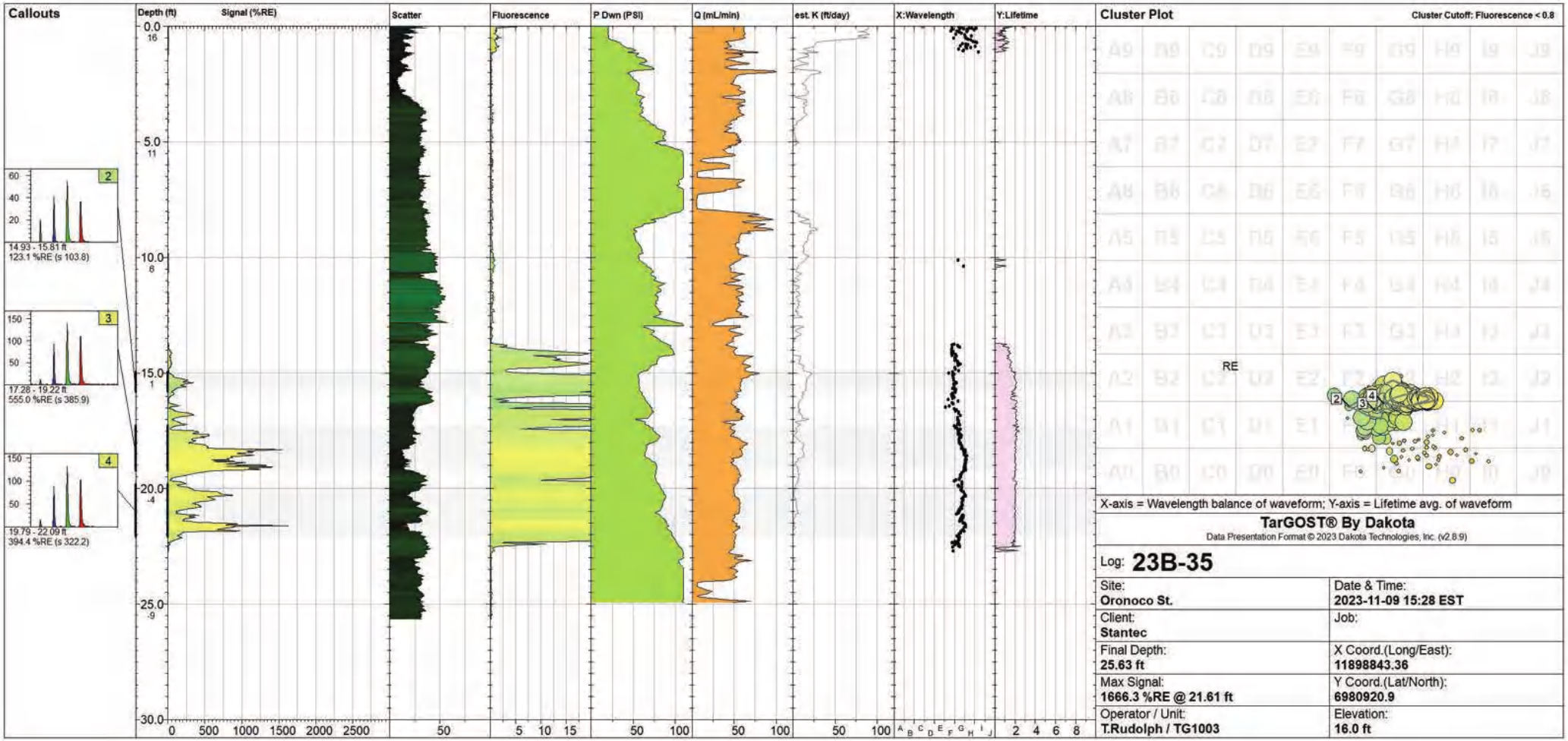

Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
16.83 - 17.92 ft
87.1 %RE (s 57.0)
3
17.97 - 18.73 ft
558.9 %RE (s 250.5)
4
18.98 - 19.55 ft
427.9 %RE (s 338.6)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-30
Site: Oronoco St.
Date & Time: 2023-11-09 10:16 EST
Client: Stantec
Job:
Final Depth: 25.53 ft
X Coord.(Long/East): 11898846.92
Max Signal: 1164.8 %RE @ 18.98 ft
Y Coord.(Lat/North): 6980948.08
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.1 ft

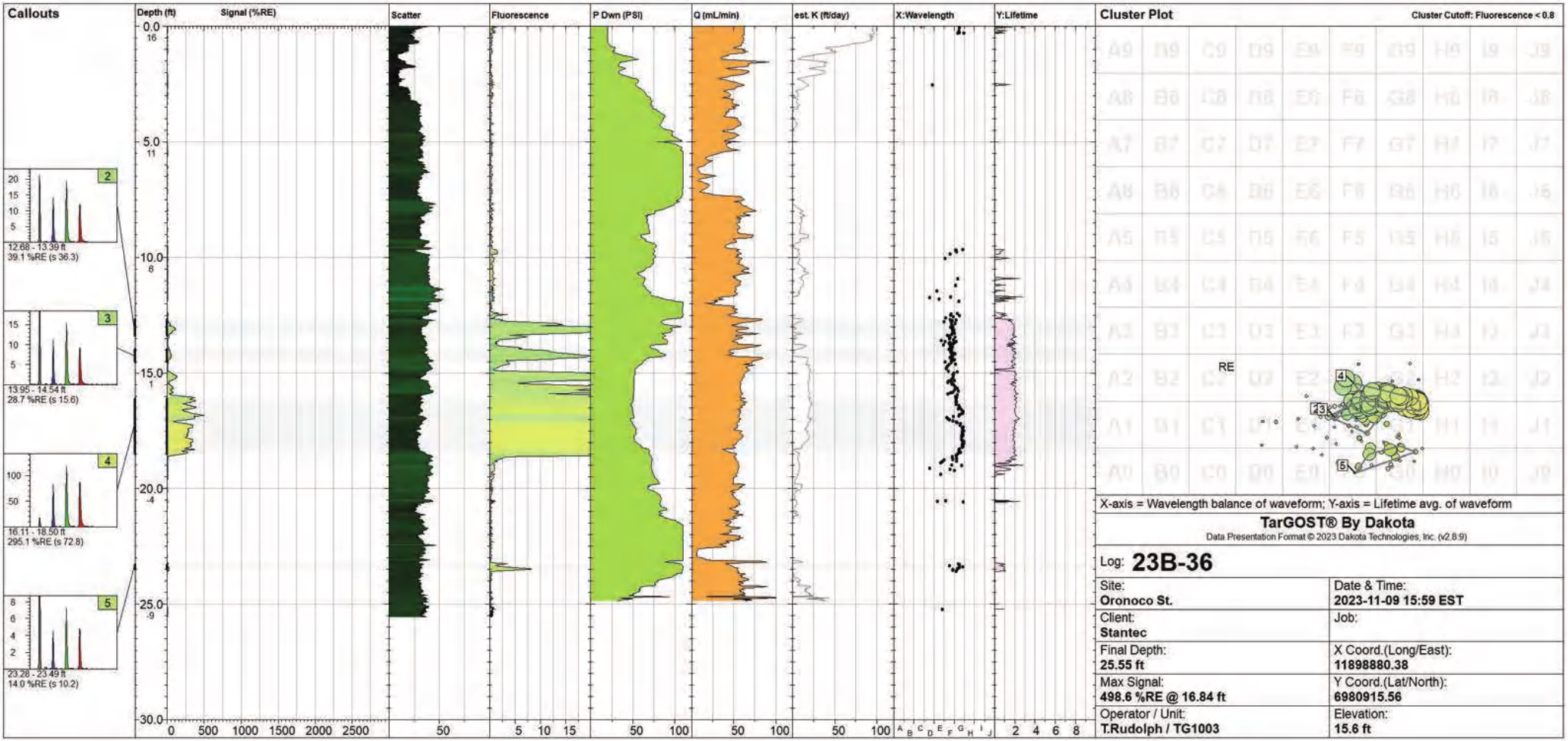

Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
16.40 - 17.04 ft
160.4 %RE (s 105.7)
3
17.68 - 18.90 ft
1059.2 %RE (s 930.2)
4
19.51 - 20.83 ft
558.9 %RE (s 205.0)
5
20.98 - 21.52 ft
269.9 %RE (s 190.1)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-31
Site: Oronoco St.
Date & Time: 2023-11-09 10:49 EST
Client: Stantec
Job:
Final Depth: 25.16 ft
X Coord.(Long/East): 11898864.36
Max Signal: 3236.1 %RE @ 18.68 ft
Y Coord.(Lat/North): 6980946.02
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.0 ft

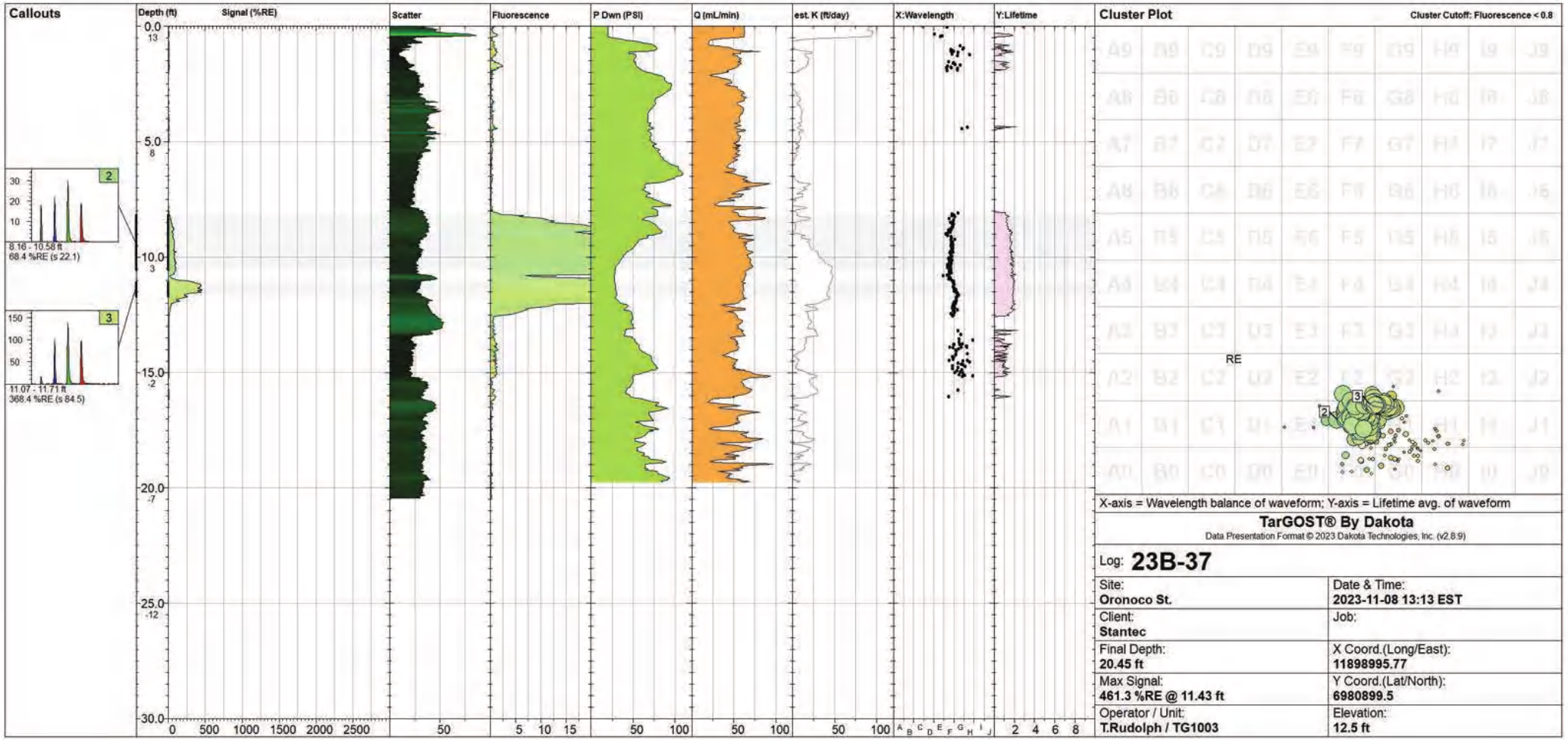

Callouts
2
13.59 - 15.22 ft
18.3 %RE (s 8.5)
3
16.53 - 19.02 ft
516.7 %RE (s 396.8)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-32
Site: Oronoco St.
Date & Time: 2023-11-09 11:22 EST
Client: Stantec
Job:
Final Depth: 25.10 ft
X Coord.(Long/East): 11898881.42
Max Signal: 2523.8 %RE @ 18.40 ft
Y Coord.(Lat/North): 6980943.21
Operator / Unit: T.Rudolph / TG1003
Elevation: 15.8 ft

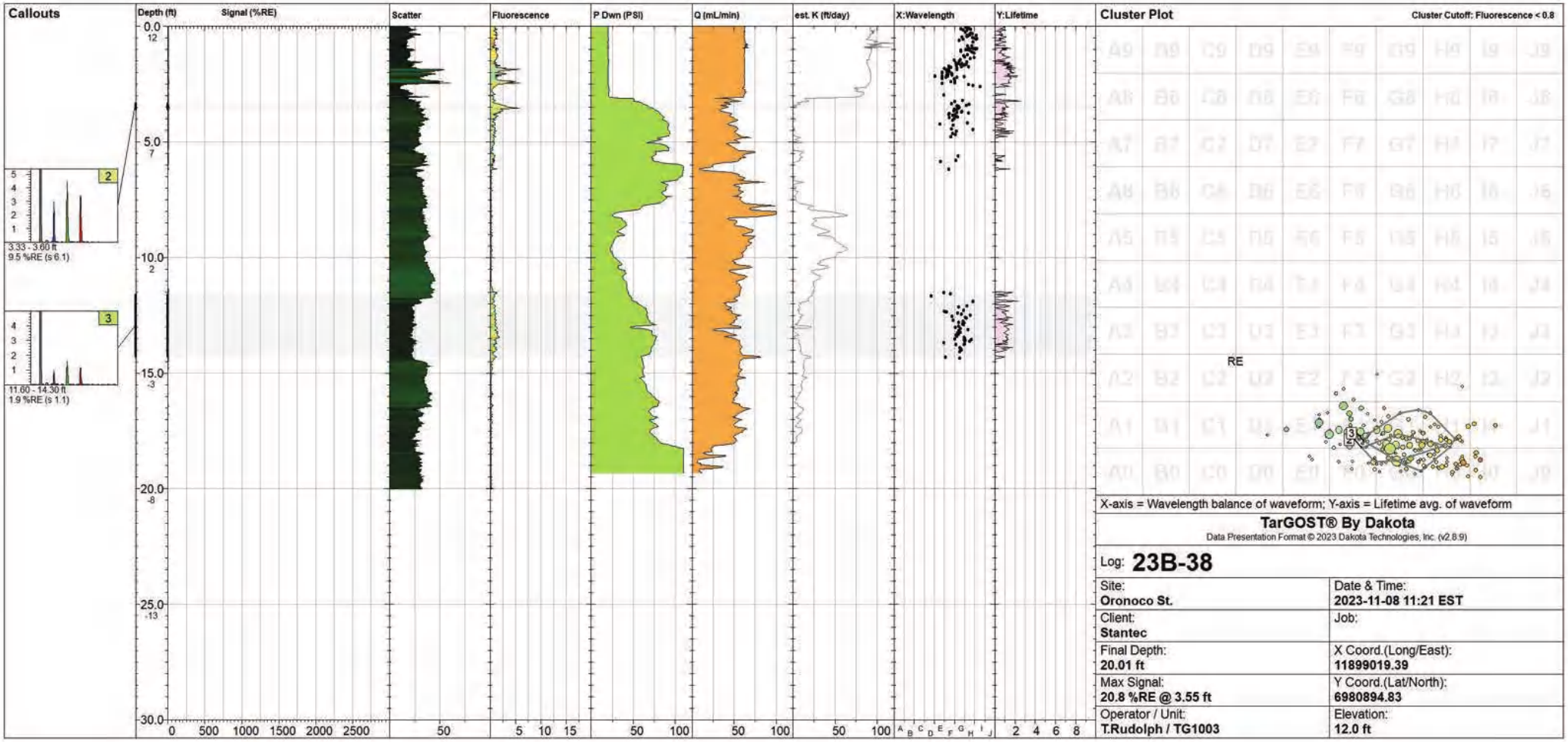

Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
3
18.23 - 19.67 ft
514.4 %RE (s 245.1)
4
20.15 - 20.83 ft
267.8 %RE (s 114.5)
5
21.42 - 22.32 ft
104.5 %RE (s 109.4)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-33
Site: Oronoco St.
Date & Time: 2023-11-09 09:05 EST
Client: Stantec
Job:
Final Depth: 25.66 ft
X Coord.(Long/East): 11898810.17
Max Signal: 1068.8 %RE @ 19.05 ft
Y Coord.(Lat/North): 6980959.33
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.4 ft


Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
16.98 - 18.39 ft
179.8 %RE (s 89.1)
4
18.52 - 20.79 ft
361.9 %RE (s 149.1)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-34
Site: Oronoco St.
Date & Time: 2023-11-09 16:27 EST
Client: Stantec
Job:
Final Depth: 25.77 ft
X Coord.(Long/East): 11898828.98
Max Signal: 695.5 %RE @ 19.13 ft
Y Coord.(Lat/North): 6980954.76
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.5 ft


Callouts
2
14.93 - 15.81 ft
123.1 %RE (s 103.8)
3
17.28 - 19.22 ft
555.0 %RE (s 385.9)
4
19.79 - 22.09 ft
394.4 %RE (s 322.2)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-35
Site: Oronoco St.
Date & Time: 2023-11-09 15:28 EST
Client: Stantec
Job:
Final Depth: 25.63 ft
X Coord.(Long/East): 11898843.36
Max Signal: 1666.3 %RE @ 21.61 ft
Y Coord.(Lat/North): 6980920.9
Operator / Unit: T.Rudolph / TG1003
Elevation: 16.0 ft


Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
12.68 - 13.39 ft
39.1 %RE (s 36.3)
3
13.95 - 14.54 ft
28.7 %RE (s 15.6)
4
16.11 - 18.50 ft
295.1 %RE (s 72.8)
5
23.28 - 23.49 ft
14.0 %RE (s 10.2)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-36
Site: Oronoco St.
Date & Time: 2023-11-09 15:59 EST
Client: Stantec
Job:
Final Depth: 25.55 ft
X Coord.(Long/East): 11898880.38
Max Signal: 498.6 %RE @ 16.84 ft
Y Coord.(Lat/North): 6980915.56
Operator / Unit: T.Rudolph / TG1003
Elevation: 15.6 ft


Callouts
2
8.16 - 10.58 ft
68.4 %RE (s 22.1)
3
11.07 - 11.71 ft
368.4 %RE (s 84.5)
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-37
Site: Oronoco St.
Date & Time: 2023-11-08 13:13 EST
Client: Stantec
Job:
Final Depth: 20.45 ft
X Coord.(Long/East): 11898995.77
Max Signal: 461.3 %RE @ 11.43 ft
Y Coord.(Lat/North): 6980899.5
Operator / Unit: T.Rudolph / TG1003
Elevation: 12.5 ft


Callouts
Depth (ft)
Signal (%RE)
Scatter
Fluorescence
P Dwn (PSI)
Q (mL/min)
est. K (ft/day)
X:Wavelength
Y:Lifetime
Cluster Plot
Cluster Cutoff: Fluorescence < 0.8
2
3.33 - 3.60 ft
9.5 %RE (s 6.1)
3
11.60 - 14.30 ft
1.9 %RE (s 1.1)
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.8.9)
Log: 23B-38
Site: Oronoco St.
Date & Time: 2023-11-08 11:21 EST
Client: Stantec
Job:
Final Depth: 20.01 ft
X Coord.(Long/East): 11899019.39
Max Signal: 20.8 %RE @ 3.55 ft
Y Coord.(Lat/North): 6980894.83
Operator / Unit: T.Rudolph / TG1003
Elevation: 12.0 ft

Appendix 3 – Operations and Maintenance Logs

ATG-Oronoco Site O&M Record

Date:

January 11, 2024 11:00 AM

Personnel:

Dane Anderson

Weather and Tide Conditions:

Outfall Boom Material:

Replacement needed

Outfall Water Conditions:

NO sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

January 11, 2024 11:00 AM

Outfall Photo #1:

Outfall Photo #2:

Outfall Photo #3:

Outfall Photo #4:

January 11, 2024 11:00 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**

System Notes:

ATG-Oronoco Site O&M Record

Date:

January 26, 2024 10:31 AM

Personnel:

Shelby Dyer

Weather and Tide Conditions:

Outfall Boom Material:

Replacement needed

Outfall Water Conditions:

SLIGHT sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

Need to replace both sections of boom(inner and outer). Also saw slight to moderate sheen. Also will need to reconnect outer soft boom to hard boom when we do boom replacement very soon. Relpaced sweep from M-93 also. Put boom at mouth of outfall.

January 26, 2024 10:31 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

January 26, 2024 10:31 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
79	31,195.2	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7.5	2	0
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
0	1.5	0
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
2	0	5

System Notes: System running normal.

ATG-Oronoco Site O&M Record

Date:

January 31, 2024 9:00 AM

Personnel:

Shelby Dyer, RP Meredith

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SLIGHT sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

Replace inner and outer soft boom. 280 ft in all.

January 31, 2024 9:00 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

January 31, 2024 9:00 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
70	31,232.1	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
8	2	0
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
2	2	0
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
0	1.5	5.5

System Notes: System running normal.

ATG-Oronoco Site O&M Record

Date:

February 8, 2024 11:10 AM

Personnel:

RP Meredith, David Sabean

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

February 8, 2024 11:10 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #4:

Outfall Photo #2:

February 8, 2024 11:10 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
63	31,299.5	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
0	0	0
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
0	0	0
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
0	0	0

System Notes:

In standby

ATG-Oronoco Site O&M Record

Date:

February 13, 2024 12:10 PM

Personnel:

John Voorhees

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

NO sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

No sheen, booms in good condition

February 13, 2024 12:10 PM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

February 13, 2024 12:10 PM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
62	31,339.6	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**

System Notes:

ATG-Oronoco Site O&M Record

Date:

February 16, 2024 9:00 AM

Personnel:

Shelby Dyer

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SLIGHT sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

Majority of sheen contain to inner boom area and mouth of outfall. Sheen is slight moderate. Did not notice any sheen at M 93. There is staining on sweep but did not smell any odor. Will keep Sweep in place for time being.

February 16, 2024 9:00 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

February 16, 2024 9:00 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
80	31,364.6	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7.5	3	0
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
1	1.5	0
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
3	0	5.5

System Notes: System running normal.

ATG-Oronoco Site O&M Record

Date:

February 20, 2024 9:00 AM

Personnel:

Shelby Dyer, David Sabean

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

MODERATE sheen

Outfall Odors:

SLIGHT odor

Additional Outfall Notes:

Moderate sheen in between inner and outer soft boom.

February 20, 2024 9:00 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

February 20, 2024 9:00 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
81	31,400.1	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7	3	8
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
0	1.5	0
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
3	0	5

System Notes: System running normal.

ATG-Oronoco Site O&M Record

Date:

February 26, 2024 9:00 AM

Personnel:

Shelby Dyer

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

NO sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

Boom looks good. No sheen spotted.

February 26, 2024 9:00 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

February 26, 2024 9:00 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
77	31,451.5	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7.5	1.5	0
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
1	1.5	0
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
3	0	5

System Notes: System running normal.

ATG-Oronoco Site O&M Record

Date:

March 5, 2024 2:19 PM

Personnel:

David Sabean

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

March 5, 2024 2:19 PM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

March 5, 2024 2:19 PM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
80	31,522	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
6.4	6.7	7.5
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
7.2	7.4	7
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
6.7	8.7	4.1

System Notes:

ATG-Oronoco Site O&M Record

Date:

March 8, 2024 9:00 AM

Personnel:

Shelby Dyer

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SLIGHT sheen

Outfall Odors:

SLIGHT odor

Additional Outfall Notes:

Installed additional boom and sweep at outfall. Also replaced sweep at M-93.

March 8, 2024 9:00 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

March 8, 2024 9:00 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
80	31,544.5	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7.5	1.5	0
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
0	1.5	0
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
0	0	5

System Notes: System running normal.

ATG-Oronoco Site O&M Record

Date:

March 12, 2024 11:54 AM

Personnel:

David Sabean

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

NO sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

March 12, 2024 11:54 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

March 12, 2024 11:54 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
88	31,576	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**

System Notes:

Standby mode, need to add coolant soon, needs wrench and funnel

ATG-Oronoco Site O&M Record

Date:

March 20, 2024 11:25 AM

Personnel:

Shelby Dyer, David Sabean

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

SLIGHT odor

Additional Outfall Notes:

Will have to change boom soon

March 20, 2024 11:25 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

March 20, 2024 11:25 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
63	31,646.4	Coolant Added

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7.5	1.5	0
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
1	2	0
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
1	0	5

System Notes: Added coolant and system running normally.

ATG-Oronoco Site O&M Record

Date:

March 28, 2024 9:25 AM

Personnel:

Shelby Dyer

Weather and Tide Conditions:

Outfall Boom Material:

Replacement needed

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

Spotty sheen in between inner and outer soft boom. Checked M-93 and saw sheen also. Will need to changed also soon.

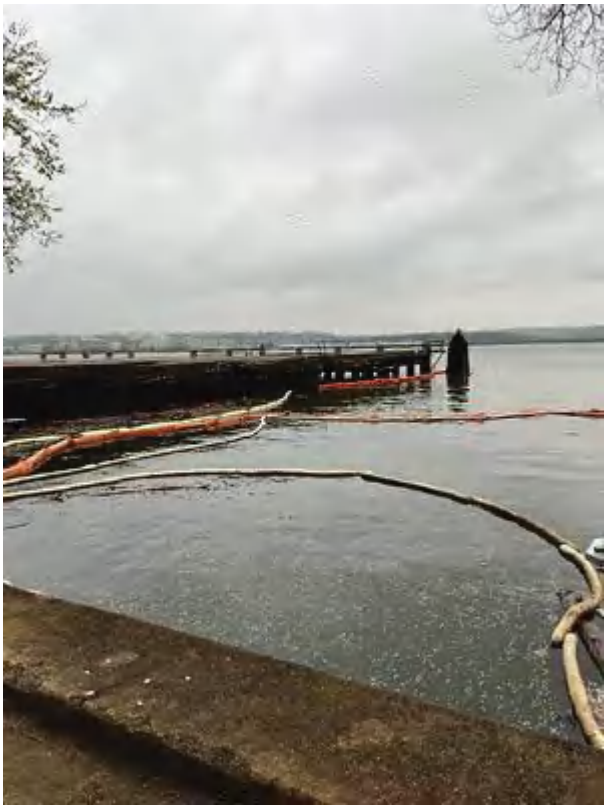
March 28, 2024 9:25 AM

Outfall Photo #1:

Outfall Photo #2:

Outfall Photo #3:

Outfall Photo #4:



March 28, 2024 9:25 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
87	31,716.1	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	20	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7.5	8	8
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
7.5	8	8
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
8.5	9.5	5

System Notes: System running normally.

ATG-Oronoco Site O&M Record

Date:

April 1, 2024 8:00 AM

Personnel:

Shelby Dyer

Weather and Tide Conditions:

Outfall Boom Material:

Replacement needed

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

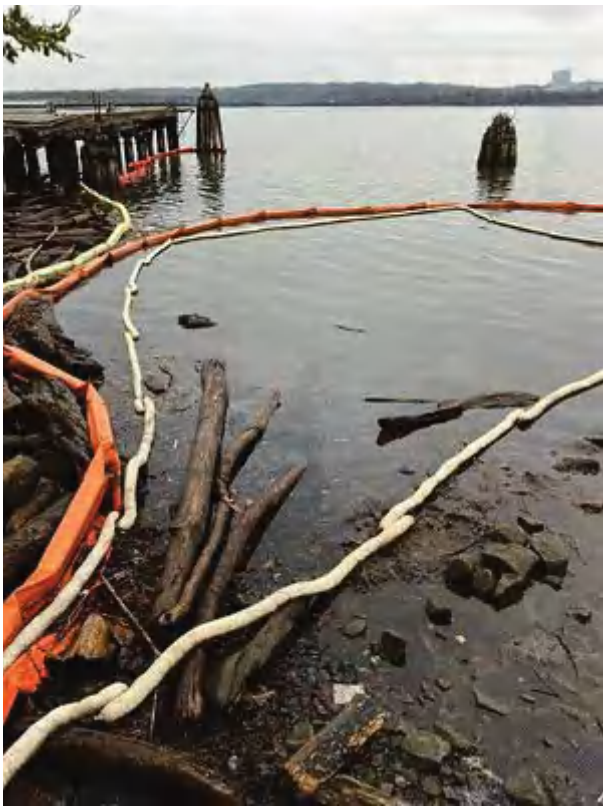
Will need to replace soft boom soon.

April 1, 2024 8:00 AM

Outfall Photo #1:

Outfall Photo #2:

Outfall Photo #3:



Outfall Photo #4:

April 1, 2024 8:00 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
85	31,751	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	20	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7	7.5	8
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
7.5	8	8
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
8	9.5	5

System Notes: System running normal.

ATG-Oronoco Site O&M Record

Date:

April 10, 2024 10:05 AM

Personnel:

Weather and Tide Conditions:

Outfall Boom Material:

Repairs needed

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

Outer boom is unanchored in one place

April 10, 2024 10:05 AM

Outfall Photo #1:

Outfall Photo #2:

Outfall Photo #3:

Outfall Photo #4:

April 10, 2024 10:05 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
83	31,833.3	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**

System Notes:

System off

ATG-Oronoco Site O&M Record

Date:

April 17, 2024 1:15 PM

Personnel:

RP Meredith

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

All booms replaced today 4/17

April 17, 2024 1:15 PM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

April 17, 2024 1:15 PM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
70		OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**

System Notes:

System off

ATG-Oronoco Site O&M Record

Date:

April 22, 2024 10:20 AM

Personnel:

Shelby Dyer

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

NO sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

Boom and sweep were replaced on 4-17-24. M-93 sweep in good shape.

April 22, 2024 10:20 AM

Outfall Photo #1:

Outfall Photo #2:

Outfall Photo #3:

Outfall Photo #4:

April 22, 2024 10:20 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
50	31,884.7	Coolant Added

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	25	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
8	8.5	9.5
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	25	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
9	9	9
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
9.5	10.5	5.5

System Notes: Restarted treatment system.

ATG-Oronoco Site O&M Record

Date:

May 1, 2024 10:32 AM

Personnel:

Shelby Dyer, RP Meredith

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

None

May 1, 2024 10:32 AM

Outfall Photo #1:

Outfall Photo #2:

Outfall Photo #3:

Outfall Photo #4:

May 1, 2024 10:32 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
92	31,910.7	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7	7.5	7.5
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
7	7.5	7.5
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
7.5	9	4.5

System Notes: System running normal.

ATG-Oronoco Site O&M Record

Date:

May 7, 2024 12:02 PM

Personnel:

David Sabean

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

M

May 7, 2024 12:02 PM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

May 7, 2024 12:02 PM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
82	31,934	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7	7.5	7.5
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
7.5	7.5	7.5
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
7.5	9	4.5
	System Notes:	System was shut down, restarted it.

ATG-Oronoco Site O&M Record

Date:

May 10, 2024 9:34 AM

Personnel:

Shelby Dyer, RP Meredith

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

NO sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

Will repair hard boom at the edge of pier.

May 10, 2024 9:34 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

May 10, 2024 9:34 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
0	0	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
0	0	0
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
0	0	0
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
0	0	0

System Notes:

N/A

ATG-Oronoco Site O&M Record

Date:

May 20, 2024 9:43 AM

Personnel:

Shelby Dyer

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SLIGHT sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

Moderate sheen at corner of outer boom nearest pier. Otherwise spotty everywhere else.

May 20, 2024 9:43 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

May 20, 2024 9:43 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
77	32,059.1	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7.5	1.5	0
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
0	1.5	8
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
0	0	5

System Notes:

System running normal. Will do housekeeping of treatment shed today.

ATG-Oronoco Site O&M Record

Date:

May 24, 2024 10:00 AM

Personnel:

Shelby Dyer

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

NO sheen

Outfall Odors:

NO odor

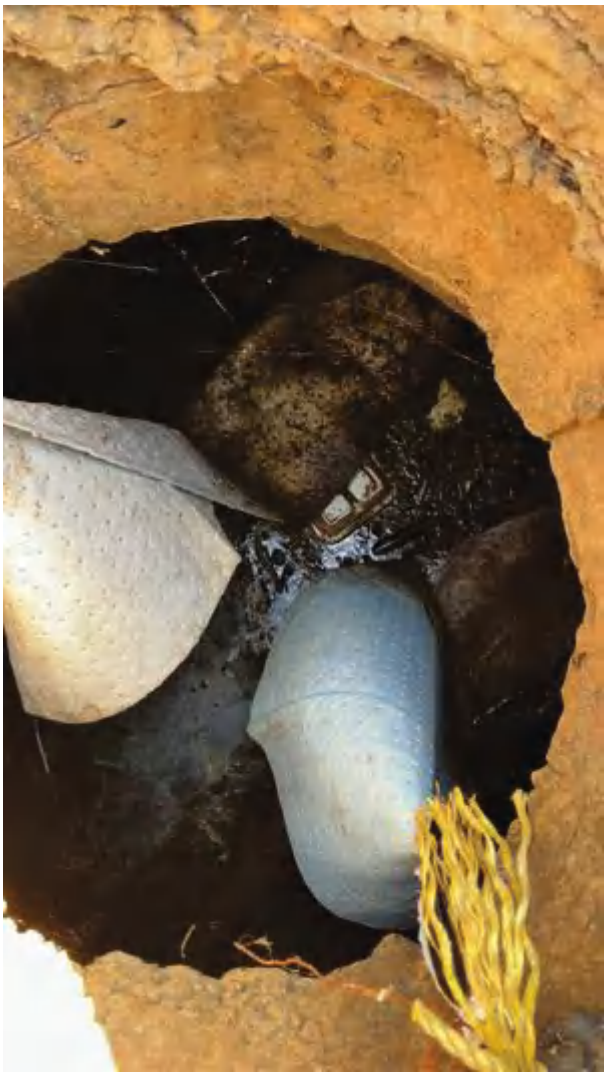
Additional Outfall Notes:

Will be replacing sweep @M-93.

May 24, 2024 10:00 AM

Outfall Photo #1:

Outfall Photo #2:



Outfall Photo #3:

Outfall Photo #4:

May 24, 2024 10:00 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**

System Notes:

ATG-Oronoco Site O&M Record

Date:

May 28, 2024 10:06 AM

Personnel:

David Sabean

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

NO sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

May 28, 2024 10:06 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

May 28, 2024 10:06 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
78	32,122	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**

System Notes: System in standby, restarted system to clear alarms.

ATG-Oronoco Site O&M Record

Date:

June 3, 2024 9:55 AM

Personnel:

Shelby Dyer

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

STRONG odor

Additional Outfall Notes:

Need to tie back in hard boom on camera side of containment. Tied back in hard boom and replaced sweep and boom in front of outfall. Have drum of sweep/boom used during changing of sweep at M-93 for storage

June 3, 2024 9:55 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

June 3, 2024 9:55 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
84	32,169.3	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7	7.5	8
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
7.5	8	8
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
8	9.5	5

System Notes:

System was not running when I arrived on site. Hit reset on panel and system started and is now running normal. Checked M-93 and will replace on next visit. Tried to open M-92 manway and could not open due to road being paved recently.

ATG-Oronoco Site O&M Record

Date:

June 13, 2024 10:04 AM

Personnel:

RP Meredith

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

NO odor

Additional Outfall Notes:

June 13, 2024 10:04 AM

Outfall Photo #1:

Outfall Photo #2:

Outfall Photo #3:

Outfall Photo #4:

June 13, 2024 10:04 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
86	32,203	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**

System Notes:

ATG-Oronoco Site O&M Record

Date:

June 17, 2024 9:40 AM

Personnel:

David Sabean

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

SPOTTY sheen

Outfall Odors:

SLIGHT odor

Additional Outfall Notes:

Spotty sheen with iridescence at outfall pipe.

June 17, 2024 9:40 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

June 17, 2024 9:40 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
89	32,240	OK

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7	7.5	8
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
7	7.5	7.5
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
7.5	9	4.5

System Notes:

Running

ATG-Oronoco Site O&M Record

Date:

June 28, 2024 10:02 AM

Personnel:

Shelby Dyer, RP Meredith

Weather and Tide Conditions:

Outfall Boom Material:

Good, no action

Outfall Water Conditions:

MODERATE sheen

Outfall Odors:

Additional Outfall Notes:

Heavy amounts of debris at outfall. Also hard boom needs repair.

June 28, 2024 10:02 AM

Outfall Photo #1:

Outfall Photo #3:

Outfall Photo #2:

Outfall Photo #4:

June 28, 2024 10:02 AM

System O&M Data

Bldg Temp:	Comp Hours:	Coolant:
87	32,331	Coolant Added

Pressures and Flows

BSW-1 Flow	**BSW-4 Flow**	**BSW-7 Flow**
0	0	0
BSW-1 Press	**BSW-4 Press**	**BSW-7 Press**
7	7.5	8
BSW-2 Flow	**BSW-5 Flow**	**BSW-8 Flow**
0	0	0
BSW-2 Press	**BSW-5 Press**	**BSW-8 Press**
7	8	8
BSW-3 Flow	**BSW-6 Flow**	**BSW-9 Flow**
0	0	0
BSW-3 Press	**BSW-6 Press**	**BSW-9 Press**
8	9.5	4.5

System Notes:	System was not running when I arrived on site. Added coolant and	reset system. System is now running.

Appendix 4 – Pipe Rehabilitation Design Documents

PROJECT MANUAL VOLUME 1 – 100% Specifications

Oronoco Street Storm Sewer Pipe Rehabilitation

City of Alexandria, Department of Project Implementation

301 King Street, Room 3200

Alexandria, VA 22314

City's Project No. RFP No. 00000292, PO No. 181357-00

12420 Milestone Center Drive, Suite 150

Germantown, MD 20876

URS Project No. 60705345

Phone: 301-820-3000

Fax: 301-820-3009

Web Site: https://www.aecom.com

Issued: March 13, 2024

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SECTION 00 01 03 – PROJECT DIRECTORY

PART 1 - GENERAL

1.1 DESCRIPTION

A. Identification of project team members and their contact information.

1.2 OWNER

A. City of Alexandria, Department of Project Implementation

1. Address:

a. 301 King Street, Room 3200
Alexandria, VA 22314

1.3 CONSULTANTS

A. URS

1. Address:

a. 12420 Milestone Center Drive, Suite 150
Germantown, MD 20876

2. Primary Contact:

a. Title: Project Manager
Name: Ed Fahnline
Email: ed.fahnline@aecom.com

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 00 01 07 – SEALS PAGE

PART 1 - GENERAL

1.1 DESIGN PROFESSIONALS OF RECORD

(Seal and Signature)	**Civil Engineer Professional Certification:** I hereby certify that these documents were prepared or approved by me and that I am a duly registered Professional Engineer. Garry Truyens, P.E. *(Print Consultant Name)* License No. Expiration Date

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

Project Specifications- Table of Contents

Sect. No.	Section Title	Section Description
00 01 01	Project Title Page	Project Manual title page
00 01 03	Project Directory	Project team members
00 01 07	Seals Page	For seals of design professionals on Project Manual.
00 01 15	List of Drawing Sheets	List of Drawings
Division 01- General Requirements		
01 00 00	General Requirements	Description of construction delivered under contract
01 10 00	Summary	Summary of the Work, phased construction, purchase contracts, Owner-furnished products, access to site, and work restrictions
01 21 00	Allowances	Description of contingency allowance requirements
01 22 00	Unit Prices	Provisions for unit prices.
01 31 00	Project Management and Coordination	Administrative requirements for project meetings; preconstruction, preinstallation, and project closeout conferences; RFIs; and project Web sites.
01 32 00	Construction Progress Documentation	Contractor's Construction Schedule including Gantt charts and CPM schedules; Contractor's reports.
01 33 00	Submittal Procedures	Procedures for Action and Informational Submittals including Delegated-Design Submittals and Submittals Schedule
01 40 00	Quality Requirements	Quality-assurance and -control requirements, special tests and inspections, and Contractor's quality-control plan.
01 49 00	Mobilization and Demobilization	Mobilization and demobilization requirements.
01 50 00	Temporary Facilities and Controls	Temporary utilities and facilities for construction support, security, and protection.

01 56 39	Temporary Tree and Plant Protection	Construction-phase tree and plant protection, trimming, protection-zone fencing, and pruning as needed.
01 73 00	Execution	General requirements for product installation, protection, field engineering, and progress cleaning.
01 77 00	Closeout Procedures	Contract closeout including Substantial Completion and Final Completion procedures, warranties, and final cleaning.
Division 07 – Thermal and Moisture Protection		
07 91 00	Preformed Joint Seals	Joint seals for precast manholes
Division 33- Utilities		
33 01 30.11	Large Diameter Storm Sewer Pipeline Inspection	Inspecting large diameter storm sewer pipelines with CCTV.
33 01 30.41	Storm Sewer Pipeline Cleaning	Cleaning of storm sewer pipeline and manholes
33 01 30.87	Temporary Storm Sewer Bypass Pumping	Bypass pumping of storm sewer around project limits
33 01 31.01	Cured-In-Place Storm Sewer Lining	Rehabilitation method for storm sewer through CIPP
33 05 61	Concrete Manholes	Installation of precast concrete manhole

Appendices

Appendix A.1 – CCTV Video Links and Inspection Reports

Appendix A.2 – CCTV Evaluation Forms

Appendix B – Maximum Groundwater Concentrations of VOCs and SVOCs

SECTION 000115 – LIST OF DRAWING SHEETS

PART 1 - GENERAL

1.1 LIST OF DRAWINGS

A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled 100% Submittal, dated March 13, 2024, as modified by subsequent Addenda and Contract modifications.

B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

Sheet No.	Drawing No.	Sheet Name
1	G-001	Cover Sheet
2	G-002	General Notes
3	C-001	Existing Conditions Plan – 1 of 2
4	C-002	Existing Conditions Plan – 2 of 2
5	C-003	CIPP Lining Profile – Oronoco St
6	C-004	CIPP Lining Profile – Oronoco St
7	C-005	CIPP Lining Profile – Oronoco St
8	C-006	Temporary Traffic Control Plan – 1 of 2
9	C-007	Temporary Traffic Control Plan – 1 of 2
10	C-501	Standard Details

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

SECTION 01 00 00 – GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. The Work to be done consists of the furnishing of all labor, materials and equipment, and the performance of all Work included in this Contract. The summary of the work is presented in Division 1 Section "Summary."

B. The Work consists of the following:

1. The Contractor shall furnish all labor, superintendence, quality control, materials, power, light, heat, fuel, water, tools, appliances, equipment, supplies, and other means of construction necessary or proper for performing and completing the Work. He shall perform and complete the Work in the manner best calculated to promote rapid construction consistent with safety of life and property and to the satisfaction of the City of Alexandria Department of Project Implementation (DPI), and in strict accordance with the Contract Documents. The Contractor shall clean up the Work and maintain it during and after construction, until accepted, and shall do all work and pay all costs incidental thereto. He shall repair or restore all structures and property that may be damaged or disturbed during performance of the Work.

2. The cost of incidental work described in these General Requirements, for which there are no specific Contract Items, shall be considered as part of the general cost of doing the work and shall be included in the prices for the various Contract Items. No additional payment will be made therefore.

3. The Contractor shall provide and maintain such modern plant, tools, and equipment as may be necessary, in the opinion of the City, to perform in a satisfactory and acceptable manner all the work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his workmanship, materials and equipment, prior approval of the City of Alexandria (City) notwithstanding.

4. The Contractor shall perform all work in accordance with applicable local, state, and federal codes and regulations.

C. Public Utility Installations and Structures:

1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, vaults, manholes, and all other appurtenances and facilities pertaining thereto whether owned or controlled by the Owner (City of Alexandria), other governmental bodies or privately owned, used to provide gas, electricity, telephone, sewerage, drainage, water or other public or private property which may be affected by the work shall be deemed included hereunder.

2. The Contract Documents contain data relative to existing public or private utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make his own investigations to inform himself fully of the character, condition and extent of all such installations and structures as may be encountered and as may affect the construction operations.

3. The Contractor shall protect all public or private utility installations and structures from damage during the work. Access across any buried installation or structure shall be made only in such locations and by means approved by the Utility Owner. The Contractor shall so arrange his operations as to avoid any damage to these facilities. All required protective devices and construction shall be provided by the Contractor at his expense. All existing utilities damaged by the Contractor shall be repaired by the Contractor, at his expense, as directed by the Utility Owner. No separate payment shall be made for such protection or repairs to public utility installations or structures.

4. Where public utility installations or structures owned or controlled by the Owner (City of Alexandria) or other governmental body are encountered during the course of the work, and are not indicated on the Plans or in the Specifications, and when, in the opinion of the City, removal, relocation, replacement or rebuilding is necessary to complete the work under this Contract, such work shall be accomplished by the utility having jurisdiction, or such work may be approved, in writing by the City, for the Contractor to accomplish. If such work is accomplished by the utility having jurisdiction it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required. If such work is accomplished by the Contractor, it will be in accordance with the General and Supplemental General Conditions.

5. All Owner (City of Alexandria) and other governmental utility departments and other Owners of public utilities which may be affected by the work will be informed in writing by the Contractor within two weeks after the execution of the Contract or Contracts covering the work. Such notice will set out, in general, and direct attention to the responsibilities of the Owner (City of Alexandria) and other governmental utility departments and other Owners of public utilities for such installations and structures as may be affected by the work and will be accompanied by one set of Plans and Specifications covering the work under such Contract(s).

6. In addition to the general notice given, the Contractor shall give written notice to Owner (City of Alexandria) and other governmental utility departments and other Owner of public utilities of the location of his proposed construction operations, at least one (1) week in advance of breaking ground in any area or on any unit of the work. This can be accomplished by making the appropriate contact with the Miss Utility of Virginia "one-call" center.

7. The maintenance, repair, removal, relocation or rebuilding of public utility installations and structures, when accomplished by the Contractor as herein provided, shall be done by methods approved by the Utility Owner at no additional cost.

1.2 PLANS AND SPECIFICATIONS

A. Plans:

1. Definition: “Plans” or “Drawings” as discussed within these Specifications are interchangeable terms for the same.

2. When obtaining data and information from the Plans, figures shall be used in preference to scaled dimensions, and large scale drawings in preference to small scale drawings.

B. Copies Furnished to Contractor:

1. After the Contract has been executed, the Contractor will be furnished with three sets of paper prints, and three copies of the Specifications. Additional copies of the Plans and Specifications, when requested, may be furnished to the Contractor at cost of production.

2. The Contractor shall furnish each of the subcontractors, manufacturers, and material suppliers such copies of the Contract Documents as may be required for their work.

C. Supplementary Drawings:

1. When, in the opinion of the City, it becomes necessary to explain more fully the work to be done or to illustrate the work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the City and four paper prints thereof will be given to the Contractor.

D. Contractor To Check Plans and Data:

1. Contractor shall verify all dimensions, quantities and details shown on the Plans, Supplementary Drawings, Schedules, Specifications or other data received from the City, and shall notify him of all errors, omissions, conflicts, and discrepancies found therein. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction or improper operation resulting there from nor from rectifying such conditions at his own expense. He will not be allowed to take advantage of any errors or omissions, as full instructions will be furnished by the City, should such errors or omissions be discovered. All schedules are given for the convenience of the City and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quality of materials and equipment included in work to be done under the Contract.

1.3 TEMPORARY STRUCTURES

A. Responsibility for Temporary Structures

1. In accepting the Contract, the Contractor assumes full responsibility for the sufficiency and safety of all temporary structures or work and for any damage which may result from their failure or their improper construction, maintenance or operation and will indemnify and save harmless the Owner (City of Alexandria) and the City's Consultants from all claims, suits or actions and damages or costs of every description arising by reason of failure to comply with the above provisions.

B. Temporary Fences

1. If, during the course of the work, it is necessary to remove or disturb any fence or part thereof, the Contractor shall, at his own expense, if so approved by the City, provide a suitable temporary fence which shall be maintained until the permanent fence is replaced. The City shall be solely responsible for the determination of the necessity for providing a temporary fence and the type of temporary fence to be used.

1.4 SAFETY

A. Accident Prevention

1. Precautions shall be exercised at all times for the protection of persons and property. The safety provisions of applicable laws, building and construction codes shall be observed.

The Contractor shall comply with the U.S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 9 1-596), and under Section 107 of the contract Work Hours and Safety Standards Act (PL-54), except where state and local safety standards exceed the federal requirements and except where state safety standards have been approved by the Secretary of Labor in accordance with provisions of the Occupational Safety and Health Act.

B. First Aid

1. The Contractor shall keep upon the site, at each location where work is in progress, a completely equipped first aid kit and shall provide ready access thereto at all times when people are employed on the work.

1.5 LINES AND GRADES

A. Grade

1. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Plans, or as approved by the City. The full responsibility for keeping alignment and grade shall rest upon the Contractor.

B. Safeguarding Marks

1. The Contractor shall safeguard all points, stakes, grade marks, monuments and bench marks made or established on the work, bear the cost of reestablishing them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining or protecting or to removing without authorization such established points, stakes and marks.

2. The Contractor shall safeguard all existing and known property corners, monuments and marks adjacent to but not related to the work and, if required, shall bear the cost of reestablishing them if disturbed or destroyed.

1.6 ADJACENT STRUCTURES AND LANDSCAPING

A. Responsibility

1. The Contractor shall also be entirely responsible and liable for all damage or injury as a result of his operations to all other adjacent public and private property, structures of any kind and appurtenances thereto met with during the progress of the work. The cost of protection, replacement in their original locations and conditions or payment of damages for injuries to such adjacent public and private property and structures affected by the work, whether or not shown on the Plans, and the removal, relocation and reconstruction of such items called for on the Plans or specified shall be included in the various Contract Items and no separate payments will be made therefore.

2. Contractor is expressly advised that the protection of buildings, structures, pipelines, etc. and related work adjacent and in the vicinity of his operations, wherever they may be, is solely his responsibility.

3. Contractor shall, before starting operations, make an examination of adjacent structures, buildings, facilities, etc., and record by notes, measurements, photographs, etc., conditions which might be aggravated by open excavation and construction. Repairs or

replacement of all conditions disturbed by the construction shall be made to the satisfaction of the Department of Project Implementation and City. This does not preclude conforming to the requirements of the insurance underwriters. Copies of surveys, photographs, reports, etc., shall be submitted to the City.

4. Prior to the beginning of any excavations the Contractor shall advise the City of all buildings or structures on which he intends to perform work or which performance of the project work will affect.

B. Protection of Trees

1. All trees and shrubs shall be adequately protected by the Contractor in accordance with the City of Alexandria's Ordinances which governs the protection of trees. Contractor shall also comply with the provisions of Section 015639 Temporary Tree and Plant Protection.

C. Lawn Areas

1. Project site areas shall be left in as good condition as before the starting of the work. Where sod is removed, it shall be carefully removed, and later replaced with same or like kind.

D. Restoration of Fences

1. Any fence, or part thereof, that is damaged or removed during the course of the work shall be replaced or repaired by the Contractor and shall be left in as good a condition as before the starting of the work. The manner in which the fence is repaired or replaced and the materials used in such work shall be subject to the approval of the City. The cost of all labor, materials, equipment, and work for the replacement or repair of any fence shall be deemed included in the appropriate Contract Item or items, or if no specific Item is provided therefore, as part of the overhead cost of the work and no additional payment will be made therefore. Private fences removed from within the Right-of-Way shall be replaced as described above at the Right-of-Way line.

1.7 PROTECTION OF WORK AND PUBLIC

A. Barriers and Lights

1. During the prosecution of the work, the Contractor shall put up and maintain at all times such barriers and lights as will effectually prevent accidents and in accordance with the Maintenance of Traffic Plan approved by the City. The Contractor shall provide suitable barricades, lights, "danger" or "caution" signs at all places where the work causes obstructions or constitutes in any way a hazard to the public in accordance with state and local requirements.

B. Smoke Prevention

1. The Contractor shall use hard coal, coke, oil or gas as fuel for equipment generating steam. A strict compliance with ordinances regulating the production and emission of smoke will be required. No open fires will be permitted.

C. Noise

1. The Contractor shall eliminate noise to as great an extent as practicable at all times. The Contractor shall strictly observe the City of Alexandria Noise Control Code, Title II, Chapter 5.
2. Noise arising from the Contractor's work shall be restricted to the allowable limits to comply with the Alexandria Noise Control Code Title 11, Chapter 5.
3. Air compressing plants shall be equipped with silencers and the exhaust of all gasoline motors or other power equipment shall be provided with mufflers.
4. Except in the event of an emergency, work shall be done within the regular working hours specified in the City of Alexandria Noise Control Code, Title II, Chapter 5. If the proper and efficient prosecution of the work requires operations outside of these hours, the written permission of the Department of Project Implementation must be obtained. In addition, approval must be granted by the City under a Noise Variance Permit.

D. Access to Public Services

1. Neither the materials excavated nor the materials or plant used in the construction of the work shall be so placed as to prevent free access to all fire hydrants, valves or manholes, or access required by emergency vehicles and/or personnel.

E. Dust Prevention

1. The Contractor shall prevent dust nuisance from his operations by keeping the construction areas sprinkled with water. Allaying dust in roadway construction areas shall be in accordance with VDOT Specification Section 511.

F. Spill Prevention

1. The Contractor shall have spill prevention measures in place and a plan with spill prevention procedures.
2. Fuel containers shall be placed within containment and with a spill kit nearby.

1.8 CLEANING

A. During Construction

1. During construction of the work, the Contractor shall, at all times, keep the site of the work and adjacent premises as free from material, debris and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of the City, such material, debris, or rubbish constitutes a nuisance or is objectionable.
2. The Contractor shall remove from the site all of his surplus materials and temporary structures when no further need therefore develops.
3. The Contractor shall be responsible and liable for all spillage and incur all associated costs including, but not limited to, costs related to repair and maintenance resulting from damages thereof.

B. Final Cleaning

1. At the conclusion of the work, all erection plant, tools, temporary structures and materials belonging to the Contractor shall be promptly taken away, and he shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances.

2. The Contractor shall thoroughly clean all piping and materials installed by him prior to final inspection.

1.9 MISCELLANEOUS

A. Protection of Wetland Areas

1. The Contractor shall properly dispose of all surplus material, including soil, in accordance with Local, State and Federal regulations. Under no circumstances shall surplus material be disposed of in wetland areas as defined by the Virginia Department of Environmental Quality.

B. Existing Facilities

1. The work shall be so conducted to maintain existing facilities in operation insofar as is possible. Requirements and schedules of operations for maintaining existing facilities in service during construction shall be as described in these Specifications.

C. Cooperation with Other Contractors and Forces

1. During progress of work under this Contract, it may be necessary for other contractors and persons employed by the Department of Project Implementation to work in or about the site. The Department of Project Implementation reserves the right to put such other contractors to work and to afford such access to the site of the work to be performed hereunder at such times as the Department of Project Implementation deems proper. The Contractor shall not impede or interfere with the work of such other contractors engaged in or about the work and shall so arrange and conduct his work that such other contractors may complete their work at the earliest date possible.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. Construction Documents: Execution of the Works shall be governed by these following documents, in whole or in part as applicable:

1. Contract Drawings
2. Specifications:
    a. Project Specifications
    b. Virginia Department of Transportation, Road and Bridge Specifications, 2020 (VDOT Specifications)
3. Standard Details:
    a. City of Alexandria, VA, Department of Transportation & Environmental Services, Design and Construction Standards, 2020 (City Standards)
    b. Virginia Department of Transportation, Road and Bridge Standards, 2016 (VDOT Standards)
    c. Virginia Erosion and Sediment Control Handbook, Third Edition, 1992 (VESCH)

B. Order of Precedence: In case of discrepancy between Specifications and Drawings, the Specifications shall govern over Drawings. In case of discrepancy between Specifications and in case of discrepancy between Standards, order of precedence for specifications and standards shall be as follows:

1. For conflicts between Contract Specifications, the Project Specifications shall govern over VDOT Specifications.
2. For requirements not specified in the Project Specifications, VDOT Specifications shall govern.
3. For conflicts between Contract Standards, the City Standards shall govern over the VESCH. The VESCH shall govern over VDOT Standards.

C. Contract Time for Completion of Work: The Contractor shall complete the Work in 210 Calendar Days. These consist of consecutive days including Sundays, holidays, and non-work days and shall begin after the Notice of Proceed (NTP) is issued.

D. In case of discrepancy in the figures, in the Drawings or in the Specifications, the matter shall be promptly submitted to the City who shall promptly make a determination in writing.

E. Project Construction Schedule: The Contractor is advised that an integral part of the project will be a construction schedule. Within 10 days of Notice-To-Proceed, the Contractor shall submit to the City the critical path method construction schedule. The schedule is to include material ordering and lead times as well as installation by Contractor. Construction schedules will be reviewed for activity logic, but it is the Contractor's sole responsibility to accomplish the work within the contract completion date.

F. Hours of Operation: All work shall be carried out between the hours of 7:00AM and 6:00 PM, Monday thru Friday, and 9:00AM and 6:00PM, on Saturdays. For work to be done at night, the contractor has to get approval from the City of Alexandria.

G. Permits: The Contractor shall be responsible for obtaining all necessary permits to work in the City's right of way.

END OF SECTION

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Use of premises.
3. Specification formats and conventions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Oronoco Street Storm Sewer Pipe Rehabilitation

1. Project Location: City of Alexandria. The project is located along Oronoco Street. Limits of the project area extend from the intersection of Oronoco Street and North Fairfax Street to the stormwater headwall outfall east of the Oronoco Street and North Union Street intersection.

B. Owner: City of Alexandria, Virginia.

C. The Work under this Contract consists of furnishing all construction activities including, but not limited to, equipment, tools, materials, supplies, labor, power, transportation and all other services and incidentals necessary for Oronoco Street Storm Sewer Pipe Rehabilitation, as depicted on the Drawings and specified herein.

D. In case Contractor encounters additional items that in Contractor’s opinion require repairs/replacement, Contractor shall bring these items to the attention of The City and follow his/her directives.

E. Project will be constructed under a single prime contract.

1.3 USE OF PREMISES

A. General: Contractor shall have full use of premises in conformance with the limitations stipulated by Virginia Department of Environmental Quality for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's (City of Alexandria) right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated. The premises is within the Oronoco Street right-of-way from the intersection of Oronoco Street and North Fairfax Street to the stormwater headwall outfall east of the Oronoco Street and North Union Street intersection.

1. The Contractor’s work shall not have excessive noise levels and shall be restricted to the allowable limits to comply with the Alexandria Noise Control Code Title 11, Chapter 5. The Contractor shall apply to the City for a noise variance permit as necessary for performance of the work.

2. The Contractor shall apply to the City for a Right-of-way Permit which includes a Maintenance of Traffic Plan to perform this work within the Oronoco Street right-of-way.

3. Keep approaches to the premises clear and available to Owner (City of Alexandria) and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

   a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.4 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the ARCOM "MASTERSPEC Format" numbering system.

1. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

   a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01 21 00 – ALLOWANCES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes administrative and procedural requirements governing allowances. This Contract includes one (1) Allowance(s) that may be used at the discretion of the City of Alexandria (City).

1.2 QUALIFICATIONS AND REQUIREMENTS

A. Contingency allowances, if included in the Contract Documents, is for the sole use of the City for costs for additional related work.

B. Selected materials, equipment, and installation can be included in Contract Documents by cash allowances.

1. Allowances are established to defer selection or scope until more information is available.
2. Other requirements will be issued by a Change Order.

C. Procedures for submitting and handling Change Orders are included in General Conditions of these Contract Documents.

D. The allowances does not include:

1. Incidental labor required to assist the City.
2. Costs for retesting on failure of previous tests and inspections, or failure of the Contractor to be ready.
3. Costs of services not required by Contract Documents.

E. Any unused allowances will be returned to the City by deductive Change Order.

1.3 SCHEDULE OF ALLOWANCES

A. Item C-4: Contingency Allowance

1. This item shall consist of miscellaneous work to be accomplished at the direction of the City including:
    a. Items of work consistent with and related to the project not indicated in the Contract Documents.
    b. Work under this item will be accomplished utilizing pay items indicated in the Bid Tab.
2. Work performed under this section:
    a. Shall comply with the various sections of these specifications as appropriate to the specific items involved.
    b. Work shall be further described, by the City, in written form and/or supplement exhibits.

c. No work will be allowed under this section without the prior written approval of the City.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form of a submittal.

B. Submit invoices or delivery slips to indicate quantities of materials delivered for use in fulfillment of each allowance.

C. Submit any additional information required by the City deemed necessary to document the use of allowance monies.

D. At Project Closeout, the unused amounts remaining in the various allowances will be credited back to the City.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01 22 00 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, applicable quality control tests, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for Each item of work.

C. Cost of quality control work shall be considered as part of the general cost of doing the work and shall be included in the prices for the various Contract Items. No additional payment will be made therefore.

D. Owner (City of Alexandria) reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner‘s (City of Alexandria) expense, by an independent surveyor acceptable to Contractor.

E. The City shall have the right to increase or decrease the volume of work by □ 25% of the total bid price without any changes in the bid unit prices.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 MEASUREMENT AND PAYMENT

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices specified in

those Sections shall be as specified therein or as specified in Virginia Department of Transportation Road and Bridge Specifications, 2020.

C. The City of Alexandria (City) reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's (City of Alexandria) expense, by an independent surveyor acceptable to Contractor.

D. The City shall have the right to increase or decrease all quantities of individual item +/- 25% of the bid quantity without any changes in the bid unit prices.

END OF SECTION

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Project meetings.
3. Requests for Interpretation (RFIs).

B. See Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Keep one copy of all construction documentation including drawings and specifications on the work site, and in good order, and make it available to the City of Alexandria.

B. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner (City of Alexandria) and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Delivery and processing of submittals.
3. Progress meetings.
4. Startup and adjustment of systems.
5. Project closeout activities.

1.5 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. The City of Alexandria's Action: The City of Alexandria will review each RFI, determine action required, and return it. Allow seven working days for The City of Alexandria's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The City of Alexandria's action may include a request for additional information, in which case the City of Alexandria's time for response will start again.
2. The City of Alexandria's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit a Change Proposal.
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify The City of Alexandria in writing within 10 days of receipt of the RFI response.

C. On receipt of The City of Alexandria's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify the City of Alexandria within seven days if Contractor disagrees with response.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Daily construction reports.
3. Field condition reports.

1.3 SUBMITTALS

A. Contractor's Construction Schedule: Submit an electronic copy of schedule (Initial or Updated) and labeled to comply with requirements for submittals.

B. Daily Construction Reports: Submit two copies at weekly intervals.

C. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

B. Activities: Treat each separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.

Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. Equipment at Project site.
3. Material deliveries.
4. High and low temperatures and general weather conditions.
5. Accidents.
6. Stoppages, delays, etc.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. See Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule.

C. See Division 1 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.

D. See Division 1 Section "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires The City of Alexandria's responsive action.

B. Informational Submittals: Written information that does not require The City of Alexandria's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. The City of Alexandria reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on The City of Alexandria's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. The City of Alexandria will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow 15 days for review of each resubmittal.

C. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by The City of Alexandria.

3. Include the following information on label for processing and recording action taken:

a. Project name.

b. Date.

c. Name and address of The City of Alexandria.

d. Name and address of Contractor.

e. Name and address of subcontractor.

f. Name and address of supplier.

g. Name of manufacturer.

h. Submittal number or other unique identifier, including revision identifier.

i. Number and title of appropriate Specification Section.

j. Drawing number and detail references, as appropriate.

k. Location(s) where product is to be installed, as appropriate.

l. Other necessary identification.

D. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

E. Additional Copies: Unless additional copies are required for final submittal, and unless The City of Alexandria observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

F. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. The City of Alexandria will return submittals, without review, received from sources other than Contractor.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked “Approved".

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Use only final submittals with mark indicating “Use for Construction" taken by The City of Alexandria.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

a. Manufacturer's written recommendations.

b. Manufacturer's product specifications.

c. Manufacturer's installation instructions.

d. Manufacturer's catalog cuts.

e. Wiring diagrams showing factory-installed wiring.

f. Printed performance curves.

g. Operational range diagrams.

h. Compliance with specified referenced standards.

i. Testing by recognized testing agency.

4. Number of Copies: Submit three copies of Product Data, unless otherwise indicated. The City of Alexandria will return two copies. Mark up and retain one returned copy as a Project Record Document.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. The City of Alexandria will not return copies.

2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."

B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

D. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

E. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

F. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

G. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

2.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to The City of Alexandria.

B. Approval Stamp: Stamp each submittal with a uniform approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 THE CITY OF ALEXANDRIA'S ACTION

A. General: The City of Alexandria will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: The City of Alexandria will review each submittal, make marks to indicate corrections or modifications required, and return it. The City of Alexandria will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

C. Informational Submittals: The City of Alexandria will review each submittal and will not return it, or will return it if it does not comply with requirements. The City of Alexandria will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

2. Requirements for Contractor to provide quality-assurance and -control services required by The City of Alexandria or authorities having jurisdiction are not limited by provisions of this Section.

C. See Sections for specific test and inspection requirements.

D. Measurement and Payment: Work associated with Testing Services will be incidental to the respective works being performed.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by The City of Alexandria.

C. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

D. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

H. Experienced: When used with an entity, "experienced" means having successfully completed projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to The City of Alexandria for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to The City of Alexandria for a decision before proceeding.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the Commonwealth of Virginia and who is experienced in providing engineering services of the kind indicated.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.7 QUALITY CONTROL

A. Quality-control services to be provided by the Contractor.

1. Engage a qualified testing agency to perform required quality-control services.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

3. Submit a certified written report, of each quality-control service.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

C. Retesting/Reinspecting: Provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with The City of Alexandria and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify The City of Alexandria and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Does not release, revoke, alter, or increase the Contract Document requirements.
6. Do not perform any duties of Contractor.

E. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 49 00 – MOBILIZATION AND DEMOBILIZATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Virginia Department of Transportation Road and Bridge Specifications, 2020 (VDOT Specifications).

1.2 SUMMARY

A. This Section includes the following:

1. Mobilization and Demobilization

1.3 MEASUREMENT AND PAYMENT

A. Item G-1: Mobilization and Demobilization

1. This price and payment shall be full compensation for providing the Payment Bond and Performance Bond; insurance, permits, utility costs unless otherwise noted; stockpiling, storage and staging areas, Health and Safety Plan(s); project meetings; full mobilization and demobilization; photographic documentation, and all else incidental thereto which separate payment is not provided under other items in the Bid Form. Refer to VDOT Specification Subsection 513.02 – Measurement and Payment, maximum as stated in VDOT Specification Subsection 513.02 – Measurement and Payment.

2. Refer to VDOT Specification Subsection 513.02 – Measurement and Payment.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to the requirements of VDOT Specification Section 513 – Mobilization.

END OF SECTION

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. None

1.3 INFORMATIONAL SUBMITTALS

A. Temporary Traffic Control/Maintenance Plan: show temporary traffic control measures to be employed during construction activities.

1.4 MEASUREMENT AND PAYMENT

A. Item G-2: Temporary Facilities and Controls

1. Temporary traffic control measures along Oronoco Street to maintain closure of traffic during construction activities will not be measured. Temporary traffic control measures will be paid at a lump sum unit price. This price shall include coordination with the City, furnishing, erecting, maintaining signs, structures, and traffic control devices and removing them when no longer necessary. The payment will be full compensation for all material, labor, equipment, tools and incidentals necessary to complete the work.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 SUPPORT FACILITIES INSTALLATION

A. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Comply with the most recent version of the Manual on Uniform Traffic Control Devices (MUTCD) issued by the US Department of Transportation, Federal Highway Administration.
2. Comply with most recent version of Virginia Work Area Protection Manual Standards and Guidelines for Temporary Traffic Control.
3. Protect existing site improvements to remain including curbs, pavement, and utilities.
4. Maintain access for fire-fighting equipment and access to fire hydrants.

B. Parking: Use designated existing parking areas for construction personnel.

C. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.

2. Remove snow and ice as required to minimize accumulations.

D. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

2. Maintain and touch up signs so they are legible at all times.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

3.2 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."

D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

E. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

END OF SECTION

SECTION 01 56 39 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for temporary site fencing.

1.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a caliper tool at a height 6 inches above the ground for trees up to and including 4-inch size at this height.

B. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape at a height 54 inches (above the ground line).

C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and as indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MEASUREMENT AND PAYMENT

A. Tree Protection Fence will be considered incidental to the CIPP lining work. This shall include fencing and all labor, equipment and incidentals required for installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of the following:
1. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
2. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For arborist and tree service firm.

B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

E. Quality-control program.

1.7 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements as specified on the plans:

1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F);

inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi ; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.

a. Height: 48 inches.
b. Color: High-visibility orange, nonfading.

B. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:

PART 3 - EXECUTION

3.1 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk at 54 inches above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Tree Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 2-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.2 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
1. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to the City.

B. Protection Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by the City. Install one sign spaced approximately every 50 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. Maintain protection-zone fencing and signage in good condition as acceptable to the City and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.3 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.4 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by the City.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by the City.

B. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 2-inch uniform thickness to remain.

3.5 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off the City's property.

END OF SECTION

SECTION 01 73 00 – EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of Work

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of the City of Alexandria-accepted deviations from indicated lines and levels, and final cleaning.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional Contractor to demonstrate their capabilities and experience. Include lists of completed project with project names and addresses, names and addresses of Engineers and owners, and other information specified in Section 330131.01 – Cured-In-Place Storm Sewer Lining.

B. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements if needed.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

C. As-built: Maintain a record of conditions and provide an as-built plan depicting final conditions. One complete set of the signed and sealed Contract Plans on full-size plan sheets shall be maintained as the Final "As-Built" Plans.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the City of Alexandria for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for electrical systems to verify actual locations of connections before equipment and fixture installation.

2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.

2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to the City of Alexandria that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to the City of Alexandria. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify the City of Alexandria promptly.

B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify the City of Alexandria when deviations from required lines and levels exceed allowable tolerances.

7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, rim and invert elevations, site furniture, and landscaping.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by the City of Alexandria.

3.4 FIELD ENGINEERING

A. Identification: Contractor to verify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of the City of Alexandria. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to the City of Alexandria before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Survey Cut Sheets: Cut sheets shall be provided to the City two (2) work days prior to any installation of any concrete improvements (including but not limited to curb, curb and gutter, weirs, abutments, and drainage structures).”Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER ACCESS

A. Site Access: Provide access to Project site for the City of Alexandria's representative/personnel.

B. Coordination: Coordinate construction and operations of the Work with The City of Alexandria's representative / personnel.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

   a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements with authorities having jurisdiction.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with the Owner.

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

B. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION

SECTION 01 77 00 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner (City of Alexandria) of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Prepare and submit final Project Record Documents.
5. Terminate and remove temporary facilities from Project site, along with construction tools, and similar elements.
6. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, the City of Alexandria will either proceed with inspection or notify Contractor of unfulfilled requirements. The City of Alexandria will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by the City of Alexandria, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment.
2. Submit certified copy of the City of Alexandria's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by the City of

Alexandria. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, the City of Alexandria will either proceed with inspection or notify Contractor of unfulfilled requirements. The City of Alexandria will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit a list which Includes name and identification of each area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of the City of Alexandria for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Comply with safety standards for cleaning. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 07 91 00 – PREFORMED JOINT SEALS

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall furnish all labor, tools, equipment, and install joint sealer for precast concrete manholes, where shown on the DRAWINGS and as specified herein.

1.2 RELATED SECTIONS

A. The following is a list of SPECIFICATIONS which may be related to this section:

1. Section 33 05 61, Manholes

1.3 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. AASHTO M198, Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Materials, equipment, and accessories specified in this section shall be products of:

1. K. T. Snyder; Ram-Nek.
2. Hamilton-Kent; Kent-Seal No. 2.
3. Sheller-Globe; Tac-Tite.
4. Conseal CS-102

2.2 MATERIALS

A. General: Joint sealer shall be preformed, plastic gasket with hydrocarbon resins and inert mineral filler, in accordance with AASHTO M198, Type B.

B. Primers: Primers shall be used when recommended by the joint sealer manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. CONTRACTOR shall clean the concrete surfaces in accordance with the manufacturer’s recommendations. Mask edges, if required, to protect adjoining surfaces and produce a straight finish line. If required by the manufacturer, prime concrete surfaces with the recommended primer. Install bond breaker tape as required by the manufacturer to ensure sealant shall perform properly.

3.2 APPLICATION

A. CONTRACTOR shall apply the sealant in continuous beads without open joints, voids, or air pockets. Remove excess sealer promptly as WORK progresses and clean adjacent surfaces. Apply the sealer in accordance with the manufacturer's printed instructions and SPECIFICATIONS.

END OF SECTION

SECTION 30 01 30.11 – LARGE DIAMETER STORM SEWER PIPELINE INSPECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This specification covers inspection of storm sewers using internal closed circuit television (CCTV) video for the purposes of assessing thoroughness of cleaning, observing and/or recording structural mainline and lateral defects, construction, operational and miscellaneous features of existing storm sewer assets described in this Contract.

B. Provide all equipment, tools, labor, materials, and incidental services necessary to perform all work for CCTV inspections of sewer lines as indicated and in compliance with the Contract Documents.

C. Types of Cleaning shall be undertaken in accordance with 330130.41 Storm Sewer Pipeline Cleaning specification in order to be able to conduct a NASSCO compliant inspection.

D. Inspections may be witnessed by the Engineer.

1.2 RELATED REQUIREMENTS

A. Section 33 01 30.41 - Storm Sewer Pipeline Cleaning

B. Section 33 01 30.87 - Temporary Storm Sewer Bypass Pumping

1.3 REFERENCES

A. National Association of Sewer Service Companies (NASSCO):

1. Pipeline Assessment and Certification Program (PACP) Reference Manual.
2. Manhole Assessment and Certification Program (MACP) Reference Manual.

1.4 DEFINITIONS

A. CCTV Inspection: Operation necessary to complete a high-definition, true-color visual inspection for verification of existing internal storm sewer line conditions.

B. AVI: AVI, which stands for Audio Video Interleave, developed by Microsoft© is the acronym given to a family of multimedia container formats as part of its video for Windows© software.

C. MPEG: MPEG, which stands for Moving Pictures Expert Group, is the acronym given to a family of international standards fused for coding visual information in a digital compressed format.

D. MOV: MOV file, a common multimedia container file format developed by Apple© for use and compatible with both Macintosh© Quicktime and Windows© platforms. MOV files commonly use the MPEG-4 codec for compression.

E. HDD: Portable Hard Disk Drive. For the purposes of this specification, HDD shall be written in accordance with the ISO-9660 Level 2 specifications.

F. Engineer: City of Alexandria Engineer / Owner's Representative / Owner / Field Inspector.

1.5 SUBMITTALS

A. Submit all contract submittals and/or drawings in accordance with Section 013300 SUBMITTAL PROCEDURES from the specifications stipulated in this Contract.

B. Sample Inspection Report: The Contractor shall submit to the Engineer the following documentation to ensure quality and conformity requirements of this contract:

1. Provide a sample report of a sewer inspection including digital files, of an actual sewer performed by each device to be used on this Contract for review at least two (2) weeks before beginning the inspection work.

   a. Submit two (2) copies of visual recording to the Engineer. The Engineer will review the inspections for completeness and accuracy of content, to ensure that the required information is provided, and the recording quality is acceptable. If the Engineer determines that the recording is defective or not of adequate quality, the Contractor shall submit another CCTV inspection for review.

   b. Submit one (1) PACP (version 7.0.0 or newer) compliant Microsoft Access, CCTV inspection Databases containing inspection and defect information. Sewer condition coding shall be submitted as a PACP.mdb file accordingly. Name the PACP database according to the following file specification: [Contractor Name]_[Contract Number]_PACP_Submittal ##.mdb.

   c. Submit a pdf copy of the television inspection logs to the Engineer. Logs shall record defects according to NASSCO's PACP.

   d. Submit sample observation photos in the sample submittal.

   e. Submit a submittal tracking spreadsheet in the sample submittal.

2. Clearly identify the equipment make, model and serial number for the sample and all submittals.

3. Demonstrate the resolution of each camera using the recording resolution specified herein.

4. If the Engineer determines that the recording is defective or not of adequate quality, the Contractor shall correct deficiencies and re-perform sewer inspection at the Contractor's expense.

5. Use the report submission accepted by the Engineer as a benchmark for subsequent inspection report submissions.

6. No inspection work is to be performed until the sample inspection reports have been accepted by the Engineer.

C. Submit copies of current NASSCO PACP certifications for all Inspectors and Reviewers who shall perform the Contracted Work in accordance with NASSCO requirements having attained and retained their PACP certifications.

D. Submit a written description of procedures to be used to the Engineer, including product literature for all digital video equipment including, but not limited to cabling, camera, monitor, footage counter, digital video titling device, and recorder.

E. Inspection reports shall be completed within two (2) weeks of the completion of a work area or intermittent submittals as approved by the Engineer.

F. For the inspection report submittals, submit two (2) copies of visual recording to the Engineer. The Engineer will review the inspections for completeness and accuracy of content, to ensure that the required information is provided, and the recording quality is acceptable. If the Engineer determines that the recording is defective or not of adequate quality, the Contractor shall re-perform the CCTV inspection at the Contractor's expense.

G. For the inspection report submittals, submit one (1) PACP (version 7.0.0 or newer) compliant Microsoft Access, CCTV inspection Database containing inspection and defect information. Sewer condition coding shall be submitted as a PACP.mdb file accordingly. Name the PACP database according to the following file specification: [Contractor Name]_[Contract Number]_PACP_Submittal ##.mdb.

H. For the inspection report submittals, submit a pdf copy of the television inspection logs to the Engineer. Logs shall record defects according to NASSCO's PACP.

I. For the inspection report submittals, submit a submittal tracking spreadsheet to the Engineer.

J. Prior to initiating cleaning or inspection efforts, the Contractor shall submit an Emergency Plan that outlines proposed methods for recovering their cleaning or inspection equipment that has become lodged, lost or uncontrollable within the manhole or sewer, including confined space entry procedures.

K. Contractor is to provide a daily schedule to the City of Alexandria with planned inspection locations.

1.6 QUALITY ASSURANCE

A. Comply with the requirements of Section 01 40 00 QUALITY REQUIREMENTS and 33 01 30.41 STORM SEWER PIPELINE CLEANING from the specifications stipulated in this Contract.

B. Comply with all codes, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.

C. Inspection shall be performed in accordance with most current NASSCO's Pipeline Assessment and Certification Program (PACP).

D. The inspections shall be performed one pipe segment at a time as per NASSCO requirements.

E. Inspection shall be performed by certified operators in accordance with NASSCO having attained and retained their PACP certification. The Contractor shall ensure each operator is fully trained and certified in all aspects of sewer inspection and capable of making accurate observations and coding / recording all conditions that may be encountered in the sewers.

F. Coding accuracy will be a function of the number of defects or construction features not recorded or omitted as well as of the correctness of the coding and classifications recorded. Coding accuracy is to satisfy the following requirements:

1. Header accuracy: 95%
2. Detail/defect coding accuracy: 85%
3. Inspections failing to meet these criteria will be rejected, re-inspected if required, recoded, and resubmitted at no additional cost.

G. Contractor shall implement a formal coding accuracy verification system before starting the Work.

1. Submit coding accuracy checks with the corresponding video recording. The Contractor shall complete the CCTV Contractor Data Submittal and a QA Review Report documenting the results of the coding accuracy verification, attached separately, and include it with each respective data submission.
2. Re-code inspections not satisfying the accuracy requirements and verify the accuracy of the inspection immediately preceding and immediately following the non-compliant inspection. Repeat the process until the preceding and subsequent inspections meet the accuracy requirements.

H. The Contractor shall provide the Engineer with a complete list of Subcontractors whom the Contractor proposes to engage at least two (2) business days prior to the commencement of Work.

I. The Contractor shall maintain an up-to-date Progress Log that tracks the progress of the work and status of inspections. The Engineer shall be provided with this information upon request. The log should document the following information at a minimum:

1. Work Package ID
2. Asset ID
3. US and DS Manholes
4. Date of inspection
5. Date of data submission
6. Status of data acceptance / rejection
7. Date of data acceptance / rejection
8. Date of segment re-inspection (as required)
9. Date of data resubmittal (as required)
10. Date of resubmitted data acceptance (as required)

J. The Contractor shall complete and internal audit to determine accuracy of video and associated NASSCO defect coding by a NASSCO certified supervisor, applying their name and reviewed by timestamp to the inspection prior to issuance.

K. The Engineer shall be entitled to an audit of the control system and be present when assessments of the storm sewer integrity are being determined. When requested by the Engineer in writing, forward to the Engineer sufficient details and information for such audit assessment.

Should any report fail to achieve a margin that the Engineer deems satisfactory, the Contractor, without any additional compensation, shall recode and resubmit any data or reports that the Engineer deems necessary.

L. All submittals will be subjected to a Quality Control/Quality Assurance (QA/QC) audit by the Engineer. Where inconsistencies are noted, the Contractor shall be responsible, where necessary and at no additional cost to the Engineer, for corrections including, re-inspection, recoding and entering additional information.

1.7 MEASUREMENT AND PAYMENT

A. Item C-2: CCTV Inspection of 72” X 44” Arch Shaped Storm Sewer

1. Payment shall be made at the contract unit price bid per linear foot of CCTV inspection for the identified storm sewer as defined in these specifications. The pipe shall be inspected using PACP coding to determine the condition of the pipe. Price will include all labor, equipment, materials, work, and incidentals necessary to complete the Work at each location.
2. Digital video recordings, Inspection coding and Inspection Reports will be included with the sewer inspection.
3. Correction and re-submission of non-compliant submissions will be at Contractor’s own expense.
4. Sewer inspections will be measured on a length basis. Length to be paid for will be the total length of sewer inspected in accordance with this specification, accepted and measured by the Engineer.
5. Payment will not be made until the required report submissions are accepted by the Engineer.
6. Payment will not be made for inspections re-performed where the Engineer has determined the requirements of the specification have not been satisfied.
7. Sewer cleaning shall be paid upon review and acceptance of the corresponding video inspection by the Engineer.
8. The “Contingency Allowance” shall relate to approved completed work that is deemed outside of all other measurement and payment items, accepted and measured by the Engineer.
9. Reverse setups performed to obtain a complete television inspection or cleaning will be incidental to the Contract.

B. CCTV Inspection for Item C-3: Cured-In-Place Pipe Lining of 460 feet of 72” X 44” Arch Shaped Storm Sewer

1. CCTV inspection to install the CIPP under Item C-3 will be incidental to Item C-3. The Storm Sewers shall be inspected using PACP coding to determine the condition of the pipe. This includes all labor, equipment, materials, work, and incidentals necessary to complete the Work at each location.
2. Digital video recordings, Inspection coding and Inspection Reports will be included with the sewer inspection.

3. Correction and re-submission of non-compliant submissions will be at Contractor's own expense.

1.8 EXPERIENCE

A. The Contractor shall submit documentation for Engineer approval to demonstrate the following experience as a business engaged in the CCTV inspection of storm sewer lines per the contract documents:

1. The Contractor shall be in good standing under local contracting requirements or otherwise properly registered, licensed or permitted by law to carry on business within the State of Virginia, throughout the term of the Contract, and shall provide the Engineer with evidence thereof per the contract documents.

2. At any time during the term of the Contract, the Engineer may, at their sole discretion and acting reasonably, request updated evidence of good standing. A Contractor, who fails to provide satisfactory evidence, will not be permitted to continue to perform any Work.

B. The Contractor and/or any proposed Subcontractor, for the portion of the Work proposed to be contracted to them, shall:

1. Have a minimum of three (3) years of experience in the field of storm sewer pipeline inspection by means of CCTV inspection technologies and have the required capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract Documents.

2. Have successfully carried out work similar in nature, scope and value to the Work and demonstrate that within the past three (3) consecutive years prior to the bid, as a prime Contractor, the Contractor has successfully completed over 5,000 feet of previous CCTV inspections on storm sewers 30" and larger for condition assessment purposes. Inspection of new infrastructure for acceptance purposes shall not be deemed as representative experience. For each project submitted to meet the experience requirements, indicate the following:

a. Name and location of project.

b. Name, address, and telephone number of Owner or Engineer.

c. Brief description of work to include length and diameter of pipelines inspected.

d. Amount of contract.

e. Date of Completion – state if project was completed on time.

3. Provide the Engineer with a complete list of Subcontractors whom the Contractor proposes to use prior to the commencement of Work.

4. Be fully capable of performing the Work required in strict accordance with the terms and provisions of the Contract Documents.

C. The Contractor shall submit, for Engineer's approval, documentation to demonstrate the following experience of the staff proposed for this project:

1. Operator certification documentation of each CCTV operator's NASSCO PACP certificate. The PACP certificate for all Operators performing work on this project shall be current on the day of the Contractor's submission and shall remain current throughout the performance of this work.

2. Documentation of supervisors' and operators' training certifications, listing of completed projects, and a minimum of five (5) years of experience in the internal inspection of sewers using CCTV inspection technologies.

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish the television inspection studio, television camera, visual digital encoding equipment/software, and other necessary equipment, materials, electricity, labor, technicians, as may be needed to perform the television inspection.

2.2 EQUIPMENT

A. The Contractor shall submit a list describing all equipment to be used for review and approval by the Engineer.

B. Sewer inspection units are to consist of a self-contained vehicle with separate areas for viewing and storage complete with the following equipment as a minimum.

1. Cellular telephone and / or suitable communication systems linking all crew members.
2. Fans and blowers capable of removing fog that may be present in sewers at the time of the inspection.
3. Video cameras, lighting, cables, easement reels and power source.
4. Video monitor and digital video recorder.
5. Computer system with video capture card or dedicated unit and other related equipment.
6. Temporary manhole covers to provide fall-in protection while performing work.

C. Sewer CCTV Video Inspection Equipment:

1. A complete closed-circuit color television system, including a camera, lighting, electronic footage counter, computer and monitor, mobile television studio, and digital video recorder/player used for the televising operations shall be specifically designed for sewer inspections. Video inspection is to consist of the following:
    a. Video camera capable of panning 360° and tilting 270° with optimum picture quality provided by focus and iris adjustment. Focal range to be adjustable from 3 inches to infinity.
    b. The inspection equipment shall be capable of inspecting a minimum 1,500 linear feet of storm sewer line without access to a manhole in between.
    c. The inspection equipment shall be capable of clearly televising the interior of 20-inch to 180-inch height storm sewer sizes.
    d. The camera should be specifically designed and constructed for such sewer inspections and shall have above ground control for forward and backward movement in the sewer using tracked, wheeled, or tethered skid or floatation devices.
    e. Capture the inspections in digital format in color from the live video source on archival grade HDD to the following minimum requirements.

1) MPEG-2 or MPEG-4 format (MPEG-4 preferred).

2) Picture Size: 1024x768 (or greater) @ 29.97 (minimum) frames per second.

3) Data/Bit Rate: 6.0 Mbit/sec.

f. Lighting for the camera shall be waterproof and suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative and provide a clear picture in 100 percent humidity conditions. Lighting shall be adjustable to allow an even distribution of light around the sewer perimeter without loss of contrast, flare out of picture, or shadowing. Lighting shall illuminate the sewer or manhole ahead of the camera to be able to determine general condition, features and upcoming defects.

1) An unclear picture due to excessive lighting (image flare), the lack of lighting or the presence of fog, steam, or excessive humidity will be considered unsatisfactory. The Contractor is responsible for identifying and implementing corrective actions to obtain suitable video quality, such as using fans or ventilation systems to dissipate the fog or by the heating of incoming air to mitigate fog.

2) A blurred picture due to fats, oil or grease will be considered unsatisfactory. The Contractor is responsible for identifying and implementing corrective actions to obtain suitable video quality, such as cleaning the sewer mainline, having the camera lens cleaned prior to reinspection of the mainline.

3) The Contractor is responsible for presenting issues regarding questionable video quality immediately to the attention of the Engineer.

4) Light heads shall be changed upon the request of the Engineer.

g. Picture quality and definition shall be to the satisfaction of the Engineer and if unsatisfactory, equipment shall be removed from the storm sewer and no payment shall be made.

h. Video overlay equipment capable of superimposing a minimum of 15 lines with up to 30 characters per line of alphanumeric information onto the video recording.

i. The focal length is the intersection point between the camera lenses widest horizontal viewing angle and the pipe's side periphery (03 or 09 o'clock) when the camera is level and looking forward. The rear of the camera must be positioned at the start of the pipe where the camera's physical distance is added to the focal length. This total distance is known as the cable calibration distance or cable set point. Record the distance from the manhole to pipe interface to the cable calibration distance at the start of the inspection and adjust the distance reading so that zero is at the manhole to start of pipe interface.

j. Larger height storm sewers of 30 inches and greater shall be inspected using an in-line inspection platform, which shall:

1) Be capable of inspecting a minimum 1,500 linear feet of sewer line without access to a manhole in between.

2) Have independently controlled drive tracks that enable the platform to maneuver around bends and climb over debris up to 12-inches in height.

3) Be operable under partially or fully submerged flow conditions.

4) Be operable in sewers of various cross-sections, and constructed of standard pipe materials including, but not limited to, brick, clay, concrete, PVC, HDPE, and steel.

5) Be tethered to facilitate extraction of the platform from the sewer, without causing damage to the sewer infrastructure, in the event the equipment fails or otherwise becomes uncontrollable within the sewer.

6) Be equipped with sufficient high intensity lighting to illuminate the larger diameter sewer for visual inspection.

k. Minimum requirements of in-line inspection technologies for CCTV video inspection equipment shall be:

1) Equipment shall be capable of continuously capturing digital video with no frame loss, regardless of the progression of the inspection for the entire length being inspected.

2) Incorporate a suitable distance-reading device to measure the location of the equipment in the pipe, to an accuracy of ±0.5% of the length of the inspection.

3) An electronic footage counter shall accurately measure the distance of the CCTV inspection equipment from the centerline of the starting manhole within +/- 2-ft. This measurement shall be displayed on the monitor and recorded on the video at all times. The importance of accurate distance measurements is emphasized.

l. In areas where a self-propelled track-mounted platform is not possible to use during the inspections, the inspections shall be performed using a tethered or parachuted floated or skid system. The Contractor shall notify the Engineer prior to the use of the floated or skid platform.

PART 3 - EXECUTION

3.1 CCTV INSPECTION

A. All open access structures or manholes will be attended at all times, and all access structures or manholes that were sealed or bolted to control odors or entry of extraneous water or for security reasons will be resealed or re-bolted after entry. The Contractor shall liaise with the Engineer to ensure that sealed or bolted chambers have been adequately sealed or bolted, post inspection.

B. Ensure camera speed does not exceed 30 feet / minute during sewer and manhole inspections.

C. Inspect sewer pipelines with pan and tilt conventional television imagery so as to record relevant features and defects of the pipeline under inspection. Inspection of pipelines shall be carried out in accordance with NASSCO PACP standards in conjunction with cleaning operations in accordance with the requirements of the contract documents. A skilled and NASSCO PACP certified technician or supervisor who shall be located at the control panel in the mobile television studio shall control the operation of the television equipment.

D. The sewer inspected distance shall represent the distance as per NASSCO guidelines:

1. From the start manhole, access or control structure and pipe interface 0.0ft of the sewer segment to finish manhole, access or control structure interface unless incomplete as per 3.02.G.

E. Whenever prevailing conditions allow, position the camera head to reduce the risk of picture distortion. In circular sewers, position the camera lens centrally (i.e., in prime position) within the sewer. In noncircular sewers, picture orientation shall be taken at mid-height, unless otherwise agreed, and centered horizontally. Direct the camera lens along the longitudinal axis of the sewer when in prime position. A positioning tolerance of +/- 10 percent of the vertical sewer dimension shall be allowed when the camera is in prime position.

F. Indicate on the monitor screen accurate automatic distance measurement that begins to move immediately as the camera moves. Ensure measurement is accurate from the cable calibration point to the pipe to finish manhole interface.

G. All defects and observations are to be circumferentially located based on the side periphery only.

H. Stop the camera and position to provide a steady perpendicular view of connections, junctions, major branches and major defects including deformed sewers, displaced bricks, holes, large displaced joints, missing bricks, missing mortar, obstructions, and large open joints for a period of time adequate to review the defect or observation for condition assessment purposes.

I. Tap observation distances must occur at the center of the tap and the side periphery. To determine use and deficiencies of the tap, the camera must continue to travel, camera centered in the perspective view (to capture other observations), to stop perpendicular to the tap and pan so that the camera can view directly into the barrel of the lateral, to enable the inspector to apply modification and descriptor codes to the tap as per NASSCO PACP standards as necessary.

J. Further to coding Taps, the Contractor shall conform to NASSCO requirements however, where defective Taps are identified, the most significant observed defect seen within the lateral shall be communicated within the “Remarks” field as per PACP requirements but also providing the associated property address of the Tap. The Contractor shall identify the affected property by completing a surface distance or calibrated footage counter measurement on the surface to confirm property number and note this within the “Remarks” field with an associated photograph taken of the offending defective tap.

K. Perform television inspections during low flow conditions. The Engineer will reject any television inspection that, because of high flow conditions or for any other reason, does not produce an effective survey of the sewer pipe. In addition, if it is determined that effective conventional television inspection cannot be performed, notify the Engineer in writing.

L. Observations that are critical to public safety or pose imminent threat to the public or environment shall be reported within 24-hours.

M. Re-perform sewer inspections where the Engineer has determined the tolerance requirements for camera position and speed and internal distance measurement requirements per these specifications have not been satisfied.

3.2 DIGITAL VISUAL RECORDING

A. Take continuous digital video recordings of the inspection view as it appears on the television monitor. The recording shall be used as a permanent record of defects. The recording shall be in MPEG file format. The digital video encoding shall include both sound and video information that can be reproduced with a video image equal or very close to the quality of the original picture on the television monitor. The replay of the recorded video information, when reviewed by the appropriate MPEG 2/4 viewing software, shall be free of electrical interference and shall produce a clear, stable image.

B. Audio recording will not be required as a deliverable on this Contract.

C. Create separate MPEG files for each sewer line segment. In case of a reverse setup, store such inspection in a separate MPEG file. MPEG files shall be written to 2.5 inch portable hard disk drives (HDD) for delivery to the Engineer. Multiple MPEGs may exist on each HDD. Each HDD folder shall be labeled, at a minimum, with the following information: Project Name, Date and time of inspection, pipe segment referenced Asset ID number, Sewer Line Sections with manhole IDs, Direction of survey, Current distance along reach (counter footage), and TV Inspection Contractor's firm name.

D. Digital video still frame captures of minimum 1024 x 768 x 24 bit JPEG shall be logged for every observation. Photographs shall be clear and accurately show the observation. Photographs shall have the following annotation: Upstream and downstream manhole ID, survey direction, footage, time and date, description. Name photos as follows: [Asset ID]_[Upstream Manhole ID-Downstream Manhole ID]_[HHMM_YYYYMMDD]_[Code]_[Footage].jpg. When multiple taps are found at the same distance at different clock positions, use an underscore and the clock position in the file name after the footage to differentiate them. For example, [Asset ID]_[Upstream Manhole ID-Downstream Manhole ID]_[HHMM_YYYYMMDD]_[Code]_[Footage]_[Clock Position].jpg.

E. CCTV video header information will be recorded for each pipe segment video and will be displayed for a minimum of 30 seconds at the start of all inspections. Inspection of the sewer shall not proceed while the information screen is being displayed. The data must be presented in a format with white text on a black background. The following information will be provided in the video header:

1. Contract Number:
2. Date: Date inspection was completed. Format: YYYYMMDD.
3. Time: Time survey was initiated. Format: 24-hr military, HH:MM.
4. Surveyed By: Name of PACP certified inspection operator conducting the inspection.
5. Certificate Number: NASSCO certificate number of the operator conducting the inspection.
6. Company: Name of company completing the inspection.
7. Pipeline Reference: Asset ID
8. Start MH ID: ID number of the MH where the inspection is initiated.
9. Finish MH ID: ID number of the MH where the inspection is ended.

10. Street: Street in which a majority of the sewer being inspected is located. Enter “ROW, (Street Name)” if sewer is not in the road but is in close proximity to a readily identifiable street. Enter “ROW” if sewer is not in close proximity to a readily identifiable street.
11. Start Location: Physical address, intersection or nearest landmark that can be used to readily identify the location of the start MH.
12. Survey Direction: Direction of inspection in relation to flow in the sewer; Upstream or Downstream
13. Material: Material composition of sewer being inspected. Format: NASSCO PACP code.
14. Height: Nominal sewer dimensions. Pipe diameter if circular, height if non-circular.
15. Width: Nominal sewer dimensions. Maximum width if non-circular.

F. The Engineer reserves the right to refuse an MPEG on the basis of poor image quality, excessive bit rates, inconsistent frame rates, or any other characteristics that may affect usability by the Engineer.

G. The Contractor shall provide at least three (3), 2.5-inch portable hard disk drives (HDD), complete with all associated drivers and software, power adaptors and USB cables, that contains completed sewer inspection video with viewing software and sewer condition coding data to the Engineer. Sewer condition coding shall be submitted as PACP.mdb files accordingly. Retained HDD’s will be returned at an agreed frequency.

H. All HDD’s shall be sized appropriately to accommodate all above mentioned files and have dual USB 3.0 (preferable) and (a minimum) USB 2.0 compatibility with a minimum data transfer rate of 480 MB/s.

3.3 INSPECTION REPORTS

A. Prepare a television inspection report covering the television inspection work and the information acquired. Inspection forms shall be completed and submitted for all pipe sections requiring inspection, including those for which an actual inspection cannot be performed as per Clause 3.05.E.

B. Name the report files according to the following file specification: [Asset ID]_ [Start Manhole Number]_[End Manhole Number]_[YYMMDD]_ [HH:MM – 24 hour format].pdf

C. Report sewer defects in accordance with NASSCOs Pipeline Assessment and Certification Program (PACP). The Engineer reserves the right to refuse any inspection report that does not comply with the PACP program. The Engineer, at their discretion, may modify this form to meet their condition assessment needs. Alternate inspection forms shall be used only if approved by the Engineer.

D. In addition to completing all mandatory PACP inspection required fields, the Contractor shall complete the following fields in the PACP Header Section:

Pipe Header Section	Field No.	Field Name	NASSCO Mandatory	REQUIRED (Yes / No)?
General Information	1	Surveyed By (*Operator / PACP User Name*)	Yes	Yes
	2	Certificate Number	Yes	Yes
	3	Reviewed By	No	No
	4	Reviewer Certificate Number	No	No
	5	Owner	No	Yes
	6	Customer	No	Yes
	7	P/O Number (Contract No.)	No	Yes
	8	Work Order	No	Yes
	9	Media Label	No	Yes
	10	Project	No	Yes
	11	Date	Yes	Yes
	12	Time	No	Yes
	13	Sheet Number	Yes	Yes
	14	Weather	No	Yes
	15	Pre-Cleaning	Yes	Yes
	16	Date Cleaned	No	Yes
	17	Flow Control	No	Yes
	18	Purpose of Survey	No	Yes
	19	Direction of Survey	Yes	Yes
	20	Inspection Technology Used	No	Yes
	21	Inspection Status	Yes	Yes
	22	Consequence of Failure	No	No
	23	Pressure Value	No	No
Location	24	Drainage Area	No	Yes
	25	Pipe Segment Reference (*Asset ID*)	No	Yes
	26	Street (*Name and Number*)	Yes	Yes
	27	City	Yes	Yes
	28	Location Code	No	Yes
	29	Location Details	No	Yes
Pipe	30	Pipe Use	Yes	Yes
	31	Height (*Diameter*)	Yes	Yes
	32	Width	Yes	Yes
	33	Shape	Yes	Yes
	34	Material	Yes	Yes
	35	Lining Method	No	Yes

Pipe Header Section	Field No.	Field Name	NASSCO Mandatory	REQUIRED (Yes / No)?
	36	Coating Method	No	No
	37	Pipe Joint Length	No	Yes
	38	Total Length (Surface Distance)	No	Yes
	39	Length Surveyed	No	Yes
	40	Year Constructed	No	No
	41	Year Renewed	No	No
Measurements	42	Upstream MH No.	Yes	Yes
	43	Upstream MH Rim to Invert	No	Yes
	44	Upstream MH Rim to Grade	No	No
	45	Upstream MH Grade to Invert	No	No
	46	Upstream MH Northing	No	No
	47	Upstream MH Easting	No	No
	48	Upstream MH Elevation	No	No
	49	Downstream MH No.	Yes	Yes
	50	Downstream MH Rim to Invert	No	Yes
	51	Downstream MH Rim to Grade	No	No
	52	Downstream MH Grade to Invert	No	No
	53	Downstream MH Northing	No	No
	54	Downstream MH Easting	No	No
	55	Downstream MH Elevation	No	No
	56	MH Coordinate System	No	No
	57	MH Vertical Datum	No	No
	58	GPS Accuracy	No	No
	59	Additional Information	No	Yes*
Yes* - when required.				

3.4 TRAFFIC CONTROL

A. The Contractor shall comply with Section 015000 Temporary Facilities and Controls from the specifications stipulated in this Contract and all local, state, and federal requirements.

3.5 ACCEPTANCE OF WORK

A. The contractor will submit required video inspections of each sewer segment to the Engineer for review and determination if the work performed is acceptable.

B. The sewer inspection shall also be used by the Engineer to determine acceptance of sewer cleaning and intruding sewer tap removals where undertaken.

C. The Engineer will review the inspection videos within fifteen (15) working days of submission.

D. The contractor will re-perform sewer inspections where the Engineer has determined the requirements of the specification have not been satisfied.

E. The contractor will correct non-compliant inspection submissions and resubmit the corrected inspections to the Engineer within ten (10) working days.

F. The contractor will repeat the process until the inspection submissions are accepted by the Engineer. Work to perform remedial work will not be eligible for additional payment.

3.6 PROJECT DELIVERABLES

A. A batch number shall be provided for each submittal of CCTV videos and associated inspection reports and MSI to allow the cross reference of data during this Contract.

B. CCTV Sewer Inspections shall include the following information:

1. The Contractor shall submit formal NASSCO PACP compliant Sewer Inspection Reports respectively, in digital (PDF and PACP.mdb) formats, that summarizes all inspection activities and includes all inspection video and data in their raw format, along with any software viewing packages required to view or utilize the video and raw data.

2. The Contractor shall supply separately two (2) duplicated, 2.5-inch portable HDD's, complete with all associated drivers and software, power adaptors and USB cables, containing all video inspections and coding data to the Engineer and Owner upon completion of the project.

3. Diagrams and sketches relating to mapping discrepancies per these specifications.

3.7 CLOSEOUT ACTIVITIES

A. The Contractor shall comply with Section 01 77 00 CLOSEOUT PROCEDURES from the specifications stipulated in this Contract.

B. Acceptance of delivery to include revisions based on QA/QC Audit.

END OF SECTION

SECTION 33 01 30.41 – STORM SEWER PIPELINE CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This specification covers the cleaning of storm sewers and manholes using varying pressures and cleaning activities, to allow installation of a new liner, CCTV inspection of pipe by observing and recording structural mainline and lateral defects, construction, operational and miscellaneous features of existing storm sewer assets and to verify rehabilitated or new storm sewer construction prior to acceptance.

B. Types of Cleaning shall be undertaken in accordance with this specification in order to be able to conduct a NASSCO compliant inspection, including removing any and all debris found within the storm sewer including branches, soils, trash, and any type of debris which can be found within a storm sewer.

C. Provide all equipment, tools, labor, materials and incidental services necessary to perform storm sewer line cleaning work as indicated and in compliance with the Contract Documents.

D. For standard cleaning evaluation purposes to inspect the pipe, storm sewers shall be considered clean when ninety-five (95) percent of the cross-sectional area of the pipe is free of loose or settled debris of any size including sludge, dirt, sand, gravel, rocks, bricks, roots, grease and other solid and semi-solid materials. The Contractor shall be responsible to ensure the pipe is completely clean when installing the CIPP liner.

E. Standard (non-specialty) Sewer Cleaning: Cleaning using the step-cleaning method described in this Contract for the entire length of the pipe using a high-pressure water jetter to remove loose or settled debris. The Contractor shall verify the level of cleanliness using a CCTV camera to demonstrate to the Engineer that the pipe is clean and ready for final CCTV inspection.

F. Removing Intruding Sewer Taps: This work shall include the cutting and removal from the sewer of intruding taps that block the passage of the cleaning or inspection equipment. Requiring the use of remote controlled hydraulically or mechanically driven saw or blade cutters or grinders, remotely operated robots or other types of equipment capable of removing solid taps to be cut and ground and removed from the sewer. To be completed only as directed by the Engineer.

G. Debris Removal: The extraction of and proper disposal of foreign material from the sewer that includes but is not limited to loose or settled debris of any size including sludge, dirt, sand, gravel, rocks, bricks, roots, grease, concrete, asphalt, encrustation, broken pipe and other solid and semi-solid materials. Any debris removed shall be properly disposed in accordance with all local, state, and federal requirements and shall not be discharged back into the storm sewer system.

H. All storm water removed from the pipes being cleaned shall be treated in accordance with the requirements outlined below in 3.01.B.2 and discharged into the Sanitary sewer system. There shall be no discharge of dewatered storm water back into the storm sewer system.

I. Reverse set-up for cleaning: will be incidental to the Contract.

J. Flow Control: The requirements for Flow Control shall follow Section 33 01 30.87 Temporary Storm Sewer Bypass Pumping.

1.2 RELATED REQUIREMENTS

A. Section 33 01 30.11 - Large Diameter Storm Sewer Pipeline Inspection

B. Section 33 01 30.87 - Temporary Storm Sewer Bypass Pumping

1.3 REFERENCES

A. National Association of Sewer Service Companies (NASSCO):

1. Pipeline Assessment and Certification Program (PACP) Reference Manual.

2. Manhole Assessment and Certification Program (MACP) Reference Manual.

1.4 DEFINITIONS

A. CCTV Inspection: Operation necessary to complete a high-definition, true-color visual inspection for verification of existing internal sewer line conditions.

B. AVI: AVI, which stands for Audio Video Interleave, developed by Microsoft© is the acronym given to a family of multimedia container formats as part of its video for Windows © software.

C. MPEG: MPEG, which stands for Moving Pictures Expert Group, is the acronym given to a family of international standards fused for coding visual information in a digital compressed format.

D. HDD: Portable Hard Disk Drive. For the purposes of this specification, HDD shall be written in accordance with the ISO-9660 Level 2 specifications.

E. Engineer: City of Alexandria Engineer / Owner’s Representative / Owner / Field Inspector.

1.5 SUBMITTALS

A. Submit all contract submittals and/or drawings in accordance with Section 013300 Submittal Procedures from the requirements stipulated in this Contract.

B. Submit a written description of procedures to be used to the Owner, including product literature for all high-pressure water jetter equipment including, but not limited to hosing, jetter nozzles, water tanks, auxiliary engines, pumps, hydraulically driven hose reels, wash down wands, vactor units and backflow prevention devices.

C. Provide written procedure for method of dewatering and debris disposal to the Engineer for approval.

D. Prior to initiating cleaning or inspection efforts, the Contractor shall submit an Emergency Plan that outlines proposed methods for recovering their cleaning or inspection equipment that has become lodged, lost or uncontrollable within the manhole or sewer, including confined space entry procedures.

E. Contractor is to provide a daily schedule to the Engineer with planned cleaning locations.

1.6 QUALITY ASSURANCE

A. Comply with the requirements of Section 01 44 00 QUALITY REQUIREMENTS of the specifications stipulated in this Contract.

B. Comply with all codes, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.

C. The Contractor shall not discharge into the storm sewer system, any water containing silt, mud or any other concentrated settleable material.

1.7 MEASUREMENT AND PAYMENT

A. Item C-1: Cleaning of 72” X 44” Arch Shaped Storm Sewer

1. Standard sewer cleaning will be measured on a length basis.
2. Length to be paid for will be the total length of sewer cleaned in accordance with this specification, accepted and measured by the Engineer. The costs of all materials, labor, equipment, and all other incidental materials necessary for standard pipe cleaning of loose and settled debris, obstructions, roots, asphalt, concrete, bricks, grease and settled and ingress deposits shall be included in the cost of this item.
3. Debris removal will be considered incidental to the work under this pay item.
4. All sewer cleaning activities shall be paid upon review and acceptance of the corresponding video inspection by the Engineer.
5. Flow control costs are incidental to the payment for Item C-3, CIPP Lining of 72” X 44” Arch Shaped Storm Sewer.
6. Bypassing costs are incidental to the payment for Item C-3, CIPP Lining of 72” X 44” Arch Shaped Storm Sewer.

B. Cleaning for Item C-3: Cured-In-Place Pipe Lining of 460 feet of 72” X 44” Arch Shaped Storm Sewer

1. Standard sewer cleaning to install the CIPP under Item C-3 will be incidental to the payment for Item C-3.
2. The costs of all materials, labor, equipment, and all other incidental materials necessary for standard pipe cleaning of loose and settled debris, obstructions, roots, asphalt, concrete, bricks, grease and settled and ingress deposits shall be included in the cost of this item.
3. Debris removal will be considered incidental to the work under this pay item.

C. Removal of Intruding Sewer Taps

1. Removal of intruding sewer taps will be incidental to the payment for Item C-3, CIPP Lining of 72” X 44” Arch Shaped Storm Sewer. Taps that block the passage of the camera or inspection platform shall be considered for removal. Taps shall be cut to within one (1) inch of the surface of the pipe wall.
2. Measurements will be taken on site at time of removal and approved by the Engineer.

1.8 EXPERIENCE

A. The Contractor shall submit documentation for Engineer approval to demonstrate the following experience as a business engaged in the cleaning of storm sewer lines per the Contract Documents:

1. The Contractor shall be in good standing under local contracting requirements or otherwise properly registered, licensed or permitted by law to carry on business within the State of Virginia throughout the term of the Contract, and shall provide the Owner with evidence thereof per the contract documents.

2. At any time during the term of the Contract, the Owner may, at its sole discretion and acting reasonably, request updated evidence of good standing. A Contractor, who fails to provide satisfactory evidence, will not be permitted to continue to perform any Work.

B. The Contractor and/or any proposed Subcontractor, for the portion of the Work proposed to be contracted to them, shall:

1. Have a minimum of three (3) years of experience in the field of storm sewer cleaning by means of high velocity water jetters and pipeline inspection by means of CCTV and have the required capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract Documents.

2. Demonstrate that within the past three (3) consecutive years prior to the bid, as a prime contractor, the Contractor has successfully performed in a timely manner at least five (5) projects similar in scope and type to the required work that totals 5,000 feet of previous sewer cleaning on storm sewers 30” in height or greater for condition assessment purposes. Cleaning for inspection of new or rehabilitated infrastructure for acceptance purposes shall not be deemed as representative experience. For each project submitted to meet the experience requirements, indicate the following:

a. Name and location of project.

b. Name, address, and telephone number of Owner, Municipality, Authority, or a designated representative.

c. Brief description of work.

d. Amount of contract.

e. Date of Completion – state if project was completed on time.

1) Provide the Engineer with a complete list of Subcontractors whom the Contractor proposes to use prior to the commencement of Work.

2) Be fully capable of performing the Work required in strict accordance with the terms and provisions of the Contract Documents.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. The Contractor shall submit information on all equipment to be used for review and approval of the Engineer.

B. The Contractor shall provide documentation of availability of the following equipment (or equivalent) for this project:

1. High Flow Jetting Pump – Cleaning: Minimum requirement is 80 GPM @ pressures up to 2,000 psi with Minimum Spool Capability of 600 feet jetter hose; Maximum requirement is up to 230 GPM @ pressures greater than 1,500 psi up to 2,900 psi; Minimum Spool Capability of 1,500 feet of dual fused jetter hose.
2. 6,000 cfm @ 15 inches hg; articulating boom; 50 feet of 6-in to 10-in vacuum pipe. Vactoring capability of not less than 40 feet vertical.
3. High Velocity Jetting Equipment:
    a. All high velocity storm sewer cleaning equipment shall be constructed for ease and safety of operation.
    b. The equipment shall have a selection of two or more velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines to be cleaned.
    c. Equipment shall also include a high velocity wand for washing and scouring manhole walls and floor. The wand shall be capable of producing flows from a fine spray to a long distance solid stream.
    d. The equipment shall carry its own water tank, auxiliary engines, pumps and hydraulically driven hose reel.
    e. All controls shall be located so the equipment can be operated above ground.
4. Mobile TV Studios in accordance with:
    a. Section 330130.11: Large Diameter Storm Sewer Pipeline Inspection.
5. Water tank, generators, pumps, and air compressors.
6. Jetting nozzles and floor skids designed specifically for the size ranges specified in the Contract Documents. Demonstrate availability of appropriate heads for the various work requirements.
7. Water-tight debris boxes with decant system and carbon treatment as necessary to meet the discharge requirements for discharge to the sanitary sewer as outlined in 3.01.B.2 below.
8. CCTV camera equipment with a locating sonde to locate buried manholes.
9. Approved backflow prevention device for filling water tanks from a hydrant.

C. Debris Removal Equipment: Vacuum unit(s) used for removing storm sewer debris to include the following:
1. Positive displacement pumps or fans producing a minimum 1,500 cubic feet per minute of air movement.
2. Storage tank.
3. Minimum 6-inch diameter suction hoses attached to a hydraulic boom.
4. Configure the storage tank to allow the liquid portion of the debris to be treated and discharged into the sanitary sewer system and not the storm sewer system.

D. Flow Control and Emergency By-Pass pumping Equipment in accordance with Section 33 01 30.87 Temporary Storm Sewer Bypass Pumping.

E. Communication Equipment

1. Equipment cleaning crews shall have and utilize a suitable communication system, linking all crewmembers.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. All open access structures or manholes will be attended at all times, and all access structures or manholes that were sealed or bolted to control odors or entry of extraneous water or for security reasons will be resealed or re-bolted after entry. The Contractor shall liaise with the Engineer to ensure that sealed or bolted chambers have been adequately sealed or bolted, post inspection.

B. All cleaning shall commence with the most upstream sections of the storm sewer lines to be cleaned and end with the most downstream sections of the sewer lines to be cleaned. The cleaning process shall be carried out using the step-cleaning method using the appropriate carrying capacity of each jetter nozzle for the respective sewer pipe height and shape. All sediments and residual wastes shall be evacuated from each successive downstream manhole as the cleaning progresses.

1. Suitable debris boxes shall be installed as necessary in the downstream manholes in such a manner that solids and debris are trapped. No silts, sand, gravel, debris, etc., shall be allowed to pass these boxes.

2. Under no circumstances shall storm water or solids removed from the storm sewer line be dumped onto streets, catch basins, storm drains, or receiving waters. The storm water shall be treated and disposed of in the sanitary sewer system. The Contractor shall test and ensure the dewatered storm water meets the discharge limits shown below. Attachment 1 to this specification is a list of questions that must be completed and submitted to AlexRenew for the Discharge Authorization Letter (DAL) to be issued for this site. Once received, AlexRene will work on drafting the DAL. Attachment 2 is a sample DAL with sample reporting forms.

Analyte	**Discharge Limits Concentration**
Arsenic	0.40 mg/L
Cadmium	0.60 mg/L
Chromium	5.30 mg/L
Copper	2.0 mg/L
Cyanide	0.90 mg/L
Lead	1.00 mg/L
Molybdenum	2.70 mg/L
Mercury	0.002 mg/L
Nickel	2.0 mg/L
Silver	1.20 mg/L
Zinc	4.7 mg/L
Oil and Grease	100 mg/L
pH	>6.0 or <11.0 S.U.
TTO (see Attach. 3 for list of chemicals to test)	1.0 mg/L

3. All materials removed shall be properly disposed at a disposal facility licensed to receive the applicable wastes. None of the debris/sediment/liquids to be recovered during cleaning are expected to be hazardous. There is a likelihood that the sediment in the pipe has a small quantity of non-aqueous phase liquids (NAPL) which has migrated from the soil beneath Lee Square Street which formally was the site of a manufactured gas plant. This NAPL is routinely disposed by the City's contractors as a non-RCRA petroleum waste. However, most all of the debris and sediment would be typical of debris/sediment in other stormwater pipes. The City will provide to the CONTRACTEOR the most recent laboratory analysis of groundwater/NAPL collected at the site to be provided to the disposal facility. The disposal facility may accept this data as adequate or may require a sample of the waste for analysis prior to acceptance.

C. Each designated manhole and storm sewer line section indicated within the Contract Documents shall be cleaned using a high-pressure water jetter. The equipment selected for cleaning shall be capable of removing loose or settled dirt, grease, rocks, bricks, sand, roots and other deleterious materials and obstructions from the storm sewer lines and manholes using the provided types of cleaning as per 1.01.E to facilitate a full inspection.

1. If cleaning of an entire sewer segment cannot be successfully performed from one manhole, the equipment shall be set up on the opposite sewer segment manhole and a reversal clean again attempted, without additional compensation.

2. In the event the Contractor is unable to completely perform CCTV inspection or cleaning from both directions due to obstructions (with the exception of a cross bore or collapse), the Contractor must inform the Engineer of this immediately. Upon approval by the Engineer, the Contractor shall, within two weeks, have the obstructions removed using specialty cleaning equipment capable of removing the obstruction and simultaneously viewing the cleaning activity from the same vantage point in order to view the cleaning operation and not cause any damage to the host pipe.

3. The Contractor shall evaluate if the line is adequately cleaned as per 1.01.E to justify televising inspection work after each cleaning pass. The Contractor is wholly responsible for determining if the line is adequately cleaned to perform the televising inspection.

4. Standard storm sewer cleaning shall be considered the use of a step method to work through the pipe in increments that removes debris in a segmented and controlled manner throughout the full length of the pipe to be cleaned. This means that the Contractor shall clean an initial portion of the pipe for a length appropriate to the carrying capacity of each jetter nozzle, storm sewer pipe height and shape and level of debris encountered, pulling back debris to the manhole. The Contractor shall then clean successive increments of pipe in the same way, each time pulling the displaced debris in solution back over increments of pipe previously cleaned. The Contractor will complete the cleaning using the step method approach through the entire segment of the pipeline with a high-pressure water jetter to ensure the sewer is adequately cleaned to complete the work.

5. During all storm sewer cleaning operations, satisfactory precautions shall be taken to protect the sewer lines from damage that might be inflicted by the improper use of cleaning equipment. Whenever hydraulically propelled cleaning tools which depend upon water pressure to provide their cleaning force or any tools which retard the flow of water in the sewer line are used, precautions shall be taken to ensure that the water pressure created does not cause any damage or flooding to public or private property being served by the sewer segment involved.

6. No additional compensation will be provided to remove equipment or repair the sewer in the event the Contractor's equipment becomes stuck in the pipe or is otherwise damaged as a result of conducting work in a pipeline.

D. The Contractor is responsible for obtaining and maintaining all necessary permits and paying the corresponding fees needed for the Work and the transporting of any equipment or material over private property and public streets. It is further the Contractor's responsibility to obtain and maintain the necessary permits and/or permission from the Owner, Municipality and/or owners of private properties.

3.2 REMOVAL OF INTRUDING SEWER TAPS

A. Removal of intruding sewer taps shall be performed, as approved by the Engineer, where the intruding tap prevents passage of the camera or inspection platform or the completion of the Cured-In-Place Pipe rehabilitation. Special precautions should be exercised during the grinding operation to assure unnecessary damage does not occur to the tap given the conditions of the sewer main and tap. Contractor shall complete the work as follows:

1. Contractor shall leave intruding sewer taps finished smooth and within one (1) inch of the inside surface of the sewer.

2. Contractor shall monitor the entire intruding sewer tap removal process and while the cutting equipment is travelling within the pipe to reach the work area by CCTV.

B. Contractor shall inspect the entire sewer section in accordance with Section 33 01 30.11 - Large Diameter Storm Sewer Pipeline Inspection – after completion of intruding sewer tap removal.

3.3 FLOW CONTROL

A. Reference Section 33 01 30.87 Temporary Storm Sewer Bypass Pumping

3.4 TRAFFIC CONTROL

A. The Contractor shall comply with Section 01 50 00 Temporary Facilities and Controls from the specifications stipulated in this Contract and any local, state, and federal requirements.

3.5 ACCEPTANCE OF WORK

A. The Contractor shall submit required video inspections of the cleaned sewer to the Engineer for review and determination if the work performed is acceptable.

B. The Engineer will review the inspection videos within fifteen (15) working days of submission.

C. The Contractor shall perform remedial work for sewer cleaning and removal of intruding sewer taps and a re-inspection for the locations where the work was determined by the Engineer as not being acceptable. Work to perform remedial work will not be eligible for additional payment.

3.6 CLOSEOUT ACTIVITIES

A. The Contractor shall comply with Section 01 77 00 CLOSEOUT PROCEDURES from the specifications stipulated in this Contract.

B. Acceptance of delivery to include revisions based on QA/QC Audit.

END OF SECTION

AlexRenew
Discharge Authorization Letter Questions

General Information 1. Name and Address of Discharging Facility 2. Facility Owner 3. Facility Owner Primary Contact - Authorized Signatory a. Name b. Title c. Mailing Address d. Phone Number 4. Delegated Authorized Signatory *(i.e. Contractor, Consultant)* a. Name b. Title c. Company d. Mailing Address e. Phone Number	1. 2. 3. 4.
Site Operations Information 5. Discharge start and end date 6. Site work hours 7. Anticipated daily operational hours of discharge to the sanitary sewer 8. Will discharges be continuous, intermittent, batch, or other? a. *If flows are intermittent/batch/other - state estimated discharge interval and release volume* 9. Anticipated daily volume discharged in *Gallons* 10. Anticipated discharge rate in *Gallons Per Minute*	5. 6. 7. 8. 9. 10.

AlexRenew

Discharge Authorization Letter Questions

Characteristics of Discharge

11. Proposed VELAP Certified Lab for testing
12. Please attach any Laboratory Analytical Reports with Chain of Custody **that include all analytes in Table 2**

Table 2 - Discharge Limits

Analyte	Concentration
Arsenic	0.40 mg/L
Cadmium	0.60 mg/L
Chromium	5.30 mg/L
Copper	2.0 mg/L
Cyanide	0.90 mg/L
Lead	1.00 mg/L
Molybdenum	2.70 mg/L
Mercury	0.002 mg/L
Nickel	2.0 mg/L
Silver	1.20 mg/L
Zinc	4.7 mg/L
Oil and Grease	100 mg/L
pH	>6.0 or <11.0 S.U.
TTO (BTEX)	1.0 mg/L

11.

12.

Process Diagram and Site Map

13. Please describe any proposed onsite treatment activity prior to discharge
14. Please attach schematics and process flow diagrams for site discharges - including any onsite treatment equipment

13.

14.

AlexRenew

Discharge Authorization Letter Questions

15. Please attach a site map including: a. Proposed discharge location - including exact location of manhole or inlet used to discharge into the sanitary sewer **Discharge equipment may not obstruct the public right of way.*	15.

ALEXANDRIA renew ENTERPRISES®

AlexRenew is an independent public authority that manages Alexandria's wastewater to improve our local waterways.

703.721.3500 | AlexRenew.com

1800 Limerick Street, Alexandria, Virginia 22314

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GENERAL COUNSEL

McGuire Woods, LLP

August 15, 2022 **via Electronic & Certified Mail**

[redacted]

Subject: [redacted] **Discharge Authorization Letter**

Dear [redacted]

Within this letter, you will find a revised version of your Discharge Authorization Letter for site [redacted].

If you have any questions or concerns, please don't hesitate to contact the pretreatment team via email at pretreatment@alexrenew.com or by phone 703.721.3500 ext. 2020.

Sincerely,

[redacted]

Allison Deines, Director of Strategy and Policy

Cc: Ross Cooper, Environmental Specialist
Aster Tekle, Laboratory Manager

APPROVAL TO DISCHARGE

Table 1 – Discharge Authorization Summary

Owner Name	[redacted]
Site Name	[redacted]
Site Address	[redacted]
Contact Name	[redacted]
Discharge volume	Up to 15,000 gallons per day, not to exceed 40,000 gallons per month
Effective Date	August 15, 2022
Expiration Date	July 24, 2024
Authorized Discharge Hours	12:00 PM – 6:00 PM
Reporting Due Dates	Semi Annual Reports – to accompany the February and August Monthly Discharge Logs Monthly Discharge Log – 10th of the following month in which discharge occurred

Approval to Discharge

- **Discharge Authorization –** [redacted] is hereby granted approval to discharge 15,000 gallons per day, not to exceed 40,000 gallons per month, into the sanitary sewer as long as all of the conditions, terms, and requirements within this document are met.
- **Discharge Hours** – The site is authorized to discharge between 12:00 P.M. and 6:00 P.M.
- **Constituent Discharge Limits** – At no time shall the water discharged to sanitary sewer exceed the concentration limits in Table 2.

Table 2 – Discharge Limits

Analyte	Concentration
Arsenic	0.40 mg/L
Cadmium	0.60 mg/L
Chromium	5.30 mg/L
Copper	2.0 mg/L
Cyanide	0.90 mg/L
Lead	1.00 mg/L
Molybdenum	2.70 mg/L
Mercury	0.002 mg/L
Nickel	2.0 mg/L
Silver	1.20 mg/L
Zinc	4.7 mg/L
Oil and Grease	100 mg/L
pH	>6.0 or <11.0 S.U.
TTO (BTEX)	1.0 mg/L

- **Prohibited Discharges** – At no time shall the discharge violate the prohibited discharges as outlined in Sec. 5-6-111 of Alexandria City Code, Ordinance No. 4501.

- **Application for renewal** – Permitted facilities may solicit letter renewal within 90 days of letter expiration in accordance with Sec. 5-6-150 of Alexandria City Code, Ordinance No. 4501.

- **Wet Weather Procedure** – [redacted] must cease discharge, without notification, within one hour prior to forecasted start of a significant rain event.

Notification

- **Discharge Request Contents** – [redacted] must request all discharges, daily, via email to pretreatment@alexrenew.com. Discharge requests must contain anticipated volume and duration of discharge.

  - **Discharge requests for weekdays** must be submitted one business day before anticipated discharge by 4:00 PM.

  - **Discharge requests for weekends** must be submitted on the Friday before anticipated discharge by 4:00 PM.

- **Notification of Site Operations Termination** – [redacted] must notify AlexRenew via email within 24 hours and via certified mail within seven days of permanent termination of site dewatering operations.

- **Duty to Halt or Reduce Activity** – AlexRenew retains the right to cease or decrease discharges to sanitary sewer for any reason.

Measuring and Reporting

- **Meter** – [redacted] is required to have a meter installed post point of compliance but prior to discharging into sanitary sewer.

- **Monthly Reporting** – [redacted] must maintain a monthly discharge log containing a list of discharge requests and actual discharge volumes recorded from the meter. [redacted] must submit monthly discharge logs by the 10th of the following month in which discharge occurred.

- **Semi-Annual Reports** – On a semi-annual basis, [redacted] will collect a representative sample to be analyzed for the parameters identified in Table 2. All samples must be analyzed by a Virginia Environmental Laboratory Accreditation Program (VELAP) certified lab. Additionally, [redacted] will calibrate its meter on a semi-annual basis. The sampling and calibration results must be submitted with the February and August monthly discharge logs.

Inspection

- **Right to Inspect** – AlexRenew retains the right to inspect the worksite and sample at any time without prior notice.

Billing and Fees

- Rates – [redacted] will be charged based on AlexRenew's latest approved *Rules, Rates, and Regulations* document containing use information. The rate starting July 1, 2022 is $9.26 per 1000 gallons plus $2.28 per 1000 gallons as a City Sanitary Sewer Capital Investment Maintenance Fee. The current rate is subject to change without notification.

- Sampling costs – All sampling and analysis initiated and performed by authorized representatives of AlexRenew may be charged to the site owner, [redacted].

- Letter Fee – The fee for issuance or renewal for a discharge authorization is $100.

ALEXANDRIA RENEW ENTERPRISES PRETREATMENT

1800 LIMERICK STREET
ALEXANDRIA, VIRGINIA 22314

Permit Number: N/A **Facility Name:** **Address:** **Phone:**	**MONITORING PERIOD**					
	FROM			**TO**		
	Year	**Month**	**Day**	**Year**	**Month**	**Day**

Monthly Report Due: By the 10th of each month

Monitoring Point:

PARAMETER	**QUALITY OR CONCENTRATION**					**Number Of Violations**	**Frequency of Analysis**	**Sample Type**
		Minimum	**Average**	**Maximum**	**Units**			
Arsenic, Total	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	-	0.40			1/1 months	Grab
Cadmium, Total	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	-	0.60			1/1 months	Grab
Chromium, Total	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	-	5.30			1/1 months	Grab
Copper, Total	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	-	2.00			1/1 months	Grab
Lead, Total	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	-	1.00			1/1 months	Grab
Mercury, Total	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	-	0.002			1/1 months	Grab
Molybdenum, Total	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	-	2.70			1/1 months	Grab
Nickel, Total	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	-	2.00			1/1 months	Grab

PARAMETER	QUALITY OR CONCENTRATION					Number Of Violation	Frequency of Analysis	Sample Type
		Minimum	Average	Maximum	Units			
Silver, Total	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	-	1.20			1/1 months	Grab
Zinc, Total	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	-	4.70			1/1 months	Grab
TTO	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	_-	1.00			1/1 months	Grab
Total Oil and Grease	REPORTED				mg/L			
	PERMIT REQUIREMENT	-	-	100			1/1 months	Grab
Cyanide, Total	REPORTED				mg/L			
	PERMIT REQUIREMENT			0.90			1/1 months	Grab
pH	REPORTED				Std. Units			
	PERMIT REQUIREMENT	6.0	-	11.0			1/1 months	Grab
Flow	REPORTED	**Min.**	**Max.**	**Total (gal.)**	**Avg. Daily Flow**			
						GPD		Cont.	REC.
	PERMIT REQUIREMENT		20,880					

ADDITIONAL COMMENTS:

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

Signature: _____

Date: _____

ALEXANDRIA RENEW ENTERPRISES PRETREATMENT

1800 LIMERICK STREET
ALEXANDRIA, VIRGINIA 22314

Permit Number:
Facility Name:
Address:
Phone:

MONITORING PERIOD					
FROM			TO		
Year	Month	Day	Year	Month	Day

Report Due: By the 10th of each month

Corrections: Incorrect entry should be stricken with one (1) line and the correct entry written next to the incorrect entry with the initials of the person making the entry.

Monitoring				Calibration (See note below)							
Date	Daily Min, pH	Daily Max. pH	No. Ex	pH 7 Buffer		pH 10 Buffer		Grab Sample		Initial	Time
				Found	Left	Found	Left	Monitor	Lab		
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											

Note: Recalibration of the pH meter required when the difference between the meter and the laboratory verification equals or exceeds 0.10 units.

EXCURSIONS AND ADDITIONAL COMMENTS:

_____
_____
_____
_____
_____
_____
_____

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

Signature: _____

Date: _____

AlexRenew Notification & Discharge Log

Notification Log

Notification Date	Notification Time	Person Notified at AlexRenew	Permission Granted Y/N	Estimated Amount in Gallons	Comments

Discharge Log

Date	Operator	Starting Time	Ending Time	Amount in Gallons	Sheen Observed (Y/N)	Comments

Laboratory Analytical Report with Chain of Custody

Priority Pollutant List

Priority Pollutants are a set of chemical pollutants we regulate, and for which we have developed analytical test methods. The current list of 126 Priority Pollutants, shown below, can also be found at 40 CFR Part 423, Appendix A.

These are not the only pollutants regulated in Clean Water Act programs. The list is an important starting point for EPA to consider, for example, in developing national discharge standards (such as Effluent Guidelines) or in national permitting programs (such as NPDES).

1. Acenaphthene
2. Acrolein
3. Acrylonitrile
4. Benzene
5. Benzidine
6. Carbon tetrachloride
7. Chlorobenzene
8. 1,2,4-trichlorobenzene
9. Hexachlorobenzene
10. 1,2-dichloroethane
11. 1,1,1-trichloreothane
12. Hexachloroethane
13. 1,1-dichloroethane
14. 1,1,2-trichloroethane
15. 1,1,2,2-tetrachloroethane
16. Chloroethane
17. (Removed)
18. Bis(2-chloroethyl) ether
19. 2-chloroethyl vinyl ethers
20. 2-chloronaphthalene
21. 2,4,6-trichlorophenol
22. Parachlorometa cresol
23. Chloroform
24. 2-chlorophenol
25. 1,2-dichlorobenzene
26. 1,3-dichlorobenzene
27. 1,4-dichlorobenzene
28. 3,3-dichlorobenzidine
29. 1,1-dichloroethylene
30. 1,2-trans-dichloroethylene
31. 2,4-dichlorophenol
32. 1,2-dichloropropane
33. 1,3-dichloropropylene
34. 2,4-dimethylphenol
35. 2,4-dinitrotoluene
36. 2,6-dinitrotoluene
37. 1,2-diphenylhydrazine
38. Ethylbenzene
39. Fluoranthene
40. 4-chlorophenyl phenyl ether
41. 4-bromophenyl phenyl ether
42. Bis(2-chloroisopropyl) ether
43. Bis(2-chloroethoxy) methane
44. Methylene chloride
45. Methyl chloride
46. Methyl bromide
47. Bromoform
48. Dichlorobromomethane
49. (Removed)
50. (Removed)
51. Chlorodibromomethane
52. Hexachlorobutadiene
53. Hexachlorocyclopentadiene
54. Isophorone
55. Naphthalene
56. Nitrobenzene
57. 2-nitrophenol
58. 4-nitrophenol
59. 2,4-dinitrophenol
60. 4,6-dinitro-o-cresol
61. N-nitrosodimethylamine
62. N-nitrosodiphenylamine
63. N-nitrosodi-n-propylamine
64. Pentachlorophenol
65. Phenol
66. Bis(2-ethylhexyl) phthalate
67. Butyl benzyl phthalate
68. Di-N-Butyl Phthalate

69. Di-n-octyl phthalate
70. Diethyl Phthalate
71. Dimethyl phthalate
72. Benzo(a) anthracene
73. Benzo(a) pyrene
74. Benzo(b) fluoranthene
75. Benzo(k) fluoranthene
76. Chrysene
77. Acenaphthylene
78. Anthracene
79. Benzo(ghi) perylene
80. Fluorene
81. Phenanthrene
82. Dibenzo(,h) anthracene
83. Indeno (1,2,3-cd) pyrene
84. Pyrene
85. Tetrachloroethylene
86. Toluene
87. Trichloroethylene
88. Vinyl chloride
89. Aldrin
90. Dieldrin
91. Chlordane
92. 4,4-DDT
93. 4,4-DDE
94. 4,4-DDD
95. Alpha-endosulfan
96. Beta-endosulfan
97. Endosulfan sulfate
98. Endrin
99. Endrin aldehyde
100. Heptachlor
101. Heptachlor epoxide
102. Alpha-BHC
103. Beta-BHC
104. Gamma-BHC
105. Delta-BHC
106. PCB-1242 (Arochlor 1242)
107. PCB-1254 (Arochlor 1254)
108. PCB-1221 (Arochlor 1221)
109. PCB-1232 (Arochlor 1232)
110. PCB-1248 (Arochlor 1248)
111. PCB-1260 (Arochlor 1260)
112. PCB-1016 (Arochlor 1016)
113. Toxaphene
114. Antimony
115. Arsenic
116. Asbestos
117. Beryllium
118. Cadmium
119. Chromium
120. Copper
121. Cyanide, Total
122. Lead
123. Mercury
124. Nickel
125. Selenium
126. Silver
127. Thallium
128. Zinc
129. 2,3,7,8-TCDD

Additional Information

- Toxic and Priority Pollutants Under the Clean Water Act

SECTION 33 01 30.87 – TEMPORARY STORM SEWER BYPASS PUMPING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The requirements and provisions shall be construed to be the minimum requirements of these specifications. This Specification shall form the requirements for implementing a temporary pumping system for diverting existing storm flow around the Work area for a duration of the work performed in the storm sewer.

B. Work covered in this document consists of bypass pumping minimum requirements, installation and operation of existing City of Alexandria storm sewer system that require temporary diversion of flow to provide adequate and reliable services at all times during planned rehabilitation/construction-related activities in this Contract.

C. It is the responsibility of the Contractor to determine the flow and size of bypass system needed. For pricing purposes, assume a dry weather bypass water volume of 0.1 million gallons per day. Assume that this bypass water from upstream of the work is pumped and discharged directly to the River or MH93 without need for treatment.

D. Unless otherwise specified, all work shall conform to the City of Alexandria's Specifications for this Contract.

1.2 DEFINITIONS

A. Average Daily Dry Weather Flow: The sum of the flow records during dry weather conditions, for a period of twenty-four hours, divided by 24.

B. Average Daily Flow: The sum of the flow records for a period of twenty-four hours, divided by 24.

C. Engineer: City of Alexandria Engineer / Owner's Representative / Owner / Field Inspector.

1.3 ASSIGNMENT OF WORK

A. The lines to be bypassed have been identified in the Drawings of this Project and will be subject to the Engineer's approval before work commences.

B. Flow Control Plans will be drawn up by the Contractor for review by the Engineer prior to mobilization.

1.4 RELATED REQUIREMENTS

A. Section 300130.11 - Large Diameter Storm Sewer Pipeline Inspection

B. Section 330130.41 - Storm Sewer Pipeline Cleaning

C. Section 330131.01 – Cured-In-Place Storm Sewer Lining

1.5 REFERENCES

A. National Association of Sewer Service Companies (NASSCO):

1. Pipeline Assessment and Certification Program (PACP) Reference Manual.

2. Manhole Assessment and Certification Program (MACP) Reference Manual.

B. The City of Alexandria Design and Construction Standards 2020

1.6 EXPERIENCE

A. The Contractor shall submit documentation for Engineer approval to demonstrate the following experience as a business engaged in the bypass pumping of storm sewer lines per the Contract documents.

B. The Contractor shall be in good standing under local contracting requirements or otherwise properly registered, licensed or permitted by law to carry on business within the State of Virginia throughout the term of the Contract, and shall provide the Engineer with evidence thereof per the Contract documents.

C. At any time during the term of the Contract, the Engineer may, at their sole discretion and acting reasonably, request updated evidence of good standing. A Contractor, who fails to provide satisfactory evidence, will not be permitted to continue to perform any Work.

D. The Contractor and/or any proposed Subcontractor, for the portion of the Work proposed to be contracted to them, shall:

1. Have a minimum of three (3) years of experience in the field of bypass pumping and have the required capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract Documents.

2. Have successfully carried out work similar in nature, scope and value to the Work and demonstrate that within the past three (3) consecutive years prior to the bid, the Contractor has successfully performed in a timely manner at least five (5) projects similar in scope and type to the required Work. For each project submitted to meet the experience requirements, indicate the following:

a. Name and location of project.

b. Name, address, and telephone number of Owner, Municipality, Authority, or a designated representative.

c. Brief description of work and equipment used with approximated flow bypass quantities in Million Gallons Per Day (MGD).

d. Amount of contract.

e. Date of Completion – state if project was completed on time.

3. Provide the Engineer with a complete list of Subcontractors whom the Contractor proposes to use prior to the commencement of Work.

4. Be fully capable of performing the Work required in strict accordance with the terms and provisions of the Contract Documents.

1.7 SUBMITTALS

A. Submit the following:

1. Submit shop drawings in accordance with Section 01 33 00 Submittal Procedures with specific requirements stipulated in this Contract.
2. Submit a written description of procedures to be used to the Owner, including product literature for all bypass pumping equipment including, but not limited to hosing, jetter nozzles, water tanks, auxiliary engines, pumps, hydraulically driven hose reels, wash down wands, vector units, autodialer and backflow prevention devices.
3. Prior to initiating bypass pumping efforts, the Contractor shall submit an Emergency Plan that outlines proposed methods for recovering cleaning equipment that has become lodged, lost or uncontrollable within the storm sewer or lateral.
4. Contractor is to provide a daily schedule to the Engineer with planned cleaning locations.
5. Detailed bypass pumping plan and description of proposed pumping system. Indicate number, size, material, location and method of installation of suction and discharge piping, size of pipeline or conveyance system to be bypassed, staging area for pumps, site access point, and expected flow. A list of the key components required for the flow control measures, including but not limited to the following:
    a. Submit generic emergency bypass pumping plans
    b. Configurations
        1) Size and location of manhole or access points for suction and discharge hose or piping.
        2) Monitoring plan (if required). Note: all plans shall include a 24 hr contact person.
        3) Cofferdams
        4) Piping or hoses (where required)
        5) Temporary pipe supports and anchoring required.
        6) Weir locations, heights and materials.
        7) Sections showing suction and discharge pipe depth, embedment, select fill and special backfill, if buried.
        8) Method of protecting discharge manholes or structures from erosion and damage.
        9) Procedures to monitor upstream mains for backup impacts.
        10) Details on pump controls and instruments to safely operate and alarm of conditions. Provide sequence of Contractor’s emergency response contacts for the autodialers.
        11) Flow metering procedure and equipment if needed.
    c. Pumps
        1) Bypass pump sizes, capacity, number of each size to be on site and power requirements.
        2) Means and methods for dealing with excessive flows or wet weather events.

3) Thrust and restraint block sizes and locations.

4) Backup pump, power and piping equipment.

5) Design plans and computation for access to bypass pumping locations indicated on drawings.

6) Method of noise control for each pump and/or generator.

7) Method of preventing odors from being generated above normal levels.

8) Emergency plan detailing procedures to be followed in event of pump failures, service backups, and flooding.

9) Alarm system that will allow prompt determination of either excessive storm sewer surcharging or loss of bypassing piping integrity during operation.

d. Calculations

1) Calculations for selection of bypass pumping pipe size.

2) Calculations of static lift, friction losses, and flow velocity. Pump curves showing pump operating range.

e. Flow Control

1) Storm sewer plugging method and type of plugs.

2) A detailed procedure for installation and removal of the flow control measures.

f. Schedule

1) For bypass pumping a schedule for installation and maintenance of bypass pumping lines.

2) Procedures for setup and breakdown of pumping operations.

3) Cold weather operational plan as appropriate to protect equipment and pipes from freezing.

6. Flow control plans shall be prepared and stamped by a Professional Engineer, registered in the State of Virginia in accordance with this specification, experienced in the design and implementation of temporary flow bypass works, and will meet requirements of codes and regulatory agencies having jurisdiction.

1.8 MEASUREMENT AND PAYMENT

A. Measurement and payment shall include but not limited to all labor, materials, equipment, tools and incidentals for the pump setup, plugging, pumping and diversion of storm flow, development of the flow control and bypassing plan, setup, pumps, piping, fuel/electricity, maintenance, transportation and storage, temporary bypass and service piping, confined space entry and equipment, inserting and removing pipe plugs, constructing bulkheads, pumping flows, monitoring water levels, installing bypass/diversion piping, trenching, jacking and boring, abandoning the jacked casing, plating for diversion piping, erecting, maintaining and dismantling above ground bypass piping bridging temporary structures, backfill, compaction, placing temporary pavement, traffic control, and any surface restoration.

B. It is the intent for bypass pumping systems to be temporary. In some cases, the City may instruct adjustment to the bypass system to allow its function for an extended period of time as identified

in the bid items. Changes at the City's request can be billed to the Contingency Allowance on the approval of the Engineer, using time and material costs incurred for the modification to the bypass set up.

C. All costs associated with bypass pumping for the movement, placement, replacement, operation, repair or other such activities relating to planned bypass pumping and associated equipment mobilization efforts shall be incidental to the payment for Item C-3, CIPP Lining of 72" X 44" Arch Shaped Storm Sewer.

1.9 CONTRACTORS RESPONSIBILITY FOR FLOODING AND SURCHARGING

A. Schedule and perform Work in manner that does not cause or contribute to incidence of flooding, surcharging, or release of storm water from the storm sewer system or bypass operation. Should any liquid or solid matter from the bypass pump system be spilled, discharged, leaked or otherwise deposited into the open environment then immediately clean up and disinfect the affected area. Notify the Owner and perform required cleanup at no additional cost to the Owner. Bypass work shall not be setup and operated during wet weather.

B. When flow in a storm sewer line is bypassed by the Contractor, the Contractor shall take sufficient precautions to protect the public health and to protect the storm sewer lines from damage that might result from surcharging. Further, the Contractor shall take precautions to ensure that storm sewer flow control operations do not cause flooding or damage to public or private property being served by the storm sewers involved. The Contractor shall be responsible for any damage resulting from his flow control operations.

1. Provide the Engineer with at least 48 hours' notice and proposed method of flow control before undertaking flow control measures during planned work.
2. Provide the Engineer with information on capacity of pumping equipment for review before setting up by-pass pumping.
3. No liquid or solid matter shall be allowed to be discharged, stored or deposited to the open environment.
4. If an autodialer is utilized with the bypass system, the automatic dialing system will notify the Contractor and the Engineer in the event of high-water levels. The Contractor must respond to all autodialer alerts.

1.10 SENSITIVE LOCATIONS

A. In case of work near commercial buildings, it shall be initiated in consultation with the business/property owners such that the work causes the least disruption to their operations.

1.11 QUALITY ASSURANCE

A. Use only materials that are suitable for storm sewer piping systems.

B. Perform leakage and pressure tests on discharge piping before operation. Notify the Engineer twenty-four (24) hours prior to testing. Should any liquid or solid matter from the bypass pump system be spilled, discharged, leaked or otherwise deposited into the open environment immediately clean up and disinfect the affected area. Notify the Owner or Engineer and perform the required cleanup at no additional cost to the Owner.

C. At a minimum, maintain and inspect temporary pumping system at the beginning and end of each shift that pumps are operating. Responsible operator shall be available to attend site at all times when pumps are operating. Further to this, if an auto-dialer is utilized with the bypass system, the automatic dialing system shall be in working order and notify the Contractor and the Engineer in the event of high-water levels.

D. Keep and maintain spare parts for pumps and piping on site, as required.

E. Maintain adequate hoisting equipment and accessories on site for each pump.

F. Maintain daily maintenance and inspection logs.

PART 2 - PRODUCTS

2.1 MATERIAL AND EQUIPMENT

A. General

1. In order to prevent the accidental spillage of flow, all discharge systems shall be temporarily constructed of ridged pipe with positive, restrained joints. Only materials may be used that withstand one-hundred fifty (150) psi pressures and greater and are suitable for contact with stormwater. Under no circumstances will aluminum "irrigation" type piping or glued PVC pipe be allowed. Discharge hose will only be allowed in short sections and by specific permission from the Engineer. The bypass pumping system shall be One Hundred percent (100%) watertight.

B. Discharge, Suction, and Bypass Pipes: As approved by Engineer.

1. Discharge piping: Determine according to flow calculations and system operating calculations submittal.

2. Suction piping: Determine according to pump size, flow calculations, and manhole depth following manufacturer’s specifications and recommendations.

3. Homogenous throughout, free of visible cracks, discoloration, pitting, varying wall thickness, holes, foreign material, blisters, or other deleterious faults.

4. Neither aluminum “irrigation type” piping nor glued PVC piping will be permitted.

5. When subject to traffic loading, compose system, such as traffic ramps or covers, install system and maintain H-20 loading requirements while in use or as directed by the Engineer.

C. Flexible Hoses and Associated Couplings and Connectors:

1. Suitable for intended service per the specifications herein and as approved by Engineer.

2. Rated for external and internal loads anticipated by the pump selected for use, including test pressure expected during leakage and pressure tests.

3. When subject to traffic loading, compose system, such as traffic ramps or covers, install system and maintain H-20 loading requirements while in use or as directed by the Engineer.

D. Valves and Fittings:

1. All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system. The pumps may be electric or diesel

powered. All pumps used must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of stormwater flows.

2. Determine according to flow calculations, pump sizes previously determined, and system operating pressures.

E. Plugs:

1. Select and install according to size of line to be plugged, pipe and manhole configurations, and based on specific site.

F. Additional plugs:

1. Make available in the event a plug fails. Plugs shall be inspected before use for defects which may lead to failure.

G. Pumps:

1. The Contractor shall provide the necessary stop/start controls for each pump.
2. Fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in priming system.
3. Electric or diesel powered.
4. Constructed to allow dry running for long periods of time to accommodate cyclical nature of effluent flows.
5. Provide the necessary stop/start controls and alarms for each pump. Autodialers shall be used to alert of problems, if a header system is used to manifold the pumps, each pump shall include an autodialer. The autodialer shall be capable of being remotely contactable, at a minimum, for up to four (4) telephone numbers; two telephone numbers shall be provided by The City of Alexandria.
6. Provide the necessary stop/start controls for each pump.
7. One stand-by pump of each size maintained on site. Back-up pumps shall be on line and isolated from the primary system by a valve.
8. Noise control shall be utilized as a means to reduce noise to a level as required to comply with City of Alexandria noise ordinances.

2.2 PERFORMANCE

A. Design Requirements: Unless stated otherwise the minimum design requirements will provide the following:

1. Provide pipeline plugs, weirs, discharge piping and pumps of adequate size to handle the flows indicated above to divert the flow indicated in the Drawings.
2. Temporary bypass system shall be capable of continuous operation 24 hours per day if necessary.

PART 3 - EXECUTION

3.1 PREPARATION

A. Maintain copy of emergency plan on site for duration of project.

B. Determine location of bypass pumping system in order to minimize disturbance to existing utilities. Field locate existing utilities in proposed bypass area. Obtain approvals for placement within public or private property. Obtain Engineer's approval of locations prior to construction.

C. The Contractor is responsible for determining the flow to be bypassed within the storm sewer system.

D. The Contractor is responsible for locating existing utilities within the area where the Contractor elects to locate buried bypass pipelines. The Contractor shall locate his bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the temporary pipeline locations from the Engineer.

E. When working inside a manhole, the Contractor shall exercise caution and comply with OSHA requirements when working in the presence of sewer gases, combustible or oxygen-deficient atmospheres, and confined spaces.

F. If it is the intent for the bypass pumping system to operate and be controlled by a series of floats to automatically start and stop pumps and to communicate with the autodialer, depending on water levels in the manhole(s). The autodialer shall alert and alarm the Contractor and Engineer by cell phone communication of potential failures and prior to any high-water alarms. The Contractor shall be responsible for ensuring proper operation and maintenance of the bypass pumping and autodialer system.

3.2 BYPASS PUMPING

A. Transport, deliver, handle, and store pipe, fittings, pumps, ancillary equipment and materials to prevent damage and following manufacturer's recommendations.

B. Inspect all material and equipment for proper operation before initiating Work.

C. Material found to be defective or damaged due to manufacturer or shipment:

1. When Engineer deems repairable: Repair as recommended by manufacturer.

2. When Engineer deems not repairable: Replace as directed by Engineer before initiating Work.

D. Delivery and Storage

1. Transport, deliver, handle, and store pipe, fittings, pumps, ancillary equipment and materials to prevent damage and following manufacturer's recommendations.

2. Inspect all material and equipment for proper operation before initiating Work.

E. Installation, Operation and Removal

1. The Contractor shall remove manhole cover (lid) and / or frame, lifting rings as necessary or make connections to the existing sewer and construct temporary bypass pumping structures only at the access location indicated on the Bypass Plan and as may be required to provide adequate suction conduit.

2. The Contractor shall ensure all signing, guarding, trip hazard protection ramps and appropriate barriers are provided, ensuring all manholes are protected from pedestrians.

3. Testing

a. The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to actual operation. The Engineer will be given 24 hours notice prior to testing.

4. Inspection

a. Contractor shall inspect bypass pumping system every two (2) hours to ensure that the system is working correctly, or every twenty-four (24) hours when working with the autodialer system.

5. Maintenance

a. The Contractor shall insure that the temporary pumping system is properly maintained and a responsible operator shall be on hand at all times when pumps are operating.

6. Removal of Flow Control

a. Plugging or blocking of flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance of work, it is to be removed in a manner that permits the flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.

F. When planned or emergency bypass pumping is required, the Contractor shall supply all necessary pumps, conduits and other equipment to divert the flow around the pipe section or manhole in which Work is to be performed. The bypass system shall be of sufficient capacity to handle existing dry-weather flow plus additional flow that may occur during wet-weather (i.e. rainfall or snowmelt events). The Contractor shall be responsible for furnishing the necessary labor and supervision to set up and operate the bypass system. Pumps and equipment shall be continuously monitored by the Contractor during the periods that bypassing is required.

G. The Contractor shall select pumping / bypassing equipment that will not have excessive noise levels from pumping / bypassing equipment and shall be restricted to the allowable limits to comply with the Alexandria Noise Control Code Title 11, Chapter 5. The pump and generator shall be equipped/sheltered in a manner to keep noise to a minimum and in accordance with the permit requirements. The Contractor shall apply to the City for a noise variance permit if necessary for work outside of the allowed hours.

H. Fuel containers shall be placed within containment and with a spill kit nearby.

3.3 FLOW CONTROL PRECAUTIONS

A. When flow in a storm sewer line is plugged, blocked or bypassed by the Contractor, the Contractor shall take sufficient precautions to protect the public health and to protect the storm sewer lines from damage that might result from surcharging. Further, the Contractor shall take precautions to ensure that storm sewer flow control operations do not cause flooding or damage to public or private property being served by the storm sewers involved. The Contractor shall be responsible for any damage resulting from his flow control operations.

B. When flow in a storm sewer line is plugged or blocked by the Contractor, he shall monitor the conditions upstream of the plug and shall be prepared to immediately start bypass pumping, if needed. Any liquid or solid matter which is bypass pumped from the storm sewer system shall be discharged to another storm manhole or appropriate vehicle or container only. No such liquid or

solid matter shall be allowed to be discharged, stored or deposited to the open environment. The Contractor shall protect all pumps, conduit and other equipment used for bypass from traffic or other possible sources of damage.

C. Should any liquid or solid matter from the storm sewer system be spilled, discharged, leaked or otherwise deposited to the open environment as a result of the Contractor's flow control operations, the Contractor shall be responsible for all cleanup and disinfection of the affected area and all associated costs.

3.4 TRAFFIC CONTROL

A. The Contractor shall comply with Section 015000 TEMPORARY FACILITIES AND CONTROLS from the City of Alexandria's Specifications stipulated in this Contract, Commonwealth of Virginia requirements, and federal requirements.

3.5 ACCEPTANCE OF WORK

A. For planned bypass pumping, no work shall commence until submittals are provided and accepted by the Engineer.

B. To the best ability of the Contractor, the bypass pipeline shall be located off streets and sidewalks and on shoulders of the roads. When the bypass pipeline crosses local streets and private driveways, the contractor must place the bypass pipelines in traffic ramps or similar covers. Upon completion of the bypass pumping operations, and after the receipt of written permission from the Engineer, the Contractor shall remove all the piping, restore all property to pre-construction condition and restore all pavement. The Contractor is responsible for obtaining any approvals for placement of the temporary pipeline within public ways from the City.

3.6 CLOSEOUT ACTIVITIES

A. The Contractor shall comply with Section 017700 Closeout Procedures of the specifications stipulated in this Contract.

B. The Contractor shall properly demobilize the bypass system. Should any restoration be required and not part of this contract, the Contractor shall inform City/Engineer of areas of restoration needed for on-call contractor to perform restoration. Any damage caused by the Contractor's negligence shall be remedied at the cost of the Contractor.

END OF SECTION

SECTION 330131.01 – CURED-IN-PLACE STORM SEWER LINING

PART 1 - GENERAL

1.1 REFERENCE

A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section.

1.2 DESCRIPTION OF WORK

A. These Specifications include the general performance requirements for the materials, installation, testing, inspection, transportation, equipment, labor and other Work or requirements necessary to rehabilitate deteriorated portions of the storm sewers shown on the Contract Drawings by means of the installation of a Cured-In-Place Pipe (CIPP) Liner System.

B. The CIPP rehabilitation shall include the complete interior lining of the existing storm sewer piping with reinstatement of connected storm sewer laterals that will result in a smooth, wrinkle free, hard, structurally enhanced, watertight and chemically inert interior finish without defects, closely following the contours of the existing piping with fully functioning laterals.

C. The Contractor shall provide a complete rehabilitation system with mainline storm sewer and all active lateral connections restored in full operational condition that will be free of leaks and infiltration and will function as required.

D. Vehicular access to all manholes and/or storm sewer segments included in this project may not be available.

E. Prior to bidding the Work, the Contractor shall familiarize themselves with the jobsite requirements/constraints and the storm sewer segments identified for rehabilitation by CIPP lining. The Contractor shall utilize the appropriate installation means, methods, materials, and equipment necessary to appropriately accommodate each specific installation.

F. The CIPP Liner System is to prevent, to the extent possible, the infiltration of coal tar contaminated groundwater into the storm sewer for the lifetime of the CIPP liner.

1.3 SUBMITTALS

A. The Contractor shall submit the information listed below for review and approval. Commencement of Work will not be permitted for this item of Work until all the listed information has been received, reviewed, and approved by the Engineer.

B. Performance Work Statement (PWS) identifying the specific material and Work requirements necessary to complete the CIPP Lining Work. This shall include at a minimum the following:

1. Statement of Product conformance to the specific requirements of the Work contained in the Contract Documents.
2. Statement indicating the Contractor shall design the CIPP Liner System in accordance with the Contractor’s field verified measurements (length, dimensions, and shape) of the storm sewer. The pipe measurements (length and dimensions) provided in these drawings are for informational purposes only.

3. Detailed CIPP installation plan, including all related work items such as a site access plan, traffic/pedestrian control plan, and items as required below.
    a. Proposed access routes
    b. Set up locations for lining installation
    c. Wet out area (if required) including:
        1) Typical insertion and curing schedule/plan;
        2) Submit wet out, insertion and curing plan for each and every lining proposed;
        3) Submit minimum 48 hours (2 working days) prior to each installation:
            a) Site Health and Safety Plan
            b) Required Construction Permits
            c) Storm Sewer Flow Control Plan in accordance with this Specification
            d) Work shall be completed during dry weather/low flow conditions
            e) Emergency Contingent Plan
            f) Work schedule
4. Maintenance of Traffic Plans in accordance with the State of Virginia requirements and MUTCD
5. Statement of CIPP Manufacturer experience to include a minimum 10 years and 100,000 linear feet of CIPP manufactured. This shall include 10 projects for CIPP with pipe diameters of similar size or greater to those found on the contract drawings. Also, must include certification for a minimum 50-year design life.
6. Statement of Contract experience and list of installation personnel that will be assigned to this project. This shall include references for all jobs successfully completed within the last five (5) years that were either completed or under construction using the proposed CIPP products. References for the Contractor performing the rehabilitation Work shall include a minimum of 100,000 linear feet (LF) successfully completed demonstrating the installation of small and large diameter (8-inch through 60-inch) CIPP installations, including installations on arch pipe. Information provided shall include a description of the jobs, the location of the jobs, the value of the jobs, the dates in which the jobs were completed, the Owner, and contact information for the jobs, including the name, title, address, phone number and email address. Applications performed by the Contractor shall be in similar geographical/climatic conditions.
7. References for the project superintendent documenting experience with the installation of the specific product/methods specified under these Specifications. If a change in superintendent is made prior to or during construction, the Contractor shall provide references documenting the new superintendents' experience as required by these Specifications for the Engineer's review and approval. References provided shall include a description of the job, the location of the job, the value of the job, the dates in which the job was completed, the Owner, and contact information for the job, including the name, title, address, phone number and email address.
8. A letter identifying the specific crewmembers that will be performing the CIPP lining operations. If any of the crewmembers are not identified on the original certification letter, then a new certification letter listing any new crew member(s) must be received from the rehabilitation system supplier indicating that they are certified to install the product prior to initiation of the lining operations.

9. Documentation demonstrating training, certification, and experience of the specific personnel that will be assigned to perform the installation of the system(s) proposed.
10. Written verification confirming that the Contractor is licensed by the specific CIPP manufacturers to install their product.
11. Manufacturer's published literature and published data for the proposed CIPP pipeline system.
12. Independent test report showing the physical properties of the proposed pipeline systems meet the requirements of these Specifications, specific installation requirements of this project and the requirements published in the manufacturer's literature.
13. Manufacturer's certification that the CIPP lining system is chemically resistant to the contaminants found in this project and outlined in Section 1.1.15 below.
14. Documentation of Product Experience: This shall include references for jobs previously completed using the proposed CIPP rehabilitation system. The jobs submitted shall be provided by the product manufacturer and show that enough of the CIPP liner product (8-inches thru 60-inches in diameter and larger) have been successfully installed in storm sewers in the United States.
15. Infrared spectrum for proposed resin and confirmation of the resins meeting ASTM D5813.
16. Curing temperature monitoring system shop drawings
17. Detailed description of any lubricant proposed for the installation process. Lubricant shall be compatible with any pretreatment program that the waste flow from the Project may be transported to. See Section 33 01 30.41 – Storm Sewer Pipeline Cleaning for pretreatment requirements prior to discharge to the sanitary sewer.
18. Method of CIPP liner inversion and curing.
19. Flow Control Plan - Method for controlling flow in the storm sewer and lateral connections, including a spill response plan clearly identifying how a spill will be addressed. Work shall be completed during dry weather/low flow conditions.
20. CIPP liner design clearly indicating the liner thicknesses for each storm sewer segment (MH to MH) signed and sealed by a professional engineer registered in the State of Virginia.
21. All calculations supporting the recommended CIPP liner thicknesses: The calculations shall be signed and sealed by a Virginia-registered Professional Engineer.
22. Certification of required resin volume and required 5 to 10 percent addition.
23. Certification from the resin manufacturer regarding approval of resin dye quantity and type.
24. Information on the maximum allowable tensile stress for the tube, from the felt manufacturer.
25. Method of addressing and controlling infiltration or other installation condition.
26. Styrene Odor Ventilation/Control Plan.
27. Manufacturer recommended CIPP repair/replacement procedures should the liner be damaged.
28. A copy of all measurements made by the Contractor for each specific pipe segment to verify the required length and diameter of liner prior to ordering of materials.

29. Certification that the CIPP installer has reviewed all available inspection data and the applicability of the CIPP liner for installation.

30. Quality assurance and quality control information from the CIPP installation Contractor and the product manufacturer.

31. The curing log identifying the required temperatures at the upstream and downstream manholes and every 25 feet minimum along the CIPP liner during the curing process.

32. Clearly marked samples of the CIPP liner material (MH to MH storm sewer segment and CIPP thickness) shall be provided to the City for approval by the City.

33. Proposed expandable waterstop at the beginning and end of the liner's installation.

34. Proposed testing procedure including number, location and sampling methods.

35. Proposed testing laboratory with qualifications, experience history and references.

36. Product Warranty and Certification Form: To insure that all products and materials proposed for use on this project are of the highest quality and specifically designed and manufactured for the intended installation or use, a Product Warranty and Certification Form shall be completed by the rehabilitative product manufacturer(s), manufacturer's representative or vendor as well as the Cured-in-Place Pipe (CIPP) Liner installer certifying that the product(s) they are proposing to use is specifically designed for the intended application, installation and/or function. Failure to complete this form may prevent the product(s) from being used on this project.

37. Record drawings, including the identification of the work completed by the **Contractor**, and the post-installation CCTV shall be submitted within 2 weeks after the project is completed.

38. Coordination and Cooperation with Agencies:

    a. The Contractor shall, on a weekly basis, submit a written installation schedule of their CIPP liner installation locations to the City.

    b. The schedule shall include, but not be limited to, actual street addresses and Work durations for each and every CIPP liner installation site shown on the Contract Drawings. Changes in the construction schedule shall be coordinated with the City and each of the identified agencies.

    c. The Contractor shall provide the City with a copy of the weekly schedule and any corresponding changes at the end of each weekly Work period.

1.4 MEASUREMENT AND PAYMENT

A. Item C-3: Cured-in-Place Pipe Lining 72" X 44" Arch Shaped Storm Sewer

1. Measurement will be made at the actual linear footage of CIPP liner successfully installed and accepted in-place by the Engineer measured along the centerline of the pipe from the centerline of the upstream access manhole/structure to centerline of downstream access manhole/structure for each size pipe, excluding manhole/structure diameter/size. Payment will be based on the CIPP liner thickness required to line the deepest pipe of the segment to be rehabilitated or any specific installation requirements of the manhole-to-manhole installation segment.

2. Payment shall be made at the contract unit price bid per linear foot of CIPP liner system installed for each size pipe included in the Contract. The unit prices includes all labor,

incidentals, materials, resident notification, styrene odor control, flow control and by-pass/flow control routing coordination, confined space entry and equipment, storm sewer cleaning, including any heavy or specialty cleaning necessary to install the liner system, sediment, grease and root removal, debris collection and disposal, robotic removal of obstructions, stopping and/or addressing active leaks, installation of pre-liners, dewatering, modification of manholes or structures to accommodate the liners installation, traffic and pedestrian control, erosion and sediment control, excavation pits, pre- and post-installation CCTV inspection, lateral reinstatements, site access and subsequent requirements, required compliance testing, initial and general backfill and compaction, borrow for backfilling, offsite disposal of unsuitable material, pavement removal, disposal and replacement in-kind, sealing of the CIPP liner at manholes and service connections, site cleanup and restoration, and all other required Work, not included under other pay items, but necessary to successfully complete the CIPP rehabilitation Work as specified.

3. The use of a preliner and/or grouting/sealing of infiltration/defects that would preclude the successful installation of the CIPP liner or the liner's ability to provide a watertight long-term pipe repair system following the CIPP lining shall be considered incidental to the CIPP lining work and no additional payment will be made for the preliner.

1.5 QUALITY ASSURANCE

A. The Contractor performing this Work shall be licensed, certified, or approved in writing by the manufacturer whose product or system that is proposed for use.

1.6 CONTRACTOR EXPERIENCE

A. The prospective Contractor must be approved, in writing, by the City prior to the award of Contract. The Contractor shall provide any information or documentation, which the City may require as proof of the Contractor's competency to perform work of the type herein specified.

B. The Contractor responsible for the rehabilitation of storm sewers must have a minimum of five (5) years' experience using the product(s) proposed and have installed at least 100,000 linear feet (LF) of the proposed lining product for pipelines 8-inches thru 60-inches in diameter or larger in the last ten (10) years. All workers performing the rehabilitation Work must be certified by the pipe rehabilitation system's supplier as qualified to perform such Work using the proposed product.

C. The superintendent for the job must have supervised jobs in which at least 5,000 LF of pipe, 60-inches in diameter or larger, has been rehabilitated using the CIPP lining product(s) proposed in the bid for this project. The superintendent for the job shall be an employee of the lining Contractor and shall be on-site during all phases of the Work involving the insertion and processing of the CIPP liner. This includes review of the pre-installation CCTV data. Any conditions which would preclude the liner from being installed shall be immediately brought to the attention of the City. If the City is not notified within one (1) week of completion of the pre-installation CCTV inspection it is assumed that the Work can be successfully completed in accordance with the requirements of these specifications. All CCTV work shall be done in accordance with Section 330130.11 Large Diameter Storm Sewer Pipeline Inspection and the National Association of Sewer Service Companies (NASSCO).

D. Note: If the Superintendent is replaced during any portion of the project, the City shall be immediately notified and the replacement must have equal or better qualifications than the

superintendent being replaced in the opinion of the City. Any changes must be submitted to the City in writing for approval before the change is initiated.

E. The Contractor shall be licensed by the specific CIPP liner process manufacturer that will be used for this project.

F. Product Experience: The product proposed for the pipe rehabilitation of storm sewers must have been in use for at least ten (10) years, and a minimum of 100,000 LF of the product must have been successfully installed in storm sewers and similar applications such as sanitary sewers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. CIPP Liner: The CIPP liner shall consist of a corrosion resistant polyester, vinyl ester, or epoxy thermosetting resin, or approved equal, impregnated flexible polyester felt. The liner shall meet the requirements of ASTM F1216-22 and shall be constructed to withstand inversion pressures, have sufficient strength to bridge missing pipe, stretch to fit irregularly shaped pipe sections, and shall invert smoothly around limited bends or offsets in the storm sewer pipe. The liner shall fit tightly to the internal circumference of the existing host pipe, and a membrane integrally bonded to the internal circumference of the felt, thus forming a smooth, chemically inert, and watertight internal flow surface. The membrane shall be a minimum of 0.25 mm +5 percent and shall not be considered to impart any structural strength to the liner. The liner shall be fabricated to a size that when installed will neatly fit the internal circumference of the host pipe to be lined. Liner coatings shall be considered an integral part of the liner system. Allowance for ovality, longitudinal and circumferential stretching of the liner during installation shall be made by the Contractor. The Contractor shall be responsible for obtaining accurate dimensions of the host pipe to be lined and any requirements of the installation before ordering any materials or commencing Work.

B. Resin: The resin volume shall be adjusted by adding 5 to 10 percent excess resin for the change in resin volume due to polymerization and to allow for any migration of resin into the cracks and joints in the deteriorated host pipe.

C. Wall Thickness: The required structural CIPP wall thickness shall be designed in accordance with the guidelines in Appendix X1 of ASTM F1216-22. The categories of design parameters noted in Tables 1-1, 1-2, and 1-3 shall be used, unless otherwise directed by the City. The CIPP liner system should be designed to accommodate a FULLY deteriorated pipe condition with no strength assumed from the host pipe. The minimum CIPP liner thickness for this Contract shall be 12 mm.

D. Wall Color: The wall color of the interior surface of the CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection(CCTV) equipment may be successfully performed.

2.2 DESIGN PARAMETERS

A. Design inputs are provided in the table below:

TABLE 2.2-1 COMMON DESIGN PARAMETERS	
Safety Factor[1]	2.0
Soil Modulus[2]	700 psi
Soil Density[3]	120 pcf

Notes:

1. In the absence of site-specific information, the City assumes a soil modulus of 700 psi.
2. In the absence of site-specific information, the City assumes a soil density of 120 pcf.
3. Groundwater is to be calculated at the ground's surface.

2.3 SITE SPECIFIC REQUIREMENTS

A. The information listed in the Table below is specific to each manhole-to-manhole segment of pipe in this project. The Contractor shall use for design, any specific information provided by the City and any information the Contractor collects during their site visits for each manhole-to-manhole segment.

TABLE 2.3-1 SITE-SPECIFIC DESIGN PARAMETERS	
Ovality	Note 7
Soil Depth Above Crown	Note 1
Design Condition	Notes 1 and 3
Live Load	Notes 1 and 2
CIPP Thickness	Notes 1, 4, 5, and 6

Notes:

1. Design thicknesses and complete site-specific designs, in accordance with ASTM F1216-22 (Appendix XI). In no case shall pre-inversion CIPP liner thickness be less than 22.5 millimeters (mm). Thicknesses shall be supported by signed and sealed calculations by a Virginia registered Professional Engineer.
2. Because the CIPP is subjected to traffic live loads as calculated by AASHTO Standard Specifications for Highway Bridges, HS-20-44 Highway Loading shall apply.
3. The Contractor shall assume all pipe segments are in a FULLY deteriorated condition and the host pipe shall not be used in the calculation for required liner thickness.
4. The Contractor must consider any factors necessary to ensure the CIPP liner thickness is not less than that specified (designed by the Contractor and approved by the Engineer) above. These factors include any stress applied to the material during transportation, handling, installation, and cure; the host pipe's material type, condition, and configuration; weather (including ambient temperature conditions); and any other factors which are reasonably expected to be found in existing storm sewer systems.
5. Design thicknesses provided by the Contractor shall be submitted and evaluated and approved by the Engineer prior to completing the Work.
6. The newly installed CIPP liner system shall be designed for a minimum fifty (50) year service life in a storm sewer under continuous loading conditions.
7. The Contractor shall be responsible for conducting all field measurements prior to any calculation submissions.

2.4 PRODUCT-SPECIFIC DESIGN PARAMETERS

A. Certain design inputs may vary by manufacturer, processes design, or installation technique. These variables are listed in the Table below with explanatory notes that follow.

TABLE 2.4-1
MINIMUM PRODUCT-SPECIFIC DESIGN PARAMETERS

Minimum Enhancement Factor, K[1]	K = 7
Minimum Initial Flexural Strength (ASTM D790)[2]	Φ_S = 4,500 psi
Minimum Initial Flexural Modulus of Elasticity (ASTM D790)[2]	E_S = 350,000 psi
Minimum Retention of Properties to Account for Long-Term Effects[3]	50%
Maximum Long-Term Flexural Modulus of Elasticity[3]	E_L = 150,000 psi

Notes:

1. Enhancement factor (K) is the additional buckling or load resistance of the rehabilitation product due to the restraining action of the host pipe. The tighter the fit of the CIPP liner product within the host pipe, the greater the value of K. Third party testing of external hydrostatic loading capacity of restrained pipe samples shall be conducted to verify the enhancement factor, K. The minimum values provided are based on the "Long-Term Structural Behavior of Pipeline Rehabilitation Systems," Trenchless Technology Center, 1994.

2. Initial values are defined in ASTM D790. The City of Alexandria, may at any time prior to installation, direct the Contractor to make cured samples (according to ASTM F1216-22) and test them in accordance with the listed ASTM standards to verify initial values of physical properties. In such tests, the Contractor's samples must achieve a 95 percent pass-rate.

3. The initial flexural modulus is multiplied by the creep factor (or percentage retention) to obtain the long-term values used for design. Long-term values shall be verified by long-term external pressure testing of circular lengths of the pipe material by third-party laboratories prior to bid (e.g., Trenchless Technology Center (TTC))

2.5 RESIN CONTENT

A. The resin content of the CIPP liner to be installed shall be 10-15 percent by volume greater than the volume requirement of the felt in the liner bag.

B. The resin used shall not contain fillers, except those required for viscosity control, fire retardance, or as required to obtain the necessary pot life. Thixotropic agents, which will not interfere with visual inspection, may be added for viscosity control.

C. Dye shall be added to resins to improve visual inspections of the resin's impregnation of the felt liner. The types and quantities of dyes added shall have prior approval from the resin manufacture.

2.6 CHEMICAL RESISTANCE

A. The corrosion resistance of the resin system shall be tested by the resin manufacturer in accordance with ASTM D543. The result of exposure to the chemical solutions listed below shall produce loss of not more than 20 percent of the initial physical properties when tested in accordance with ASTM D543 for a period of not less than one year at a temperature of 73.4º F plus or minus 3.6º F.

TABLE 2.6-1 CONCENTRATIONS OF CHEMICAL SOLUTIONS FOR CHEMICAL RESISTANCE TEST	
CHEMICAL SOLUTION	**CONCENTRATION, %**
Tap Water (pH 6-9)	100
Nitric Acid	5
Phosphoric Acid	10
Sulfuric Acid	10
Petroleum Hydrocarbon Based Fuels (e.g., gasoline, diesel, etc.)	100
Vegetable Oil[1]	100
Detergent[2]	0.1
Soap[2]	0.1
NAPL[3]	100

Notes:

1. Cotton seed, corn, or mineral oil.
2. As per ASTM D543.
3. Contractor shall include a statement that their product has been proven to resist "NAPL" contaminant described in d and e below.
4. "The groundwater surrounding the storm-drain has dissolved phase and non-aqueous phase liquid (NAPL) coal tar impact that has migrated to the stormdrain from an adjacent historic manufactured gas plant (MGP). This includes polycyclic aromatic hydrocarbons (PAHs), Volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs). Appendix B of these Specifications includes the maximum concentrations of VOCs, PAHs, and SVOCs from the 2017 and 2018 site investigations of the groundwater surrounding the stormdrain. The liner material could come into contact with both dissolved phase compounds and NAPL.
5. Coal tar and its fractions are variable depending on the source of coal tar and method of processing. However, in general coal tar fractions include light oil (benzene, toluene, ethylbenzene and xylene, heavy solvent naphtha), middle oil tar acids (phenol, cresol, xylenes, higher tar acids), middle oil tar bases (pyridine, heavy bases), naphthalene, heavy oil (methylnaphthalenes, dimethylnaphthalenes, acenaphthene), anthracene oil (fluorene, phenanthrene, anthracene, carbazole), and pitch. Coal tar may also include concentrated forms of trace minerals found in the coal, including cyanides, sulfur, and some heavy metals (arsenic, chromium, lead, etc.) (Management of Manufactured Gas Plant Sites, Amherst Scientific Publishers, 1996), (Microsoft Word - More About Manufactured Gas.doc (epa.gov)."

2.7 MANUFACTURE INFORMATION

A. Unless otherwise approved by the City, the CIPP liner shall not be impregnated at the Work site. The liner bag shall be impregnated with resin in a clean, controlled environment not more than 72-hours before the proposed time of the installation and stored out of direct sunlight at a temperature of less than 30º F. The Contractor shall provide all appropriate transport, handling and protection equipment, including refrigerated, or otherwise suitably cooled, transport equipment. If requested, the Contractor shall accommodate any activities required for inspection of the liner's resin impregnation process.

B. All fabricating and Contractor testing shall be carried out under cover, and no materials shall be exposed to the weather until they are ready to be inserted into the host pipe. All materials should be protected from the weather and exposure to ultra-violet light (sun light) as practical during the manufacture and installation process.

C. Each liner shall be accompanied by suitable documentation indicating time and date of manufacture, felt thickness, number of layers, length of liner, diameter of the liner resin types, resin content, catalyst, relevant batch numbers, resin impregnation date and time, etc.

2.8 PRODUCT DATA SHEET

A. Preliner

1. A preliner may be required to help control infiltration or accommodate other liner installation requirements.
2. The preliner shall be as recommended by CIPP lining system manufacturer. If required for successful installation of the liner, the preliner shall be utilized and installed as part of the CIPP lining process at no additional cost to the CIPP lining work.
3. A preliner may be required to help control infiltration or accommodate other liner installation requirements.
4. The preliner shall be as recommended by CIPP lining system manufacturer.
5. If required for successful installation of the liner, the preliner shall be utilized and installed as part of the CIPP lining process at no additional cost to the CIPP lining work.

PART 3 - EXECUTION

3.1 ODORS

A. Control of Styrene Odors:

1. The Contractor shall take special precautions to effectively control the release and migration of styrene odors generated during the CIPP lining process, and prevent such odors from entering resident’s homes, and/or businesses through service connections, etc.
2. The Contractor shall provide, as directed by the City, all labor and equipment necessary, to ventilate the atmosphere of the storm sewer being CIPP lined to prevent the migration of styrene odors to adjacent storm sewers.
3. The Contractor shall submit a ventilation plan for review by the City. Typical ventilation scenarios may consist of the installation of exhaust fans on nearby upstream and downstream manholes; however, the Contractor shall take whatever steps are required to minimize any nuisances to the public caused by the release of styrene odors associated with the CIPP lining process.
4. These steps may include, but are not limited to, the use of ventilation and exhaust fans, the use of odor mitigation equipment on the steam exhaust, suitable nozzles and fittings so the exit velocities are maintained below acceptable noise and vibration levels, and the use of a pre-liner to prevent migration of the odors into lateral connections.
5. The Contractor shall provide and maintain calibration for two (2) styrene odor detection meters.

6. One detection meter shall be supplied to the City of Alexandria's Fire Department, and the other is to remain at the project site for use by the Contractor or the City.

7. Copies of the Material Safety and Data Sheets (MSDS) shall be kept onsite during each active CIPP lining setup for the duration of the project and to be provided upon request to any affected residents.

8. The Contractor shall be responsible for coordinating all styrene odor mitigation activities with the City, and the City of Alexandria's Fire Department. Styrene odor mitigation shall be included in the Contractor's unit price bid for the installation of the CIPP liner system and no separate payment will be made.

3.2 SEWER MANHOLE REMOVAL AND REPLACEMENT

A. The CONTRACTOR shall provide all labor, materials, equipment, and services required to remove and restore the manhole following liner installation. The following general sequence is anticipated for this task:

1. Perform subsurface utility screening around the manhole for the area impacted by the manhole excavation.

2. Saw cut pavement.

3. Excavate to the base of the manhole.

4. Remove and store cover, frame, and any pavement spacers.

5. Remove taper and riser(s) for disposal.

6. Expand hole in storm sewer to allow access.

7. Line storm sewer with CIPP.

8. Replace riser with precast concrete pipe sections.

9. Install joint sealant between sections.

10. Replace frame and cover.

11. Backfill with appropriate material to immediately below base of pavement.

12. Restore saw-cut area to grade.

B. The pavement saw cut should be of an adequate size to allow the workers to remove the soil from around the cone without undermining or unduly damaging the remaining pavement. The excavation shall be stabilized as necessary to prevent material from falling into the storm drain and to create safe working conditions. The excavated soil should be removed and disposed of by the CONTRACTOR. The soil shall be either direct loaded for off-site disposal or placed in roll-off boxes to be temporarily staged until disposed offsite. Based on site investigations, the groundwater in the soil surrounding MH 92A and MH93 is expected to have relatively low levels of dissolved phase petroleum hydrocarbon contamination. The CONTRACTOR should assume that some of the excavated soil will be impacted by petroleum hydrocarbons and will need to be disposed as a non-RCRA petroleum waste. The City will provide to the CONTRACTOR the most recent laboratory analysis of groundwater collected at the site to be provided to the disposal facility. The disposal facility will also require a sample of the excavated soil for analysis prior to acceptance.

C. The existing cover, frame and any pavement spacers should be carefully removed and stored for reuse. The taper and riser(s) should be removed and disposed of properly by the CONTRACTOR. The taper and riser(s) may be temporarily staged until they are removed for disposal.

D. The CONTRACTOR should only cut the top of the storm sewer pipe sufficiently to allow egress for the CIPP liner and associated equipment, if necessary. Upon completion of the work, the existing surface should be prepared to provide as suitable base for the replacement manhole. The existing surface should be cleaned with a whisk broom, wire brush, chisel, or other method to assure a flat seating surface free of rocks, gravel, asphalt, protruding concrete, dirt, or other material.

E. The replacement Manhole riser rings and taper shall have a 24-inch internal diameter and be constructed of precast concrete free from cracks, voids or other defects conforming to ASTM C 478. To the extent practicable, the CONTRACTOR shall use riser rings not less than four (4) inches and not more than twelve (12) inches in height. If precast concrete riser rings cannot be used due to field conditions, bricks may be used upon approval by the ENGINEER.

F. The use of bricks shall not diminish the requirement for watertightness. The bricks shall conform to ASTM C216 Grade SW, Type FBS. Brick joints shall be ½ inch minimum thickness. Provide Standard Portland cement meeting requirements of ASTM C150, Type I or Type II. Provide fine aggregate for mortar that is natural sharp sand meeting requirements of ASTM 144, ASTM C404, Size No. 2.

G. An interior joint seal should be used between the pipe segments. A butyl rubber blended material that meets or exceeds all requirements of AASHTO M-198 and ASTM C 990 Section 6.1.1 for Bitumen Sealants. The butyl rubber seal should be Crete-Stik or its equivalent.

H. The top of casting shall match finished grade. Replace existing cover on top of existing manhole frame rim or provide new frame and/or cover as may be indicated. If replaced, the manhole frame and cover shall be in accordance with Standard Details as shown in the City of Alexandria Design and Construction Standards. The manhole frame should be set on preformed butyl joint material and capped with high strength hydraulic cement grout.

I. The stone backfill should consist of Number 57 stone or its pre-approved equivalent. The stone should be placed and spread evenly to within one inch of, but in no case above, the base of the remaining pavement.

J. The remaining excavation should be paved to grade by the CONTRACTOR. An asphalt pavement should be used that is pre-approved by the OWNER for use on this road by the City of Alexandria.

K. Basis for Payment: Payment for manhole cone removal and replacement shall be included in the unit price bid for CIPP lining.

3.3 LINING PROCEDURE

A. The storm sewers to be CIPP lined shall be inspected no more than four (4) weeks prior to performing any storm sewer lining operations per the requirements of the Television Inspection Section of these Specifications to verify requirements and applicability of the lining. The Contractor shall design the CIPP Liner System in accordance with the Contractor’s field verified measurements (length, dimensions, and shape) of the storm sewer.

B. The pipe measurements (length and dimensions) provided in these drawings are for informational purposes only. Note: It is expected that the Contractor review the pre- installation data to identify any conditions that would preclude the specified Work from being completed. The pre-installation inspection should be used by the Contactor to identify any conditions that would affect the proposed rehabilitation.

C. Any discoveries that would affect the Work, shall be immediately brought to the attention of the City for further direction. If no items are noted by the Contractor, it shall be assumed that all CIPP lining Work can be completed as specified.

D. The storm sewer segment to be lined shall be by-passed in accordance with the Flow Control Section of these Specifications. It will be the Contractor's responsibility to coordinate all by-pass pumping/flow control operations, including access requirements, traffic control, by-pass pipe routing and land use negotiations with impacted property owners or agencies having jurisdiction as needed to complete the required Work. All Work is to be completed during dry weather/low flow conditions.

E. All active leaks in the host pipe to be lined shall be stopped and/or addressed before the liner is installed. The Contractor shall grout active infiltration observed in the pipe prior to CIPP liner installation that, in the Contractor's opinion, would impede the specified performance or successful installation of the CIPP liner. The location of areas requiring grouting to control infiltration shall be determined by the Contractor based on their review of the pre-installation CCTV inspection. The grouting/sealing of defects shall be in accordance with ASTM F 2304. Grout material shall be submitted for approval and deemed acceptable to the Engineer. Grouting will not be measured separately for payment. The installation of a pre- liner may also be required to control active infiltration, styrene odor or to control other installation conditions impacting the liner prior to installing the CIPP liner.

F. The segment to be lined shall be sufficiently cleaned and all roots, debris and/or other items necessary to install the CIPP liner removed as needed to accommodate the installation of the CIPP liner. Cleaning shall be performed in accordance with the Storm Sewer Cleaning Section of these Specifications.

G. The Contractor shall be responsible for measuring the actual lengths of CIPP liner to be installed and recording this information on a CIPP lining schedule, which shall be kept current, up to date and be readily available upon request of the City.

H. Any protruding storm sewer lateral connections or other obstacles shall be trimmed flush with the interior of the host pipe as necessary to accommodate the installation of the CIPP liner prior to installation of the CIPP lining.

I. The CIPP liner shall be installed in accordance with ASTM F1216-22. Inversion shall be by water. Pull and inflate installation will not be allowed unless specifically approved by the Engineer.

J. The Contractor shall conduct operations in accordance with applicable OSHA standards, including those safety requirements involving Work on an elevated platform and entry into a confined space environment. The Contractor shall make suitable precautions to eliminate hazards to personnel located near construction activities when pressurized air is being used.

K. In the event the insertion of the impregnated CIPP liner is delayed by unexpected site conditions, but prior to the start of the insertion process, the Contractor shall store, at his own cost, the liner,

for a further period of up to 72-hours maximum, below 30º F for use when installation conditions allow.

L. The CIPP liner shall be inverted into the host pipe from a suitable platform located above the inversion manhole or other approved point of inversion. The free open end of the liner bag shall be firmly secured to the platform and the folded liner passed down a suitably reinforced column to a shute or bend leading to the opening of the host pipe to be lined. Potable water at ambient temperature shall be supplied to the platform at a rate sufficient to cause controlled installation of the liner into the pipeline. Use of non-potable water shall be used only upon approval from the City. The Contractor shall assume potable water usage when developing unit pricing. Pull and inflate installation will not be allowed unless specifically approved by the Engineer. Air inversion and steam curing is not acceptable for this project.

M. The CIPP liner inversion rate shall not exceed 32-feet per minute and the tail of the liner or the tail tag rope shall be suitably restrained to prevent liner run away, if applicable.

N. Individual CIPP liner installation runs can be made over one or more access locations as determined in the field by the Contractor's installation techniques and as approved by the Engineer.

O. The Contractor shall supply a suitable heat source and recirculation equipment capable of delivering the required curing temperature to the far end of the liner to quickly and uniformly raise the temperature in the entire liner, once inverted in the pipeline, above the temperature required to commence the exothermic reaction of the resin as determined by the catalyst system employed. The Contractor shall place temperature gauges between tube and host pipe's invert position to monitor temperature every 25 ft at minimum during cure cycle. VeriCure or equal shall be used.

P. Initial cure of the CIPP liner will occur during temperature heat-up and shall be completed when exposed portions of the newly installed liner appear to be hard and sound and the remote temperature sensor indicates that the temperature is of a magnitude required to realize an exotherm or cure in the resin. After initial cure is reached, the temperature shall be raised to the post-cure temperature recommended by the resin manufacturer. The post-cure temperature shall be held for a period as recommended by the resin manufacturer, during which time the recirculation of the heat source and cycling of the boiler to maintain the temperature shall continue. The curing of the CIPP must take into account the existing pipe material, the resin system used, and ground conditions (temperature, moisture level, and thermal conductivity of soil).

1. The curing period shall be carried out under an inversion head to maintain a minimum hoop tension in the liner felt of 1 lb/sq.in.

2. The Contractor shall maintain a curing log of CIPP liner temperatures throughout the inversion during the curing process to document that proper temperatures and cure times have been achieved along the entire length of the CIPP liner.

Q. Invert through Manholes: The invert through manhole structures shall be continuous and smooth through all manholes. If a CIPP liner is installed through a manhole, the bottom portion of the liner shall remain in the channel of the manhole and the bench of the manhole shall be grouted and shaped as necessary to support the installed liner. If the liner terminates on either side of a manhole, the invert shall be built-up to remove any flow restrictions that may have been created

and to form a continuous invert through the manhole. The cost of this Work shall be included in the unit price bid for the CIPP liner system.

R. The finished CIPP liner shall be continuous over the entire length of an insertion segment between two (2) manholes or access structures and be as free as commercially practicable from visual defects such as foreign inclusions, dry spots, air bubbles, pinholes, leaks, wrinkles, dimples and/or delamination. The CIPP lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to the inside of the newly lined pipe. Wrinkles in the finished lined pipe which:

1. Cause a backwater greater than one (1) inch in depth,
2. Have a height equal to or greater than one (1) inch,
3. Cause a maintenance problem or inconvenience as determined by the Engineer,
4. Cause debris and solids to hang-up and accumulate, or
5. Reduce the structural stability of the pipe are unacceptable and shall be removed or repaired by the contractor in a method that is approved by the Engineer at no additional cost to the City.

S. The inner surface of the CIPP liner shall be free of cracks and crazing with a smooth finish and with an average of not over two (2) pits per 12-inch square, providing the pits are less than 0.12 inch in diameter and not over 0.04-inches deep and are covered with sufficient resin to avoid exposure of the inner fabric. Some minor waviness, that in the Engineer's opinion will not appreciably decrease the flow characteristics of the system or be the cause of a possible blockage, shall be permissible.

T. There shall be no measurable annular space between the host pipe and the installed CIPP liner. The installed CIPP liner shall have a snug fit at all service connections and manhole terminations and shall be evidenced by indentation and flairs in the liner respectively. These connections shall be watertight to ensure no groundwater can enter the pipe.

U. Sealing the ends of the CIPP liner: The CIPP liner shall be sealed at the upstream and downstream manhole entrances with an expandable waterstop/hydrophilic end seal, such as Hydrotite, by Greenstreak or approved equal to prevent passage of groundwater that may generate between the host pipe and the installed CIPP liner system. CIPP connections at manhole opening shall be a watertight seal. The seal shall be installed per manufacturer's instructions. The seals are to be rechecked after 48 hours and if not holding then repair is to be done till there are no leaks.

3.4 CLEANING AND CCTV OF THE STORM SEWER PIPE

A. Pre-Insertion Cleaning:

1. Clean storm sewer pipe before pre-insertion television inspection.
    a. Immediately before installation of the lining complete a high-pressure flush and vacuum in storm sewer sections to be rehabilitated and repaired including pertinent manholes.
    b. Remove any root, debris buildup and any other obstruction that may interfere with the lining operation.

2. Debris removed from storm sewer during cleaning shall be transported in watertight containers and disposed of in accordance with local, State, and Federal Regulations.

B. Pre-Insertion CCTV Inspection:

1. Inspect storm sewer pipe before insertion of resin impregnated tube to ensure pipe is clean and existing pipe conditions are acceptable for lining.

2. Any notable condition that could affect the lining operation will be removed/repaired prior to initiating the lining.

C. Line Obstructions:

1. If pre-insertion CCTV inspection reveals obstruction in existing pipe that cannot be removed by storm sewer cleaning equipment, with approval of the City, refer to the appropriate specification.

D. Post-Insertion CCTV Inspection

1. Inspect storm sewer after installation of the CIPP and the reconnection of all active sewer laterals.

2. Conduct finished inspections continuous over entire length of sewer manholes within 48 hours of installation.

3. Line shall be free from visual defects, damage, and deflection.

4. No visible infiltration through the liner, at the joints, at the service connections or at the manholes

5. Ensure proper sequence of work occurs between mainline and lateral lining activities.

3.5 CLEARING PROTRUDING LATERAL CONNECTIONS

A. Based on the Contractor's review of the pre-installation CCTV inspection, the Contractor with the concurrence of the Engineer shall determine if protruding storm sewer lateral connections will need to be cleared.

B. If the Contractor and Engineer determine that a protruding lateral must be cleared prior to the installation of the CIPP liner system, it shall be the responsibility of the Contractor to clear the protruding lateral. The Contractor shall clear the protruding lateral utilizing robotic equipment to trim the protruding lateral whenever possible.

C. The Contractor shall make the removal so that the protruding lateral is trimmed flush with the inner wall of the host storm sewer pipe. Any damage caused to the lateral beyond the main storm sewer pipe or to the main storm sewer pipe itself, caused by the removal of the protruding lateral shall be the responsibility of the Contractor and repaired to the satisfaction of the Engineer at no additional expense to the project. Clearing of protruding lateral utilizing robotic equipment to trim the protruding lateral will be paid separately.

D. If clearing a protruding lateral remotely is not possible, the Contractor shall notify the Engineer. At the Engineer's direction, the protruding lateral shall be cleared utilizing a point repair by excavation. If a point repair is deemed to be necessary, the Contractor shall contact the City for point repair requirements. The Contractor shall CCTV inspect each of the protruding laterals following removal from the mainline storm sewer, prior to lining of the storm sewer. The

Contractor shall clear all protruding laterals to the satisfaction of the Engineer. Clearing of protruding lateral utilizing a point repair will be paid separately.

3.6 WATERTIGHT LATERAL REPAIR

A. The Contractor is to install a watertight seal for any service laterals connecting to the main line segments to be rehabilitated with CIPP lining. The finished lateral product meets or exceeds ASTM F1216-22 for Cured-In-Place Pipe. The contractor shall use BLD Liner, LMK, or equal to create a watertight seal around the lateral and prevent any groundwater infiltration through the connection.

3.7 CLEARING OBSTRUCTIONS BY POINT REPAIR

A. The Contractor shall determine if any obstructions will likely need to be cleared based on their review of the pre-installation CCTV inspection. It shall be the responsibility of the Contractor to clear the storm sewer of all obstructions such as dropped joints, protruding lateral, roots, broken pipe or other defects that will prevent the successful insertion of the CIPP liner system.

B. If inspection reveals an obstruction cannot be removed by cleaning or remote removal methods or other in situ (in-place) techniques, then the Contractor shall promptly notify the City.

C. The Contractor shall CCTV inspect each of the obstruction removals from the mainline storm sewer, after the removal has been completed.

D. The Contractor may be directed to perform additional point repairs as necessary to clear such obstructions that are identified at the time the Work is being completed. This may include defects which occurred after the original CCTV inspections were completed. If a point repair is deemed to be necessary, the Contractor shall contact the City for point repair requirements. Clearing obstructions utilizing point repairs will be paid separately.

3.8 REINSTATEMENT OF LATERAL CONNECTIONS

A. The exact location and number of laterals to be reinstated shall be determined by the Contractor from review of the pre-installation inspections prior to rehabilitating the storm sewer.

B. It shall be the Contractor’s responsibility to accurately field locate all existing laterals, whether currently in service or not.

C. Immediately following the CIPP liner installation and curing, the Contractor shall cut a relief hole at each lateral except for visible plugged/capped services or other services identified by the City which will not be reinstated to relieve the connection.

D. The relief hole shall be expanded to at least 95 percent of the diameter of the lateral and allow for temporary service until such time as the final reinstatement/reconnection can be made.

E. The final connection shall be opened to 100 percent of the existing connections diameter, and the Contractor shall brush each opening upon reinstatement to form a smooth transition into the mainline storm sewer.

F. The Contractor should use extreme caution when reinstating any connections to PVC pipe or other pipe material that can be damaged by the reinstatement process.

G. Any lateral overcuts or other damage caused by the Contractors reinstatement operations shall be repaired using dig-up and replace point repair at no additional expense to the City.

H. Repair method shall be submitted to the Engineer prior to completing the repair.

I. The Contractor shall be responsible for restoring/correcting, without any delay, all missed or faulty reconnections, as well as being responsible for any damage caused to property owners for not reconnecting the services soon enough or for not giving adequate notice to the owners regarding restricted use. All services which are reconnected to the rehabilitated sewer shall be identified on the "As Built Drawings" with the exact distance from the nearest upstream manhole, clock position (12 o'clock being the top of the pipe) and offset distances to the service lateral cleanout.

3.9 FINAL ACCEPTANCE/TESTING

A. The Contractor shall collect restrained samples/specimens as described below for each of the storm sewer segment that is CIPP lined. The Contractor shall permanently stamp or mark the test pieces with the date of liner manufacture and batch number, installation date, liner thickness and location (manhole to manhole storm sewer segment) of the test sample. Costs for collecting and testing these samples shall be included in the bid price for each CIPP liner size in the Contact.

B. Should the City desire to make additional independent tests in addition to what is described below, the Contractor shall, upon request of the City, furnish any reasonable number of test pieces of raw material samples as the City may require, stamped or marked with the date of manufacture and batch number, if applicable and the liner thickness.

C. Tests shall be made on specimens of resin, catalyst and felt as supplied or pieces of cured liner cut from waste areas when possible. Otherwise, the specimens shall be cut from a piece of cured liner representative of the material inserted and prepared and cured in a similar technique to the process employed.

D. The test specimen shall be conditioned in accordance with procedure "A" of ASTM Designation D618-21, Standard Methods for Conditioning Plastics and Electrical Materials for Testing.

E. The test specimen shall be prepared and physical properties tested in accordance with ASTM F1216-22, Section 8.1. The properties shall meet or exceed the values identified in Table 1 of ASTM F1216-22.

F. In addition to the testing requirements specified above, the Contractor shall verify that the installed thickness of the CIPP liner is within minus 5 percent and/or plus 10 percent of the specified liner thickness. The Contractor shall hire an independent testing laboratory for the purpose of taking samples to determine the actual installed liner thickness. The results of the liner thickness measurements shall be submitted to the City. Samples shall be taken from each liner thickness at each liner insertion section. The costs for thickness testing shall be included in the bid price for each liner size or liner thickness used on this project.

G. The Contractor shall, in preparation for insertion of the liner bag, and in placing of stops within the terminal manholes of an insertion run, allow a minimum of 12 inches of liner to facilitate the cutting out of one full size restrained cured liner section, for each size and thickness of CIPP liner installed, from the waste portion at the end of an insertion run. The lengths of the full-size section

thus provided shall be as practicable, in order to facilitate the testing specified below by an independent testing laboratory:

1. Send one sample from each liner segment installed to test in accordance with applicable ASTM standards for:
    a. Tensile Properties,
    b. Flexural Modulus,
    c. Flexural Strength,
    d. Wall thickness shall be conducted, a minimum of three samples per project will be tested.
    e. If tests do not meet the minimum values:
        1) Additional samples originally not sent for testing may be required to be tested, as directed by the City.
        2) Contractor bears all costs associated with additional testing.

Property	ASTM Test Method	Minimum Value
Flexural Strength	D790	4,500 psi
Flexural Modulus	D790	350,000 psi
Tensile Strength	D638	3,000 psi
Thickness	D5813	Contract requirement

H. Resin Sampling:
1. Wet-out facility resin mixing equipment shall have a valve downstream of the mixing function and immediately upstream of application of mixed resin of tube where resin samples may be drawn.
2. Batch mix facilities, if any, shall provide sampling of mixed batch.
3. Submitted “wet-out” schedule cannot be modified without 24-hour notice to the City.
4. Resin samples shall be drawn at times determined by the City.
5. Perform prior to conducting laboratory tests.
6. Take a wall thickness measurement in accordance with ASTM D2122
7. Make a minimum of four measurements, evenly spaced, on each test specimen.
8. Average thickness shall be equal or greater than required design thickness.
9. Failure of thickness shall be grounds for rejection for CIPP liner.

I. Field thickness testing:
1. Calculate average thickness using measured values.
2. If properties test do not meet the minimum physical and thickness requirements, the CIPP shall be repaired or replaced at the Contractor’s expense.
3. All curing, cutting, and identification of samples will be witnessed by the City.

J. The CIPP liner shall be continuous over the entire length of the rehabilitated pipe between manholes as specified in the Drawings. The liner shall be free of all foreign inclusions, visual and

material defects except those resulting from pre-lined conditions (such conditions shall be brought to the attention of the City prior to lining). There shall be no pits, pinholes, or cracks.

1. The surface shall be smooth and free of waviness throughout the pipe. The liner shall be continuous through straight-through manholes (those manholes with only one inlet and outlet storm sewer pipe).
2. The project will not be declared substantially complete until the post-installation CCTV inspection video has been submitted and reviewed by Engineer.
3. Any defects found from review of the post-installation CCTV inspection must be corrected prior to substantial completion being declared.

K. The final acceptance of the installed CIPP liner system shall be based on the Engineer's evaluation of the post-installation CCTV inspection data prepared by Contractor, receipt of satisfactory liner test results and inspection of the installation site. The Contractor shall be responsible for the condition of the CIPP liner and shall address any damage caused by other operations or subcontractors that occur within the storm sewer as part of the Contract.

L. The City, at its discretion, may perform tests to check compliance with the specifications as they pertain to liner and/or pipe strength, compaction of backfill, concrete strength, and other such items where performing the tests is not specified as the responsibility of Contractor. The Contractor shall cooperate with the City by providing samples, making necessary excavations for compaction tests, and other related services necessary to carry out the testing, at no cost to the City. In the event of failing tests, the Contractor shall bear the cost of any corrections and re-testing after the Work has been corrected.

M. During the minimum two (2) year warranty period, any defects which will affect the integrity, strength, or watertightness of the CIPP liner system shall be repaired at the Contractor's expense, in a manner mutually agreed to by the City and the Contractor. The Contractor shall CCTV the storm sewers once a year over the two-year warranty period. The first inspection shall be one year after substantial completion and the next inspection shall be at the end of the two-year warranty period.

END OF SECTION

SECTION 330561 – CONCRETE MANHOLES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. CONTRACTOR shall furnish and install precast concrete manhole base, sections, adjusting rings, steps, and manhole ring and cover, complete.

B. Provide all equipment, tools, labor, materials, and incidental services necessary to perform all work for CCTV inspections of sewer lines as indicated and in compliance with the Contract Documents.

C. Types of Cleaning shall be undertaken in accordance with 33 01 30.41 Storm Sewer Pipeline Cleaning specification in order to be able to conduct a NASSCO compliant inspection.

D. Inspections may be witnessed by the Engineer.

1.2 RELATED REQUIREMENTS

A. City Alexandria, Virginia Department of Transportation & Environmental Services – 2020

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) International:

1. Pipeline Assessment and Certification Program (PACP) Reference Manual.
2. Manhole Assessment and Certification Program (MACP) Reference Manual.

1.4 SUBMITTALS

A. CONTRACTOR shall submit manufacturer's technical descriptions of manhole sections, steps, rings, and covers.

B. CONTRACTOR shall submit repair materials and methods to ENGINEER for review and approval.

C. Material and procedures to be used in structure abandonment shall be approved by ENGINEER.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Precast Manhole Sections:

1. Precast reinforced concrete manhole top sections shall be produced using Type II Portland cement, or as approved by ENGINEER, and be fabricated in accordance with ASTM C478.
2. Flexible plastic sealant, RAM-NEK, or equivalent, shall be required for all horizontal mating surfaces between precast top sections and precast slab tops of meter vaults.

3. Manhole sections shall be clearly marked with the information specified for product marking in ASTM C478.

4. Imperfections in the precast concrete manhole base or sections shall be reviewed by ENGINEER prior to repair.

B. Manhole Frames and Covers:

1. Manhole frames and covers shall be three hundred and thirty-eight (338) pounds or greater, twenty-four-inch (24") inside diameter, as manufactured by D & L, Model A-1161 with closed pick hole or approved equal.

2. Frost proof covers if required shall be D & L, Model A-1019 with closed pick hole or approved equal. The ring and cover shall conform to ASTM A48/A48M Class 35B.

3. Watertight frames and covers if required shall be NEENAH R-1915/R-1916 Series (as applicable) or approved equal.

C. Joints:

1. All precast concrete joints shall be made with a preformed joint sealer or grout. All joints that are made with the joint sealer shall also be pointed with mortar on the inside of the section.

a. Mortar:

1) Mortar used in jointing precast concrete manhole sections shall be composed of one (1) part Portland cement and not more than three (3) nor less than two (2) parts of fine aggregate. Portland cement shall meet the requirements of ASTM C150, Type II. Hydrated lime or masonry cement shall not be used.

2) Fine aggregate shall consist of well-graded natural sand having clean, hard, durable, uncoated grains, free from organic matter, soft or flaky fragments or other deleterious substances such as calcium chloride. The fine aggregate shall be thoroughly washed and shall be uniformly graded from coarse to fine with a minimum of ninety five percent (95%) passing the #4 sieve and a maximum of seven percent (7%) passing the #100 sieve.

3) All mortar shall be fresh for the WORK at hand. Mortar that has begun to set shall not be used.

b. Joint Seals:

1) Precast concrete manhole section joint seals shall meet the requirements of Section 07 91 00, Manhole Preformed Joint Seals.

PART 3 - EXECUTION

3.1 GENERAL

A. The manhole shall be constructed on a properly compacted subgrade and in such a manner that the center of the manhole coincides with the intersection of the projected centerlines of the inlet and discharge pipelines. The surface shall be level to permit proper construction of the riser sections.

B. Changes in size and grade of channels for gravity pipelines shall be made gradually and evenly using concrete made with ASTM C150, Type II Portland cement. The invert channels may be formed directly in the concrete manhole base or may be constructed by laying sewer pipe through the manhole and cutting out the top half (1/2) of the pipe after the concrete has cured and reached design strength. The floor of the manhole outside of the channels shall slope upward from the springline of the pipeline to the wall of the manhole at not less than one (1) inch per foot nor more than two (2) inches per foot.

3.2 INSTALLATION

A. Placement of Precast Concrete Base and Riser Sections:

1. Sections: Set the base and each manhole riser section such that the manhole will be plumb. Use sections of various heights to bring the ring and cover to the proper grade. The last riser section prior to placement of an eccentric cone or flat top shall be the shortest available but in no case greater than twenty-four (24) inches in height.

2. Joints: Sections shall be clean and dry. Mortar joints shall not be used when temperature of the air or section will be below thirty-five degrees Fahrenheit (35°F) when placing and curing, unless supplemental heat is used to keep the sections warm and mortar from freezing.

   a. Using Joint Sealer: The mating surfaces of the two sections to be joined shall be thoroughly cleaned. Apply the joint sealer to the seat of the base or riser section that is already in place. Only one joint is permitted in the sealer. Carefully lower the second precast concrete section onto the first section so that the joint sealer compresses forming a uniform seal. Each succeeding precast section shall be jointed in a similar manner.

   b. Using Mortar: The mating surfaces of the two (2) sections to be joined shall be thoroughly cleaned. Apply a one inch (1") minimum bed of freshly mixed mortar to the joint of the section already in place. The mortar shall be uniform in thickness and cover the entire perimeter of the section. Carefully lower the second precast concrete section onto the first section so that the mortar compresses forming a uniform seal. Tool the mortar for a uniform appearing joint. Each succeeding precast section shall be jointed in a similar manner.

3. Lifting Holes: Fill all lifting holes with mortar.

B. Adjusting Rings, Ring, and Cover Installation:

1. Install ring and cover on one or maximum of two precast concrete adjusting rings.

2. Each adjusting ring shall be a maximum of eight (8) inches high.

3. Adjusting rings shall be placed similar to the precast concrete manhole rings (thoroughly cleaned and placed with mortar or joint sealer).

4. The total allowable height of adjusting rings, ring, and cover shall be one (1) inch less than the manufacturer’s shortest precast concrete riser section.

5. Unless otherwise indicated in the DRAWINGS, set the top of the adjusting rings such that no part of the cast iron ring and cover will project above a point one- quarter inch (1/4") below the finish surface of pavement.

C. Pipe Connections:

1. The manhole shall be thoroughly bonded to the barrel of the pipe and all connections with pipe shall be made without projections or voids.
2. All pipes shall have a Hamilton Kent or approved equal waterstop gasket applied around the pipe.
3. The joint between the PVC pipe (if applicable) and manhole wall shall be sealed with a non-shrink grout.

3.3 FIELD QUALITY CONTROL

A. Each manhole shall be watertight from infiltration and exfiltration of water.

B. CONTRACTOR shall inspect and repair all visible leaks and damp spots.

C. When required by ENGINEER, manholes shall be pressure tested by filling with water to the level of the top of the top riser to determine watertightness. There shall be no measurable loss of water in a one-hour (1 hr.) time period.

3.4 TRAFFIC CONTROL

A. The Contractor shall comply with Section 01 50 00 Temporary Facilities and Controls from the specifications stipulated in this Contract and all local, state, and federal requirements.

3.5 ACCEPTANCE OF WORK

A. The contractor will submit required video inspections of each sewer segment to the Engineer for review and determination if the work performed is acceptable.

B. The sewer inspection shall also be used by the Engineer to determine acceptance of sewer cleaning and intruding sewer tap removals where undertaken.

C. The Engineer will review the inspection videos within fifteen (15) working days of submission.

D. The contractor will re-perform sewer inspections where the Engineer has determined the requirements of the specification have not been satisfied.

E. The contractor will correct non-compliant inspection submissions and resubmit the corrected inspections to the Engineer within ten (10) working days.

F. The contractor will repeat the process until the inspection submissions are accepted by the Engineer. Work to perform remedial work will not be eligible for additional payment.

3.6 CLOSEOUT ACTIVITIES

A. The Contractor shall comply with Section 01 77 00 CLOSEOUT PROCEDURES from the specifications stipulated in this Contract.

B. Acceptance of delivery to include revisions based on QA/QC Audit.

END OF SECTION