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TRENCHLESS NORTH AMERICA



The Official Magazine of the North American Society for Trenchless Technology



NASTT 2024 NO-DIG SHOW RECAP

Green Above Green Below

SUMMER 2024
Volume 14 • Issue 3

Providence RI | April 14 – 18, 2024

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TRENCHLESS NORTH AMERICA



The Official Magazine of the North American Society for Trenchless Technology

SUMMER 2024 – VOLUME 14, ISSUE No. 3

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NASTT 2024 NO-DIG SHOW SETS SAIL IN PROVIDENCE!

Ocean breezes and spring excitement were in the air as the world's largest trenchless technology conference and trade show gathered at the Rhode Island Convention Center in beautiful historic Providence. Held for the first time in the populous Northeast region, nearly 2000 attendees enjoyed a busy fast-paced week of networking events and a wealth of new information on innovative trenchless products and services. The NASTT No-Dig show is one of the must-attend underground construction conferences in North America.



FEATURES

8 Q&A: Dave Sackett, Brierley Associates

As an active NASTT volunteer and longtime proponent of the trenchless industry, Dave Sackett brings a wealth of geotechnical expertise to the table garnered from his 35+ years experience on various trenchless and tunneling projects. Dave is the current Board Chair of the NASTT Southeast Regional Chapter and has moderated sessions and presented at several No Dig conferences. He offers his perspective in this wide-ranging interview.

12 Morty's Trenchless Academy: Optimizing Aurora Water's CIP Program

This edition's Morty's feature examines Aurora Water's decision-making methodology and asset management principles in the development of a rehabilitation and renewal program for the City of Aurora's 1,200 miles of linear wastewater assets. The program incorporates input from stakeholders including operators, engineers and finance considerations, ultimately relying on strong teamwork to secure best results.

28 NASTT 2024 Abbott Innovative Product Award Winners

The Abbott Innovative Product & Services Award celebrates companies with a state-of-the-art product or service making a significant impact in advancing the trenchless industry. The award is named for the late Joseph L. Abbott, Jr., an active NASTT member since its founding in 1990 and a champion of innovation. The Award winner and three finalists are profiled.

42 New Subaqueous Trenchless Outfall In Long Island, NY

This paper was selected as one of the Outstanding Papers – New Installations, from all the presentations at the 2024 NASTT No-Dig Show in Providence RI. The paper describes how various challenges to completion were overcome in the HDD installation of a new 3,300LF 30-inch pipe to replace an existing pipe that was 90+ years old.



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WELCOME TO THE SUMMER 2024 EDITION OF NASTT'S TRENCHLESS NORTH AMERICA

Dear NASTT Members and Trenchless Advocates:

This edition reviews the successful 2024 No-Dig Show in Providence RI, looks ahead to October's No-Dig North and is packed with your regular features and updates from the industry.

Adding Membership value is central to the focus of the Board of Directors. Many of the initiatives in our new Strategic Plan are underway and these projects delivered over the coming weeks, months, and two years.

Sharing knowledge and education is central to the NASTT mission. Membership only has value if it provides solutions or alternatives to our challenges. This is driven by an awareness of the capabilities of trenchless technology as a solution to the increasing environmental, financial, and social challenges faced by owners as the demand to both expand the utility network and update aging infrastructure in an efficient manner. By strategically promoting the advantages of trenchless technology we continue to increase our membership by providing a place where those answers can be found through NASTT.

The new **NASTT Knowledge Hub** is a splendid example of sharing resources. This valuable Membership benefit allows users to search and download papers and proceeds from 24 years of No-Dig and No-Dig Show technical programs, publications, videos, and other media content.

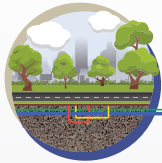
Updated Good Practice Training Courses for Horizontal Directional Drilling (HDD) and Cured-In-Place-Pipe were presented in Providence as well as the launch of the HDD Good Practice Guidelines publication – available in both digital and print format. The Training Course schedule allows you to attend courses either virtually or attended at various locations throughout Canada, Mexico, and the United States

Membership value starts at local level with Regional Chapters. We are delighted that there are eight conferences between now and the early part of next year, providing further networking opportunities and engagement and selected training courses with CEU available. Attended training is also a fantastic way to meet the instructors – often the authors of the material - and draw on their experience and knowledge. Regional and local projects are often designed and delivered by engineers and contractors with an understanding of the nuances and challenges involved. Regional Conferences are the front line for that engagement.

As the experience of a great No-Dig Show in Providence turns to memories (which was your favorite No-Dig Show?), we look forward to the 2024 No-Dig North at Niagara Falls, Ontario. As we look to collaborate more with other organizations to provide value, we are delighted to announce that NASSCO will be running a technical session track to supplement the record number of abstracts received. It elevates the values and diversity of information available – and that helps all of us. Registration and hotel reservations can be made at www.nodignorth.ca – we look forward to seeing you there!

Enjoy your read!

Matthew Izzard, Executive Director
North American Society for Trenchless Technology (NASTT)
mizzard@nastt.org



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TOGETHER, WE ARE DRIVING THE FUTURE OF TRENCHLESS TECHNOLOGY FORWARD

Hello NASTT Members and Trenchless Champions!

As we roll into the second half of the year, I want to share some key updates and upcoming opportunities that are of importance to your chapter and our organization and industry.

First and foremost, a big thank you to everyone who participated in our recent 2024 No-Dig Show held in Providence, RI. Your engagement and contributions made it a resounding success. The presentations were insightful, and the networking opportunities were invaluable. This issue includes an overview of the event. I hope those of you who attended will look back fondly on the great experience and those of you who were unable to attend will be excited to make your plans not to miss out next year!

We are currently in the thick of 2025 planning so mark your calendars for March 30-April 4 in Denver, CO! We are now accepting applications for our municipal scholarship program for the 2025 conference. The NASTT No-Dig Show Municipal & Public Utility Scholarship awards employees of North American municipalities, government agencies and utility owners who have limited or no training funds with a Full Conference and Exhibition registration to the NASTT No-Dig Show. Hotel accommodations are provided for selected applicants. Recipients have full access to all exhibits and technical paper sessions. The application deadline is November 1, so please spread the word to any eligible candidates who may benefit from this opportunity. Detailed information about the scholarship program and the application process can be found on our website at <https://nastt.org/no-dig-show/municipal-scholarships/>.

We are excited that the fifth edition of the Horizontal Directional Drilling (HDD) Good Practices Guidelines book has been released. And by popular demand, the book is now available as a digital download as well as a print-on-demand version! The fifth edition includes updated content reflecting the latest advancements and techniques in HDD. Alongside the book, we have also updated our HDD training course to align with the new edition. These courses are designed to provide both new and experienced professionals with the knowledge and skills needed to excel in their roles. Please check our website for more details on how to purchase the book and enroll in the courses.

We are also excited for the upcoming No-Dig North conference, scheduled to take place from October 28-30 in Niagara Falls, ON, Canada. This event is a premier opportunity for professionals in our field to learn about the latest innovations and best practices in trenchless technology in Canada. We encourage all members to attend and take advantage of the technical sessions, exhibits, and networking opportunities. Early bird registration is now open, so be sure to register soon to secure your spot. Visit www.nodignorth.ca for all the details.

Thank you for your continued support and dedication to our organization and the industry. Together, we are driving the future of trenchless technology forward. If you have any questions or need further information on any of the topics mentioned, please do not hesitate to contact me.

Matthew Wallin

**Matthew Wallin P.E., Chair
North American Society for Trenchless Technology (NASTT)**



**NEW HEIGHTS.
UNDER GROUND.**

*“Mark your calendars
for the 2025 NASTT
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*“Thank you for your
continued support
and dedication to
our organization
and the industry.”*

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with
Dave Sackett

As an active NASTT volunteer and longtime proponent of the trenchless industry, Dave has been involved throughout his 35+ year career in 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. He has particular expertise and experience in the application of geoscientific data to engineering projects constructed within soft soils to hard, crystalline rock. He has mapped extensively in sedimentary and meta-sedimentary rock and has designed / managed geoscience projects on five continents. Dave is the current Board Chair of the NASTT Southeast Regional Chapter and has moderated sessions and presented at several NASTT No-Dig Show conferences.

What first inspired you to become interested in construction & engineering field, particularly underground construction?

I actually started out at about 10 years old wanting to be a geologist – specifically a “dinosaur doc” out fossil hunting. I kept that aspiration going until my first paleontology class (study of fossils) in college when my professor told me that if I wanted to make decent money in paleontology, I would probably have to forget about dinosaurs and work for an oil company, spending all day looking in a microscope at conodonts and foraminifera (two kinds of tiny creatures used to age date the materials they are deposited in). That was the end of my dream as a paleontologist! Thereafter I kept with geology but drifted towards geomorphology – which is the study of landforms and far more related to the engineering side of the science. So, I finished up my degree in the same field I wanted to study since a young boy – just with a different twist.

My first professional job was with a big Dutch geotechnical firm, and I spent 30 years working there doing site characterization work, onshore and offshore, for geological and geophysical projects around the world. Really a great career, but we would usually complete our studies long before the first brick was laid on a construction project, and I had little understanding of the trenchless industry.

In late 2016 I moved to Brierley Associates – a firm that specializes in underground design, and I began immediately to get interested and involved in the trenchless field. For underground construction, the ability to characterize correctly how the ground behaves is perhaps the single most important part of getting the project built successfully.



BRIERLEY ASSOCIATES

Creating Space Underground

Outline your experience of first being introduced to trenchless technology methods and applications.

My first trenchless projects were focused on HDDs and microtunnels in the southeastern Virginia area. However, at the same time I was working on geological / geotechnical aspects of project design throughout the US and internationally. One of the most interesting projects I worked on as I was getting acquainted with the trenchless industry was actually a tunnel rehabilitation project in Detroit. That project required careful and correct assessment of ground conditions to design a structural rehabilitation solution for tunnels built in the late 1920s to mid 1940s that were already past their design lives but needed to be upgraded to continue for another several decades. Many of the lessons learned from that project on how to study and model the subsurface materials were directly applicable to my future trenchless projects.

How did you first get involved with NASTT? What are some of the goals and initiatives you would like to see NASTT pursue?

My first No Dig show was at National Harbor in Washington DC in 2017, and my first presentation was at Orlando during the Covid era (2021). I have now participated or presented at every show since and a few regional shows as well. With my move from Virginia to Florida a few years ago, I wanted to see what I could do to help the Southeastern Chapter (SESTT) become more active. The folks from NASTT were so helpful and encouraging that I decided to join the Board of SESTT. At this past No Dig show in Providence, I was voted as Chairman of the SESTT, so I am now really involved in working with NASTT to grow the regional chapters. As far as potential initiatives, I would like to see if there is some way that NASTT can work with trenchless contractors to ensure

“I finished up my degree in the same field I wanted to study since a young boy.”

that they are well qualified and experienced for the types of projects they are bidding on. I am not sure if a Certification system is appropriate, but we should try to make sure that the work performed by contractors in the trenchless industry is done by qualified individuals using appropriate equipment and methods. This will result in projects that are safe, environmentally friendly, and having a minimum impact to existing conditions.

What are your thoughts on the current state of the trenchless industry? What areas do you see evolving in STEM education and post-secondary academics?

The number of record-breaking crossings getting built each year is proof of the strong state of advancement in our industry. This includes everything from small diameter pipe to large diameter microtunnels. Trenchless crossings are being successfully installed across longer distances, in more

“I am hugely optimistic for continued innovation within our industry.”

difficult geology, and more accurately, than ever before. The diverse backgrounds of personnel from drillers to engineers to surveyors, materials and equipment providers, are all required to continue to set new bars of excellence. I am hugely optimistic for continued innovation within our industry driving that narrative. STEM education and post-secondary academics have a role to play in these trends towards larger projects and greater complexity. Unfortunately, in North America for many years we seem to struggle to get our brightest young students interested in the STEM fields – that is a big reason so many of the well qualified trenchless professionals working here are expats. Trade schools can also play their part, and a greater emphasis on getting some vocational training for field personnel in the trenchless industry would likely improve performance and decision-making during critical components of projects.

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Is the trenchless industry generally doing a good job of attracting young professionals? What do you think can be done to better engage students and young professionals in the trenchless industry?

As per many others I have talked to in this industry, I think we in the trenchless field struggle to be as glamorous as other areas to recruit outstanding engineering and related students coming out of the university with their respective degrees. However, with the industry breaking new ground and new records nearly monthly, I see a real shift towards a greater emphasis on carefully designed and constructed pipe installations that require well trained and experienced personnel. The days of “winging it” once equipment is set up on site are probably drifting into the past, and that is a good thing.

We will need to continue to engage with the active student chapters that have formed under the NASTT umbrella and try to breathe life into other student chapters that are not so active. For the SESTT, I would like to see us add a new student chapter every couple of years, but just as importantly to grow our relationship with the existing student chapters to be sure we give the students a keen appreciation of the benefits of becoming trenchless professionals.

Biggest challenges facing the trenchless industry today? Has acceptance and understanding of trenchless technology improved?

We are seeing a lot of HDD Contractors who are stretching their experience, performing longer and more complicated, and riskier, crossings. And that is fine, as long as their standard of care is to acceptable industry standards, and they are progressively taking on greater challenges so that their personnel are consistently growing their expertise. Further, the lack of a good quality geotechnical / geological characterization of these riskier crossings is a concern – it is important to have a good understanding of ground conditions

“Its important to have a good understanding of ground conditions during the early design phases.”

during the early design phases so that the best trenchless methods are designed and implemented for the projects. However, we occasionally see firms that have little or no comparable experience trying to attempt these for the first time without the proper equipment or personnel experience. It is important that contractors are previously familiar with the particular pipe types, crossing distances or depths, and complicated methodologies like the intersect method. When these issues of lack of experience or good field practices combine to result in a failed crossing attempt, it can set back our industry. These failures can be costly to both Owner and Contractor, and make Owners more reluctant to use trenchless technologies going forward. So, all of us in the industry need to be sure we are keeping up with the latest methods, equipment, and training opportunities.

What do you personally enjoy most about working in the trenchless technology field?

For me the relative importance of properly characterizing the ground conditions for trenchless projects is obvious to nearly everyone in this industry. That means my efforts to justify a well prepared and implemented site investigation are understood and accepted by most Owners and contractors alike. I also like the opportunity to travel around to different areas of the country to work on trenchless projects. So, you can expect me to continue to be an advocate for the trenchless industry. And I look forward to attending future No Dig shows and continuing to support the NASTT.

The graphic features logos for HDPE Municipal Advisory Board and PPI (Plastics Pipe Institute) at the top. The main text reads "Your Video Library Resource" and "HDPE Installation Reports from the Field". A QR code is provided with the text "Find out more:" next to it. The background shows a close-up of large black pipes.



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Optimizing Aurora Water's CIP Program for Improved Use of Trenchless Construction

By: Andrea Long and Swirvine Nyirenda, Aurora Water



Maintaining over 1,200 miles of sanitary sewer system that ranges in size from six to 48 inches takes teamwork. Incorporating input from its operators, engineers, and the finance team, Aurora Water team members work together to develop a rehabilitation program for its assets. Aurora Water uses asset management principles to drive financial planning, prioritize repairs, and allocate funding based on the condition of their assets.

For the linear wastewater assets, the procedure generally follows an Inspect-Evaluate-Prioritize-Rehabilitate strategy. The first step, Inspect, involves their operation staff, whose responsibility, among many other things, is to use closed-circuit television (CCTV) to record and code the condition of the pipelines using the National Association of Sewer Service Companies Pipeline Assessment Certification (NASSCO PACP) coding system. The recordings and codes are tracked in their GraniteNet system, which currently includes over 75,000 CCTV surveys.

Historically, steps two, three, and four (Evaluate, Prioritize, and Rehabilitate) were performed manually by Aurora's principal engineer. Operations would notify the principal if anything was out of the ordinary during their initial CCTV recordings and the principal would review the other CCTV recordings to create lists to prioritize the issues. The rehabilitation methods

varied from digging and replacing the line, or a portion of it, to cured-in-place pipe (CIPP) solutions. This approach was very time-consuming for both the operations staff and the principal engineer. It also lent itself to increased human error, or assets getting "lost in the mix".

To help automate this process and reduce staff's evaluating time, through a series of internal workshops, Aurora engineering staff developed a decision tree based on the pipelines PACP codes. The decision tree was broken out into four categories which cover the majority of the available PACP codes: Major, Minor, Continuous, and Special Defects. Depending on the types of defect codes entered and/or their frequency, the logic created would help dictate what types of rehabilitation (if any) were needed. Figure 1 shows a general review of the recommended rehabilitation for each defect category. Outcomes of "Reinspect 5 years" and "Reinspect 10 years" are also potential results but were removed from the figure for clarity.

As Table 1 below shows the eight rehabilitation approaches the decision tree would populate along with how many assets were in that approach based on the decision tree logic. Figure 2 shows the pie chart of the initial analysis for a visual perspective.

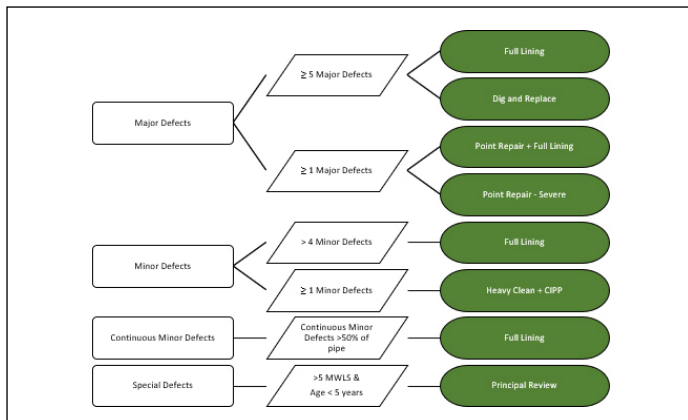


Figure 1: Initial Decision Tree Logic (Simplified)

Table 1: Decision Tree Logic Results

Rehab Approach	# of assets
Reinspect in 10 years	42,174
Reinspect in 5 years	788
Dig and Replace	24
Full CIPP Lining	702
Heavy Cleaning and CIPP	54
Point Repair and CIPP Lining	104
Point Repair Severe	741
Principal Engineer Review	14,601

“Design is underway on the pipelines that were identified as critical.”

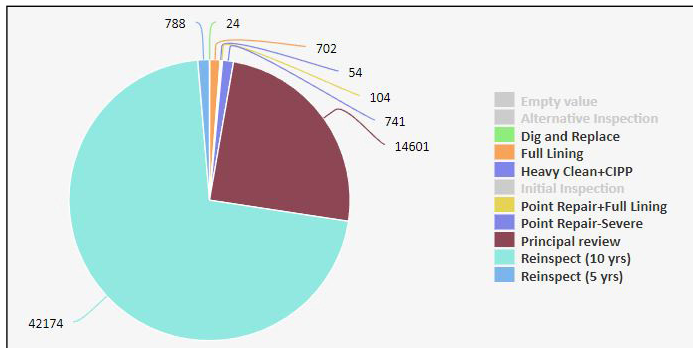


Figure 2: Initial Decision Tree Results

Based on the initial analysis, 72 percent of the City’s pipelines were classified as ‘Reinspect in 5 years’ or ‘Reinspect in 10 years’. A small percentage (less than 0.5 percent) required immediate attention or a ‘Dig and Replace’ approach. Despite the coding efforts aimed at automating the decision-making process, nearly 25 percent (or over 14,600) assets still required

‘Principal Review’. The meant the principal engineer would still be required to review the CCTV data and PACP codes to decide what rehabilitation, if any, were needed. While this approach required the review of fewer videos than in years past, it remained challenging for staff to manage alongside their other responsibilities.

Aurora hired Tetra Tech to find ways to improve the existing logic and minimize the number of pipelines that required ‘Principal Review’. Tetra Tech was also asked to spot-check the videos in the ‘Dig and Replace’ and ‘Point Repair’ categories to confirm the decision tree logic approach was adequate for managing the assets and data.

Tetra Tech’s review showed the majority of PACP code that resulted in ‘Principal Review’ was ‘Miscellaneous Water Level Sag’. The existing decision tree logic included a check for ‘sags’ at the beginning of the analysis. Sags in pipelines is the deflection of the pipe between supported ends, resulting in a dip in the bottom of the pipe that can eventually lead to problems with the pipe integrity and other problems. If there are greater than five sags for pipes less than five years old, the logic recommends ‘Principal Review’. However, if there are only one to four sags, or the pipe is older than five years, the logic recommends ‘Re-inspection’. Including this logic at the beginning of the decision tree resulted in pipes with any

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Morty's Trenchless Academy

number of sags not being checked for other defects that may have resulted in a different rehabilitation outcome.

Tetra Tech recommended updating the logic for sags and moving the Principal Review outcome to a last-step check before rehabilitation recommendations. Under the updated logic, only sags greater than or equal to 40 percent on pipes less than five years old, or a sag greater than or equal to 80 percent on any pipe, would result in a 'Principal Review' outcome. By categorizing sags in pipes by their size instead of the total quantity, these pipelines will continue through the decision tree to a rehabilitation/replacement outcome, alleviating most of the pipes in the 'Principal Review' category. Utilizing 40 percent or more as the criteria for a 'Principal Review' (even without considering age) will lead to a 90 percent reduction in the total number of inspections in that category, reducing from 14,137 to 1,471. Tetra Tech also recommended further refining the 'Principal Review' category into the following sub-categories:

- Principal Review | Major Defect
- Principal Review | Minor Defect
- Principal Review | Continuous Minor Defect
- Principal Review | Sags Only

This refinement will allow staff to focus their efforts on reviewing the pipelines in a more manageable 'Principal Review' category. Aurora Water is currently working on implementing the decision tree recommendations from Tetra Tech into their GraniteNet system. They are also focusing their efforts on the pipelines that were in the highest need of rehabilitation. Design is underway on the pipelines that were identified as critical and in highest need of repair and include a mix of digging and replacing the lines to CIPP. Aurora's principal engineer is also

evaluating future years' budgets to address the pipelines in need of point repairs and lining.

Special thanks to Shiva Sapkota for his help during the creation and implementation of the decision tree and to Dan Phipps with Tetra Tech for all his team's help with the review of the CCTV videos and decision tree logic.



Andrea Long has a Bachelor of Science in Civil Engineering from Rose-Hulman Institute of Technology. Currently she is the Principal Engineer on Aurora Water's Project Delivery Services team where she manages the stormwater and wastewater capital project programs. She has been with the City of Aurora for over seven years and is actively involved in RMWEA's Collection

Systems Committee, RMNASTT, and NASTT. Outside of work she enjoys mountain biking and camping with her family.



Swirvine Nyirenda has a Bachelor of Engineering (Mechanical) from the University of Zambia and a Master of Science in Engineering (Environmental) from Tulane University. Currently, he is the Project Delivery Services Manager in the Planning & Engineering Division of Aurora Water. The project delivery services team executes an annual CIP program

of approximately \$150M. Swirvine has been with the City for over 15 years. Outside of work Swirvine enjoys watching soccer, primarily the English Premier League.



NASTT

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No-Dig North is owned by the North American Society of Trenchless Technology (NASTT). For more information about NASTT or other NASTT events, please visit nastt.org.



NASTT REGIONAL CHAPTERS

Regional Issues, International Support

Contact Your Regional Chapter Today.



The grassroots of NASTT is a network of 12 Regional Chapters throughout the United States, Canada and Mexico. Regional Chapters network at the local level, share infrastructure challenges and develop new ideas. Regional Chapters hold various events throughout the year, and like NASTT, are dedicated to the advancement of trenchless technologies for the benefit of the public and the environment.

With your NASTT membership you are automatically enrolled not only in the national and international organization, but also in your Regional Chapter. So join today and get to know the “local heroes” that are making their communities better places through the innovative engineering solutions of trenchless technologies.

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educate • train • research • publish

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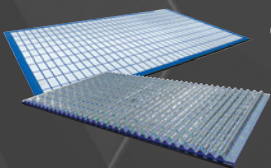


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NASTT 2024 No-Dig Show Sets Sail in Providence!

Helping Protect the Natural Environment: **Green Above, Green Below**

Ocean breezes and spring excitement were in the air as the world's largest trenchless technology conference and trade show sailed into harbor in historic Providence Rhode Island, first time ever in the populous Northeast region. Held April 14 - 18 at the beautiful Rhode Island Convention Center, the NASTT 2024 No-Dig Show showcased numerous environmentally friendly trenchless solutions and cost-saving opportunities that municipalities and utilities can implement to help their communities.

Nearly 2000 attendees, including NASTT Student Chapter members and Municipal Scholarship recipients, enjoyed a busy fast-paced week of fun, networking events and a wealth of information about the latest in innovative trenchless products and services. With six tracks of peer-reviewed, presentations, nearly 200 informative trade exhibits and multiple networking opportunities, the NASTT 2024 No-Dig Show again reinforced its stature as one of the premier must-attend underground construction conferences in North America.

The NASTT 2024 No-Dig Show in Providence demonstrated beyond question that trenchless technology offers both innovative rehabilitation and technically advanced replacement options for communities and utilities looking for cost effective, non-disruptive and greener infrastructure solutions. It displayed the resilience, resourcefulness and innovative foundations of the trenchless industry, and the people who pursue it with a passion.

As the show heads West and preparations begin for the NASTT 2025 No-Dig Show in Denver, CO, March 30 – April 3, the trenchless technology industry remains at the forefront as a key environmental steward offering an impressive toolbox of methods and ideas which help preserve our natural resources. As we head to the Mile-High City of Denver in 2025, we're excited to introduce the theme of "New Heights, Underground".

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"I am always amazed at the positive energy that No-Dig Show builds in creating real opportunities for everyone."

– Matthew Izzard, NASTT Executive Director

Sunday Social – Municipal Attendees, Young Professionals and University Student Members



Each year NASTT Hosts a welcoming reception as a pre-conference warmup on Sunday for all Municipal Scholarship recipients, young trenchless professionals, and NASTT Student Chapter members

Opening Breakfast & NASTT Awards



Monday morning commenced with the Opening Breakfast which featured peer networking, awards, a full breakfast and light-hearted entertainment setting an upbeat tone for the coming week!



Craig Vandaele, Vice President - Trenchless Preconstruction Services, Michels Corporation (left) receives the 2024 NASTT Volunteer Award from Matthew Izzard, NASTT Executive Director (right)



“Trenchless Technology” magazine 2024 Person of the Year: Craig Vandaele, Vice President - Trenchless Preconstruction Services, Michels Corporation (left) with 2024 NASTT Ralston Young Trenchless Achievement Award winner, Tucker Toelke, Michels Corporation (right)



Tiffanie Mendez, Sunbelt Rentals, NASTT Board of Directors Officer-at-Large (left) presents the 2024 NASTT Michael E. Argent Memorial Scholarships to six worthy recipients (from left to right) Katya Opel, Louisiana Tech University; Jonathan Matymish, Queen's University; Gabriel Lipe, Louisiana Tech University; Malinalli Juárez Moya, UNAM School of Engineering; Nohemi Juárez Hernández, UNAM School of Engineering; and Tieren Adams, University of Massachusetts at Lowell.



Attendees were treated to a wild ride from Opening Breakfast entertainment comedian Dana Daniels and his psychic parrot, Luigi! The crowd roared with laughter throughout his act and left the breakfast feeling energized and ready to take on the week of learning and networking with gusto!

Ribbon Cutting & Exhibit Hall



The annual ceremonial ribbon cutting opened the exhibit hall and welcomed sponsors, exhibitors, attendees and guests to the NASTT No-Dig Show! L-R: NASTT No-Dig Show Technical Program Committee Co-Chair, Chris Knott (BTrenchless); NASTT No-Dig Show Technical Program Committee Co-Chair, Andrew Sparks (Integrated Trenchless Engineering) NASTT 2024 No-Dig Show Planning Committee Chair, Babs Marquis (Delve Underground); NASTT Board Chair, Matthew Wallin (Bennett Trenchless Engineers); and NASTT Executive Director, Matthew Izzard (NASTT)



NASTT Chair Matthew Wallin welcomed delegates to the ceremonial ribbon cutting opening the 2024 NASTT No-Dig Show Exhibition



Conference delegates eagerly awaited the opening of the 2024 Exhibit Hall



Student Trenchless Research Competition competition was another great success. Winning entries flanked by Tiffanie Mendez (Sunbelt Rentals) (left), and Jennifer Glynn (Woodard & Curran, Inc) (right)



Delegates stream into the Exhibit Hall to discover the latest innovations in the trenchless industry.



Networking and education are always top of mind during the NASTT No-Dig Show. The exhibit hall is buzzing with the latest innovations in the trenchless industry with product and equipment demonstrations and lively technical discussions. Exhibitors offer raffles, food and beverages, give-aways and more in their booths for attendees to explore and enjoy

Technical Sessions & Forums



A core feature of the NASTT No-Dig Show is the unparalleled technical schedule which spans six tracks over the course of three days. Over 140 sessions on all aspects of trenchless technology were presented and also included panel forums with industry experts offering topic discussions where audience Q&A and participation is encouraged! Registrants are able to earn Continuing Education Units to support their professional development with their attendance to the technical sessions

Meet Greet Drink & Eat: Networking Reception and Silent Auction



Vermeer sponsors a raffle where ticket-holders are entered for their chance to win \$5,000! All proceeds from ticket sales go to the NASTT Educational Fund.



Crowd favorite, Morty the Tunnel Rat, was on-site as the unofficial mascot of the Educational Fund!



Over 60 trenchless industry organizations donated an item to the Silent Auction (trenchless product/service, jewelry, trips & tickets, electronics & gadgets, collectibles)



There were over 150 Municipal & Public Utility Scholarships and 125 No-Dig Show Student Scholarships awarded in 2024 thanks to generous supporters of the NASTT Educational Fund



The Meet, Greet, Drink & Eat networking reception was the largest event held during the 2024 No-Dig Show and was a great time to unwind and network with industry colleagues



The NASTT Annual Meet Greet Drink & Eat and Silent Auction event helps raise funds for targeted trenchless training and courses to the industry. The Silent Auction also assists with the publication of resource manuals and sponsoring university students' attendance to the NASTT No-Dig Show as well as awarding student scholarships. It was a fun way to unwind and network after an intensive day of Technical Sessions, relaxed and enjoyed by all!

Casino Royale & NASTT Hall of Fame



Long time NASTT member, trenchless advocate and recognized expert on geotechnical engineering and trenchless methods, Brian Dorwart, PE, PG, Trenchless Specialist with Brierley Associates, was honored with an induction in to the NASTT Hall of Fame. Shown here receiving his award from NASTT Executive Director Matthew Izzard



Brian Dorwart, PE, PG, with Dana, his wife of 45 years, receiving the honorary NASTT Hall of Fame pin from Matthew Izzard, NASTT Executive Director



A job well done! NASTT 2024 No-Dig Show Planning Committee Chair, Babs Marquis, flanked by Matthew Izzard, NASTT Executive Director (left) and NASTT Board Chair, Matthew Wallin (right). Babs Marquis (Delve Underground) receives the 2024 Chair Award for Distinguished Service from Matthew Wallin, NASTT Chair



For the second year running, Casino Royale was a festive celebration, networking event and good time had by all!

NASTT 2024 No-Dig Show



Casino Royale attendees dressed to impress for a festive evening including cocktails, delicious hors d'oeuvres, socializing, laughter and networking with industry friends and colleagues - roll the dice and make a sure bet with the No-Dig Show!

Innovation Trends in the Trenchless Industry

By Cindy L. Preuss, P.E., CDM Smith Water Conveyance Discipline Leader and Matthew Izzard, NASTT Executive Director



The Abbott Innovative Product Award, awarded annually by the North American Society for Trenchless Technology (NASTT), celebrates state-of-the-art products or services making a significant impact in advancing the trenchless industry. The award is named for the late Joseph L. Abbott, Jr., an active NASTT member since its founding in 1990 and a champion of innovation. Submissions are judged in four categories:

- INNOVATION (concept, method, development)
- VALUE (need, advantages, cost)
- COMPETITIVE POSITION (pricing, quality, market share)
- IMPACT (sustainability, social/environmental responsibility and potential)

Awarded annually since 1999, finalists present their new technology at the prestigious opening technical forum of the NASTT No-Dig Show, led by Cindy Preuss and Matthew Izzard since 2019. Winners are announced at the ribbon cutting ceremony that opens the door to the exhibit hall where their product or service is showcased.

“It is a great privilege to get the inside scoop on the best new trenchless technologies and applications at the Forum,” said Izzard. “The quality of submissions and presentations makes for a keenly contested award and introduces many now mainstream trenchless technology applications. It is rewarding to see the growth of manufacturers and suppliers as engineers, contractors and engaged owners adopt these new technologies.”

Participating as the Chair of the Innovative Product Awards selection since 2019 has been a favored highlight of Preuss’

“The Innovative Product Awards and the showcasing of the finalists at the No-Dig Show, serve to advance and broadly promote innovations within the industry.”

– Cindy Preuss, Chair, Innovative Products Awards Selection

“The quality of submissions and presentations makes for a keenly contested award.”

– Matthew Izzard, NASTT Executive Director

No-Dig Show experience and career. “The Innovative Product Award program is an outstanding vehicle to draw attention to the latest industry needs, trends and the dynamic companies developing and producing these advancements.”

“Covering both pipe rehabilitation and new installations,” she continued, “the Innovative Product Awards and the showcasing of the finalists at the No-Dig Show, serve to advance and broadly promote innovations within the industry.”

Innovation Trends in the Industry

In recent years, the committee has seen a marked shift in the type of applications submitted for this prestigious recognition. Products are trending away from major raw technological advancements (brand new technologies) to more application-based advancements (e.g., greater sensitivity with acoustic-based inspection tools). We see this shift as being born out of necessity, in the following ways:

- **Sophistication:** We are pushing the envelope with larger and/or more challenging installations. This leads to a concerted effort to improve the equipment and tooling already in use (e.g., better steering capabilities for an HDD rig). Innovation building on innovation.
- **Market need:** Utility owners and engineers are looking for better ways to understand the performance of their infrastructure and the unseen conditions. The industry is answering the call by expanding applications of existing equipment and developing multi-inspection tools and technologies that allow assessments of different pipe materials.
- **Pivoting from mishaps:** Innovation is often driven through overcoming adversity. Failure to employ various trenchless tools and equipment on more challenging projects drives the development of multi-purpose tooling or hybrid equipment and

Abbott Award for Innovative Products & Services

technologies (e.g. the direct pipe method). These innovations have resulted in expanded capabilities for tackling complex site constraints, longer/larger installations, and/or tricky geotechnical substrate.

- **Work surplus:** As more infrastructure improvement projects are being initiated, the productivity surrounding construction execution is critical to maximize the amount of work that can be done. This can include expanding the capabilities

(associated with lengths and diameters, for example) around assessing and rehabilitating existing pipelines as well as installing new pipelines.

NASTT and the underground utility infrastructure industry continue to be encouraged and excited to see the new opportunities created by innovations and the teams furthering the trenchless industry with passion and creativity.

2024 Abbott Innovative Product & Services Award

The 2024 Abbott Innovative Product & Services Award winner was announced at the NASTT 2024 No-Dig Show in Providence, Rhode Island. The Abbott Innovative Product & Services Award celebrates companies with a state-of-the-art product or service making a significant impact in advancing the trenchless industry.



NASTT Abbott Award - Rehabilitation



Andrew Marshall, Sales Manager, BRAWO Systems accepts the 2024 Abbott Innovative Product & Services Award from Cindy Preuss, NASTT Innovative Products Selection Committee Chair, and Matthew Izzard, NASTT Executive Director



Andrew Marshall, Sales Manager, BRAWO Systems discussed the enormous advantages of the BRAWO Magnavity SX light curing system in trenchless pipe rehabilitation

The award was given to **BRAWO® SYSTEMS** for its **BRAWO Magnavity SX**. The light curing system consists of an intelligent LED head with 96/192 high-performance UV LEDs, a 60-meter-long combination hose with integrated power and compressed air supply, a retraction unit and a control box. Operation is made even more convenient by the larger

10-inch touchscreen panel. “The technology of the **BRAWO Magnavity SX** offers enormous advantages in the field of trenchless pipe rehabilitation,” explained Andrew Marshall Brawo Systems Sales Manager at the Innovative Products Forum at the 2024 No-Dig Show. Visit BRAWO Systems at www.brawosystems-usa.com/.

2025 Award Window to Open in September

Visit www.nastt.org/awards for details about applying for the 2025 Abbott Innovative Product & Services Award. Contact membership@nastt.org for more information or to join NASTT.

Abbott Award for Innovative Products & Services

AWARD FINALISTS

NASTT also honors the following three companies whose innovative products were finalists:



Hobas Pipe USA
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www.hobaspipe.com

This new high pressure water or wastewater rehabilitation option offers up to 450 psi design pressure class. It is unique as no other pipes other than steel have this pressure class to offer. FRP pipes are installed 2 to 3 times faster than rolled and welded steel plate option, and do not require mortar lining, joint covering or outside coating for corrosion resistance. FRP offers a 150-year design life, 3X the steel alternatives reducing the life cycle costs. This reduces the future infrastructure repair and replacement costs and offers the greenest pipe lining option today.



PICA Corp.
Navigator
www.picacorp.com

PICA created an autonomous inspection device with the end user in mind. The device uses a super-sensitive ultrasonic crystal to detect acoustic anomalies that could be leaks or gas pockets, a magnetometer to detect metallic features along a non-metallic pipe, and a pressure sensor to identify variations in pressure that could be detrimental to the pipeline. The design of our device allows the user to upload the information as soon as an internet connection is available, which allows our data analyst to provide a preliminary analysis often within hours of the successful field operations.



Pipe Trekker Inc.
A-150 Pipe Crawler
www.pipetrekker.com

The A-150 crawler is ideal for conducting inspections in pipelines with smaller diameters, with a camera head centering in 6 to 24 inches (150-600mm). Built rugged, with industrial-grade anodized aluminum and stainless steel construction, and a sapphire camera lens cover, this crawler is engineered to withstand the harshest environments. With a 50m (164-foot) depth rating, 305M (1000-foot) depth rating, full HD camera with 360 degree pan and 280 degree tilt range of view. The A-150 is capable of quick and easy recordings to full NASSCO compliant PACP reporting with GIS integrations.



Product overview presentations of the winner and finalists are available in the NASTT Trenchless Knowledge Hub. Click the Knowledge Hub button at www.nastt.org.



THE NASTT 2025 NO-DIG SHOW MUNICIPAL & PUBLIC UTILITY Scholarship Program

The NASTT No-Dig Show Municipal & Public Utility Scholarship Award has been established to **provide education and training** for North American municipalities, government agencies and utility owners who have limited or no travel funds due to restricted budgets.

Selected applicants will be awarded **complimentary full conference registration** to the NASTT 2025 No-Dig Show in Denver, CO, March 30 - April 3, 2025. One day conference registrations will also be available. Registration includes **full access to all exhibits and technical paper sessions...** all you have to do is get yourself to the conference! Selected applicants will also be eligible to receive **overnight accommodations**. Selection based on responses to the application as well as need.

APPLY TODAY! Application deadline is November 1, 2024.



NETWORKING EVENTS | EXHIBIT HALL | TECHNICAL SESSIONS

Visit nastt.org to learn more



The No-Dig Show is owned by the North American Society for Trenchless Technology (NASTT), a not-for-profit educational and technical society established in 1990 to promote trenchless technology for the public benefit. For more information about NASTT, visit our website at nastt.org.

NASTT 2024 No-Dig Show Scholarships Provided to Municipal & Public Utilities



Municipal and public utility scholarships covered registration and accommodations costs for over 150 delegates attending the 2024 No-Dig Show, April 14 – 18 in Providence, Rhode Island!

In 2013, NASTT established the No-Dig Show Municipal & Public Utility Scholarship Award Program to provide education and training for employees of North American municipalities, government agencies and utility owners who have limited or no training funds due to economic challenges. At least 100 applicants are awarded the scholarship annually, with a total of over 2,000 scholarships since the inception of the program.

Who Do You Want to Meet at future NASTT No-Dig Shows?

Doing business with municipal agencies and public utilities is crucial to the trenchless industry. NASTT's Municipal & Public Utility Scholarship brings hundreds of decision-maker agency representatives in-person to the No-Dig Show. Nearly 2,000 delegates are onsite each year looking for solutions to their infrastructure challenges that you can provide.

Make plans to join us to secure these future customers! Mark your calendars for next year at the Colorado Convention Center in Denver, March 30 - April 3, 2025.

“The show provided many opportunities to network with contractors, consultants, and decision makers within municipalities and utilities across the United States and Canada.”

– Joseph Barnes, Johnson County Wastewater

“I found the sessions interesting and gained a lot of useful information to bring back to my community. I had such a narrow view of Trenchless Technology before the show, and now see it in a clearer fashion and in a larger light. The exhibits were interesting and I found many products or ideas that directly related to what I deal with on a day to day basis.”

– Matt Overeem, Village of Wilmette



Each year NASTT hosts a reception for the Municipal Scholarship recipients to network with each other and kick off the conference

NASTT 2024 NO-DIG SHOW MUNICIPAL & PUBLIC UTILITY SPONSORSHIPS

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 WSSC Water
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an elite community of
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Career Advancement Doors Opened!

“ Because of NASTT, I have a pretty stacked tool belt that helps me bring innovative approaches to infrastructure concerns. My experiences with trenchless technologies gives me a ‘leg-up’ over others. ”

~ Eric Schuler, PE, Onondaga County Department Water Environment Protection



Education Second to None

“ NASTT is far and away the leading educator and networking pool in the trenchless industry. If your company plays a part in the trenchless industry, you will benefit from NASTT membership much more than you realize. ”

~ Joe Lane, Aegion Corp.



Tops at Staying on Top of the Industry

“ I first joined NASTT to stay current on technological developments, best practices and market trends. Participating in NASTT committees and events and accessing its expert mentors and professionals is essential to the success of almost any project. ”

~ Marya Jetten, Jacobs Engineering Group



Amazing Network

“ NASTT has been the most significant vehicle relative to the industry-specific connections I've made and cultivated throughout my career. ”

~ Cindy Preuss, PE, CDM Smith



Membership Helps Me Strut My Stuff

“ I would not be doing what I love to do without the presence and impact of NASTT. I wanted the industry to know about a record HDD project and NASTT gave me the access and opportunity to tell to the industry. ”

~ Jim Murphy, UniversalPegasus International



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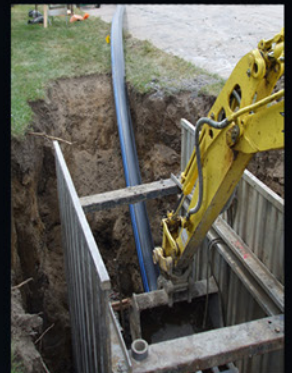
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ARA's US & Canada Second Quarter Economic Forecast Released

Rental industry's growth projection increased since last quarter

In its updated forecast, the American Rental Association (ARA) indicates that the United States equipment rental industry's growth projection has increased since last quarter. The most current projections indicate 9.7 percent increase in 2024 totaling \$79.2 billion in construction and general tool rental revenue. This is an increase from last quarter's projection of a 7.9 percent increase totaling \$77.3 billion.

"The 2024 ARA forecast through the lens of our exclusive rental revenue model, and survey results gathered from members, confirms the continuation of a growing rental industry," states Tom Doyle, ARA vice president program development.

"There has been no serious bust, thus, there is no serious boom," says Scott Hazelton, managing director at S&P Global. "The outlook remains steady and inflation is falling. The growth rates tail off in the future years, with growth of 3.8 percent in 2025 and 3.1 percent in 2026."

Jeff Vance, senior vice president of operations services, Sunstate Equipment Co., adds, "Our forecasts are in line with S&P's as well. We did see a softer winter and spring than we typically see, with used equipment prices softening substantially as well but we are seeing single digit growth in 2024."

Vance also says that supply chain issues have loosened, making it easier to get fleet and parts. In addition, he mentions new vendors have been introduced into the marketplace with new technology, especially in the electric and battery-operated space.

"We're doing a lot of investigation into electrification," he says. "The power grid is always a topic in our minds. But, more electrification is coming, so we must be prepared to service our customers in those ways."

The updated forecast for total Canadian equipment rental revenue shows a 7.2 percent growth this year, totaling \$5.79 billion. Broken down by segment, general tool and construction and industrial equipment (CIE) are both expected to see growth.

Canadian general tool revenue this year is projected to be 6.8 percent, \$1.08 billion, up from last quarter's projection of \$954 million. Canadian CIE revenue is projected to be \$4.71 billion. Darryl Cooper, president, Cooper Equipment Rentals, says, "Our experience mirrors what ARA is reporting. Despite headwinds in the residential market, revenues are up, with western Canada stronger than eastern Canada."

General tool revenue is projected to increase 9.7 percent this year to \$16.6 billion and investment is expected to expand in 2024 and beyond. This year, investment in general tool is projected to increase 7.3 percent with growth into 2025 at 7.9 percent and into 2026 at 6.4 percent.

"Our housing market is still being stubborn, so we see a 9.7 percent growth in 2024, an 8.8 percent increase in revenue growth in 2025," says Hazelton. "Investment in general tool is higher than CIE, due to a faster replacement rate."

What's driving this forecast? Congress suspended the debt ceiling through 2024. The Federal Reserve will not be cutting rates until December. Rate cuts being deferred to December does not affect 2024, but weakens 2025's growth.

The residential fixed investment is up modestly this year after two years of double digit declines, this is important as it indicates housing starts, home improvements, and more.

An important development in this month's forecast is the inclusion over recent history and in the forecast of faster immigration growth into the US. This raises the projection of the resident population by roughly 7 million by the end of this decade, raising our projections of



both labor supply and aggregate demand. Over the next couple of years, S&P projects the added demand will roughly match the added supply, implying faster near-term growth and roughly the same (rising) unemployment path as in last month's forecast.

For more in-depth economic data, visit www.ARArental.org/ara-rentalytics, to learn more about Rentalytics™.

About ARA: (www.ARArental.org) The American Rental Association, Moline, Ill., is an international trade association

for owners of equipment and event rental businesses and the manufacturers and suppliers of construction/ industrial, general tool, and event rental equipment. ARA members, which include more than 12,000 rental businesses and more than 1,000 manufacturers and suppliers, are located in every U.S. state, every Canadian province, and more than 40 countries worldwide. Founded in 1955, ARA is the source for information, advocacy, education, networking, and marketplace opportunities for the equipment and event rental industry throughout the world.



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Tri-Loc: The Premier Mechanical Press-fit Connection for Pipe

Trinity Products is a leading manufacturer of spiralweld pipes, proudly made in the USA and fabricated at facilities across the country. Trinity has redefined the pipe industry with the introduction of the innovative Tri-Loc mechanical press-fit connection. Tri-Loc has been in production for over five years and has proven to be a highly reliable and cost-effective method for pipe installation. Not only does Tri-Loc simplify installation, but it also significantly enhances job site efficiency, contributing to streamlined operations and superior project outcomes.

During its extensive testing phase, Tri-Loc not only met but exceeded our expectations. It demonstrated an exceptional ability to withstand the jacking forces required during sustained tunneling. Tri-Loc is available in both 3- and 4-tooth design profiles, ensuring a tight and secure fit, making it suitable for a wide range of applications. Its precision is a testament to its reliability, providing you with the reassurance you need for your projects.

To enhance the Tri-Loc manufacturing process, Trinity has invested \$9 million in a state-of-the-art Horizontal Boring Mill (HBM). This facility has revolutionized the manufacturing process by enabling us to machine the Tri-Loc connections directly into the pipe. This results in a superior product with numerous benefits:

1) **Precision:** The Horizontal Boring Machine (HBM) creates highly precise and accurate joints with the most stringent tolerances in the industry. Customers receive a certificate of compliance for all critical measurements, ensuring that the product is manufactured to precise specifications and instilling confidence in its ability to handle the challenges of trenchless applications.



- 2) **Consistency:** The Tri-Loc pipes are manufactured in-house, allowing our expert team to have complete control over the manufacturing process. This reduces variability and ensures that our high-quality standards consistently deliver reliable results for the end user. It guarantees dependable and repeatable performance, even in the most challenging project conditions.
- 3) **Efficiency:** Our vertically integrated manufacturing process gives Trinity Products unparalleled control over lead times, allowing greater availability and reducing overall production time by 50 percent.

At Trinity, we prioritize innovation and are dedicated to the future of Tri-Loc. Our employee-owners are committed to ensuring that our product remains at the forefront of the industry through continuous improvement and optimization. We are confident that Tri-Loc's superior quality and cost-effectiveness make it the premier solution for a variety of projects. If you are interested in learning how Tri-Loc can improve quality and reduce costs on your next project, please connect with our team today.



Signaling a New Era in Water Infrastructure Solutions

Aegion Rebrands as Azuria Water Solutions

Aegion Corporation, a leading provider of pipeline rehabilitation and water solutions, has announced its official rebrand to Azuria™ Water Solutions. This significant change reflects the company's strategic focus on delivering technology-enabled solutions for the water infrastructure market.

"Azuria Water Solutions marks a new chapter for our company, and I am proud of our teams' momentum during this transformation," said Rob Tullman, CEO of Azuria Water Solutions. "Over the last three years, the company has divested unrelated businesses, acquired 12 companies with industry leading talent and services, and has partnered with cutting-edge technologists. This rebrand underscores our focus on water as well as our commitment to addressing the evolving needs of our customers and the critical challenges facing water infrastructure."

The new Azuria Water Solutions brand embodies the company's dedication to:

- **Innovation:** Azuria Water Solutions is committed to developing cutting-edge technologies that improve the efficiency, longevity, and sustainability of water infrastructure.
- **Sustainability:** The company recognizes the importance of water conservation and is focused on solutions that minimize environmental impact.
- **Customers:** Azuria Water Solutions delivers exceptional customer service and builds strong partnerships with its clients.

The rebrand includes a new logo and visual identity for the company and its operating divisions, reflecting a commitment to a fresh, modern approach to water infrastructure solutions.

Now unified with refreshed branding, Azuria portfolio companies include Insituform Technologies®, Corpro®, Underground Solutions®, MTC®, Environmental Techniques®, Insituform® Linings UK, EN-TECH Infrastructure, C&L Water Solutions, Culy Inc, and Portland Utilities (PUCC).

For more information, visit www.azuria.com.





Auger Boring Goes Automatic

New Driveline Offers Efficiency, Precision and Reliability

Auger boring, a trenchless method for installing underground pipelines, revolutionized the construction industry from the 1950s well into the 1990s with minimal technological changes. Auger boring minimizes surface disruption and reduces environmental impact. While the auger boring method has changed regarding the size and scope of projects, the basic components of the drive line remain the same: a diesel engine to a manual transmission coupled to a planetary gearbox. Michael Byrne Manufacturing worked extensively with product development teams from Allison Transmission and John Deere to develop a new drive line integrating an Allison automatic transmission with John Deere power pack. The Byrne B-Series planetary gearbox continues to be the only gearbox designed specifically for the auger boring application.

The addition of the Allison transmission contributes efficiency, precision, and reliability. Allison Transmission is a global leader in propulsion solutions renowned for its robust and efficient transmissions designed for various heavy-duty applications. In the context of auger boring machines, Allison Transmission provides several key advantages:

1. **Power and Torque Management:** Auger boring machines require significant power and torque to drive the auger and overcome soil resistance. Allison transmissions are engineered to efficiently manage and deliver high torque at low speeds, which is essential for effective drilling through different soil conditions without stalling.
2. **Smooth Operation:** The seamless gear shifts and precise control of Allison transmissions contribute to smooth and uninterrupted drilling operations. This smooth operation is crucial for maintaining accuracy and preventing damage to the equipment or the pipeline being installed.
3. **Durability and Reliability:** Auger boring operations often occur in challenging environments, including rocky soils or areas with high groundwater levels. Allison transmissions

are built to withstand these conditions, offering durability and reliability that ensure continuous operation with minimal downtime.

4. **Shift on the Fly:** Operators can operate the auger bore machine remotely and shift gears from the remote control. Ability to operate the machine and connect auger with your remote is safer and saves time. Gauges to monitor critical machine functions are available on the remote control.

The new Michael Byrne Mfg D72-1.5 Auger Bore Machine featuring the Allison Transmission drive train was recently in action at a Fredericksburg, VA job site for Ron Merzlak and his team at Rising Sun Inc. The bore had challenging conditions with a very tight area for the launch pit and crossed 455 feet under one of the busiest highways in the country, Interstate 95. The D72-1.5 has raised the bar for industry standards in torque, horsepower, and thrust.

Rising Sun Inc utilized an Akkerman 240A Guided Bore Machine that was powered by the direct connect power pack of Michael Byrne Mfg auger bore machine. The pilot bore was successfully completed in less than two days. Rising Sun Inc found the direct connect power pack to the GBM extremely valuable on this set up due to the tight confines of the launch pit.

The weld on reamer method of opening the pilot bore to the 42-inch casing diameter was chosen by Rising Sun Inc after evaluating the soils on both sides of the bore and feedback from the pilot bore. A 24-inch reamer followed the pilot bore for 10 feet then connected to a 42-inch reamer, the final casing diameter. The bore was completed over the next 10 days as weather and lane closure restrictions resulted in some lost production days.

Ron Merzlak comments on this challenging bore; "We were training a new bore crew and chose to do it on this bore. The crew foreman had never done a bore, this was his first try at it. The MBM 72/1.5 with the Allison automatic transmission and the integrated Akkerman guided bore machine did an outstanding



job on this project. Not only did the MBM machine bore without any hesitation for changing soil conditions but the fact that we were able to use the MBM integrated power pack for the Akkerman GBM system which saved us space in our very limited work area, not to mention the significant cost savings. Our new bore foreman had no difficulty in selecting the correct speed/power setting but only needed to select a general range of power, the Allison transmission with the torque converter selected and operated the system at the correct speed/power for the existing and changing soil conditions. All of this was performed using the remote control which was also part of the MBM bore machine system. The equipment that MBM provided along with the integrated Akkerman GBM we were able to meet our target point for the 452 foot bore, within 2 inches.

“We have always promoted a “Team Work” culture within our company and I must say that Jim Weist and his team demonstrated the same by providing Rising Sun Inc. with outstanding customer support on this project.”

Auger boring with Allison Transmission represents a synergy of advanced engineering and practical application in the construction industry. By enhancing power delivery, ensuring smooth operation, and improving reliability, Allison Transmission will contribute significantly to the success of trenchless installation projects worldwide. As infrastructure demands grow and environmental awareness increases, the partnership between Michael Byrne Mfg auger bore machines and Allison Transmission will play a pivotal role in shaping the future of underground utility installations.

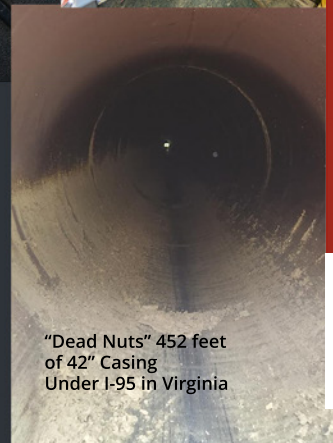
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- Full remote operation, hydraulic and drive train
- Proven performance with heavy-duty Allison transmission
- Gear powered rack drive
- Byrne B-16 gearbox

“The Allison transmission operated exceptionally, enabling our operators to set correct speed/power for the existing changing soil conditions. All of this was performed using the Michael Byrne remote control. The equipment that MBM provided along with the integrated Akkerman GBM we were able to meet our target point for the 452’ bore, within 2”. A truly collaborative effort by all parties involved

Ron Merzlak
Rising Sun, Inc after completing a 452 foot bore



“Dead Nuts” 452 feet of 42” Casing Under I-95 in Virginia



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 April 14-18, 2024

MM-T2-02

New Subaqueous Trenchless Outfall in Long Island, NY – Overcoming Various Challenges to Completion

Hiren Shah, PE, Mueser Rutledge Consulting Engineers (MRCE), New York, New York
 Matthew Thogersen, PE, D&B Engineers and Architects, Woodbury, New York
 Gregory Bosch, Mears Group, Inc., Houston, Texas

1.0 ABSTRACT

The existing 3,300-foot subaqueous Outfall at the Belgrave Wastewater Treatment Plant was 90+ years old. It discharged treated effluent into scenic Little Neck Bay which is surrounded by a residential community. The Outfall had been repaired in 1972 but additional leaks were discovered in 2004 and further damage by 2012 Superstorm Sandy required its replacement to address a NYSDEC Order on Consent. Funding gaps required the District to obtain funding assistance to replace the Outfall.

Trenchless installation of the 30-inch diameter DR9 HDPE outfall pipe by horizontal directional drilling (HDD) and diffuser installation in a marine cofferdam was the selected option. Land and marine geotechnical borings revealed challenging soil conditions. These included a 40-foot thick, soft and highly plastic organic clay stratum, underlain by a sand stratum with greater than 30 percent gravel content that contained cobbles and boulders and less than 30% fines. On land, the organic clay was overlain by miscellaneous fill with construction debris. In order to minimize the risk of inadvertent fluid return, 200-foot long, 54-inch diameter steel casings were required at land and marine end points. Site constraints on the land side placed the HDD end point near existing plant structures requiring vibration and settlement monitoring, especially during casing installation with the percussion hammer. Community noise monitoring program was required due to proximity to residential areas.

Additional project highlights included: pile-supported platform at the marine end point, HDD intersect drilling, a full-time drilling mud Engineer, and HDD land rig with front end lowered below ground level to address limited work space.



NEW SUBAQUEOUS TRENCHLESS OUTFALL IN LONG ISLAND, NY – OVERCOMING VARIOUS CHALLENGES TO COMPLETION

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The presentation of this paper was highly scored by attendees at the 2024 No-Dig Show in Providence RI.

All No-Dig Show technical papers are available for download at www.nastt.org

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2024 No-Dig Paper – New Installations

1.0 ABSTRACT

2. INTRODUCTION

Replacing 3,300-foot subaqueous Outfall at the Belgrave Wastewater Treatment Plant was... It discharged treated effluent into scenic Little Neck Bay which is... by a residential community. The Outfall had been repaired in 1972 but additional... discovered in 2004 and further damage by 2012 Superstorm Sandy required its re... assistance to replace the Outfall.

2.1 PROJECT BACKGROUND

The Belgrave Water Pollution Control District (District) was established in 1928 as a Special District within the Town of North Hempstead in New York. The BWPCD owns and operates a municipal wastewater treatment plant (Plant) located in Nassau County (at the Nassau/Queens border) which serves the Villages of Lake Success, University Gardens, Russell Gardens and part of Great Neck.



Figure 1. Site Location

2.2 PROJECT NEED

The Plant's original Outfall was a 90+ year old, 24-inch diameter, 3,300 linear foot cast-iron pipe. The initial 1,500 LF section of the Outfall from the Plant was supported by timber piles and exposed above the high tide through the tidal wetlands, where it then transitioned at a concrete manhole to the subaqueous portion for 1,800 LF to the terminus point in Little Neck Bay (Figure 2).

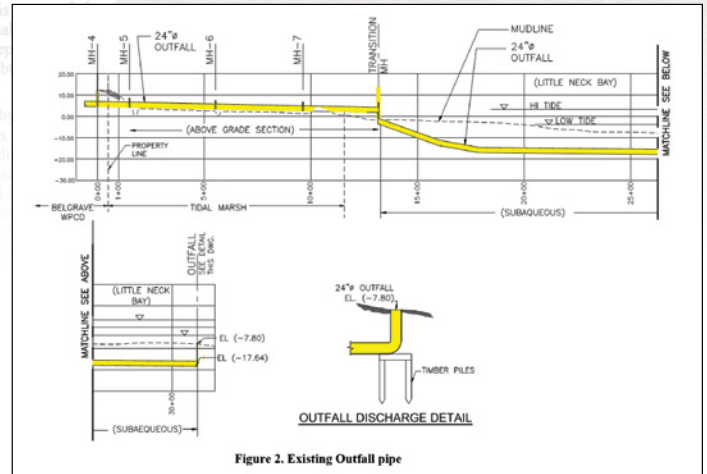


Figure 2. Existing Outfall pipe

The Outfall was repaired in 1972 in the subaqueous section due to a pipe joint failure. The Outfall again began experiencing leaks in the early 2000s resulting from severe storms and was severely damaged by 2012 Superstorm Sandy causing further leakage at the exposed and damaged concrete manholes (Figure 3) and unfavorable hydraulic conditions in the Plant from the storm surge. The New York State Department of Environmental Conservation (NYSDEC) then issued a "Notice of Violation" followed by an "Order on Consent" to the District to replace the existing Outfall with a new Effluent Pump Station and new entirely subaqueous Outfall with an effluent diffuser. A CORMIX model was utilized to calculate effluent dilution at the edge of acute and chronic mixing zones to assist in design of the new Outfall diffuser. The selected diffuser design which consists of an HDPE 30-inch diameter header with six 6-inch diameter diffuser outlets with duck bill valves to cover a range of flow and velocity, and to promote mixing of the receiving waters in the Bay to prevent ammonia toxicity.

Various options for replacement were evaluated. The selected option was replacement by Horizontal Directional Drilling (HDD).



Figure 3. Damage to existing outfall and manholes

2.3 FUNDING CHALLENGES

Due to the District's size and tax base, the undertaking of a large construction project was a significant financial burden on the District. To reduce impact of the project to the District's tax rate, the District pursued multiple State and Federal funding and grant opportunities.

The project was partially funded by three (3) grant sources for this \$25 Million Project, which included the Storm Mitigation Loan Program (SMLP) administered by the NYSEFC, Water Quality Improvement Program (WQIP) administered by the NYSDEC, and the Water Infrastructure Improvement Act (WIIA) administered by the NYSEFC. Additionally, the District needed to undertake a significant bond in order to fund the project.

3.0 TRENCHLESS ALIGNMENT, GEOTECHNICAL INVESTIGATION AND HDD DESIGN

3.1 HDD ALIGNMENT

The HDD method was selected for the construction. The HDD outfall alignment is illustrated in Figure 4. Approximately 50 linear feet of the 3,200 linear feet HDD alignment is located on land and the remaining 3,150 linear feet is outboard of the shoreline. The land endpoint is located within the existing Plant and the marine endpoint is located in Little Neck Bay.

3.2 GEOTECHNICAL INVESTIGATION PROGRAM

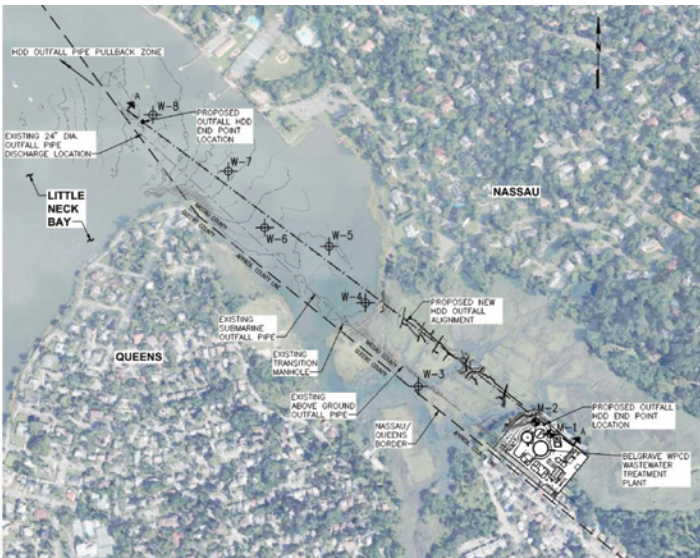


Figure 4. HDD Outfall alignment and geotechnical boring locations

The geotechnical investigation program included 2 land borings and 6 marine borings. The marine borings were about 500 feet apart and were drilled with mud rotary drilling techniques to obtain high quality split spoon samples and undisturbed

tube samples. The land borings were 60 feet in depth and extended to approximately 50 feet below the proposed bore path. The water borings were challenging to perform due to the relatively shallow water depth and marshy ground which required a track drill rig mounted on a small floating barge. The water borings were about 100 feet deep and approximately 20 feet below the proposed bore path. All borings included two-inch diameter split spoon samples with SPT N-Values typically at 5 feet intervals except in gravelly soils, where a three-inch diameter split spoon sampler was used for better sample recovery. Three-inch diameter fixed piston tube samples were obtained in the soft organic marsh deposits and Shelby tube samples in the relatively stiffer silt/clay soils to minimize disturbance during sampling. Field testing on the fine-grained soils included a pocket penetrometer (for compressive strength) and torvane (for shear strength) upon retrieval of the samples from the borehole. All borings were backfilled with tremie cement bentonite grout.

Laboratory tests included: natural water content, atterberg limits, triaxial undrained shear strength, unit weight, fines content and soil gradation tests.

3.3 SUBSURFACE GEOLOGIC PROFILE

The subsurface geologic profile consists of post glacial marine deposits underlain by reworked glacial till impacted by near shore erosional environment. Below these were the Upper Cretaceous age deposits (Magothy Formation) which consist of fine clayey sands, fine sands, silts, clay layers, and also zones of coarse sand and gravel. This challenging stratigraphy is illustrated in Figure 5. Near the land endpoint at the Plant, the surficial soil layer was a miscellaneous fill (Stratum F) about 15 feet thick, placed during Plant construction, which comprised of loose to medium compact sands with trace to some silt and obstructions & voids as evidenced by drill rig chatter and mud loss during the borings. The underlying soil layer below the fill and below the bay mudline (up to about 40 feet thick) was a soft to very soft organic silty clay (marsh deposit Stratum O) with water contents ranging from 40 to 110 percent, plasticity index from 20 to 45 percent and undrained shear strength from 150 to 225 psf (pounds per square foot). In some borings the organic marsh deposits were mixed clay and sands (Stratum OS). Underlying the marsh deposits was a sand layer (Stratum S) consisting of loose to compact fine to coarse sands with trace to some silt and gravel content of up to 35 percent. Occasional cobbles/boulders were present in the sand stratum. Below the sand stratum was a fine-grained stratum (Stratum M) comprising medium stiff to stiff clayey silt to silty clay. The soils of Stratum M had water contents ranging from 20 to 45 percent, plasticity index from 3 to 20 percent and undrained shear strength from 2500 to 6500 psf.

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1.0 ABSTRACT

Subaqueous Outfall at the Belgrade Wastewater Treatment Plant was

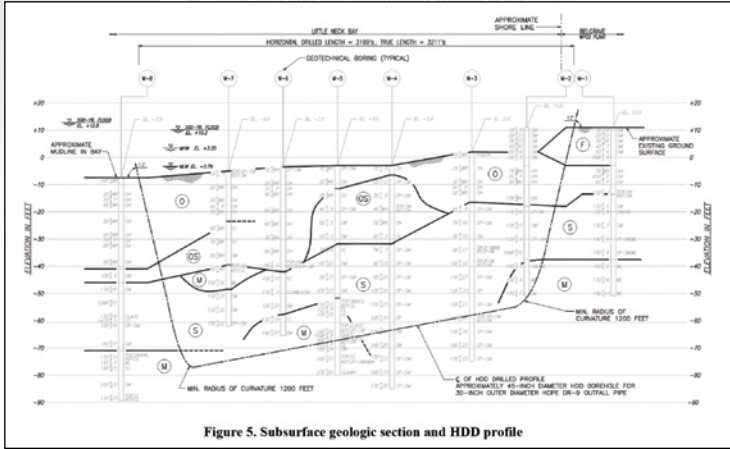


Figure 5. Subsurface geologic section and HDD profile

Figure 5. Subsurface geologic section and HDD profile

3.4 HDD DESIGN

The HDD design was performed by the geotechnical and trenchless engineer (MRCE) engaged by the prime engineer (D&B). Based on the constrained site with existing structures at the Plant and limited available workspace, the location of the land end point was very restrictive (Figure 6). Based on the subsurface geologic profile and soil strata characteristics, it was desired to locate the HDD profile within the favorable Stratum M silts/clays (Figure 5) as much as possible (to minimize the HDD run in Stratum S which contains up to 35 percent gravel, less than 30 percent fines, with cobbles/boulders).

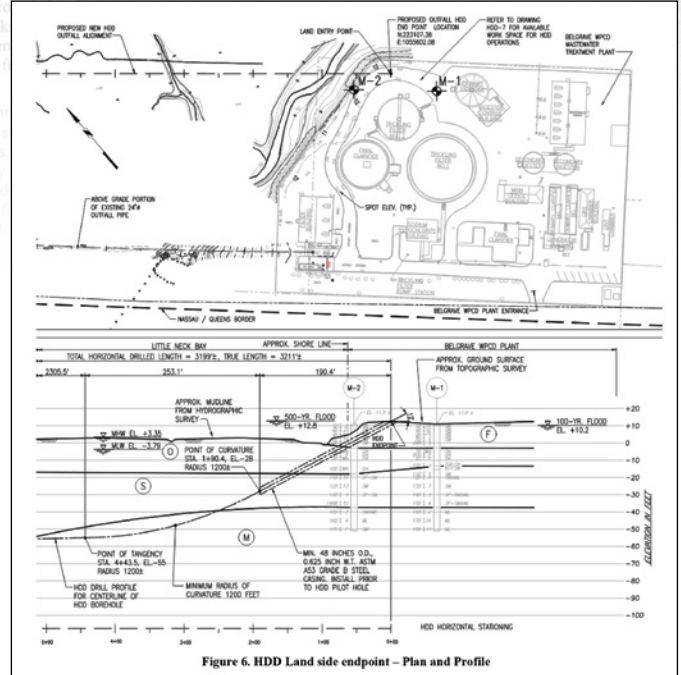


Figure 6. HDD Land side endpoint – Plan and Profile

Figure 6. HDD Land side endpoint – Plan and Profile

Analysis for the risk of inadvertent fluid return for the HDD pilot bore required a 200-foot long conductor casing embedded within Stratum S with an entry angle of 12 degrees.

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HDPE PE 4710 pipe was selected as the product pipe. Pullback analysis for the 3,200 linear foot pipe required a DR9 IPS pipe with an outer diameter of 30 inches. A 48-inch diameter conductor casing would permit an HDD borehole of 42-inch diameter for the 30-inch OD HDPE pipe. An HDD bend radius of 1200 feet in Stratum M was selected in design based on discussions with experienced HDD contractors and based on the contractors planned drill tooling.

Installation of the steel conductor casing at the HDD land end point would typically be performed with a pneumatic impact hammer such as a Grundoram® hammer. The ground vibrations and noise during driving the casing with the hammer were a concern. The nearest existing plant structure (Trickling Filter No. 2 – 60-foot diameter reinforced concrete tank structure) was located about 30 feet from the HDD end point. If the ground vibrations were excessive, the loose sands of Stratum F and Stratum S could potentially densify and cause some settlement of the existing structure. Based on the distance of the structure to the casing installation and MRCE's experience with vibration related densification of such soils, if the ground vibrations at the structure did not exceed 0.5 inch/sec peak particle velocity, the risk of potential settlement of the existing structure was very low (Lacy, H. S. & Gould, J. P. 1985, Shah, H. J. 2021). A vibration and movement monitoring program at the existing plant structures in the vicinity of the HDD land end point was required during the HDD work.

At the marine end, analysis for the risk of inadvertent fluid return required a 215-foot long conductor casing embedded within Stratum S for an entry angle of 12 degrees (Figure 7).

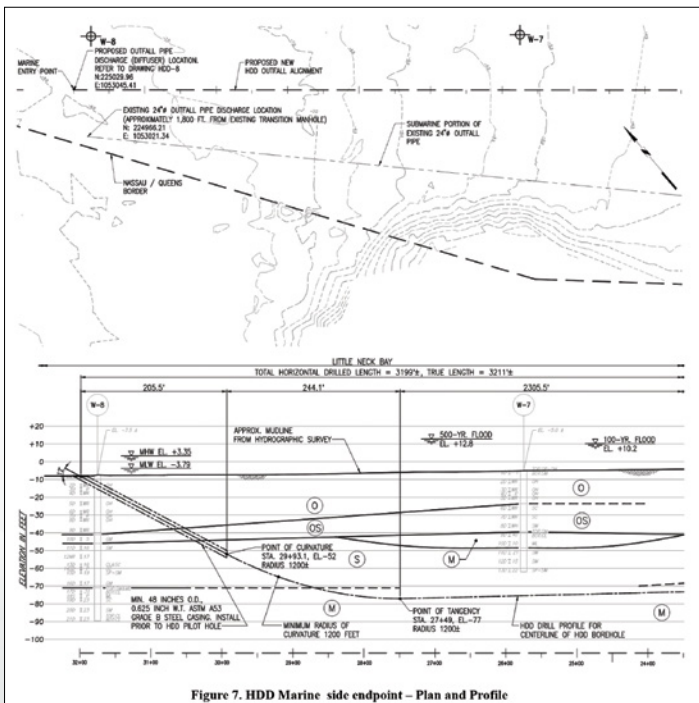


Figure 7. HDD Marine side endpoint – Plan and Profile

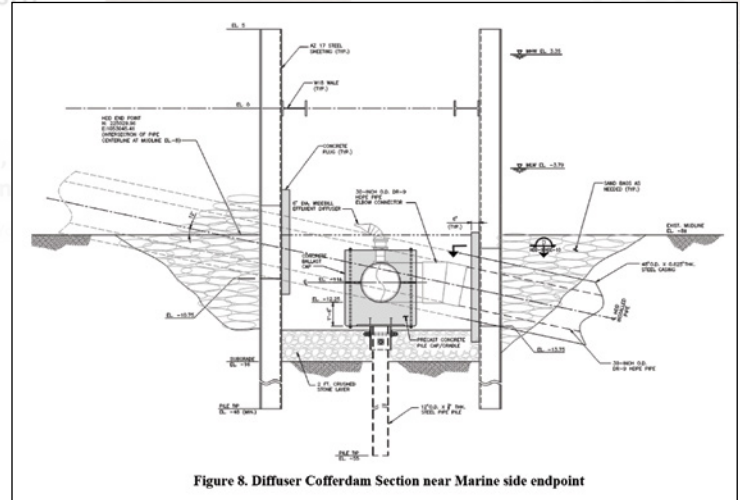


Figure 8. Diffuser Cofferdam Section near Marine side endpoint

A diffuser section was installed after the HDD outfall pipe installation. A cofferdam was needed to construct the diffuser section and connect it to the HDD installed outfall. The diffuser section needed to be supported on pile foundations to resist uplift forces due to the cyclic tidal and storm surge events. Steel pipe piles 40 feet long, 12-inch OD embedded in Stratum S were selected for diffuser support. The sequencing required a portion of the cofferdam below the HDD outfall and conductor casing to be installed prior to HDD installation and the upper portion of the cofferdam to be installed after the HDD installation (Figure 8).

4.0 TRENCHLESS HDD OUTFALL CONSTRUCTION

The HDD outfall construction project was awarded to the General Contractor, JT Cleary Inc. (JTC) who engaged Mears Group Inc. (Mears) as the HDD sub-contractor. Mears planned to perform the HDD operations with two rigs. An American Augers DD-440 rig would be used on the land entry side operations and an American Augers DD-140 rig on the marine exit side. At the marine end point operations would be performed from a pile supported platform.

4.1 HDD PROFILE RECONFIGURATION

Mears' initial plan was to follow the as-designed 12 degrees angle at the entry and exit points along with the 1200 ft bending radius on both sides. Prior to construction, the tie-in point of the HDD to the trench build was lowered by about 2 feet by design. As a result, the HDD entry point needed to be set back. However, due to limited available workspace, adequate setback distance was not available. Mears' solution was to set the front end of the rig lower below ground, use an entry angle of 14 degrees, increase the entry vertical curve to 1,500 feet, flatten the bottom tangent, and lower the profile invert by 10 feet which also reduced the risk of inadvertent returns. Mears also employed the intersect HDD method to facilitate entry into the conductor casing by the

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1.0 ABSTRACT

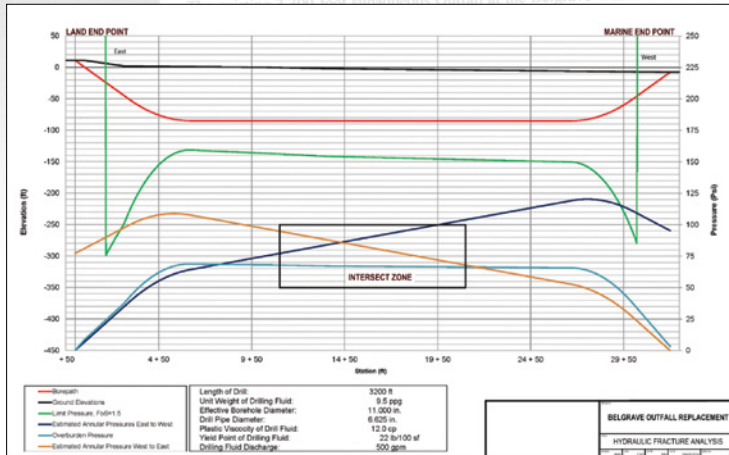


Figure 9. Estimated Annular Pressures with Intersect Method of Pilot Hole Drilling

pilot bore and further reduce the risk of inadvertent fluid returns. The estimated annular pressure graph resulting from the intersect method is illustrated in Figure 9. The pressures were estimated using the Bingham plastic model.

The design required minimum 48-inch OD, 5/8-inch thick steel conductor casings at both land and marine end points. For the 30-inch OD HDPE outfall pipe, standard industry practice called

for the final ream pass to be 42-inch diameter, which would fit through the 48-inch diameter conductor casing. Mears elected to increase the diameter of the conductor casing to 54-inch OD on both sides to allow more annulus for the 42-inch fly cutter to pass through the casings.

4.2 MARINE PLATFORM

JTC provided the marine support for the HDD operations. JTC had the option of using a jack-up barge or a marine platform. They decided to design and construct a marine platform 100 x 40 feet in plan supported on driven vertical and batter steel pipe piles (Figure 10). JTC obtained a permit from the NYSDEC. The steel frame was designed for HDD equipment vertical loads and maximum lateral force from the marine DD 140 Rig of 300 kips with a factor of safety of two. Support was provided by four vertical steel pipe piles, each with a design axial capacity of 175 kips, 36-inch diameter and 80 feet long, along with 8 batter steel pipe piles, each with a design axial capacity of 255 kips, 24-inch diameter, 120 feet long and 15-degree batter. One vertical pile and one batter pile were tested with a dynamic pile load test with a PDA (pile driving analyzer), prior to installation of the production piles. Four support barges were employed by JTC, ranging in size from 150 x 40 feet to 250 x 55 feet.

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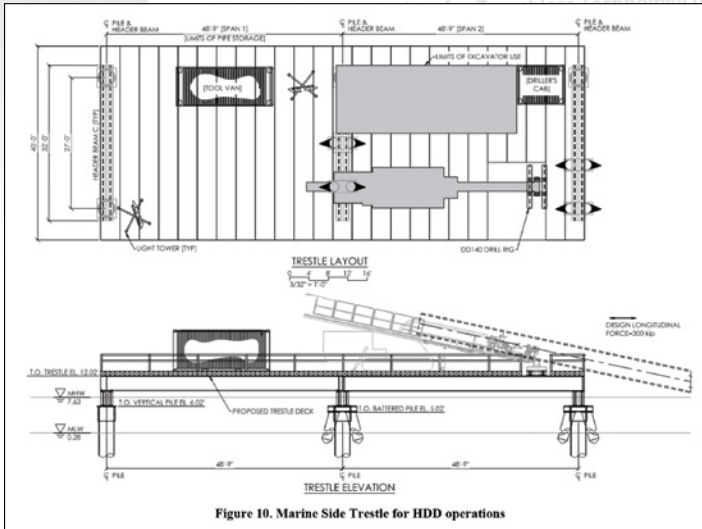


Figure 10. Marine Side Trestle for HDD operations

4.3 NOISE AND WORK HOUR RESTRICTIONS

As noted earlier, the Plant is located directly adjacent to a residential neighborhood and the work area within Little Neck Bay. Noise mitigation consisted of work and time restrictions to between 7AM and 7PM. Continuous noise monitoring was specified which required the Contractor to submit weekly noise reports and to notify the Engineer immediately if any noise readings exceeded the threshold limits set by local ordinances at the property line which were 85 dBA for Queens and 67 dBA for Nassau County. These limits were typically satisfied during construction. Exceptions were made when necessary, including during the continuous pipe pull back operations. Sound barriers were not required around the work site since the site layout provided natural buffer zone of trees and distance from the properties with the restrictive sound threshold limits.

4.4 VIBRATION AND MOVEMENT MONITORING

Vibration and movement monitoring at existing structures was required during construction on land, particularly during the conductor casing installation. The 54-inch conductor casing was installed with a pneumatic Grundoram® Taurus hammer. The layout of the vibration and movement monitoring points at the existing structures is illustrated in Figure 11. The nearest monitoring points were installed at the Trickling Filter Tank No. 2 at a distance of 30 feet from the casing installation. The vibration peak particle velocities (ppv) were measured continuously with InstanTel seismographs and movements were monitored with prisms surveyed by an automated total station (AMTS – with an accuracy better than 1/16 inch) with readings every two hours. The vibrations monitored at the nearest seismograph during casing installation ranged between 0.1 and 0.4 inch/sec with a couple of isolated spikes up to 0.75 inch/sec. Movement monitoring readings showed displacements which were less than 0.25 inch.

4.5 HDD DRILLING

A 12.25-inch drill bit with 6.625-inch drill rods was used for pilot hole drilling. The drill fluid was designed to carry the coarse sands and gravels from the annulus. The 12.25-inch drill bit helped mitigate the potential for annular pack-off by creating a larger annular space.

Brownline's gyro steering tool (GST) and interface provided continuous monitoring of the location of the drill head during the pilot hole operation. The system uses a set of optical gyroscopes and accelerometers to compute its location relative to true north. This information is analyzed by the GST's data processor located in the GST and then sent to the graphical user interface through a wire line that runs through the drill string. Accuracy of the GST tool is 0.04- degrees of azimuth, 0.02- degrees of inclination, and 0.02- degrees of tool face.



Figure 11. Vibration and Movement Monitoring

GSTs were used for both borehole assemblies during the pilot hole (one rig drilling from land entry and the other drilling from marine exit). When the drill bits came near each other, Brownline used a radar tool to determine their proximity to one another. Drillers eventually “touched bits” and then tracked out of the previously drilled hole towards the entry point. The HDD alignment and profile generated after the pilot hole was established, showed the horizontal and vertical deviations were typically within the specified tolerances from the theoretical (+/- 3 feet).

The annular drilling fluid pressure in the HDD borehole near the drill bit was required to be monitored during pilot hole drilling to reduce the risk of inadvertent fluid returns. The annular drill fluid pressure was monitored continuously along both the drill

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1.0 ABSTRACT

heads (drilling from land entry side and marine exit side) by the Mears Driller, Steering Techs and Superintendent. The graph of the annular pressures which were monitored is shown in Figure 12. The trend of actual annular pressure was taken into account and compared to the estimated annular pressures during the pilot hole drilling operation. When rapid increases in annular pressures were encountered, the drilling operations would stop and the crew would trip out of the hole to clean the annular space of any obstructions that may have been increasing the annular

pressure. After the annular pressure returned to an acceptable level, drilling operations would resume.

Mears employed a full time Drilling Fluid Specialist on site to monitor and test the properties of the drilling fluids several times each shift, given the challenging stratigraphy. A daily drilling fluid report was generated by the Drilling Fluid Specialist, containing the results of the quality control tests, which included viscosity, density, gel strength, sand content and pH. Mears employed the following proactive drilling practices to mitigate the potential for adverse impact from the soil formations:

1. Control the rate of penetration to ensure proper borehole cleaning and control cuttings loading in the annulus around the drill rods
2. Pump the full theoretical fluid volume of the hole without drilling to provide additional hole cleaning throughout the drilling, especially near the end-of-shift
3. Swab each pipe joint as it was drilled
4. Pump high-viscosity sweeps 2-3 times a shift to clear bore path of cuttings at low annular pressures
5. Utilize hydrocyclone and centrifuge in the fluid separation system to help remove fines

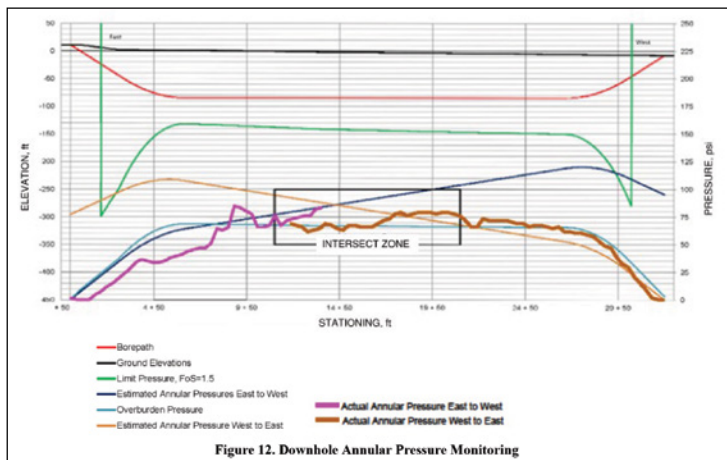


Figure 12. Downhole Annular Pressure Monitoring

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6. Use 50, 74 and 80 mesh screens as part of the Primary Shaker system
7. Use 120, 170 and 200 mesh screens as part of the Desander system
8. Use 200, 230 and 270 mesh screens as part of the Desilter system
9. When necessary – dispose of the entire drill fluid volume and replace with fresh batch of fluid when the mud weight reached or exceeded 10.0 lb/gal and plastic viscosity reached or exceeded the yield point of 18-23 lb/100 sq.ft.
10. Use appropriate additives for a marine environment and chlorinated City water, such as Soda Ash, Max Gel, PAC-L Force, Hydro Force, Sand Force, Det Force, Clay Decay
11. Maintain a hydration tank to ensure that the proper fluids had fully hydrated prior to pumping them downhole.

These practices led to effective completion of the pilot hole operation. Upon completion of the pilot hole, Mears performed two reaming passes, the first pass with a 30-inch tapered fly cutter and the second pass with a 42-inch tapered fly cutter. Both the reaming passes were called forward reaming so drill fluids would return to the land rig through the larger reamed hole. The marine rig provided the tension and the land rig provided the rotary effort. Occasional boulders were retrieved in the reaming passes. After the reaming passes, a swab pass was performed with a 36-inch barrel reamer.

4.6 PIPE STRINGING AND PULLBACK

The 30-inch OD DR9 PE 4710 HDPE pipe as the outfall carrier pipe was fabricated in 200- foot long sections onshore. The pipe sections were joined by thermal fusion in accordance with ASTM F 2620 by qualified operators and inspectors. The 200-foot long sections were brought by a barge to the marine end for fabrication into the final pipe string. As the pipe sections were fused on the barge, the fully assembled string was then floated out on the bay until it was ready to be pulled back into the HDD borehole. (Figure 13).

Mears estimated the required pullback force of approximately 141,000 lbs which was less than the maximum allowable pull force of 335,00 lbs for the 30-inch OD HDPE pipe. The pull force estimate was made based on the approach described in the Pipeline Research Council International (PRCI). In this method, a drilling fluid density of 10.5 ppg, coefficient of soil friction of 0.3, and fluid drag coefficient of 0.015 were among the installation properties considered. A buoyancy modification procedure was also employed, wherein the pipe was filled with water during pullback to reduce the pipe buoyancy and thus reduce the overall pull force. The actual pull force encountered during pipe pullback was up to 149,000 lbs.

Mears worked a total of 61 shifts to install the conductor casing onshore and offshore, rig up onshore and offshore, drill the HDD pilot hole, complete two reaming passes, swab the HDD borehole, perform pipe pullback, and rig down.

5.0 CONCLUSIONS

1. This large project for a limited tax base District required multiple funding sources including three government grants and a bond underwriting. The total project cost came in accurately at \$ 24.5 million compared to the project budget of \$ 25 million which was established based on useful inputs from three contractors obtained during design.
2. A detailed geotechnical investigation program during design played a key role in the project success by accurately defining the soil stratigraphy and strata characteristics.
3. Long length steel conductor casings at both ends of the 3,200 feet long land to water HDD installation addressed the very soft to soft organic marsh deposits along the alignment and minimized the risk of hydro-fracture and inadvertent fluid return. The use of the HDD intersect method avoided pilot hole entry into the installed conductor casing and further reduced the risk of inadvertent fluid return.

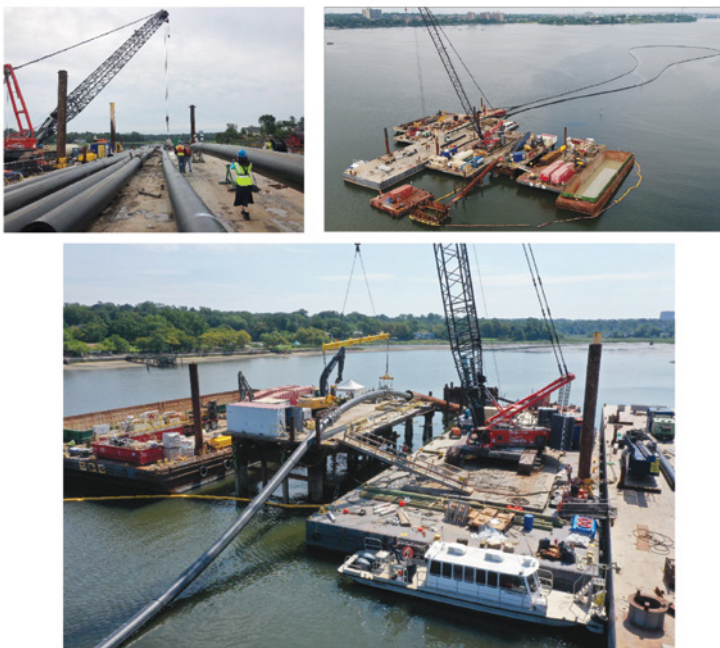


Figure 13. Final Pipe Fabrication and Pullback on the Marine Side

Figure 13. Final Pipe Fabrication and Pullback on the Marine Side

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4. The sand stratum present below the marsh deposits was also challenging for HDD due to the presence of up to 35 percent gravels, occasional cobbles/boulders and less than 30 percent fine grained material. Lowering the HDD profile helped reduce the HDD length through the unfavorable sand stratum by placing it into the more favorable underlying stiffer silt/clay soils.
5. A robust drill fluids management program during construction helped overcome the varied and challenging subsurface stratigraphy. A full time Drilling Fluids Specialist during the HDD operations to perform quality control testing and monitoring of the drilling fluids also played a key role in the success of the HDD installation.
6. Downhole annular fluid pressures monitoring allowed making prompt adjustments to the drilling operations and reduced the risk of inadvertent fluid return.
7. A constrained available workspace on the land side was overcome by setting the front end of the rig lower below ground.
8. The vibrations and movements at nearby existing Plant structures were monitored to ensure no adverse impacts to the structures, especially during installation of the conductor casings with the pneumatic hammer. The monitored vibrations and movements were below the threshold limits and had no adverse impacts to the structures.
9. A large marine support trestle (100 ft x 40 ft) at the marine exit end supported on high capacity driven vertical and batter steel pipe piles resisted the large axial and lateral forces generated from the HDD operations. Required permits were obtained for the platform and piles from the NYSDEC, which was removed after construction.
10. Construction of a steel sheet pile cofferdam built in two stages along the new HDD alignment helped accommodate the future diffuser construction tie-in to the HDD installed pipeline.
11. On-site fabrication of the HDPE product pipe in Little Neck Bay with the use of a large pipe fusing barge was beneficial in stringing the required large diameter (30 inches) and long length (3,200 feet) HDPE pipe. The pullback force generated during the final pipe pullback was close to the estimated value and less than the maximum allowable pipe pull force.
12. The noise limit restrictions during construction were overcome based on the favorable site conditions which provided a natural buffer zone of trees and safe distance from the residential properties.
13. Due to proper planning, the project was completed prior to the NYSDEC consent order dates even though construction was performed during the 2020-21 Covid-19 pandemic which experienced long lead times on materials and equipment.

14. Effective collaboration between the Owner, Engineer and Contractor resulted in successful completion of the installation with no significant impacts to the sensitive surrounding communities and environment.

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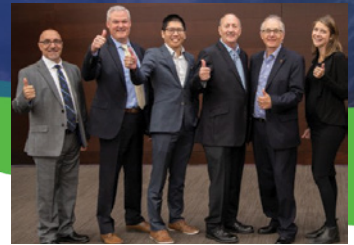
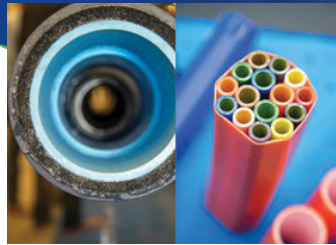
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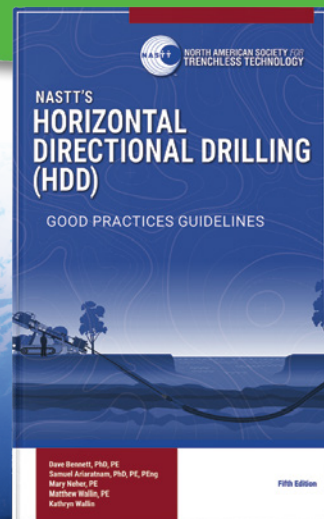
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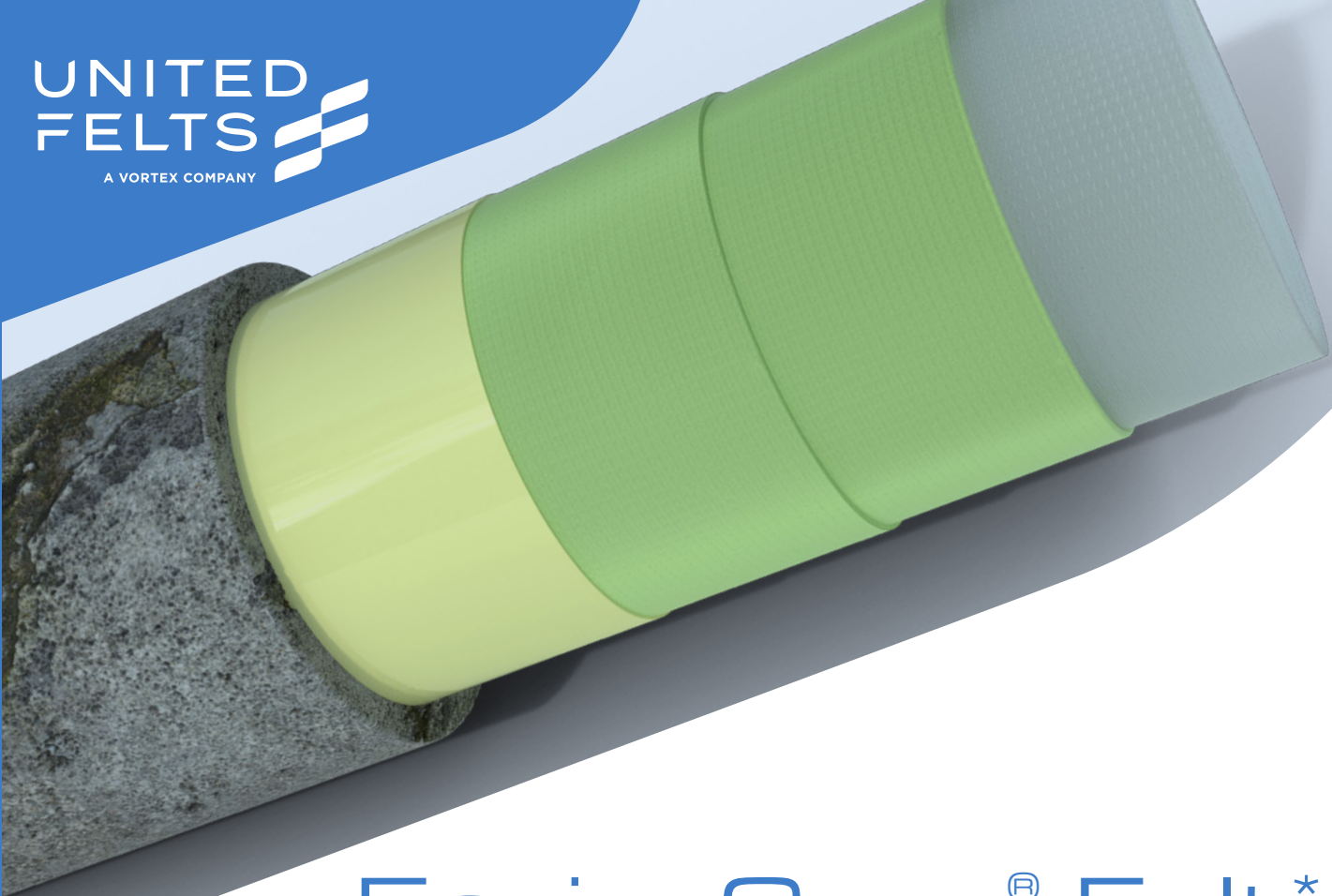


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