



# SOUTHEAST JOURNAL OF TRENCHLESS TECHNOLOGY 2023

OFFICIAL PUBLICATION OF THE SOUTHEAST SOCIETY FOR TRENCHLESS TECHNOLOGY



**Drilling in Paradise**  
**Gulf Breeze Case Study**  
**Force Main Rehabilitation**



**"IT'S BEEN A JOY!"**  
Leonard Ingram  
SESTT Executive Director

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# SESTT CHAIRMAN MESSAGE 2023

## Moving Trenchless Technology Forward in Our Region

John Matthews, Ph.D. , SESTT Chairman

**T**hough we have now gotten far beyond the dreaded Corona virus, its impact on the global economy and supply chain remain. This along with growing labor shortages is creating opportunities for even more innovation in our industry. As an educator, we see these challenges as a chance to spread the word about opportunities in trenchless to our students and also look to innovate with our research to help meet the growing technology needs. Because despite all of these challenges, citizens still expect utilities to supply them with clean water, adequate collection and processing of sewerage, and maintain and upgrade all other essential utilities and public services. Trenchless technology providers play a vital role in helping municipalities manage these challenges now and in the future.

We look forward to meeting in Providence Rhode Island at the NASTT 2024 No-Dig Show on April 14 - 18 to learn about new and existing innovations in Trenchless Technologies and underground construction services.

We will also have the opportunity to visit booths and exhibits with forward looking technologies and innovations.

Moving forwards, the trenchless technology industry must continue highlighting the need to not only to maintain our infrastructure but also to upgrade it to the next level for future generations in order to maintain a healthy nation. One of government's foremost obligations is to provide its people with clean and safe drinking water and an efficiently functioning infrastructure. It will challenge us all to the core to create the necessary new materials, processes, and technologies to achieve this.

We thank everyone involved in the Southeast Society for Trenchless Technology (SESTT), participants in our regional Trenchless Technology seminars, and the advertisers and editorial contributors in this magazine for their ongoing support in promoting Trenchless Technologies. As we continue assessing and upgrading infrastructure to promote healthier lives, and improved social and

*“Trenchless  
technology  
providers play a  
vital role.”*

environmental conditions, your efforts and dedication are vitally important!

Sincerely,

John Matthews, Ph.D.  
SESTT Chairman



SESTT SITE





# GREETINGS FROM THE EXECUTIVE DIRECTOR

**Leonard E. Ingram, Sr., PWAM, Executive Director, SESTT**

**W**ITH JOY AND SADNESS, I will be stepping down from my role as Executive Director of the Mid Atlantic, Midwest and Southeast Societies for Trenchless Technology. I will surely miss all the many friends that have made in the last 22 years, but I look forward to an active semi-retirement. In early 2000, on our way to New Orleans to a trenchless trade show, my good friend Dr. Tom Iseley told me that we needed to organize an NASTT Southeast Chapter for Trenchless Technology (SESTT). Later in 2000, Dr. Iseley, Jerry Trevino and I founded and incorporated SESTT. In the Spring of 2001, we conducted the first SESTT Trenchless Technology seminar in Charleston SC. Shortly after that, I became the Executive Director of SESTT. Then in 2003, I was approached by Mr. Mark Bruce and others to take over the task of Executive Director for the existing Midwest Society for Trenchless Technology (MSTT), which I agreed to accept. Then in 2004, I was approached by my now good friend Mr. Richard Thomasson about helping him form the Mid Atlantic Society for Trenchless Technology (MASTT) and I agreed. Shortly thereafter, I became the Executive Director for MASTT. Since my beginning as the SESTT Executive Director, I have organized, conducted, managed and closed out 134 successful one and/or two-day seminars for the three NASTT Chapters over the 22 year period. It has been a joy!

**Thanks for your support!**

My plans for the future are to spend more time with my loving wife, Suzy, my Son and Daughter, and my five wonderful “Auburn” Grandkids. I also plan to be more active with Dr. Iseley’s Buried Asset Management Institute – International (BAMI-I) and my own company, Cahaba Products, Inc. (Southern Flavor Seasonings).

As for SESTT recent activities, we conducted a very very successful “Trenchless Technology, SSEs and Buried Asset Management” seminar in Raleigh NC on November 14, 2023. Mr. Dave Sackett, PG, CPG, Brierley Associates and SESTT Board of Directors Member, was my “hero” and helped me to organize and conduct the very successful full day seminar. The Guest Presenter was Mr. Adam Haggerty PE, Asset Manager, Raleigh Water, Mr. Thomas Chen, Senior Data Scientist, Xylem, and Mr. Charles Woldorff, Principal Business Analyst, Hazen and Sawyer with the presentation, “Predicting The Future: Raleigh Water’s Use Of Machine Learning For Water & Sewer Pipe Failure”. (see pages 28-29)

In early 2023, Mr. Andrew Pattison, A to B Publishing, published the SESTT Journal of Trenchless Technology 2022 and is publishing the SESTT Journal of Trenchless Technology 2023 in February of 2024. For more information about the SESTT

Journals or to place an advertisement or article, please contact Andrew at marcomap@shaw.ca or at call his cell at **(204) 275-6946**. Your can also find the SESTT journals online at [www.sestt.org](http://www.sestt.org).

For now, “**So Long**”, to all my many good friends that I have made in the Trenchless Technology industry and “**THANKS FOR YOUR SUPPORT!**”. In the next few months, I look forward to working with NASTT Reginal Chapter and Events Coordinator Ms. Victoria Cox, SESTT Chairman Dr. John Matthews and NASTT Executive Director Mr. Matthew Izzard, to help successfully move MASTT, MSTT and SESTT forward under new management in any way that I can. As I have said many times, “**I DIG NO DIG!**”

**It has been  
a joy!**

*Thanks for your support!*

Leonard E. Ingram, Sr., PWAM  
Executive Director, MASTT, MSTT & SESTT



# MESSAGE FROM NASTT CHAIR

Matthew Wallin, P.E., NASTT Chair

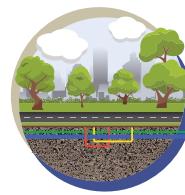
## No-Dig 2024 Heads East!

**H**ello Southeast Chapter Members. We are in the thick of planning for the 2024 No-Dig Show which meets in Providence, Rhode Island this April. The Rhode Island Convention Center offers a great location within the heavily populated northeast US corridor to meet and discuss everything new in the trenchless industry. Providence is accessible directly from the Rhode Island TF Green airport (PVD) or by a 50-mile drive or train ride from Boston-Logan airport (BOS). The conference will feature the ever-popular panel discussion forums during the technical program on a variety of trenchless topics.

We are also featuring new track topics including a focus on renewable energy. As an important part of the trenchless industry, I urge you to join us in Providence in April. Interact with 200 exhibitors, explore innovative products and services, participate in technical sessions for practical solutions, and network with colleagues throughout the week at the various events designed for creating meaningful connections. Our Show motto is Green Above, Green Below as it is important that our industry is a steward of our precious natural resources, so we welcome the opportunity to provide a forum for learning about the latest in innovative trenchless products and services that help us all accomplish that lofty goal.

In the coming months we have many additional events planned to bring the

*Our volunteers and committee members are what keep us moving in the right direction.*



**GREEN ABOVE.  
GREEN BELOW.**

Planning Committees and Technical Program Committees. There are many opportunities for you to consider where your professional expertise can be put to use through networking with other motivated volunteers. With education as our goal and a strong drive to provide valuable, accessible learning tools to our community, we are proud of our continued growth as both an organization and as an industry. Our volunteers and committee members are what keep us moving in the right direction.

For more information on our organization, committees, and member benefits, visit our website at [www.nastt.org](http://www.nastt.org) and please feel free to contact us at [info@nastt.org](mailto:info@nastt.org).

We look forward to seeing you at a regional or national conference or training event soon! And we hope you are planning to join us in Providence next April.

*Matthew Wallin, P.E.*

NASTT Chair

# SOUTHEAST SOCIETY FOR TRENCHLESS TECHNOLOGY BOARD EXECUTIVE 2023 - 2024



## Dr. John Matthews - *Chairman*

Dr. John Matthews has over 20 years of experience in the installation, rehabilitation, and inspection of infrastructure systems. He is the Director of the Trenchless Technology (TTC) and Eminent Scholar Chair in Construction at Louisiana Tech. Previously, he served as the Program

Manager at Pure. Prior to joining Pure, he served as Water Infrastructure Lead at Battelle for five years, and as a Researcher at the TTC for six years, where he led numerous research studies related to pipeline infrastructure. He also has experience as a field inspector on numerous trenchless projects. He has given over 200 conference presentations and authored more than 290 technical publications. He is an active member of NASTT and ASCE and currently serves on the ISTT Board of Directors. He has named the Trenchless Technology Person of the Year Award by *Trenchless Technology* magazine in 2023 and has won three ISTT Awards (2005, 2012, 2022).



## Dave Sackett - *Secretary*

Dave Sackett has throughout his 35+ year career been responsible for the management of geological interpretations of high-resolution geophysical data, nearshore and landside site characterization, planning and execution of geotechnical investigations, preparation of geological and geotechnical

reports and technical reviews for trenchless and tunnel projects.

Mr. Sackett has logged geotechnical boreholes, mapped three-dimensional geologic exposures including tunnel interiors, installed and monitored geotechnical instrumentation, and authored technical reports. His expertise is within the application of geoscientific data to engineering projects constructed within soft soils to hard, crystalline rock. Mr. Sackett's experience with trenchless technology projects (including horizontal directional drill (HDD), pipe jacking and microtunnel includes field mapping, site characterization, preparation of project documents including Geotechnical Data Reports and Geotechnical Baseline Reports, and project/program management. He has mapped extensively in sedimentary and meta-sedimentary rock and has designed / managed geoscience projects on five continents. Dave has been participating in the NASTT for several years, has been on the Board of the SESTT for the past three years, and is active in both presenting and moderating sessions at several No Dig conferences. He has a BS degree in Geology from the University of Tennessee.



## Jimmy Stewart - *Vice Chairman*

Jimmy Stewart has over 25 years' experience working in consent order driven cities, where he has been involved in the full-service environmental assessments, technical water/wastewater evaluations and rehabilitation processes for water, wastewater and storm water systems.

Vice President of AWWIS (Advanced Water/Wastewater Infrastructure Solutions). AWWIS provides and unbiased portfolio of technologies for inspections and rehabilitation for both Pressure and Gravity applications, asset management programs and digital solutions for utilities and engineers and across the United States. Jimmy is a past NASSCO Board Member, past WEF Collection System Committee Chair. Recipient of WEF and WEF Member associations Golden Manhole and 5S Society awards. He is currently Vice Chair of the Southeast Society of Trenchless Technology (SESTT) and Serves on the BAMI-I Board of Directors



## Ed Diggs - *Treasurer*

Ed Diggs has been involved with CCTV inspection equipment for nearly 30 years, working with municipalities, contractors and engineers, insuring their specific needs. He began his career in the sewer business as a senior manager with R.S. Technical Services and for the past twenty years has been employed by SPX Cues, Inc. in various positions. Currently Ed's role is with SPX Cues' sister company PIPC (Pipeline Inspection Partners Corp.), a purveyor of Cues High Technology products, where he develops business for 2D and 3D multi-sensor platforms and reports. Ed is a member of NASTT, SESTT, WEF, FWEA, WEAT, APWA, and AWWA.

# SOUTHEAST SOCIETY FOR TRENCHLESS TECHNOLOGY BOARD OF DIRECTORS 2023 - 2024



## Jerry Trevino - *Past President*

Jerry Trevino is President of Mechanical Jobbers Marketing, Inc. and Protective Liner Systems, Inc. He is also the principal owner of other consulting and real estate companies. Jerry is an engineering graduate from the University of Texas in Austin. Before specializing in infrastructure rehabilitation, he worked as a project engineer and in research and product development for Procter and Gamble and Mobil Oil. He now specializes in the development, manufacturing and installation of all types of polymeric and cementitious coatings, liners and FRP composites used to rehabilitate infrastructure for municipalities and the industrial sector. He has expanded his business to include assessment of pipes and manholes to help his municipal and industrial clients to be able to pinpoint and get ahead of deterioration. He strongly believes that trenchless technologies offer numerous methods to maintain and upgrade aging infrastructure.

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# NASTT 2024 No-Dig Show Preview

## Welcoming North America's Underground Infrastructure Community to the Populous Northeast!



*"Be a part of the excitement as a presenter, sponsor and exhibitor!"*

The North American Society for Trenchless Technology looks forward to hosting the 2024 No-Dig Show in Providence, Rhode Island April 14-18. Hosting North America's premier trenchless educational and networking event in the Northeast for the first time, presents a golden opportunity for the Northeast Trenchless community to showcase the progress it has made in utilizing trenchless applications as the preferred method for underground infrastructure construction in the Northeast.



*The NASTT No-Dig Show is being hosted in the Northeast for the first time*

Within an easy day's drive from most cities in the populous northeast – Providence is just a few hours' drive from Portland ME, Philadelphia, PA, NY, NJ, VT and CT – the 2024 NASTT No-Dig Show promises to draw significant attention from top infrastructure decision-makers across the Northeast including municipal authorities, utilities, engineers, contractors, suppliers and policy-makers.

The 2024 NASTT No-Dig Show motto "Green Above, Green Below" exemplifies the trenchless industry's position as an important steward of our environment and natural resources, utilizing approaches that have significant environmental and social benefits. Trenchless Technology is at the forefront of ongoing efforts to reduce GHG emissions.

Check the website [www.nodigshow.com](http://www.nodigshow.com) for registration, updates and further information. The excitement and anticipation is building - join us in Providence and be a part of the networking and learning!

*Babs Marquis CCM*

Delve Underground  
2024 No-Dig Show Planning Committee Chair  
Secretary, NASTT Board of Directors  
Past Chair, NASTT-NE Chapter



*Providence is an easy day's drive from most cities in the Northeast*



APRIL 14-18 | PROVIDENCE, RI

# NO-DIG SHOW

2024



2024

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# DRILLING IN PARADISE: The Race to Replace Aging Pipelines



## ***High Accuracy Directional Drilling along Florida's Oldest Causeway***

By: Taylor Bomarito, PE, Hazen and Sawyer

**Owner:** City of Miami Beach, FL

**Engineer:** Hazen and Sawyer

**Contractor:** David Mancini and Sons, Inc.

**Driller:** Centerline Directional Drilling Service, Inc.

## **INTRODUCTION/PROJECT BACKGROUND**

The City of Miami Beach (City) is a barrier island city in South Florida, connected by bridges and causeways to mainland Miami. The City receives potable water from the Miami-Dade Water and Sewer Department by means of four transmission mains, which provide water service to the more than 80,000 residents and 9 million tourists who flock annually to the island city. One of the four transmission mains is located along the Venetian Causeway, Florida's oldest causeway, which

aerially spans ten man-made islands via ten historic bridges. In total, the City has 28 aerial water and sewer main crossings along the Causeway, which traverses one of Florida's most protected water bodies, Biscayne Bay.

The overall condition of the water and sewer main aerial crossings along the Causeway is very poor. The existing aerial bell and spigot joint pipe has either non-existent or failing coating systems, resulting in significant corrosion due to the saline environment. Furthermore, in multiple locations, failed water main supports

have led to joint deflection exceeding manufacturers' recommendations. At nearly all bridges along the Causeway, the pipe supports show signs of significant corrosion, and some supports have failed completely. Over the last several years the City has experienced multiple failures along the aerial pipelines requiring frequent and costly emergency repairs.

In response to these failures, the City accelerated the design and construction of certain segments of the pipelines on an emergency basis, with Hazen and Sawyer serving as the Engineer. Exacerbating the challenge was Miami-Dade County's plan to replace the 1920s-era bridges in the near future, which disallowed the use of replacement aerial pipelines. To expedite repairs for the most critical sections, the project was split into three phases:

- Emergency Dade Boulevard Force Main Replacement, a fast-tracked

**HDD allowed the project to be constructed with minimal impact on residents, pedestrians, and vehicular traffic.**



*Existing water main aerial crossing showing significant joint deflection, pipe corrosion, and pipe support failures*

This article covers the Phase 1 project's design and construction efforts. The location of this phase of the project extended between Rivo Alto Island and Belle Isle, a corridor spanning multiple islands and bridges, including a bascule bridge. An aggressive schedule was required for the project, based not only on the poor condition of the existing pipelines, but also on the near-term bridge replacement project.

## PROJECT COMPLEXITY

In addition to the regulatory and social hurdles involved in the historic corridor, the project included a vast number of technical constraints including a large number of existing and planned future utilities, bridge load restrictions, and complex HDD geometries with minimal radii. However, the key design challenge for the project was the need to coordinate the proposed pipe alignments with existing

design-build, consisted of approximately 3,500 linear feet of 20-inch HDPE force main installed primarily via Horizontal Directional Drill (HDD).

- Phase 1 consisted of approximately 2,200 linear feet each of 36-inch HDPE water

main and 12-inch HDPE force main installed primarily via HDD.

- Phase 2 will consist of approximately 5,200 linear feet of 36-inch HDPE water main and 2,600 linear feet of 12-inch force main installed primarily via HDD.



*Phasing of the Venetian Causeway water and sewer replacement projects*



The HDD installation was designed to navigate a narrow corridor between the proposed new bridge foundations and edge of right-of-way

and future bridge infrastructure along with right-of-way constraints. Miami-Dade County is currently undergoing the design of the replacement bridges within the corridor due to the extremely poor condition of the existing bridges, which were originally constructed in 1926. Project design required extensive coordination with Miami-Dade County and their replacement bridge design consultant, who are upgrading and expanding all of the historical Venetian Causeway bridges over the next 5-7 years, to avoid conflicts with the future bridge infrastructure.

The water and sewer project intended to maintain the proposed replacement piping within the right-of-way to avoid the need for easements, which would involve difficult, costly, and time-consuming negotiations. However, the right-of-way conditions were quite constrained; the replacement bridges were proposed to be widened to nearly the entire right-of-way width, with foundations consisting of primarily deep drilled shafts.



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**The key design challenge for the project was the need to coordinate the proposed pipe alignments with existing and future bridge infrastructure along with right-of-way constraints.**

Preliminary design of the bridges indicated roughly 4-foot gaps were available between the right-of-way lines and the proposed adjacent bridge foundation. Since horizontal directional drilling (HDD) is typically not a precise installation method, this gap was insufficient to navigate the 3.2-foot diameter pipelines. Extensive coordination with the replacement bridge design team was performed to relocate bridge foundations to provide for the minimum feasible constructible envelope for the pipelines.

The bridge designers were able to relocate bridge foundations at select critical locations to provide a sufficient yet minimal utility

corridor for the proposed pipelines. Both the City utility designers and County bridge designers agreed to modify their proposed construction methods and infrastructure locations for the betterment of both projects. The proposed pipeline alignments were precisely designed to navigate the HDD installations within these narrow corridors. The project's extremely tight constraints provided a unique challenge for HDD, requiring constructed accuracy near the limits of feasibility.

Construction tolerances for both pipeline and foundation installations, geotechnical variability, and guidance/

survey accuracy limitations were researched and considered in the development of Contract acceptance criteria for the project's pipeline alignments. Ultimately the Contractor was required to install the HDD pilot holes with an accuracy of +/- 1.0 to 1.25 feet (+/- 12 to 15 inches), at a depth of 60 to 70 feet below grade, to traverse the narrow corridor.

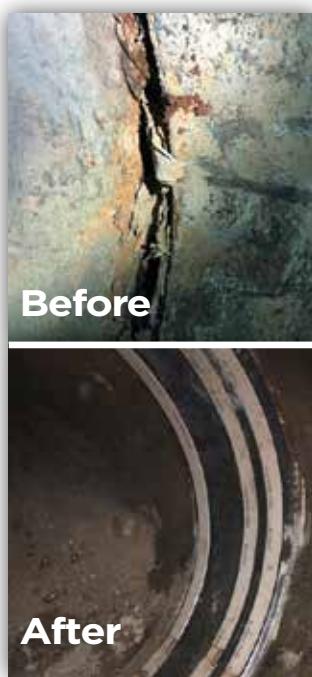
Accuracy in the installation of horizontal directionally drilled pipelines has increased over the past few decades based on advances in technology, construction methods, and engineering. The increasing usage of HDD in urban

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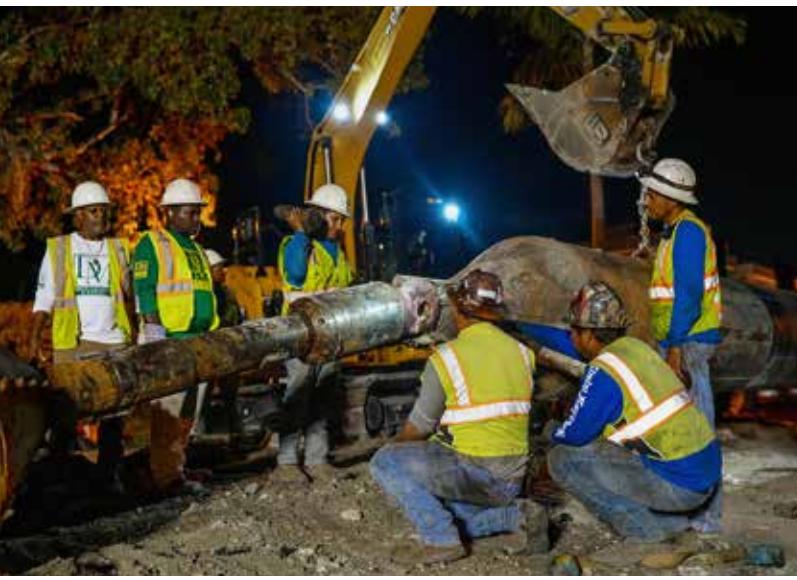


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DMSI and Centerline staff inspect the connection between the reamer and pipe string prior to pullback



Butt fusion of the pulling head onto 36-inch HDPE piping

environments puts greater emphasis on guidance accuracy and as-built precision, necessitating a more careful review of project alignments and use of cutting-edge technologies. The Phase 1 and 2 projects utilized acceptance criteria for alignments through the use of specific critical alignment locations and provided specifications for construction methodology and sequencing to accommodate the current and future planned construction as well as technological limitations of pipe installation by HDD.

## CONSTRUCTION

The design for Phase 1 of the project was completed in May 2022 and was advertised for bid in June 2022. David Mancini and Sons, Inc. was selected for construction, with Centerline Directional Drilling Service, Inc. serving as the driller. Construction began in December 2022, with drilling completed by April 2023, and project completion anticipated in December 2023.

Pilot-hole as-builting via multi-pass gyroscopic runs was utilized to verify Contract tolerances at critical locations adjacent to future bridge infrastructure.

The Contractor was able to achieve the desired accuracy tolerances, though re-drilling of portions of the two alignments was necessary. In addition, post-installation gyroscopic survey mapping was utilized to produce a highly accurate as-built for use by the replacement bridge designers. The final pipeline centerline alignment deviated from the pilot-hole centerline as much as 4 feet vertically, though horizontally stayed within 0.5 feet in horizontal tangents and within 1.5 feet in horizontal curves.

## SOCIAL AND ECONOMIC CONSIDERATIONS

Replacement of the Phase 1 pipelines via HDD allowed the project to be constructed with minimal impact on residents, pedestrians, and vehicular traffic. The trenchless installation allowed the pipeline construction to severely limit surface restoration and Maintenance of Traffic (MOT) impacts. The City, Engineer, Contractor, and County worked together to minimize the footprint of the work zone and were able to optimize the MOT, maintaining

traffic flow in both directions on the Causeway and thus reducing traffic impacts to the community.

Construction sequencing also allowed the City to maintain water and sewer service to utility customers along the corridor. Careful project planning and work sequencing allowed for the Phase 1 project to be performed with minimal construction time and minimal impact on the local community.

Many of the project's environmental permits, which included United States Army Corps of Engineers (USACE) and Florida Department of Environmental Protection (FDEP) permits, had to be acquired on an emergency basis. Minimization of impact on the public was also key. Not only is the Causeway an important thoroughfare connecting Miami Beach to the Miami mainland, but the project corridor is located amid some of Florida's most expensive real estate.

## CONCLUSION

The completion of construction of the Phase 1 project validated much of the design methodology used for the project. The combined efforts of the project team, including the City of Miami



MOT plans allowed for flagged two-way traffic when pipe was fused and strung out for pullback along the two-lane road

Beach, Hazen and Sawyer, David Mancini and Sons, Inc., Centerline Directional Drilling Service, Inc., and many others, resulted in a successful project, which was recognized by the American Society of Civil Engineers (ASCE) Miami-Dade Branch as Project of the Year Category 1 for 2023 and was granted the Cuban American Association of Civil Engineers (CAACE) Presidential Award for 2023.

Phase 2 of the City's utility replacement

project was advertised for bid in October 2023 and is expected to begin construction in early 2024. The bridge replacement detailed design is well underway, with construction expected to begin in the next several years.

The design engineers for Phase 1 and 2 will be presenting more details about the design of these projects at the NASTT 2024 No-Dig Show in Providence, RI, April 14-18, 2024. 

#### ABOUT THE AUTHOR:



**Taylor Bomarito, PE** is an Associate with Hazen and Sawyer in Jacksonville, FL. His bachelor's and master's degrees in environmental engineering are both from the University of Florida. Taylor is a member of NASTT, AWWA, and WEF.

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# CASE STUDY: FLORIDA COMMUNITY ENHANCES FIRE PROTECTION WITH WATER MAIN UPGRADE VIA HDD USING CERTA-LOK®

By: David Moore, P.Eng, MBA, Westlake Pipe & Fittings

## GULF BREEZE, FLORIDA

*When the Midway Water System near Gulf Breeze, Florida needed to upgrade the water main along Hickory Shores Boulevard to support fire services, they were presented with a choice between using the originally planned trench excavation method or the horizontal directional drilling (HDD) method proposed by contractor Evans Contracting Inc.*

## CHALLENGE

With a customer base of 8,119 connections, the Midway Water System planned to retrofit older neighborhoods they serve with larger, more modern water pipes to improve fire protection for property owners. Firefighters had previously experienced reduced water volumes that were insufficient to support their efforts when responding to emergency situations involving active fires. Evans Contracting's bid proposed the use of HDD as a more cost-effective solution to install the new pipeline rather than the proposed open cut method. The Midway engineers evaluated the proposal during the bidding process to determine if HDD was a suitable alternative to the original plan and ultimately selected Evans Contracting to carry out the project using the HDD method.

**Project Type:** Potable Water  
**Application:** Horizontal Directional Drilling (HDD)  
**Owner:** Midway Water System Inc.  
**Product Used:** Certa-Lok® RJIB (C900)  
**Contractor:** Evans Contracting Inc.  
**Engineer:** Fabre, a Bowman Company



*Contractor utilized the cartridge style assembly method*

## APPLICATION

Evans Contracting's bid proposed the use of HDD as a more cost-effective solution, which in addition to a cost savings, provided other benefits. The HDD method maintained roadway access as well as protection and preservation of

the trees, lawns, driveways, and fences in the surrounding area. This was especially important for Hickory Shore Boulevard, an area bordered by a large body of water, East Bay, and lined with a natural landscape and waterfront homes. The suburban beach-town environment posed additional obstacles that had to be considered.

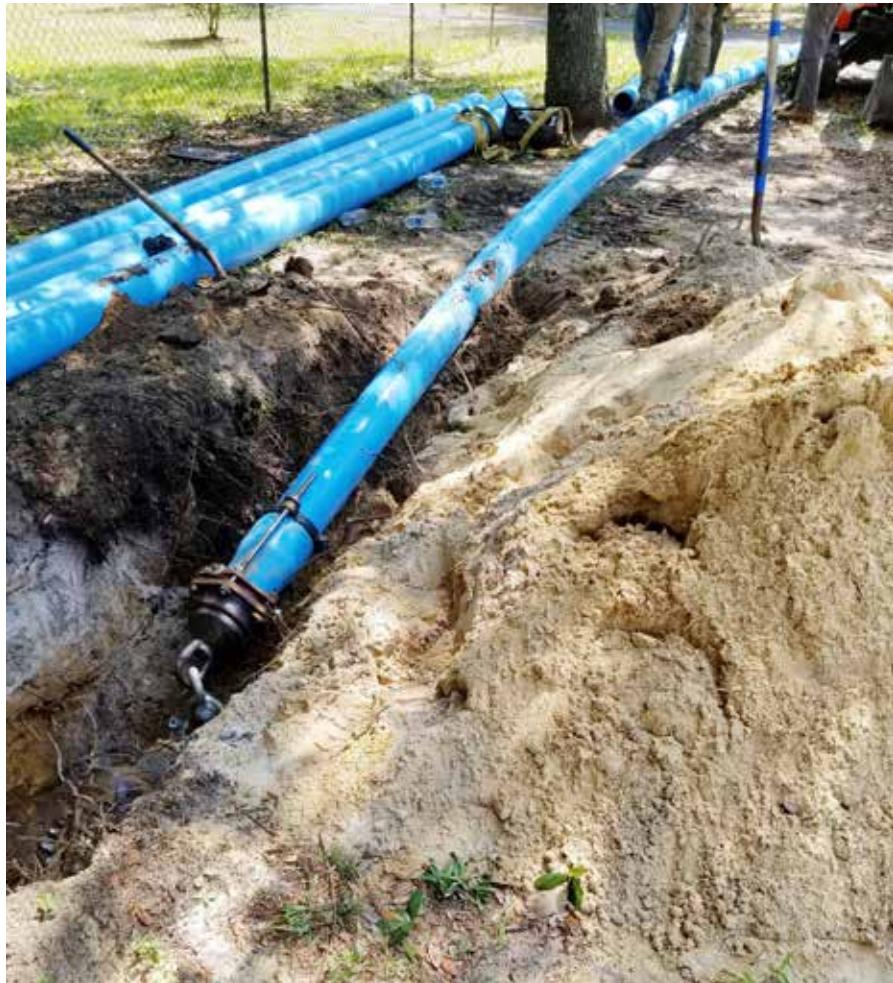
HDD installation techniques traditionally limit excavation to the area surrounding the entry and exit locations, and overall, the use of HDD allowed for a more efficient and environmentally-friendly installation of the fire protection line, while preserving the surrounding landscape and minimizing disruption to the community. The principal construction featured new 6-inch PVC water lines, 11 tapping sleeves and valves, 14 gate valves, 18 fire hydrants, and 13 road crossings with steel casings. For the HDD project, the product selected was 10,955 feet of 6-inch DR18 Certa-Lok® restrained joint integral bell (RJIB) PVC pipe.

## SOLUTION

The new water main project started in November 2021. With the pilot hole drilled using a Vermeer D24X40, a reaming pass was made and the bore hole was ready to receive the 6-inch pipe selected for the water line. To begin the pullback process, an initial 20-foot length of pipe was attached to the puller head and drill stem. As the driller began pulling the pipe in, the contractor utilized the cartridge style assembly method to join the Certa-Lok one stick at a time as the drilling continued. This process continued for the entire project length of 10,995 feet using multiple drill shots with a maximum drill length of 2500 feet. The upgrade to the water main system included installing the 6-inch fire protection line beside the existing 2-inch and 4-inch lines. A fire protection line is a dedicated pipe that carries a large volume of water specifically for firefighting; the line is installed in specific locations and connected to fire hydrants providing a reliable source of water with water volume and pressure guaranteed. The contractor seamlessly upgraded the existing water system by incorporating a 6-inch fire line integrated with the pre-existing infrastructure through a series of valves and connections. With the utility company monitoring the project, they noticed how efficiently the fire line was being installed and expanded the project to install more fire protection lines down other roads outside of the original plan.

**“Most places the only visible work was a new fire hydrant.”**

Cecil Jernigan, Engineer, Fabre, a Bowman Company



A fire protection line is designed with a larger diameter pipe

To handle the expanded project scope, the contractor skillfully processed several change orders, allowing installation and connection of more 6-inch pipes than originally planned.

Typically, a fire protection line is designed with a larger diameter pipe, compared to the drinking water distribution pipes, to handle higher water flow rates. The pipes are connected or ‘looped’ through a series of valves and control points allowing the fire department to isolate the fire protection

line. The looped configuration of the pipe ensures a constant water pressure and flow even in the event of high water demand.

Certa-Lok C900 RJIB, manufactured by Westlake Pipe & Fittings, was well suited for the installation method selected by Evans Contracting. Certa-Lok joints can be assembled in less than 1 minute per joint and the cartridge-style assembly engages each joint as the pipe is in motion working seamlessly with pipe pullback operations; the pipe is ready to go into service immediately and can be



Maximum drill length was 2500 feet



Utility noticed how efficiently the fire line was being installed

**We installed the runs in fewer hours with less equipment than traditional open-cut.**

installed by pulling or pushing the pipe. The cartridge-style assembly also offers a contained assembly area allowing the contractor to maintain the flow of traffic, with some residents not being aware that construction was taking place. The complete pipe length was successfully pulled in each of the project construction zones.

"It was very nice to see the project with thousands of feet of new water line being

installed and most places the only visible work was a new fire hydrant," said Cecil Jernigan, engineer at Fabre, a Bowman Company.

Originally specified for a traditional open cut method, the owner, engineer, and contractor saw the cost savings by installing the long sections of pipe by HDD instead of open cut. HDD minimizes surface disruption and eliminates the need for excavation, reducing the amount of time, cost, and resources required for site excavation.

"There were no issues with the product," said Keith Chavis, construction manager at Evans Contracting Inc. "There was no concern pulling the pipe to the maximum drill length of 2500 feet, no issues at all." Chavis further explained, "Construction time was also decreased and we were able to install the runs in fewer hours with

less equipment than traditional open-cut technologies".

With the success of the project, Midway Water System has asked Evans Contracting to continue improving fire protection systems in other surrounding roadways with the installation of another 6000-8000 feet of Certa-Lok water main via HDD. 

#### ABOUT THE AUTHOR:



**David Moore,**  
P.Eng, MBA, is a Regional Engineer for Westlake Pipe & Fittings Florida territory specializing in design and implementation of complex water and wastewater solutions for municipal customers. As a consultant for his clients, David provides solutions that help ensure long service life and provide corrosion-resistant options and reduced life cycle costs. David is a leading trenchless expert in new technologies and installation techniques, with a focus on making your project a success.



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# NORTH CHARLESTON SEWER DISTRICT (NCSD) FORCE MAIN REHABILITATION

By: Andrew Costa, Insituform Technologies

The 2021 Force Main Rehabilitation project represents a huge accomplishment in the trenchless industry in both installation efficiency and record setting installation distance, all while solving a critical infrastructure rehabilitation need for the North Charleston Sewer District (NCSD).

Deemed a “win/win/win” by municipal owners, engineering representatives, and cured-in-place-pipe (CIPP) contractor alike – this project – publicly bid in early 2022 – is the culmination of a significant amount of planning, problem solving, and innovation, resulting in an immensely successful project to date and set for final completion later in 2024.

## INTRO / JOB BASICS

The force main assets were installed in the early 1970s and are an integral part of NCSD’s collection system – much of which is between 40 and 50 years old. The over 5 miles of medium diameter force mains handle nearly 75 percent of NCSD’s daily flow. The project consists of a multi-phased, trenchless approach to remediating this piece of critical infrastructure as part of NCSD’s ongoing strategic and capital plans. NCSD typically experiences two types of failure modes in its force main system: hydrogen sulfide exposure at the crown line via uncharged pipe that is not full of flow, and electrolysis from aggressive soil conditions – both which contributed to the need to successfully rehabilitate this integral part of their infrastructure.



Liner materials are designed and manufactured for each individual pressure pipe installation, and shipped to the site in refrigerated trucks

With four distinct phases, the project is categorized by the pump stations along the pipeline’s alignment in the NCSD collection system. The force mains carry flow from the following pump stations, which comprise the breakdown of work scope.

The nearly 17,000 foot alignment of the job spans a number challenging geographic and topographic areas, from its predominant location in marshes and lowland areas, adjacent to railroads, to heavily wooded areas as it progresses through aerial crossings at streams and

- 1) Ingleside – 6,84 LF of 20-inch ductile iron pipe (DIP)
- 2) Northwoods – 5,045 LF of 30-inch DIP
- 3) Turkey Creek – 2,215 LF of 30-inch prestressed concrete cylinder pipe (PCCP)
- 4) Noisette – 3,283 LF of 30-inch CIP/DIP and 596 LF of 30-inch C900 PVC

**“Then project represents a huge accomplishment in the trenchless industry in both installation efficiency and record setting installation distance.”**



A proprietary new conveyor technique was used for this project that substantially reduced installation time

reservoirs along the route. A wide array of access was needed to get equipment and manpower to the install and termination sites, to perform excavation for the access pits, as well as bypass pumping installation and operation.

## MATERIALS & PROCESSES

For this project a combination of both standard Insituform felt tube, and reinforced InsituMain® composite tube was utilized, based on the operating/test pressures of each pipe segment along the force main. Both types of CIPP materials were manufactured in Insituform's World Class manufacturing facility in Batesville, Mississippi. As custom engineered solutions, the liner materials are designed and manufactured specifically for each

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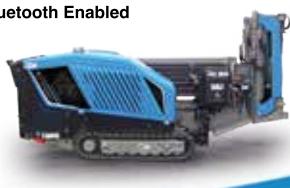
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individual pressure pipe installation. For this particular application, the liners were designed at thicknesses varying from 11mm to 21mm to meet the project operating conditions. After

manufacturing, the dry tube was shipped to Insituform's Bessemer, AL wetout facility to be impregnated with resin. The vacuum impregnation process ensures a thorough and uniform saturation of the





*Historically, installations of extremely long lengths and larger diameters are accomplished with the “Over-the-Hole” method*

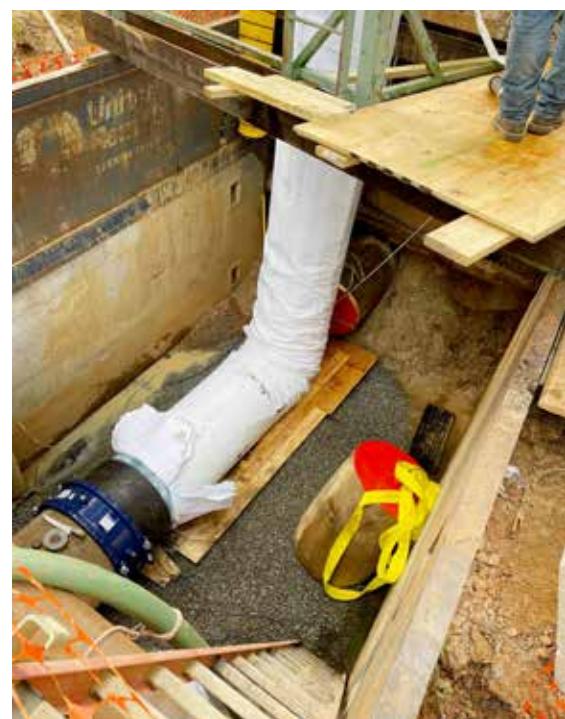


material with the resin system and is done in a highly controlled facility environment under strict quality controls that far exceed field wetout conditions. The wet tube was then shipped in refrigerated trucks to the jobsite in South Carolina sequentially for each installation and phase of the job.

Once onsite and ready for installation, the liners are fed from the reefer truck and staged on a conveyor that helps move the heavy material to the top of the installation tower. For this project, a proprietary new conveyor technique was utilized that helped the crews reduce the installation time needed, enabling the crew to drastically expedite the inversion time, mitigate the challenges associated with installing fiber-reinforced pressure CIPP tube, as well as achieve extremely long lengths – while still maintaining the high quality of installation that is expected, all while installing the tube in record time.

The resin-impregnated tube is installed using water and hydrostatic head pressure which causes the tube to invert and travel the distance of the host pipe, taking the cylindrical shape of host pipe as it presses tightly against the inside wall. The water is then heated and circulated to cure the resin in place. For this project, a few different resins were utilized – including a vinyl ester (VE) resin system. Regardless of resin type, all project installations were heat cured using water inversion/water cure.

A recent updated approach to CIPP lining in pressure pipe applications was utilized in this installation. Fiberglass reinforced plastic (FRP) spool pieces were used as end terminations in order to terminate the CIPP liner. Historically, CIPP liners in pressure pipe applications terminated directly onto the host pipe and were either cut flush or were cut back a few inches and a mechanical end seal was applied to seal the CIPP/host pipe



*The resin-impregnated tube inverts and travels the length of the host pipe*

transition. This methodology relies on the bad host pipe for termination and end sealing of the CIPP liner. Instead, for this installation an FRP spool piece is stubbed up against the host pipe at both the entry and exit points and sits outside of the bad host pipe. The FRP surface is abraded, and a bonding agent is applied. The CIPP liner is installed into the FRP piece at the start of the installation, travels along the length of the host pipe, and then finishes by exiting outward past the other FRP spool piece at the end of the installation. When the resin of the CIPP marries with the bonding agent of the FRP and the liner is cured, a very aggressive CIPP/FRP bond is formed. End seals are then installed to terminate the liner, but in this new methodology, the termination now happens outside of the host pipe, eliminating the process of connecting a brand new CIPP liner back to a bad asset, and instead connecting to and terminating on a brand new piece of pipe, external of the deteriorated host pipe.

The final step prior to the installation of the mechanical fittings and closure piece is a hydraulic pressure test, to verify that the liner has been installed



*Using an updated methodology, termination of the liner was done outside of the host pipe*

properly and can withstand the range of internal operating pressures. CIPP liners are pressure tested according to ASTM F1216, whereby the lines are tested to twice

the known working pressure, or the working pressure plus 50 psi, whichever is less. For this project, with the varying operating pressures of the force mains,



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### **Project Team:**

**Owner – North Charleston Sewer District (NCSD)**  
**Engineer – W.K. Dickson**  
**Consultant – Jacobs**  
**Contractor – Insituform Technologies, LLC**

a variety of test pressures were performed, up to 60 psi.

To perform the tests, the lines are filled with water, and capped at both ends. The lines are pressurized to the prescribed testing levels and must hold constant at that pressure for one hour. As with new pipe testing, allowable leakage levels are taken into account and are also governed by the ASTM F1216 standard. To date, all pressure tested lines have passed with flying colors.

## **SETTING RECORDS**

This project provided the opportunity to showcase the strength and innovation of Insituform's manufacturing, wetout, and installation expertise, resulting in the longest pressure CIPP install in company history – and possibly the longest ever in the industry. Each of the 10 installations or “shots” were over 1,100 feet in length, averaging nearly 1,700 feet, with the longest record setting installation of nearly 2,600 LF of 30-inch DIP. Traditionally, the installation of long lengths of medium to large diameter tube is accomplished via the “Over-the-Hole” (OTH) method. However, in this application, the record-

setting 2,600-foot installation was accomplished via the traditional or “trucked in” method. Accomplishing this feat took a huge collaborative effort from Insituform’s in house design team, manufacturing personnel, wet-out staff, operations staff, and installation crews to ensure that each step of the process – from design to installation – was a) achievable b) executed precisely according to plan, and c) performed at an extremely fast pace – all while pushing the limits of previous achievement.

## **CHALLENGES**

As with any construction project, challenges are inevitable and this one was no different. One of the big differentiators between contractors is what happens when challenges arise, and how those challenges are addressed, communicated, and solved – ideally with a team approach with owners and engineers. The project’s timing was one of the bigger hurdles to overcome. There was a large span of time covering the bidding period, contracts period, and installation schedule – especially for a multi-phased project such as this. During this span, the US economy

experienced unprecedented inflationary headwinds, including skyrocketing material costs, labor shortages and cost increases, rising fuel and transportation costs – all which directly impacted the project, and contributed to huge variability in resin pricing, a generally stable component of CIPP lining projects. Now, those relatively consistent costs had become highly volatile and presented budgetary challenges that the owner, engineer, and contractor needed to work through to ensure the project stayed on track toward a successful completion.

Additionally, the inflationary impact presented lead-time challenges for critical materials such as end-connections, fittings, etc. which impacted the schedule and needed to be taken into consideration when mapping out the project’s timeline. Fortunately, the lines of communication between all parties remain constantly open and the project was able to continue forward through close collaboration between owner, engineer, consultant, and contractor.

Currently the project is over 50 percent completed, with the last phase scheduled for Summer 2024. Special thanks to the project team for their contributions to the success of the project to date: 

## **ABOUT THE AUTHOR:**



**Andrew Costa** has worked in the trenchless water/wastewater industry since 2006. His experience includes positions in the contracting, manufacturing, and distribution sectors. His expertise in the water/wastewater markets includes cementitious/polymer manhole rehabilitation, specialty coatings, cured-in-place pipe (CIPP) rehabilitation, carbon fiber remediation, geopolymer solutions, and concrete corrosion. He is currently a Vice President of Sales for Insituform Technologies - the leading worldwide provider of CIPP and other technologies/services for the rehabilitation of pipeline systems. He is currently on the National NASTT Board of Directors and serves on the board of the Southeast NASTT chapter.



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## **SETT BATON ROUGE SEMINAR JANUARY 25, 2023:**

### **GUEST PRESENTATION**

#### **"Trenchless Technology in Baton Rouge"**

Mr. Rickey Brouillette, P.E., Chief Of Engineering & Technology - Wastewater, City of Baton Rouge, Department Of Environmental Services

### **PRESENTATIONS**

#### **Welcome to Seminar & Buried Asset Management Institute - International (BAMI-I),**

Leonard Ingram, PWAM, SETT Executive Director & Admin/Treas. BAMI-I (BAMI-I) &

#### **Welcome & The Trenchless Technology Center,**

**John Matthews, Ph.D., Louisiana Tech University**

Professor, Director of The Trenchless Technology Center and SETT Chairman

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Troy Stokes, Akkerman Inc

#### **Unique Trenchless Sewer Force Main Installations With Fiberglass Pipe,**

Jeff LeBlanc, P.E., Thompson Pipegroup

#### **Large Diameter Pipe And Manhole Structural Rehabilitation With Spray Applied Geopolymer Mortar,**

Richard Goodrum, GEOTREE Solutions

#### **Biogenic Corrosion and Cementitious Materials,**

Tom Tolve, IMERYS

#### **Internal Joint Seals,**

Jeremy Kieninger, Miller Pipeline

#### **Sewer and Water Construction Trenchless Technologies,**

Ted Dimitroff, Trenchless Consulting, LLC

#### **Epoxy Is Stupid!,**

Tom Godbey, Standard Cement Materials, inc.

#### **Carbon Fiber Pipe Strengthening For Wastewater Pipelines,**

Mike Larsen, Structural Technologies

#### **Multi Sensor Inspection,**

Ed Diggs, Pipeline Inspection Partners Corp. PIPC (Purveyor of Cues High Technologies)

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**T**he Trenchless Technology seminars hosted by SETT in locations across the Southeast have been a mainstay of trenchless technology outreach and education efforts across the region for two decades.

The first **Trenchless Technology, SSES and Buried Asset Management Seminar** was held early in the year on January 25, 2023 at the Hilton Baton Rouge Hotel. On November 14 the second seminar was hosted by the Neuse River Resource Recovery Facility in Raleigh NC. Both seminars were very successful and well-

attended events with a good range of educational and informative presentations on trenchless technology topics.

The SETT Baton Rouge Trenchless Technology seminar featured a presentation from Mr. Rickey Brouillette, P.E., Chief Of Engineering & Technology - Wastewater, City of Baton Rouge, Department Of Environmental Services. There were eleven other presentations by industry professionals on a wide range of trenchless technology topics.

The Raleigh NC seminar highlighted a tour of the Neuse River Resource Recovery Facility and a guest presentation on "Predicting The Future: Raleigh Water's Use of Machine Learning for Water & Sewer Pipe Failure" by Mr. Adam Haggerty PE, Asset Manager, Raleigh Water, Mr. Thomas Chen, Senior Data Scientist, Xylem, and Mr. Charles Woldorff, Principal Business Analyst, Hazen and Sawyer. Additionally, there nine trenchless technology presentations, making for a full, busy day of learning and networking.

Since 2003, SETT has been hosting **Trenchless Technology, SSES and Buried Asset Management Seminars** in various cities across the SETT Chapter's ten state area. These seminars have engaged over 2200 underground infrastructure professionals over this period, facilitating meaningful direct networking between industry and owner groups.



*Mr. Rickey Brouillette, P.E., Chief Of Engineering & Technology - Wastewater, City of Baton Rouge, Department Of Environmental Services, delivers an excellent presentation on "Trenchless Technology in Baton Rouge"*

# **“SESTT Seminars facilitate meaningful direct networking between industry and owner groups.”**



Mr. Adam Haggerty PE, Asset Manager, Raleigh Water, with presentation on "Predicting The Future: Raleigh Water's Use of Machine Learning for Water & Sewer Pipe Failure"

As part of the SESTT mandate to “promote Trenchless Technology through education for the public benefit”, the seminar programs are designed to inform public officials, engineers, utility company personnel, designers, and contractors involved with the construction, rehabilitation, and management of underground infrastructure assets, in the Southeastern US. They are great

venues for educating decision-makers on the many social and economic benefits of using trenchless technology in their infrastructure renewal and new construction programs.

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## **SESTT RALEIGH SEMINAR NOVEMBER 14, 2023:**

### **GUEST PRESENTATION**

**“Predicting The Future: Raleigh Water’s Use of Machine Learning for Water & Sewer Pipe Failure”**

Mr. Adam Haggerty PE, Asset Manager, Raleigh Water, Mr. Thomas Chen, Senior Data Scientist, Xylem, and Mr. Charles Woldorff, Principal Business Analyst, Hazen and Sawyer.

### **PRESENTATIONS**

**Welcome to the Trenchless Technology Seminar,**  
Leonard Ingram, PWAM, SESTT Executive Director

**Buried Asset Management Institute - International (BAMI-I) & Certification Of Training In Asset Management (CTAM) Program,**  
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Richard Goodrum, GEOTREE  
**Multi Sensor Inspection,**  
Adam Slifko, PIPC / CUES, INC.  
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