NORTHEAST REGIONAL CHAPTER

NORTHEAST JOURNAL
OF TRENCHLESS TECHNOLOGY PRACTICES

NASTT-NE Trenchless Conference 2022

NYC Queens Borough Microtunneling

PIPES Act 2020 Implementation

2022 FALL EDITION

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MESSAGE FROM NASTT-NE CHAIR

Eric G. Schuler, P.E., NASTT-NE Chair

Welcome to the (lucky) 13th edition of Northeast Journal of Trenchless Technology Practices! Thank you for taking the time to open this publication and check out the content that our Chapter has pulled together for this Fall edition. A lot of hard work goes into pulling these magazine together, and our Publisher does a great job keeping us volunteers looking good. These Journals also would not be what they are without the participation of all our advertisers who have products and services showcased throughout these pages.

This Regional Chapter is always evolving, growing, and learning from our past experiences relating to both Journal content and annual conference results. We are a volunteer-run organization and it takes a strong commitment from a select group within this industry to keep the "wheels-on-the-wagon" as we strive to provide sound educational and networking experiences for our 7-state region. As you read this magazine, **I encourage you to get involved with our close-knit group**! We have several committees ranging from Journal Content, to Conference Content, to Conference Venue Planning; all of which can use additional volunteers.

We have also selected a Conference location for 2023 and will be back in the Empire State. Venue location announcement will occur during the 2022 Conference in Portland, Maine and will be fully revealed during the Spring 2023 Journal Edition.

We will be using our 2023 conference to drum-up as much interest as possible for 2024 No-Dig in Providence, Rhode Island. No-Dig 2024 has the potential to be the largest No-Dig to-date with its close proximity to large metropolitan areas such as New York City and Boston.

Ok now onto some real-world stuff…

What a year to have projects in Construction!

Coming out of the COVID-19 pandemic, I think most of us saw inflation as a certainty. However, I do not think many of us could have predicted how significant it would be. Construction costs have skyrocketed throughout the year, with some material vendors not holding prices for more than a couple weeks. Supply chain constraints impacted deliveries so significantly that project schedules couldn't (and still can't) be accurately pulled together. Volatility in the markets with which we operate has impacted Owners, Consultants, and Contractors in an adverse manner. I have seen Owners handle this climate two ways: 1. Do nothing and put projects on the shelf until things settle. 2. Adapt budgets and project timelines and keep chugging along in case it gets worse than it currently is.

At my employer we just kept chugging along. Everything was just expected to be over budget, but putting projects on hold would just impact capital planning down the road. It could really have a negative snowball-type effect for sound infrastructure management practices if we just sat still. We handled supply chain concerns by extending out the window of projects being put into construction to ensure contractors had more time than ever necessary to complete projects. Having very long construction windows gave much more flexibility in being able to absorb any factors in the world occurring outside of our control. Hopefully this climate subsides "soon", but I think we are in for this ride for the foreseeable future.

"I ENCOURAGE YOU TO GET INVOLVED WITH OUR CLOSE-KNIT GROUP!"

On that note, I'll close this introductory message with another Thank You! Thank you for being a part of our Chapter's journey and hopefully I see you in Portland, Maine (or Portland, OR at No-Dig 2023). Enjoy the Day! -Eric

Eric Schuler

Eric G. Schuler, P.E.
Chair, NASTT-NE

MESSAGE FROM NASTT CHAIR

Alan Goodman, NASTT Chair

In Person Events are Back and Better than Ever!

Hello Northeast Chapter Members. It feels like we are embarking on a fresh start now that restrictions are lifting across North America. We are excited as we look forward to the future! We're riding high on the success of the NASTT 2022 No-Dig Show held earlier this year in Minneapolis. We hosted over 1,700 attendees and more sponsors than ever before. The trenchless industry is ready to be back to in person with networking and education leading the way.

In the coming months we have many events planned to bring the underground infrastructure community together. We are excited for the Northeast Chapter be able to hold your 6th Annual Northeast Trenchless Conference this year! Your chapter has experienced significant longevity and plays a vital role in the strength of the trenchless industry in the region. I hope you will all be able to join us in Portland, Maine, November 14-15 for two days of trenchless training, education, and networking opportunities.
Visit **www.nenastt.org** for details!

Be sure to mark your calendars and save the date for the NASTT 2023 No-Dig Show in Portland, OR, April 30 – May 4. The city of Portland is a perfect location for our industry to come together to celebrate and educate with the theme, ***Green Above, Green Below***. It is important that our industry is a steward of our precious natural resources, and we welcome the opportunity to provide a forum to learn about the latest in innovative trenchless products and services. Learn more at **www.nastt.org/no-dig-show**.

"RIDING HIGH ON THE SUCCESS OF THE NASTT 2022 NO-DIG SHOW!"

If you or your company has attended a NASTT Conference (National or Regional) you may leave that conference wondering how you could get more involved. I ask that you consider getting engaged in one of the many NASTT committees that focus on wide variety of topics. Everything from Publications Committee, Good Practice Course Committee, No Dig Planning Committee with many others for you to consider. With education as our goal and striving to provide valuable, accessible learning tools to our community, one of the things of which we are most proud at NASTT is that we have been able to grow. In keeping with our mission of education and training, we are offering our Good Practices Courses in a live, virtual format throughout the year. For the latest information on upcoming events, visit our website at: **www.nastt.org/training/events**.

For more information on our organization, committees, and member benefits, visit our website at **www.nastt.org** and please feel free to contact us at **info@nastt.org.**

We look forward to seeing you at a regional or national conference or training event soon!

Alan Goodman

Alan Goodman,
NASTT Chair

NASTT-NE BOARD 2022-2023

ERIC SCHULER – CHAIR

Eric Schuler is the Director of Engineering for a public water authority serving 16 municipalities in Central New York. As a Department Head he oversees all of Engineering, Distribution, and Maintenance Operations for MVWA. Mr. Schuler has over 10 years of experience in both the private and public sectors. He earned his Bachelor of Science in Civil Engineering degree from Clarkson University in Potsdam, NY and has primarily been involved in wastewater, drinking water, civil-site, and stormwater sectors. Eric is a licensed Professional Engineer in New York whose design, project management, and construction-related experiences have helped successfully execute many "trenchless"-focused projects.

Early in his engineering career he gained exposure to various trenchless technologies through utility evaluations and development of utility project design alternatives. He immediately started to envision great opportunities for communities plagued by utility deficiencies and construction constraints to utilize CIPP, HDD, among other trenchless technologies; and for them to be able to benefit from both social and economic perspectives. Eric has also stressed the importance for municipalities to incorporate asset management into utility system evaluations and system rehabilitation designs in order to aid development of capital projects and to determine the most suitable trenchless applications for implementation.

In addition to NASTT-NE, Eric is also a Board Member for the Central New York Branch of the American Public Works Association (APWA), a Director of the Central New York Water Works Conference (CNYWCC), and is active with the New York State American Water Works Association (NYAWWA). Eric continues to push for growth of trenchless technologies in upstate-New York and has trained utility owners on the use of hydraulic modeling methods for proper development of utility rehabilitation project design. He is an advocate for educating (designers & installers) of trenchless applications through proper training and increased accessibility of industry standards/guidelines to ensure successful project design and execution. The successful use and increased awareness of modern-day trenchless technologies that incorporate innovative equipment and materials are what Eric believes will continue to shape and drive the direction of the utility industry for the coming decades.

JONATHAN KUNAY – VICE CHAIR

Jonathan Kunay, P.E., PMP is an Associate Engineer and the global Conveyance Market Discipline Leader for CDM Smith in Boston, MA. He has 19 years of experience working as a design engineer and project manager on a variety of trenchless projects including infrastructure assessment with traditional and state-of-the-art investigative techniques, rehabilitation using CIPP, HDD and pipe bursting, facilities planning and master planning, leak detection of water distribution systems, enterprise asset management and risk/criticality studies.

While trenchless technologies have been his primary focus over the past 16 years, he also has worked on civil site design for commercial developments and municipalities, navigated Consent Order driven long-term programs, designed new pumping stations and developed alternatives for sewer separation projects. Jonathan is based in New England; however, his diverse project experience has brought him many places to experience unique perspectives in the trenchless marketplace. He has worked on trenchless projects all over the United States including California, Texas, Illinois, Tennessee, Louisiana, South Carolina, Nebraska, Virginia, Florida and Georgia. He has also implemented trenchless projects and programs internationally in the Middle East, China, South America, the Pacific Islands and Europe.

Jonathan was the project manager and design engineer responsible for helping to bring service lateral lining into the New England market in 2008 as part of a comprehensive sewer system rehabilitation program. This comprehensive model has now been adopted across the country as a proven methodology by which infiltration and inflow can be removed in large quantities from the sewer collection system. This comprehensive approach has been presented at conferences to showcase the validity of utilizing a holistic trenchless methodology when large percentages of I/I by volume must be eliminated.

Jonathan has a Bachelor of Civil Engineering and a Minor in Environmental Engineering from the University of Cincinnati, is certified in NASSCO's Pipeline Assessment and Certification Program (PACP), Manhole Assessment and Certification Program (MACP), and Lateral Assessment and Certification Program (LACP), and is involved in multiple committees in the National Association of Sewer Service Companies (NASSCO).

EXECUTIVE COMMITTEE

CHARLES TRIPP – TREASURER

Charles Tripp, P.E. is a Technical Manager focusing on Pipeline Rehabilitation Design and Condition Assessment for the New England Water Business Line at AECOM in Chelmsford, MA. He has 16 years of experience working as a design engineer and project manager on a variety of trenchless projects including pipeline rehabilitation, condition assessment, risk modeling, and general asset management. His varied design experience also includes collection systems design and peer review, wastewater treatment, water resources, and site-civil design to improve municipal infrastructure.
Charles was first introduced to trenchless technologies through his involvement in multiple sanitary sewer rehabilitation projects starting early in his career. He also briefly served as a Field Engineer for a world leading CIPP construction company. This experience provided a wealth of exposure and instilled a desire to pursue and advocate for the use of trenchless technologies in projects as a way of mitigating the impacts of excavation in urbanized areas, but also as a means of cost-effective design.

Charles studied Civil Engineering at the University of Massachusetts Amherst earning his B.S. and went on to receive his M.S. in Environmental Engineering from the Worcester Polytechnic Institute. He is a licensed professional engineer in Massachusetts, New Hampshire, Rhode Island, and New York, and is also PACP/MACP certified by NASSCO.

As Treasurer for the Northeast Chapter of NASTT, Charles continues to capitalize on his devotion to trenchless technologies and in advocating for its use in the local construction market. He continues to apply his experience to the effective management and administration of fiscal matters of the organization.

JOHN ALTINYUREK – SECRETARY

John Altinyurek is presently a Senior Staff Engineer with the New York,NY office of McMillen Jacobs Associates. He previously worked for WSP for 6 years. During his career in the underground industry, John has been involved in major tunneling and trenchless projects in the New York City area for clients such as the NYC Dept. of Design & Construction, New York City MTA Transit, Port Authority of New York New Jersey, Amtrak and continuing his work on New York State Department of Environmental Conservation/Nassau County Design-build Bay Park Conveyance Project in Long Island, NY.

For the past 7 years, he has focused on underground construction management and design for tunnels and conveyance including transit projects, water and wastewater pipeline design and construction projects. He has worked on various pipeline projects utilizing microtunneling, pipe jacking, horizontal directional drilling, and other tunnel rehabilitation methods.

John views NASTT-NE Regional chapter as a very important organization in promoting the rapidly growing trenchless design and construction methods in the United States. As a young professional, John hopes to bridge the gap for his peers to get engaged with the NASTT-NE Chapter and be involved in the trenchless industry early on in their careers.

NASTT-NE BOARD 2022-2023 EXECUTIVE COMMITTEE

BABS MARQUIS – PAST CHAIR

Babs Marquis is presently the Trenchless Practice lead for the East Coast and Construction Manager with the Burlington, Mass., office of McMillen Jacobs Associates. He previously worked for Jacobs Engineering Group for 10 years and Stone & Webster for 11 years. During his extensive career in the trenchless industry, Babs has been involved in major tunneling and trenchless projects in the Northeast for clients such as the Massachusetts Water Resources Authority, Boston Water & Sewer Commission, the Metropolitan District Commission (Hartford, CT), Narragansett Bay Commission (Providence, RI), NYC Dept. of Design & Construction, NYC Dept. of Environmental Protection and continuing his work on a recently awarded New York State Department of Environmental Conservation/Nassau County Design-build Bay Park Conveyance Project in Long Island, NY.

For the past 25 years, he has focused on underground construction management for tunnels and conveyance including water and wastewater pipeline design and construction projects, with emphasis on trenchless construction methods. He has worked on various pipeline projects utilizing microtunneling, pipe jacking, horizontal auger bore, pipe bursting and other pipeline renewal methods.

Babs views the NASTT-NE Regional Chapter as an important vehicle to promoting greater awareness and understanding of trenchless applications at the local level. He sees the level of interest and confidence in trenchless technology growing among owner groups based on the successful completion of many high profile projects across the Northeast. Drawn to the varied unique and innovative aspects of trenchless technology, Babs believes access to ongoing education is key to even greater owner acceptance and NASTT-NE Chapter is a key component towards achieving this acceptance by making information available at the grassroots level as well as attracting student chapters from the region and a robust local participation in the Chapter activities throughout the region.

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NORTHEAST REGIONAL CHAPTER

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PORTLAND, ME
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TRENCHLESS CONFERENCE

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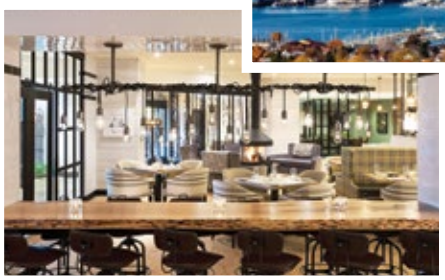

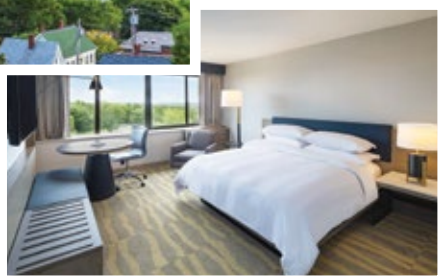

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for information on future conferences

NASTT Northeast Chapter Technical Sessions				
Time	**Presentation**	**Speaker**	**Presentation**	**Speaker**
7:30 AM	**Registration Desk Opens**			
7:30-8:15	**Breakfast and Networking - Vendor Area Open**			
8:15-8:45	**Opening remarks - NASTT-NE Chair, NASTT Executive Director, UMASS Lowell**			
	AM Track 1 - General Trenchless (SALON A)		**AM Track 2 - Domestic Water Applications (SALON C)**	
	Jonathan Kunay - Moderator		**Raj Gondle - Moderator**	
9:00am-9:25am	Trenchless 101: Experiences and Lessons Learned Roundtable		Machine Intelligence for the Identification of Lead Service Lines	*Mike App (ElectroScan)*
9:30am-9:55am			Innovative Repair Solutions to address Bridge Mounted Water Mains	*Steve Soldati (AEGION)*
9:55am-10:35am	**Break - Vendor Time**			
10:35am-11:00am	Trenchles Goes Hybrid: Old Tricks are Finding New Applications	*Brian Dorwart (Brierley)*	SIPP - Another Tool in the Toolbelt	*Eric Schuler (MVWA)*
11:05am-11:30pm	Live Outdoor Demonstration Achieving success in UV CIPP & Leveraging Technology to Restore Assets Accurately (Vortex Companies)			
11:25am-11:55pm				
12:00pm-1:00pm	**Lunch** **Keynote Speaker - Matt Timberlake, CAO (Vortex Companies)**			
1:00pm-1:25pm	**Vendor Time**			
	PM Track 1 - HDD, Microtunneling, Geotech (SALON A)		**PM Track 2 - Sanitary/Storm Sewer Applications Applications (SALON C)**	
	Charles Tripp - Moderator		**Claudia Law - Moderator**	
1:30pm-1:55pm	National Grid 10 HDD Presentation	*Jesse Lubbers (Kimley-Horn), Seth Herman (National Grid)*	ACUA Ventnor Margate Emergency FM HDD Replacement	*Mike Bisignani & David Wooley (GHD)*
2:00pm-2:25pm	HDD Method to Install Thread-Bar Tie-Rods Using Excavator Drill Attachment: A Case History	*Kenneth Allard, Kenneth A. Pidgeon (ECI)*	West Marlborough Street Storm Drain Rehabilitation – Challenges Beneath the Streets of Downtown Newport	*Dan Scott (Kleinfelder)*
2:30pm-2:55pm	Design and Construction of 5,100 LF of Soft Ground Microtunnelling in Hartford, CT.	*James Sullivan (AECOM)*	Sanitary System Rehabilitation Norwich Public Utilities, Norwich Connecticut	*Larry Sullivan (NPU), Peter von Zweck (Jacobs), Bill Cotter (Jacobs)*
3:00pm-3:55pm	HDD Industry and Gyroscopic Navigation	*Tom Forconi (Brownline USA)*	Water/Sanitary/Storm Trenchless Evaluation	*Tyler Pitts (GHD)*

NASTT-NE TRENCHLESS TECHNOLOGY CONFERENCE 2022
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Vortex Companies

KEYNOTE SPEAKER

Matt Timberlake *currently serves as the Chief Administration Officer at Vortex. Matt oversees the HSE, HR, Fleet and Procurement divisions, and helps develop and implement processes designed to improve performance for business units and employees. Matt is focused on inspiring his team to change how underground infrastructure in maintained globally. Prior to joining Vortex, Matt grew up in the family business, the Ted Berry Company, where he started his career as a field technician in industrial facilities and provided cleaning services to municipal wastewater collection systems in the Northeast. Matt went on to serve as President of Ted Berry, where he expanded the business from a cleaning and CCTV contractor to offering a full suite of trenchless solutions ranging from CIPP lining and pipe bursting to manhole rehabilitation and slip lining. In February 2019, Vortex Companies acquired the Ted Berry Company.*

"A SHIP IN HARBOR IS SAFE, BUT THAT IS NOT WHAT SHIPS ARE BUILT FOR."

MICROTUNNELING: INSTALLATION OF 96-INCH RCP IN HIGHLY URBANIZED / RESIDENTIAL COMMUNITY OF NEW YORK CITY'S QUEENS BOROUGH

By: Vijay Jeyakrishnan, McMillen Jacobs Associates
Dinesh Patel, Arcadis
Ketty P. Paulino, New York City Department of Design & Construction

INTRODUCTION

The New York City Department of Design and Construction (NYC DDC) SE859 project is an infrastructure upgrade to improve water, sewer, and drainage services to the Maspeth neighborhood in the Borough of Queens, New York.

As one of New York City's major capital improvement undertakings, the project as designed involves construction and resident engineering inspection for replacement of a combined sewer in 70th Street between Queens Boulevard and Queens–Midtown Expressway (Figure 1). The major scope includes 5-foot by 8-foot open-cut installation a few feet away from commercial and residential building and 12-foot by 8-foot box culverts beneath an elevated section of railroad. The project also includes microtunneling to install 96-inch inside diameter/115.5-inch outside diameter reinforced concrete pipe (RCP) for 3,425 feet at 40- to 65-foot depths in mixed ground conditions consisting of glacial till, sand, gravel, cobbles and boulders, and clay. The project alignment runs through busy residential and commercial streets, and two major thoroughfares: Grand Avenue and Queens Boulevard. Grand Avenue connects Brooklyn and Queens Boroughs and Queens Boulevard, which connects Queens Borough to Midtown Manhattan and has eight lanes of traffic including two bicycle lanes. Technical and construction challenges during construction involved extensive coordination with various state and city agencies, traffic management, subsurface utility coordination, public safety, and community liaison required to effectively execute a project of this magnitude in a densely populated residential and commercial community. Added to these challenges was competition for limited construction space with a mandated project requirement to minimize the construction footprint to the extent possible to limit impact to the environment, residents, and the concentrated fast-paced commerce in Queens.

NYC DDC accepted bids on October 24, 2018, and Northeast Remsco Construction was the successful contractor. With NYC DDC designing the project, Resident Engineer/Inspection services were provided by Arcadis and McMillen Jacobs Associates. The project value is $101,123,987.45 and the notice to proceed was August 12, 2019, and with the contractual completion date to be August 10, 2023.

Figure 1: Project Scope & Alignment

PROJECT INTENT:

This SE859 major infrastructure construction project was undertaken by the NYC DCC to mitigate flooding and improve quality-of-life by replacing the aging combined sewer and water main and upgrade sewer and drainage in the Maspeth community of the Borough of Queens.

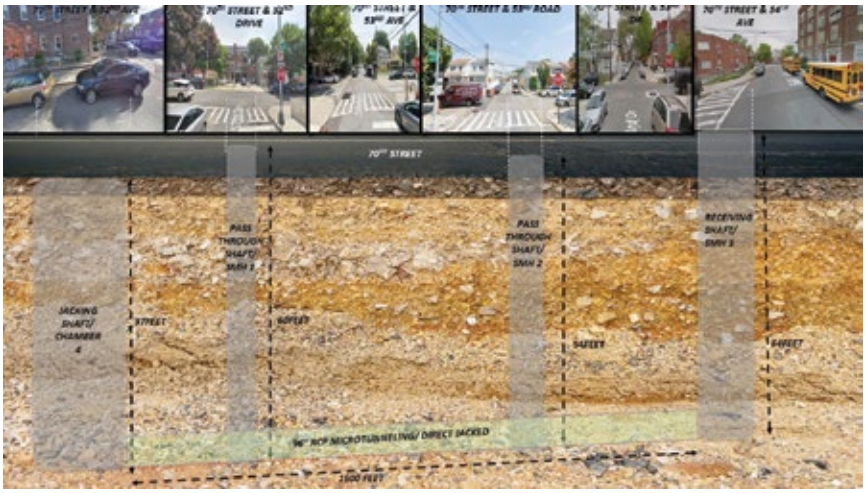

Figure 2: Profile/Street view of 70th Street 1,600-foot Alignment

TRENCHLESS CONSTRUCTION METHODS...ALLOWED THE PROJECT TEAM TO HAVE A CLOSE WORKING RELATIONSHIP WITH THE COMMUNITY.

SUBSURFACE AND GEOLOGICAL CONDITION:

General subsurface conditions along the project alignment varied with the depth of the excavation as well as along different sections of the alignment and included clay, silt, sand, gravel, cobbles, and boulders. While groundwater was encountered for much of the open-cut work, most of the microtunneling work was above the water table. With the ground conditions generally consisting of sand with varying amounts of gravel, silt, and clay and no groundwater present, different support of excavation (SOE) methods were considered in order to select the most suitable SOE for the project conditions and challenges. The shafts ranged from 35-feet to 65-feet deep and were located near residential and commercial structures. Despite the depth of the shafts no groundwater was present; blow counts ranged from 11 to 63 per foot, indicating loose to densely compacted soil material.

70TH STREET: CHALLENGES AND MITIGATION WITH SHAFT CONSTRUCTION AND TUNNELING

The overall project microtunneling scope included five setups to complete eight drives, with one of the drives installing 214 feet of 85-inch-diameter Hobas centrifugally cast fiberglass reinforced (CCFRP) pipe using an AVN1800 microtunnel boring machine (MTBM), under Queens Boulevard. The remaining seven drives consisted of 3,540 feet of 96-inch RCP installed using an AVN2000AB MTBM. This article highlights one of the longest drives (at 1,600 feet), discussing technical design details, the project team operational approach undertaken to navigate and resolve project constraints during construction, and the level of construction coordination on 70th Street between Calamus Avenue and 54th Avenue. The work on 70th Street included approximately half of the contract microtunneling work, excavation of three deep shafts ranging from 54 to 64 feet (Figure 2), construction of five cast-in-place concrete structures with two chambers and three special manholes, and the cut-and-cover installation of 120 feet of 96-inch RCP.

COMMUNITY AND INTERAGENCY CORDINATION:

Because of the equipment staging requirements, the deep shaft construction, and the overall project alignment running through busy and narrow streets, community and interagency coordination was crucial to the project success and to the safety of the public and construction crews.

As an advantage to the project, the Resident Engineer/ Inspection (REI) team included a dedicated position for Construction Community Liaison (CCL). The primary responsibilities of the CCL consisted of keeping the community informed, providing construction updates and notifications for road closure and/or water shutdown to community and businesses, fielding complaints, and addressing specific community concerns. During the construction work on 70th Street, the project team proactively coordinated daily with the public school in close proximity to a Microtunnel work shafts, one result being that the contractor refrained from using the crane and/or swinging heavy loads during students' arrival and discharge.

On some of the portions of 70th Street between 54th Avenue and Calamus Avenue, the traffic stipulation called for restricted working hours from 9 a.m. to 2 p.m. instead of the normal 7:00 a.m. to 3:30 p.m. and maintaining a 12-foot lane for local and emergency access during working hours. Any modifications to traffic stipulations included in the contract required complex coordination and approval from NYC Department of Transportation (DOT). Apart from providing access to school entrances, close coordination with school officials resulted in limiting the work hours during school days for the safe passage of school buses and the off-loading of students.

The residential structures were in close proximity to most of the shafts. Therefore, coordination was required between the building owners and project team prior to any shaft excavation, in order to

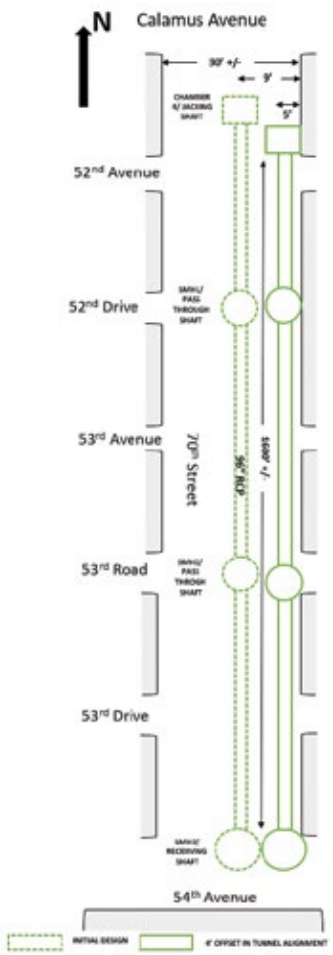

Figure 3: 4-foot Offset from Design Location

perform the preconstruction surveys to document the condition of these buildings prior to the start of construction. Also, installation of settlement monitoring points was required, and these points were continuously monitored for movement during shaft excavation and microtunneling to confirm no settlement. Other critical coordination required was to provide residents with driveway access, and access for municipal waste collection on scheduled days.

In addition, the construction contract included retaining the services of an arborist to directly coordinate with NYC Department of Parks and Recreation to minimize construction impacts to trees in close proximity to construction and within the heavy equipment swing radius. Other city and state agency coordination during the overall project execution, included NYS DEP, NYS DOT, NYC Transit, LIRR, and NYC DOB.

SHAFT CONSTRUCTION AND MICROTUNNELING ALIGNMENT – DESIGN ADJUSTMENTS:

70th Street between Calamus Avenue and 52nd Avenue is 30-feet wide and residential, with a single traffic lane and two parking lanes. To mitigate the construction impact on residents, the contractor proposed shifting the location of the Chamber 4 / Jacking Shaft approximately 100 feet and increasing the length of the microtunneling. The corresponding reduction in deep open-cut pipe installation maintained better access and reduced impact to the homes on this block. To have lesser impact on the community and to keep an active traffic lane throughout the construction, the contractor proposed offsetting the microtunnel alignment approximately 4 feet from the initial design (Figure 3). Additionally, an intermediate pass-through shaft was shifted south to keep the intersection open to traffic.

The construction contract included installation and monitoring of geotechnical instrumentation by the contractor. The instrumentation installed was settlement monitoring with automated total stations (AMTS) mounted at all the shaft locations, and vibration monitoring. In addition, as this was a highly dense residential area, the contractor also periodically monitored the noise generated because of construction.

UTILITY CONFLICTS: CHALLENGES AND MITIGATION:

Provision for interagency coordination was included in the construction contract facilitated by the REI team in order to assure compliance with the required coordination effort. Also, this project was designed as a joint bid with utility companies. That means there is a provision in the contract to relocate existing utilities if required. All potential utility interferences identified in the contract were scheduled and utilities coordinated to be relocated after Notice to Proceed.

An initial challenge to mobilizing for shaft construction and staging the microtunneling equipment for the jacking shaft work zone located at the intersection of 70th and 52nd Street involved the protection of low-hanging overhead communication cables. These had to be raised and zip-tied to provide clearance for the soil separation plant. For added safety to the crew members servicing the soil separation plant, line guards had to be used to sleeve and protect the Con Edison overhead electrical cable prior to mobilization.

Another critical utility was Verizon's fiber optic communication cables, which serve a major portion of the Maspeth neighborhood that ran along the 70th Street project alignment between Calamus Avenue and 54th Avenue. These fiber optic cables had to be winged-back and supported within the SOE of the jacking shaft /Chamber 4 and within the intermediate/pass-through Special Manholes 1 and 2 shafts (Figure 4). And they had to be winged back completely at the receiving shaft / Special Manhole 3 location.

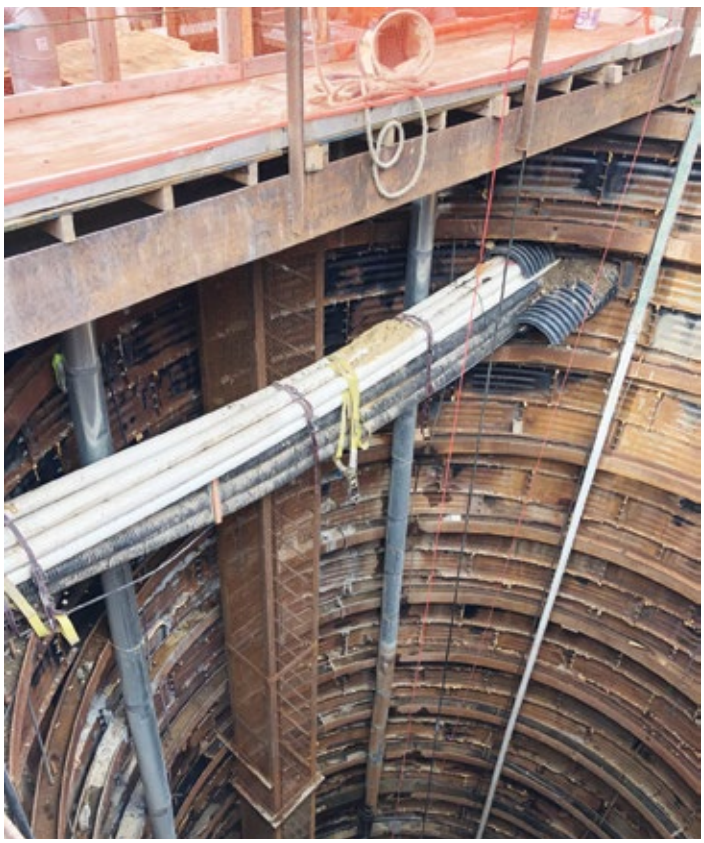

Figure 4: Verizon-Fiberoptic Cables Supported within Intermediate/ Pass-through Shaft-SMH1

In addition to the Verizon fiber optic communications cables, an active 30-inch RCP combined sewer (Figure 5), approximately 28-feet-long had to be exposed and supported within the SOE of the jacking shaft (Chamber 4). To support the 30-inch RCP sewer, the contractor cut in half a 48-inch-OD x 1-inch-thick wall steel pipe to use as a continuous support cradle and hung the cradle from the 2 HP 10x42 steel beam above with nylon ratchet straps. Also, the east side the SOE face of the jacking shaft / pass-through shafts and the receiving shaft of the 70th Street alignment were very close to an active 8-inch plastic gas main.

JACKING AND RECEIVING SHAFT CONSTRUCTION:

The support of excavation (SOE) considered for the jacking shaft at 70th Street and 52nd Avenue intersection was soldier piles and timber lagging with mega bracings (29'L x 28'W x 37'D) to accommodate the follow-on cast-in-place construction of the permanent Chamber 4 structure. The east face of the jacking shaft was approximately 11.5 feet from the nearby existing building, and a 5-foot-wide sidewalk on the west side of the shaft had to be always maintained. The contractor utilized all space available including placing two units each of 30-foot-long x 7-foot-wide bridge decking onto the capping beam (added as part of the SOE design) over the west section of the jacking shaft, optimizing and utilizing only 50 percent of the space opening for access to the shaft during its construction to complete the microtunneling operation until cast-in-place construction of the permanent

Figure 5: 30-Inch RCP Active Sewer Supported within Chamber 4 / Jacking Shaft

structure. All the microtunneling-related equipment, including the pipe staging area and the jacking shaft, was restricted to within a footprint area of approximately 8,000 square feet, taking advantage of every available usable area (Figure 6). The contractor provided two crossing guards around the jacking shaft continuously during construction for the crew and public safety.

With limited space for shaft and equipment staging, ground support systems that could be installed in circular geometry for intermediate and receiving shafts ranked high in the selection and consideration process. Some of the SOE considered earlier included steel sheeting, rib and board lagging, and jet grout columns. But the final choice, liner plates, has the benefit of installation of the shaft within proximity to residential building foundations with no vibration.

In addition, even though the shafts were deep, there was no groundwater to contend with. The liner plates were back grouted as each ring of liner plate was installed in the intermediate shafts (SMH1 and SMH2) as well as the receiving shaft (SMH3). SMH1 was 60 feet deep at the 70th Street and 52nd Drive intersection, and SMH2 was 54 feet deep at the 70th Street and 53rd Road intersection. Both were 21 feet in diameter. SMH3 was 64 feet deep at the 70th Street and 54th Avenue intersection and 30 feet in diameter, with sufficient room to retrieve the MTBM and accommodate follow-on permanent structures—size and configuration to be constructed at each location. King beams and bracing were added at each portal opening, cut through the liner plates to transfer the SOE compression loads across the opening. During SMH1 SOE, liner plate installation and excavation, the crew encountered boulders and rocks. Because of the space constraints, a rock splitter was deployed to fracture the boulder into manageable sizes to enable its removal. At the SMH3 location, where lenses of loose sand were encountered, the zones were stabilized with sodium silicate permeation grouting.

INTERMEDIATE/ PASS-THROUGH SHAFTS:

After evaluating the challenges associated with staging the support equipment and microtunneling operations at each jacking pit, the contractor eliminated some shafts to combine three microtunnel drives into a single 1,600-foot drive on 70th Street, making this the longest drive on the project. This single long drive went 526.5 feet from Chamber 4 to SMH1; 649.5 feet from SMH1 to SMH 2; and 417 feet from SMH2 to SMH3. Before the microtunnel operation, at intermediate shafts SMH1 and SMH2, the crew cut/removed liner plates and ribs every 2 to 3 feet on either side within the 12-foot circular area, in conflict with the tunnel alignment. In parallel, they filled the shaft with 1,000 psi flowable fill and poured the final 6 inches of 4,000 psi concrete as an overburden at the top of the fill, backfilling approximately 8 feet above the top of the proposed 96-inch RCP (Figure 7). After RCP had been jacked through these two intermediate shafts and the drive completed, the flowable fill was re-excavated to the bottom of manhole elevation for the cast-

Figure 6: Chamber 4 / Jacking Shaft–Construction Site Layout

Figure 7: SMH1 Intermediate / Pass-through Shaft

in-place construction. Having the shafts located at regular intervals allowed the machine to stay within line and grade. The crew could stop the MTBM at these intermediate shafts, accessed to the cutter wheel to assess the wear and tear on the cutter discs and scrapers for any replacement.

70TH STREET MICROTUNNELING OPERATION:

The new Herrenknecht's AVN2000AB 9.6-foot-diameter, 25-foot-long MTBM ("Maspeth Mole") was launched on November 5, 2020 (Figure 8). The contract required the combined sewer installed by single pass microtunneling to be with a 96-inch inside diameter (115.5-inch OD) reinforced concrete pipe (RCP); Class V, wall C pipe with internal protective coating consisting of two coats of carboline bitumastic and one coat of acrylic as required by New York City standards, with each 10-foot section of pipe weighing over 18 tons. The steel bell and concrete spigot joint was preferred and considered more suitable for microtunneling because of its increased jacking capacity and its inherent protection against soil particles entering the pipe joint as the pipe string was advanced. Each section of pipe included three 2-inch threaded ports for lubrication during pipe installation and for grouting between the pipe and the ground after the microtunneling was completed.

To ensure project success, the contractor developed and implemented an aggressive lubrication plan, with one injection pump continuously providing bentonite through a distribution ring at the rear of the MTBM, while a second

Figure 8: Lowering of MTBM AVN2000AB at Chamber 4 / Jacking Shaft

Figure 9: Final Walkthrough & Inspection of 96-inch RCP

pump injected bentonite along the pipe string. The crew periodically performed the Marsh Funnel test, in order to keep the viscosity of the lubrication high or in balance, so as to avoid losing the lubrication to the permeable ground during the mining operation. Also, the crew monitoring the spoils continued to pump the drilling fluid in order to stabilize the face and to avoid clogging and transference of the spoils to the separation plant. They adapted continuously to overcome the varying loose to dense to mixed ground conditions on 70th Street. In addition to utilizing the available boring logs, the contractor also performed further geotechnical investigations along the alignment during construction as a proactive measure and to better understand the ground conditions. The machine mined through ground consisting of glacial till, silt, sand, cobbles, rocks, boulder, and stones. In addition, two intermediate jacking stations (IJSs) were incorporated to supplement the 1,100 tons of thrust provided by the main jacks. Even with these measures, the jacking forces exceeded 1,000 tons and both IJSs were used to overcome challenges encountered with the long drive as the MTBM traversed through changing ground conditions and loose soil. The machine broke through into Special Manhole 3 / Receiving Shaft (deepest shaft of the entire project) on December 28, 2020, finishing the longest single drive of the project. Figure 9 shows James Franco- Foreman of Northeast Remsco Construction during the final walkthrough and inspection of 96-inch RCP.

CONCLUSION

The contractor provided many proposals and adjustments to make this project a success. These include the early and proactive proposal to make adjustments to the design alignments by shifting chambers and special manhole structures and offsetting the microtunnel alignment on 70th Street. The contractor also recommended standardizing the internal diameters for all eight special manhole structures for the cast-in-place construction and proposed 454 feet of trenchless construction as an alternative to open-cut construction at 70th Street and Queens Boulevard crossing. All of these had a positive influence on the construction schedule and facilitated minimum traffic disruption and social impact to the community.

Provision and allocation of resources in the contract for dedicated community coordination meetings, project updates, and notifications proactively addressed the community's expectations of the impacts resulting from the selected trenchless construction methods, which allowed the project team to have a close working relationship with the community.

Because of the level of coordination and cooperation by community leadership, residents, and different agencies with the project team, the combined sewer replacement and water main upgrade is expected to be completed on schedule.

ABOUT THE AUTHORS:

***Vijay Jeyakrishnan**, Project Engineer, has been with McMillen Jacobs for more than three years and is based out of the New York City office. He is a civil engineer with a master's degree in Construction Management and has nine years of project management and construction management experience in underground construction focusing on trenchless, including new installations, rehabilitation, and condition assessment projects.*

***Dinesh Patel**, Resident Engineer, has been with Arcadis for more than 19 years and is based out of the White Plains office. He is a civil engineer and has 40+ years of project management and construction management experience in infrastructure work for water and wastewater facilities.*

***Ketty P. Paulino**, Engineer in Charge, has a background in civil engineering and a master's degree in Construction Management. She started with the Department of Design and Construction (NYC DDC) in 2015, overseeing multiple capital and federal construction projects of various types including but not limited to infrastructure upgrades, water supply and wastewater management, green infrastructure, step streets, and trenchless/tunneling projects including microtunneling and horizontal directional drilling.*

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SUPPORTING OPERATORS AS THEY IMPLEMENT THE PIPES ACT OF 2020

By: Bob Wilson, Northeast Gas Association

Bob Wilson, Vice President Special Projects, Northeast Gas Association (NGA) works closely with pipeline operators on safety management system implementation including emissions mitigation. NGA facilitates collaborative learning and education through its committee structure to facilitate long term strategies that reduce pipeline safety risk including emissions mitigation. The 2020 PIPES ACT incorporates new regulatory requirements that formalize and amplify emission reduction as a component of pipeline safety. In this article, Bob shares tools, technology and practices to consider as operators integrate the mandates into their day-to-day operations.

In my 38 years serving the gas pipeline and distribution industry and with NGA, public safety and gas system reliability has always been top priority. Gas distribution operators have been actively pursuing methane emission reductions from a public safety perspective especially after the introduction of the EPA Natural Gas Star Program in 1993. For over 25 years, the gas industry has voluntarily participated in technology transfer and emissions reduction strategies from wellhead to burner tip. See: **www.epa.gov/natural-gas-star-program-historical-accomplishments**.

The science is clear. Emissions from pipeline operations are recognized as a potential safety related hazard and an environmental risk. Although many were doing a lot of work voluntarily, the PIPES Act of 2020 includes legislation that mandates operators to look at their procedures, document plans and engage in emissions risk mitigation projects proactively. The pipeline safety regulatory component aims to minimize public safety impacts and environmental risk while ensuring system reliability.

The Northeast Gas Association formed a committee to specifically assess emission mitigation reduction opportunities and technologies. The Methane Emissions Reductions Committee (MERC) is a collaborative group within the Northeast region that's evaluating technologies, practices, methods, construction and maintenance practices that help achieve zero methane emissions.

We intentionally ensured that the committee included all sizes and scales of operators. They are looking at leak prone pipe replacement strategies, operations and maintenance emissions control techniques and pipeline rehabilitation strategies associated with distribution pipeline systems to reduce emissions. NGA's role is to help members address current emission mitigation goals while pursuing longer term asset utilization de-carbonization visions. This unique collaborative process allows for subject matter experts from across the region to share leading practices through an open exchange of ideas and experiences. Sharing leading practices and experiences has extraordinary value in helping shape safety culture. We don't call them best practices because that can lead to a competitive mindset of 'Is our idea better than others?' In sharing leading practices, we set the ego aside. We talk about the challenges our members face and how they're working to solve them.

PIPES ACT OF 2020 PROTECTING OUR INFRASTRUCTURE OF PIPELINES AND ENHANCING SAFETY ACT SECTION 114

Mandate to Update Inspection and Maintenance Plans to Address Eliminating Hazardous Leaks and Minimizing Releases of Natural Gas from Pipeline Facilities.

Excerpts:

"... operators are to update their inspection and maintenance plans to address the replacement or remediation of pipelines that are known to leak due to their material (including cast iron, unprotected steel, wrought iron, and historic plastics with known issues), design, or past operating and maintenance history."

"inspection and maintenance plans (are) to address the elimination of hazardous leaks and minimization of releases of natural gas (including, and not limited to, intentional venting during normal operations)."

"implement technologies to prevent and minimize both unintentional, fugitive emissions as well as intentional, vented emissions."

TOOLS AND TECHNOLOGIES FOR REDUCING & ELIMINATING EMISSIONS

There's no one size fits all solution. A toolbox of fit-for-purpose solutions is key to maximize emissions mitigation success over a broad range of assets and operations. Our members are exploring a host of activities for emissions control and mitigation such as venting controls during purging and depressurizing pipelines for performing operations and maintenance activities. A key strategy is maximizing recovery of gas back into the pipeline system versus releasing it into the atmosphere. Tools to recompress gas and recover gas from blow down operations are being considered and implemented on a broader scale. Simply put, Operators are looking at technology and equipment that can recover gas instead of bleeding gas into the atmosphere. Advanced control technologies help minimize release of any gasses during a normal operation or emergency venting operations.

The committee is reviewing gas main isolation procedures and stop off tools, including low-dig technologies that can be used to isolate sections of main more effectively so we can reduce the extent of the main segment involved in an isolating procedure. Minimizing the extent of main segment isolation also reduces pressure reduction venting once they are isolated to enable conducting work on them safely.

Technology has evolved tremendously over the last couple of decades from understanding the methods of quantifying emissions to broader application of trenchless technologies and pipeline rehabilitation techniques. For example, there's recognition and refocus on the strategic implementation of trenchless rehabilitation strategies using Cured-In-Place-Lining (CIPL) as an emissions risk mitigation tool in lieu of open trench pipe replacement. Utilization of state-of-the-art robotic tools to seal legacy cast iron pipe joints is yet another trenchless technology technique that is being explored on a broader scale. We encourage operators to consider the overall carbon footprint of implementing leak prone pipe mitigation strategies and not just fugitive emissions when evaluating replacement versus rehabilitation. A strategic balance of pipe replacement and pipe rehabilitation will get us to the ultimate goal of minimizing emissions in our industry-wide glidepath to maximzing de-carbonization of assets.

There is a shift and refocus happening that requires significant operational change. Emissions risk mitigation needs to be part of the DNA of safety culture long term. To effectively implement new practices and technology, there must be operational ownership and recognition of emissions mitigation as an integral component of pipeline safety at the grassroots level, with the technicians who are on the front line in day-to-day operations. Operational ownership centered on safety and emissions risk requires upfront work including answering questions such as "Why are we doing this?"

SUSTAINABLE CULTURE CHANGE BEGINS WITH UNDERSTANDING THE "WHY"

When implementing operational changes, questions emerge that need to be answered. Our members recognize, like with other safety and environmental management system implementation components, employee engagement from both a top-down / bottom-up approach is key to success. We are big believers in a structured approach to management of change and going into the field and educating employees so they understand why things are changing. A big part of ensuring sustainable change is explaining the "why" in a way that employees can relate to in their role as an emissions mitigation contributor. Field staff are at the forefront of decision making and actions in safety and emissions mitigation day to day. Instead of telling them what to do, help them understand the 'why.' Arming them with the tools, education and the understanding, leads to sustainable changes. The willingness to listen to employees and understand their point of view and ideas unleashes tremendous potential. Ideas that technicians in the field have come up with are some of the technologies being implemented successfully today.

PLAN, THEN IMPLEMENT

The first step to compliance with section 114 of the PIPES ACT, begins with reviewing operation and maintenance plans to ensure emissions mitigation considerations are integrated in routine operations and maintenance procedures. There is an Advisory Bulletin and checklist developed by PHMSA for state jurisdictional regulators authorized through PHMSA to conduct inspections. Operators need to provide a summary of how they meet the requirements in their plans and ensure that procedures are addressing emissions risk and mitigation.

See: **https://www.phmsa.dot.gov/news/phmsa-advisory-bulletin-pipeline-industry-must-take-actions-address-methane-leaks-pipelines**.

The next step is implementation, or simply, walking the talk. Operators will develop and conduct internal QA/QC inspection protocols, audits and eventually, will be subject to regulatory audits to ensure what is written is practiced in the field. Field inspections will continue to ensure operators are conducting operations in accordance with their procedures.

At NGA, our members have recognized the necessity to integrate emissions risk considerations as part of our evolving safety culture. As such, we embedded emissions mitigation considerations into pipeline safety management system practices; both from a strategic and tactical perspective. Emissions mitigation considerations are now part of pipeline safety management system implementation Tactical Guides. These practical operations focused guides help operators focus and integrate the principles of plan-do-check-act into routine operations including emissions mitigation.

Our fall operations conference in October had sessions to help educate operators on the "how to" piece of emissions risk mitigation. It's not somebody coming in and lecturing operators on what to do, it's our membership sharing leading practices with each other in the spirit of continuous improvement and true learning. Education and training helps, but leaders who walk the talk and engage employees until they realize that this challenge is theirs, get the best results. Leadership engagement has extraordinary value in helping shape safety culture.

All of the operating trade organizations across the country, and around the world, are focused on doing whatever they can do to help reduce emissions and control emissions risk. We work closely with AGA, SGA, APGA, and other organizations to further our joint understanding of leading practices. Research organizations such as NYSEARCH, the research arm of NGA as well as GTI Energy and others continue to provide the industry with innovative technology solutions in achieving our common goal of emissions mitigation.

It is a very interesting time in the industry with the converging of advances in technology, innovations, public awareness and policy changes happening simultaneously. Emissions control and risk mitigation is in the DNA of our day-to-day business, and will continue long into the future.

The Northeast Gas Association (NGA) is the nation's largest regional energy trade association serving more than 35 companies across 9 states in the northeast region of the U.S. that serve over 14 million gas customers. Members include natural gas utilities, local distribution companies (LDCs) serving New England, New York, New Jersey and Pennsylvania, interstate pipeline companies and LNG/CNG importers and suppliers.

ABOUT THE AUTHOR:

***Bob Wilson** is Vice President Special Projects, for the Northeast Gas Association (NGA). Bob served 38 years in the natural gas industry including 32 years with National Grid and its predecessor companies before retiring and taking a position at the Northeast Gas Association in 2017. He holds a B.S. in Chemical Engineering. His experience spans LNG/SNG Operations, Gas Quality & Interchangeability, Forensic Analysis of Gases, RNG/Landfill Gas Recovery Operations, Pressure Regulation & Control, Compressor Station Operations, Gas Codes & Standards, Environmental Operations. Prior to retiring from National Grid, he held the position of Director of Pipeline Safety for US Operations. He leads an NGA membership collaborative regarding Pipeline Safety Management System (PSMS) implementation with a focus on operationalization of strategy.*

CURED-IN-PLACE-LINING (CIPL) FOR LEAK PRONE PIPE

By: Mario Carbone, Progressive Pipeline Management (PPM)

Cured-In-Place-Lining (CIPL) is a proven and viable solution for gas operators to eliminate leaks and minimize emissions in compliance with the PIPES Act. Progressive Pipeline Management (PPM) has been working with gas companies utilizing Starline® Cured-In-Place-Lining (CIPL) for twenty years. The technology is being integrated into gas operators' long-term strategy to manage leaking infrastructure. Many of the big leaks and gas main needs are in inner cities in the Northeast and metropolitan areas such as Chicago where cast iron pipes can be 60-100 years old.

The regulation identifies areas where Congress believes additional oversight, research, or regulations may be needed to protect the infrastructure of pipelines and enhance safety. Included within this act are new mandates for PHMSA requiring operators to update, as needed, their existing distribution integrity management plans, and O&M plans. PHMSA will also require that leak repair programs consider the environment and the use of advance leak detection practices and technologies.

CIPL allows gas operators to use advanced leak repair technology to permanently eliminate leaks and minimize methane emissions, while reducing the carbon footprint compared to traditional pipe replacement programs.

LEADERSHIP ENGAGEMENT HAS EXTRAORDINARY VALUE IN HELPING SHAPE SAFETY CULTURE. CIPL ALLOWS GAS OPERATORS TO USE ADVANCED LEAK REPAIR TECHNOLOGY TO PERMANENTLY ELIMINATE LEAKS AND MINIMIZE METHANE EMISSIONS

EMISSION MITIGATION CASE STUDY 2005: BROOKLYN 8-INCH CIPL

Scope: line 7000 feet of 6-inch and 8-inch cast iron gas mains were lined

There was an underground oil spill under the Greenpoint Section of Brooklyn. The oil companies were addressing an oil spill near the area where there were gas lines. This leak prone area had methane emissions detected. The gas operator worked with PPM to use CIPL to line their gas mains to within the area of the plume to eliminate methane emissions from their system. It was done proactively to demonstrate that the methane readings were not coming from the gas mains. The pipelines were inspected annually and they remain methane and leak free today.

PPM's CIPL process and materials all fall within the strict confines of ASTM F2207 as well as ASTM D543. The cost savings and reduced carbon footprint compared to traditional "rip and replace" is significant. CIPL minimizes the impact of excavations, reduces traffic congestion and is proven to extend the life of renewed pipelines by 100 years. A lined pipe is considered a composite pipe, with leaks sealed and future leaks prevented.

LINING MYTHS

As effective as the technology is, there are still misperceptions that impede adoption. One myth is that the epoxy used in the liner is "glue." PPM uses a two-part epoxy resin to structurally bond the liner to the host pipe, not at all glue. PPM's epoxy cures, hardens, and fills up any gaps, cracks, or fissures. "Glue" has no such characteristics. Excessive "glue" impairs its ability to bond, and the objects won't adhere properly. In contrast, PPM's epoxy is moldable, and fills in surface irregularities and holes or deep cracks.

The excellent adhesive properties of PPM's epoxy resin are due to the attractive forces between the epoxy resin and the surface of the substrate. These forces create a permanent bond that forms between the reactive sites in the resin and the surface of the substrate. The final product is a precise thermoset plastic, which is resistant to high operating temperatures, corrosion, UV exposure, and aggressive chemicals, oils and fluids. PPM's epoxy's structural permanent bond lasts as long as the bonded objects exist after the adhesive is fully cured and hardened.

Leaking 42-inch cast iron gas main repaired using utilizing Starline® Cured-In-Place-Lining (CIPL)

ABOUT THE AUTHOR:

***Mario Carbone** is COO of Progressive Pipeline Management. Ingenuity and perseverance define his leadership. Mario's decades of experience enable PPM to design, develop and test new technologies and robotics while complying with required industry standards. He spent thirty-two years in design, maintenance and construction with Brooklyn Union Gas/ KeySpan Energy and ten years as the senior manager for gas research and development with KeySpan Energy. Mario holds three gas pipeline industry patents for new technologies in gas pipeline purging, live gas polychlorinated biphenyls (PCBs) pipeline sampling, and live service pipeline transfer without interruption. In addition to his expertise in Starline CIPL, engineering and managing field operations, Mario is versed in current regulations for corrosion and pipeline environmental procedures. His inventiveness to overcome challenges led PPM to win the Trenchless Technology Project of the Year multiple times.*

A FIRST CRACK AT SIPP

By: Eric Schuler, P.E., Mohawk Valley Water Authority

INTRODUCTION/BACKGROUND

Managing old infrastructure is fun. Personally, I am a rehab guy and have always been enamored by the ability of our industry to take an asset exhibiting various degrees of deterioration and transform it into "like new". Prolonging asset life cycle is always looked at as a benefit, but to conduct rehab with such a relatively minor impact to old neighborhoods and busy downtown areas is such a selling point for utilizing trenchless technology.

Here at Mohawk Valley Water Authority (MVWA), we have over 750 miles of linear assets ranging in age from 1868 to 2022. Nearly 30 percent older than 100yrs, 40 percent meeting the 50-100 year metric. All kinds of conditions: the kind where you can poke a hammer claw through a cast iron pipe wall, to brand shiny new Class 52 Ductile that hopefully has a 500 year design life (just kidding). Not the rosiest of pictures, but there are worse out there. MVWA, like many utilities in the Northeast has historically had trouble implementing a linear asset renewal plan that was sustainable and that had support from governing Board Members and local communities. Trying to transform a nearly 1,000-year replacement plan into something manageable was going to take some creative solutions and a heck of a sales pitch from our Engineering Department.

> **"BOTH SIPP AND CIPP ARE GREAT TOOLS FOR A WATER UTILITY'S TOOLBELT."**

Significant tuberculation in the host pipe

Fortunately, our Engineering Staff has a key team member that has tracked main break and leak frequency per pipe segment for the last 25+ years. This data was crucial for diving right into a Phase 1 rehab project for 2022. We had money allocated in our Capital Funds to conduct a "PILOT" program for rehab technologies. The groundwork was laid for progressing with a SIPP (Spray-in-Place Pipe) Rehab before I got involved with MVWA; it was just a matter of finalizing rehab limits and getting the bid docs out on the street. SIPP was chosen due to the comfort level with service reinstatement and the need for a Class 3 Semi-Structural System. Existing host pipes being targeted still had good wall thickness, so there wasn't a push to go Class 4. The following are some highlights and key points from the project:

SELECTION OF PROJECT AREAS

Utilizing data developed in-house to target problem areas comprising of nearly 3500 LF of 6- and 8-inch water mains in residential areas. Adjoining segments were preferred and two clustered locations within the City of Utica were chosen for Project Areas. Pipe ages ranged from 70-100 years old.

"PARTNERED" APPROACH FOR CONSTRUCTION

MVWA intended to execute all site prep and restoration during this rehabilitation process. We wrote the bid documents to reflect such so that the rehabilitation contractor was only responsible for installing temporary water services and conducting rehabilitation options. Our crews excavated access points at valve locations and removed sections of pipe to facilitate rehab process. Restoration efforts included installing new valves, couplings, short lengths of pipe, and surface restoration. We also conducted all "return to service" laboratory work before placing the water main back in active status. (MVWA is fortunate to have a USEPA certified lab in-house).

SIPP CONTRACTOR AND PROCESS DETAILS

Veolia North America was awarded the contract for this work, and submitted a

Communication with area residents was key to success

Relatively minor impacts to old neighborhoods and busy downtown areas are key features of trenchless technology

Warren 100 percent solids 2-part epoxy product for application. The product was NSF-61 certified and met or exceeded all of our specification requirements for a Class 3 Semi-structural lining system.

Pre-cleaning and pre-lining inspection of the existing mains was a challenge. Significant tuberculation was built-up in the pipe interiors and required a significant number of passes with the scraper and pigs to get it clean for lining application.

Once the existing stretch of main passed the video inspection (and was pretty bone dry), the lining system was installed once atmospheric conditions were appropriate. The lining spray head applied the coating at an excess of 10,000rpm and at approximately 175degF. Once cure time was completed, we conducted another video inspection to confirm a visual acceptance of liner. Samples of liner were also taken during application for lab testing to occur to verify strength metrics.

LESSONS LEARNED

1. Access points were chosen at valve locations in order to maximize asset renewal for the target corridors. New valves (and new hydrants!) were going to be a key component of this project. The old "touch-it-once" philosophy. Get everything within a defined area up to a certain standard and be done with it. No need to come back to tinker with a bum valve or a faulty hydrant on a street that so much money was recently invested in.
2. Sags in the pipe were problematic during surface prep stage. It took many passes from foam pigs to get rid of any water located in these sags. It did cause some minor delays in project scheduled, but it was impossible to predict where sags were present when heading into the project.
3. Crosses were problematic. The intent was to line through existing crosses that were located at intersections, however, these crosses also had a belly in them that held water. We ended up having to excavate additional holes adjacent to the

Access points were chosen at valve locations

SIPP is a Class 3 Semi-Structural System

cross locations in order to help facilitate standing water removal. In hindsight, we should have excavated the crosses originally as part of our access point excavation plan.

4. Previous repair locations were not fun. We had to dig a couple additional access pits to facilitate removal of the Contractor's scraper mechanism that got stuck in the pipe. This was of no fault to the Contractor, just was bad luck of getting snagged on previous main-break locations that were previously repaired by external clamp.
5. Even more communication! We communicated with residents through door hangers and even going door-to-door to discuss impacts to service. It still wasn't enough and we ended up doing additional post-construction outreach to community leaders/elected officials

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SIPP worked well

to mitigate concerns of residential/commercial impacts during future phases of rehab.

FUTURE UNFOLDING

We did have a successful Phase 1 of Watermain Rehabilitation and it was definitely a cost savings utilizing in-house staff to assist with the efforts. SIPP worked well for us and we are pleased with the results. We also are looking forward to utilizing the same collaborative mindset to implement CIPP rehab options within our system as well. Both SIPP and CIPP are great tools for a water utility's toolbelt, but no single technology is a one size fits all solution to rehab.

Since this project completed, we revised the 25-year Capital Plan and passed it through the Board of Directors Capital Project Committee to set the stage for ramp-up of (trenchless) rehabilitation and (non-trenchless) replacement of linear assets starting in 2023. For the next 5 years it would get us on pace to a 250-year system renewal plan, with escalation occurring again 5 years out. Still work to be done to lower that system renewal number, but we are moving in the right direction.

ABOUT THE AUTHOR:

***Eric Schuler** is the Director of Engineering for the MVWA, a public water authority serving 16 municipalities in Central New York. Eric is Chair of the NASTT Northeast Regional Chapter (NASTT-NE)*

HISTORY AND DEVELOPMENT OF GEONEX HORIZONTAL HAMMER BORING SYSTEMS

By: Paul Wilkinson, Kilduff Underground Engineering, Inc. (KUE)
Kimmo Juvani, Geonex Inc, (GEO)

Effective solutions for installing small diameter tunnels through, solid rock, broken rock and difficult soft ground are pretty thin on the ground however they do exist, and we discuss here the development of Horizontal Hammer Boring (HHB) technology in Scandinavia over the last 30 years.

Scandinavian ground conditions can be extremely onerous requiring utilities to be installed through hard rock and soft ground littered with boulders that has forced contractors to think out of the box to find reliable cost-effective solutions to install underground ducts.

Pneumatic hammer well drilling technology from the 50s commonly referred to as Down-The-Hole (DTH) hammers provided a solution. Driven by compressed air the hammer mechanism has a fairly simple rapidly reciprocating piston arrangement that percussively strikes a drill head assembly 2 to 10 times per second to generate massive percussive impact energy that disintegrates and drives through the ground. Exhaust air from the piston is directed through the drill head to flush spoil cuttings to the surface.

Pentti Juvani, father to sons Kai and Kimmo from Boreal Star Oy, a family-owned Finnish contracting company, adopted DTH technology in 1993 and converted hammers to run horizontally on their homemade rigs that when put to work also demonstrated the ability of the percussive energy to pull attached casing strings through the ground, providing cost saving benefits of not requiring shafts with thrust walls to pipe jack casings through the ground.

"IN 2019 THE GEONEX SYSTEM RECEIVED NASTT'S INNOVATIVE PRODUCT OF THE YEAR AWARD."

Boreal Star's initial small-scale enterprise expanded rapidly with the company transitioning to being a solely HHB business by 1997. The company was sold in 2006 but Kimmo Juvani remained to be heavily involved in HHB contracting to 2011 registering an achievement record of more than 10,000 bores extending to 650,000 feet in the ground!

Having mastered HHB contracting, Kimmo's attention moved to and refocused on developing, designing, and manufacturing state of the art plug and play HHB equipment that could be offered to the Scandinavian and world-wide trenchless market.

By 2012 the concept for 1) A pneumatically powered horizontal hammer that uses exhaust air and augers to return excavated spoil down the casing 2) A hydraulically powered rig with a rotary drive unit to guide casings and drive the augers 3) A system controlling power pack unit, had been devised and the company Geonex Oy was founded.

Designs were finalized, and supply chains formed allowing for production and sale of the first HZR 400 system in 2013.

Further designs to create four systems to cover casing installation in the range of 5.5 to 48 inches were completed by 2017:

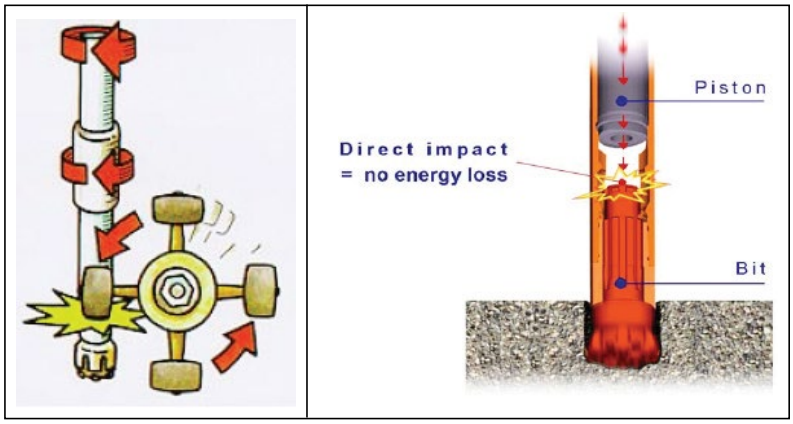
a) HZR 220 + PP 180HA for casings 5.5-to-8.625-inch,

b) HZR 400 + PP 90 for casings 6.625 to 16-inch,

"IT IS ALSO BEING UNUSUALLY USED TO EXCAVATE CATACOMB GRAVES IN ISRAEL."

Reliable cost-effective solutions to install underground ducts through solid rock, broken rock and difficult soft ground

Pentti Juvani, father to sons Kai and Kimmo from Boreal Star Oy, a family-owned Finnish contracting company



Rapidly reciprocating piston arrangement percussively strikes drill head assembly 2-10 times per second to generate massive percussive impact energy

> ***"CUSTOMERS ARE MOVING TO PURCHASE ADDITIONAL UNITS AFTER DELIVERY OF THE FIRST."***

c) HZR 610 + PP 180 for casings 10.75 to 28-inch &

d) HZR 1200 + PP180 for 24 to 48-inch casings

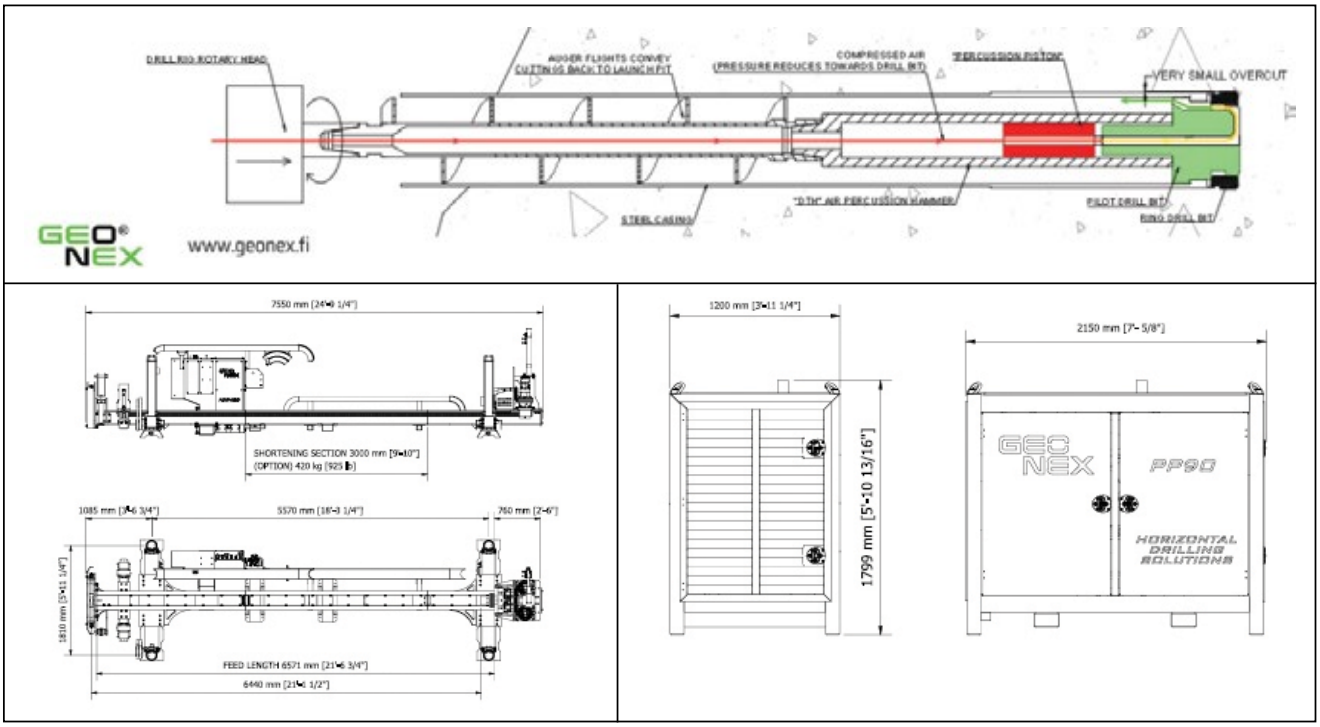
Key system benefits include the ability to operate in all ground with the same cutter head. Installation rates of 7 feet per hour through hard rock and 20 feet per hour in mixed ground with boulders that are reliable and fast. Control via a wireless light-weight hand portable control unit, allows the operator to be safely positioned remote from the rig, where required. Low set up costs, due to self-propulsion of the hammer shafts are not always required, which in turn allows for economical use of long 40-foot casing elements. Access for recovery is only required for removal of the ring bit and the short starter casing. Labor requirements are also low, typically systems up to 24-inch can be manned with three workers, with one being a coded welder. For 30-inch and above, it is recommended to have two welders, taking the total crew requirement to four workers. With remotely activated hydraulic legs for lateral and height adjustment rigs can be set up and ready to bore in half a day shift. All in all, a reliably robust efficient solution that can install 300-foot long bores within a week. The equipment is almost completely retractable, only leaving behind the peripheral cutter bit and starter casing allowing blind hole bores such as starter and receiving casings for horizontally drilled crossings to be undertaken.

Cased bores are limited to approximately 330 to 500 feet in length. Active steering is currently not available however when launched and correctly operated accuracy of approx. 0.5 percent over bore lengths is achieved. It is important to monitor that the hammer assembly and lead casing are installed on the designed alignment and use the hydraulically adjustable legs of the rig to make as required adjustments. Impact forces generated by the hammer disturb ground at the excavation face that trend to slight downward movement of the hammer along the bore. The "Rule of Thumb" is, the harder, denser, or better load bearing the ground the better the accuracy. Operators also need to adjust hammer impact frequency to suit project conditions and / or changed project conditions, higher than required frequency will induce greater downward movement trends.

Uncased open hole bores in competent rock can extend 1000 to 1500 feet and have the ability to be steered via the initial 6-inch pilot bore using sonde detection equipment for guidance.

In 2019 the Geonex system received NASTT's Innovative Product of the Year Award and to date over 50 Geonex systems have been sold to Finland, Sweden, Norway, Israel, Switzerland, Austria, USA, Canada, Germany, Spain & Portugal. Scandinavia remains the most popular market where HHB is used for around 80 percent of 5.5-inch to

2019 NASTT Innovative Product of the Year Award



By 2012 the concept had been finalized, with sale of the first HZR 400 system in 2013

In Norway bores mainly run through strong to extremely strong 50,000+ psi unconfined compressive strength rock

48-inch cased trenchless crossings < 500 feet in length, most bores are installed through terrain with frequent boulders. In Norway bores mainly run through strong to extremely strong 50,000+ psi unconfined compressive strength rock. In Switzerland the versatility of the system has been recognized and Geonex has been nominated for projects to minimize the risk of bore failure due to unforeseen natural ground conditions, it is also being unusually used to excavate catacomb graves in Israel.

The equipment from Finland is gaining traction and acquiring a reputation of "once used or seen never forgotten". Orders are being placed without work in-hand and customers are moving to purchase additional units after delivery of the first.

For Kimmo, supported by Tuomas Lassheikki and an ever-increasing work team product development is not over. Whilst writing the article a trial has been undertaken in Finland with an actively steerable 8-inch guided pilot casing that is to be reported under separate cover as is the factory test and field trial using mechanically interlocked steel casings that can offer an alternative to site butt joint welding of casings.

DTH and HHB hammers are not new to market, but the cleverly adapted Geonex package certainly is and offers ease of market entry to customers. For engineers and contractors, it puts on the table a "go to solution" for the installation of small diameter tunnels in the "rock and the hard places".

ABOUT THE AUTHOR:

Paul Wilkinson *is a Senior Consultant who has been associated with Kilduff Underground Engineering (KUE) from its onset in 2014 and brings 31 years of Microtunnelling experience to the company. Formerly serving as General Manager for Iseki Euro Paul has personally overseen the installation of over 120 KM of micro tunnel, on over 200 projects in 27 countries.*

Kimmo Juvani *is the CEO / President of the Geonex Group. Kimmo has nearly 30 year career working with Horizontal Hammer Boring. He started as CEO of trenchless contracting company solely working with HHB in Scandinavia. Later in 2012 Kimmo transferred from contracting to manufacturing of Geonex Horizontal Hammer Boring solutions as CEO / President of Geonex Group. Kimmo holds records in HHB contracting of over 10,000 holes and 200,000m.*

A SHORE THING!

Inspiration for Monopoly, Atlantic City, Not Playing Games with Wastewater System: Sand Infiltration and Failures Force Major Pipe Replacement with HDPE

By: Plastics Pipe Institute, Inc. (PPI)

Beautiful beaches punctuate the New Jersey coastline, but while sand is welcomed and appreciated along the ocean's edge, it can wreak havoc on the pipes that comprise a community's wastewater collection system. The Atlantic County Utilities Authority (ACUA) struggled with this firsthand when a critical force main line connecting three shoreline communities to the wastewater treatment plant began to fail.

The original 30-inch-diameter, welded-steel force main that conveys wastewater from the towns of Ventnor, Longport, and Margate, a region referred to as Down Beach, was installed in the mid-1970s. It extends north from the Down Beach area toward the treatment facility. Along the way, it passes through a former municipal airstrip, Bader Field, under a navigable waterway called Beach Thorofare, and beneath both the Atlantic City Expressway and the New Jersey Transit train lines that run between Atlantic City and Philadelphia.

By the 1990s, the steel pipe began exhibiting signs of deterioration due to an excess of sand and grit in the system. "We're a beach community," said Tom Ganard, ACUA's chief engineer, "and we get a lot of beach sand coming into our system through various means — street manholes, infiltration, people coming off the beach and taking showers — and this grit runs through the line. It was literally wearing a groove in the bottom of the steel pipe," he explained.

After a series of failures in the line, the Authority sliplined a portion of the steel main coming from the Down Beach area up to Bader Field. But in 2017, the worst-case scenario unfolded. "I can remember exactly where I was on September 23, 2017, when I got the call that you never want to get," said Joe Pantalone, vice president of ACUA's Wastewater Division. "That was the first main break of Bader field."

The ACUA acted quickly to bypass the line but it was only a temporary solution. The Authority knew it was on borrowed time and began the design and permitting process for the total replacement of a mile and half of force main. "Once we knew that we had problems in that one area, we immediately decided to replace the entire Bader Field main," said Pantalone.

ACUA's troubles weren't over just yet. While in the design and permitting process, another catastrophic failure occurred in 2019, just south of the previous break. This kicked the project into overdrive, and the

The 30-inch diameter HDPE PE 4710 pipe being pulled backward in the HDD process. (Photo courtesy of ACUA)

ACUA secured advanced permission to move forward with the total replacement it had already been planning.

The $8 million replacement project was divided into two phases: the first was the replacement of the Bader Field main line using a standard open-cut construction. This phase was completed in 2020 by Arthur R. Henry Inc. (Egg Harbor Township, NJ)

The second phase, which was not in failure mode but was part of ACUA's master plan, is the portion running under Beach Thorofare, the Atlantic City Expressway, and the New Jersey Transit lines. General contractor C. Abbonizio Contractors (Sewell, NJ) used horizontal directional drilling (HDD) for this section, including the formidable 1,500-linear-foot underwater segment.

For the HDD, the Abbonizio crew did a smaller 8-inch-diameter pilot hole drilled to establish the bore path direction. At the point where it comes out of the ground, they reattached a larger-diameter bore — in this case, a 42-inch drill —and then pulled it back through the same path, making the hole the size needed for the HDPE pipe replacement. Then, the new pipeline was pulled through the opening.

C. Abbonizio subcontracted the horizontal drilling portion to Michels Corporation, a family owned and operated energy and infrastructure construction company headquartered in Brownsville, Wis. The drill rig was a Uni 250x400 with a pulling force capacity of 250,000 pounds and a torque capacity of 40,000 ft-lbs.

The directional boring was completed in June 2021 and only took a few days. The accuracy of the drill was nothing short of amazing. "They literally hit the survey stake that was more than a thousand feet away that they had put in the ground at the exit point," said Ganard. "Now, the pipe just needs to be connected to the current system on both sides.

One of the benefits of using directional drilling is that it minimizes disruption to not only marine activity on the waterway but also the channel bed, water, and aquatic plants and animals in the bay. "The whole project is working in an environmentally sensitive area," Ganard noted. "So, the fact that we could do the directional drilling really saved a lot of environmental disturbance that could be related to a construction project." After installation, the pipe was approximately 80 feet below the Beach Thorofare.

"The entire process amazed me," said Nicholas Listner, with the engineering department of C. Abbonizio. "More specifically, watching them track the pipe as it was drilled was definitely the most

> ***"WE REALLY WENT THE EXTRA MILE TO CARRY OUT WHAT WE ARE PLEDGED TO DO BY REPLACING THE ENTIRE MAIN."***
>
> **- Joe Pantalone, Vice President, Wastewater Division, ACUA**

> **"THE FACT THAT WE COULD DO THE DIRECTIONAL DRILLING REALLY SAVED A LOT OF ENVIRONMENTAL DISTURBANCE THAT COULD BE RELATED TO A CONSTRUCTION PROJECT."**
>
> **- Tom Ganard, Chief Engineer, ACUA**

The 30-inch diameter HDPE PE 4710 pipe enters the HDD path to go under the Beach Thorofare waterway. (Photo courtesy of ACUA)

The HDD path for the HDPE pipe under the Atlantic City Beach Thorofare waterway. (Photo courtesy of ACUA)

interesting part for me. There was a team guiding the drill head from an office. They knew where the pipe was at all time — both the location and the elevation."

For both phases of the Down Beach force main replacement project, high-density polyethylene (HDPE) pipe was the material of choice. The 30-inch HDPE DIPS has an outside diameter of 32 inches.

"We knew HDPE was a good solution for [this project] where we're running at 60 psi," Ganard said. "We had used it approximately 20 years earlier in another portion of our system, and when we inspected it, we did not see any signs of wear. We were comfortable that this pipe would have much better characteristics for what we'd be putting through it."

According to the Plastics Pipe Institute, Inc. (PPI), the pipe can be used in methods of underground installation such as HDD or open cut. "A recent industry survey showed that HDPE pipe continues to be the most common type of pipe used in trenchless installations," offered Camille George Rubeiz, P.E., F. ASCE, senior director of engineering for the Municipal and Industrial Division of PPI and is also the co-chair of the HDPE Municipal Advisory Board. "Properly designed, installed and fused, HDPE has a 100-year design life, zero allowable leakage, largest internal diameter and is the best water piping solution for open cut and trenchless installations. Plus, it has a larger flow capacity per PPIPACE.com, C coefficient of 150 - up to 50 percent higher C than others, corrosion and tuberculation resistance, lowest initial cost and lowest life cycle cost.

"The prevention of infiltration was one of the key benefits of the pipe here in Atlantic City. But a critical factor was also taken care of and that was because of the HDPE pipe's inherent resistance to salt water which eats away at other types of pipe. Plus, it has resistance to water hammer, fatigue, ground movements, freezing temperatures and earthquakes." PPI is the major North America trade association representing the plastic pipe industry.

According to Listner, several HDPE pipe companies were used on this project. The pipe was produced by Performance Pipe (Plano, TX), a division of Chevron Phillips Chemical Company LP. A McElroy Manufacturing, Inc. (Tulsa, OK) Trackstar 900i butt fusion machine was used to join the

straight pipe ends. "This machine basically melts the pipe together," explained Listner.

The 45- and 11.5-degree bends were manufactured by GF Central Plastics, LLC. (Shawnee, Okla.). Electrofusion couplings were produced by Integrity Fusion Products, Inc. (Peachtree City, GA) "These are an alternative method of joining two pipes," said Listner. "The pipe joints fit inside of this coupling and again the materials are heated to create a water-tight seal between the different products. We use these couplings in tight or uneven spaces where a butt fusion machine cannot be used." Performance Pipe, McElroy, GF Central Plastics and Integrity Fusion are PPI member companies.

When it comes to pipe material, HDPE is ACUA's preference. "Based on our history with steel pipe, we won't be using that ever again," noted Ganard. "But that's old technology anyway. We've had a lot of success with the HDPE pipe, so it's our preferred method for force main replacement."

The Down Beach force main replacement project is a massive undertaking that will resolve decades of challenges with a deteriorating steel pipeline. But for ACUA, it's much more than that. "No one pays attention to the Wastewater Division until there is a failure," said Pantalone. "This shows the community that we are diligent in our reinvestment into our infrastructure, we stopped the bleeding as quickly as we could, and we didn't stop there. We really went the extra mile to carry out what we are pledged to do by replacing the entire main."

Additional information can be found at the Plastics Pipe Institute's Municipal & Industrial Division's website: www.plasticpipe.org/municipalindustrial

Heat fusing the sections of HDPE pipe was done and the resulting monolithic pipeline was staged along a runway at the former Bader airfield, ready for the 1,500-foot HDD pull 80 feet under the Beach Thorofare waterway. (Photo courtesy of ACUA)

ABOUT PPI:

The Plastics Pipe Institute, Inc. *(PPI) is the major North American trade association representing the plastic pipe industry and is dedicated to promoting plastic as the materials of choice for pipe and conduit applications. PPI is the premier technical, engineering and industry knowledge resource publishing data for use in the development and design of plastic pipe and conduit systems. Additionally, PPI collaborates with industry organizations that set standards for manufacturing practices and installation methods.*

MAILING IT IN

By: Tyler Price, Underground Magnetics

UMagHDD.com

The United State Postal Services delivers billions of pieces of mail and packages to more than 160 million residential and commercial addresses every year. The logistics behind doing this before technology and automation were introduced are unimaginable. Every industry adopts technological advancements at a different pace. While our industry was built on hard work and traditional methods, most HDD contractors are bound to face a challenge that encourages them to give some new tech a try.

With over 50 years of experience in the HDD industry, Chuck Cohen with Apollo Trenchless is an old school contractor that uses traditional methods to get the job done. Earlier this year, Chuck found himself on a project that was not going well while using his older locator.

With a mailbox sized hole already cut in the concrete wall of the building, Mr. Cohen knew there was no room for error. If that wasn't enough, the job required him to drill from the parking lot of his local post office, through a parking garage with cars moving, and power paralleling his bore path. After struggling with his current locator, he gave his old buddy, Mike Young at Underground Magnetics, a call to ask for help.

So, one rainy Saturday morning, Mike loaded up a Mag 9 locating system with the Echo 50XF transmitter and hit the road. He chose the 50XF because of the dual coil antenna that allows the transmitter to work in frequencies below 1 kHz and up to 41 kHz.

Once Mike arrived, he knew the project would require a frequency below 1 kHz. They set the transmitter in K32 (.32 kHz), allowing them to drill around the active power they were paralleling and work through the passive interference generated by the rebar and wire mesh. With this new technology, they made short work of the job hitting the hole with no issues.

No matter how seasoned a contractor might be, there are always going to be limits that can't be met without updated equipment. Thankfully, advanced locating systems like the Underground Magnetics Mag 9 receiver and the Echo 50XF transmitter are available and ready to tackle just about any job.

Tyler Price is the marketing director at Underground Magnetics Inc.

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The **Echo-50XF** eats **heavy rebar** and **wire mesh** for breakfast. When it comes to **passive interferance**, this is the only transmitter you need. With **16 frequencies** (.**325kHz - 41kHz**) and **two power levels** this will be your go-to for almost any job. Call to schedule your demo with the Mag 9 or Mag 5s and Echo-50XF.

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NATIONAL GRID TRENCHLESS CONDUIT PROJECT NEAR THE BUFFALO INTERNATIONAL AIRPORT

By: Pat Pierce, Underground Solutions, Inc.

Figure 1. Staging Area for the National Grid Trenchless Project in Buffalo, NY

> **"THE LARGER INSIDE AREA OF THE PIPE ALLOWED FOR A SMALLER OVERALL DIAMETER PIPE, WHICH TRANSLATED TO A SMALLER BORE HOLE."**

National Grid, one of the largest investor-owned energy companies in the U.S. serves more than 20 million people throughout New York and Massachusetts, employed trenchless technology to replace aging electrical infrastructure located near the Buffalo Niagara International Airport. The existing electrical conductors had been placed in service underground more than 50 years ago. To provide the least amount of disruption to the community in a very busy area, the new electrical conductor installation solution was determined to be trenchless technology.

The area around the Buffalo Airport has become much more developed since the original electrical conductors were placed into service more than 50 years ago. Additional hurdles included multiple parties who were involved. National Grid received an easement from the landowner to stage everything during the construction process. The project started on land owned by the Niagara Frontier Transportation Authority (NFTA), crossed a local road and highway, and then ended on more land owned by the NFTA. The project proceeded under Federal Aviation Administration (FAA) guidelines, due to the proximity of the Buffalo Airport, and was also overseen by the New York Department of Transportation (NYDOT), due to the highway crossing.

The successful project was designed by the engineering company CDM Smith. They have worked with National Grid on many of their infrastructure projects, throughout the utility company's service area. Trenchless installation has been used by National Grid for several other projects as well, which made the decision to employ trenchless technology much easier. This project was managed by Shaun Beckwith at National Grid, who is the Senior Construction Supervisor of Substation & Civil Construction / West. He routinely works on complex construction projects for National Grid.

The project required a 24-inch casing pipe, with four 5-inch conduits to be pulled inside the casing pipe. It was inserted underground approximately twenty feet away from the original installation. This project used Fusible PVC® from Underground Solutions, Inc. for both the casing pipe and the electrical conduits. This material was chosen due to the superior tensile strength of Fusible PVC®, which has twice as much tensile strength as other thermoplastic pipe that is used for trenchless construction projects. Because of the strength of Fusible PVC®, the wall thickness is also substantially thinner than other thermoplastic pipes, which allows for a much larger internal diameter when comparing similar sizes of pipe. The larger inside area of the pipe allowed for a smaller overall diameter pipe to be used, which translated to a smaller bore hole for this trenchless project. Another important consideration involves choosing a material that allows for a high pulling force to be used. Fusible PVC® meets all of these requirements.

The general contractor for this project was Ferreira Construction, which is a large national construction company. The project was managed by their Warwick, RI operation. Ferreira was responsible for the entire installation of the project. They were instrumental in making sure that the whole trenchless project was completed successfully, which included proper site safety, environmental compliance, and from an overall operational perspective as well.

The conduit and casing material had to be fused together first, and that work was completed by Underground Solutions. All of the Fusible PVC® was fused into individual complete strings, so that each whole length of casing and conduit pipes could be pulled into place. Because this was an electrical conduit project, the pipe material also had to be debeaded so that the new electrical conductor cable could be pulled through the individual 5-inch conduits without any

Figure 2. The fusion operation for the 24-inch Fusible PVC® casing pipe

internal obstructions. When thermoplastic pipes are fused together, a bead (or ridge) develops where the thermoplastic pipes are melted together. A procedure is used where the bead is removed both inside and outside of the pipes after they are fused together. The pipe fusion process occurred at the same time as the bore hole was being drilled.

Once the area was staged for construction by Ferreira, the first step was to drill the bore hole for the Fusible PVC® casing and conduit materials. This phase of the project was completed by Laney Directional Drilling Company from Waller, TX. Horizontal Directional Drilling (HDD) projects start with drilling a pilot hole to set the proper directional course for the project. In this case, a 12-inch pilot bore hole was drilled, followed by multiple reaming passes to open the bore hole to the final diameter that was required for this project. During the drilling process, a "mud" mixture is used. The mud material is primarily bentonite mixed with water. This drill mud is injected through the tooling that is used (the drill rods). The mud helps to cool the tooling during the drilling operation, as heat builds up in the tooling during the drilling process. Another very important function of the mud is to stabilize the bore hole, and to seal and maintain the inside hole diameter during the entire process. The mud also serves as a carrier for the spoils (the material that is removed from the bore hole during the drilling operation), as they are returned to the drilling side of the project. A reclaimer is also used on site, which separates the solids from the used drill mud so that the clean drill mud can be sent back into the bore hole.

With the bore hole completed, the drilling company then pulled the pipes into place along the bore hole path. The drill rig that was used had a 500,000-pound pull force capacity. The 24-inch Fusible PVC® casing pipe was pulled through the bore hole first. Once that phase of the project was completed, the four individual 5-inch conduits had to be pulled through. The four 5-inch Fusible PVC® conduits were assembled as a bundle prior to insertion, which means that they were all placed in spacers so that they were connected as a single bundle for the ease of installation.

Figure 3. The 24-inch Fusible PVC® casing pipe ready to be pulled into the bore hole

Figure 4. The 24-inch casing pipe being pulled into the bore hole

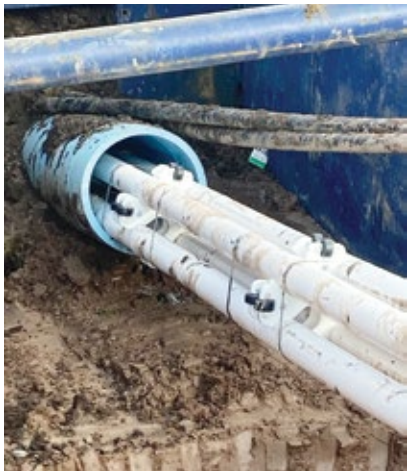

Figure 5. The 5-inch conduit bundle emerges from the bore hole

Figure 6. The grouting operation

Grout tubes were also placed into the spacer assembly, as grouting was required for this project.

After the pipes were all in place, the inner annulus of the casing pipe was filled with a highly flowable sanded grout to hold the conduit bundle in place, and to prevent any future disturbance within the casing pipe. The outer annulus of the casing pipe, within the bore hole itself, was also grouted to help displace drilling fluids, and to fill the voids surrounding the outside of the casing pipe. Outer annulus grouting will also help to mitigate any future surface settlement. The grouting operation was completed by InTerra Innovation, Inc. of Chelsea, MA.

The successful trenchless installation of more than 4,000 feet of Fusible PVC® casing and conduit pipes for this National Grid project was completed in October 2022. The overall scope of this work relied on the proper engineering design, along with teamwork from everyone involved.

ABOUT THE AUTHOR:

***Pat Pierce** is the Regional Sales Manager covering New England and New York for Underground Solutions. He has worked in a variety of industries throughout his career, primarily focusing on manufacturing management, marketing, and sales functions. Pat holds a B.S. in Chemical Engineering and an M.B.A. from the University of Massachusetts at Amherst.*

TRENCHLESS:

A NO DIG SOLUTION TO BUILD BETTER UNDERGROUND

UMass Lowell NASTT Student Chapter Report

By: Dr. Raj K. Gondle

Prof. Raj Kumar Gondle and Dennis Doherty along with UMass Lowell's NASTT Student Chapter recently visited a HDD Field Site in Lowell

The North American Society for Trenchless Technology (NASTT) is a premier resource for trenchless education and training of best engineering practices. NASTT offers in-depth training in numerous trenchless topics including Horizontal Direction Drilling (HDD), Microtunneling, Pipe Jacking, Pipe Bursting, and new installation methods.

The NASTT and the Northeast board have continuously supported education, training, networking, and recruitment

opportunities for the Student Chapter at UMass Lowell. Students from the Civil and Environmental Engineering program at UMass Lowell are highly encouraged to join student clubs like the NASTT Student Chapter early on in their university education. The student leaders share the great things and the exciting opportunities offered as a part of experiential learning and engineering education outside of the classrooms.

The trenchless industry has shown an interesting and fresh career path to students who had no prior knowledge about trenchless engineering. The involvement with the NASTT has proven that there is truly something for every individual in the industry. Upon graduation, students truly appreciate how the NASTT student chapter has helped them to transition from academia to industry practice.

Students and faculty visiting a microtunneling project site at Springfield, MA

Students attending the 2021 NASTT-NE Trenchless Technology Conference in West Point NY

ABOUT THE FACULTY ADVISOR:

***Dr. Raj K. Gondle** is an Assistant Teaching Professor in the Department of Civil and Environmental Engineering at the University of Massachusetts Lowell (UMass Lowell). He serves as a faculty advisor for the NASTT UMass Lowell Student Chapter. He was recognized with the 2020 UMass Lowell Departmental Teaching Excellence Award and the 2017 ASCE ExCEEd teaching fellow.*

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PPM PROGRESSIVE PIPELINE MANAGEMENT

THE INFRASTRUCTURE RENEWAL SPECIALISTS

CURED-IN-PLACE-LINING (CIPL) IS A PROVEN TECHNOLOGY FOR RENEWAL OF LEAK PRONE PIPE

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