



MIDWEST JOURNAL OF

# TRENCHLESS TECHNOLOGY 2022

OFFICIAL PUBLICATION OF THE MIDWEST SOCIETY FOR TRENCHLESS TECHNOLOGY

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### 14 Welcome to the 10th Annual MSTT Publication!

In the 10th annual *MSTT Midwest Journal of Trenchless Technology*, long-time MSTT President Jeff Boschert of the National Clay Pipe Institute revisits his original Welcome Message in the magazine's inaugural edition. With its popular seminars, MSTT has a stellar record of success in promoting trenchless technology for the public benefit across the Midwest.

### 16 Precision Line and Grade - on-Time and Under-Budget!

A project to construct a new overflow sewer in the City of Milwaukee encountered the anticipated challenge of installing deep pipe within a congested high-density urban area. The only location available within the already crowded corridor was in the parkway under a mature stand of trees. Trenchless options were explored and the Pilot Tube Method was ultimately selected as the best option due to the precise slope of the proposed sewer.

### 20 Casting Light on the Future of Lateral Rehabilitation

With the development of a brand-new version of the patented T-Liner, the first ever LED UV-cured T-Liner used for sanitary service lateral lining, there was the intriguing idea to install this next generation liner into the same collection system that had received the first-ever T-Liner 25 years ago. This article details the work done with the South Palos Township Sanitary District in implementing this innovative new technology.

### 26 Wheeling & Lake Erie Railway Rehabilitation: Medina OH

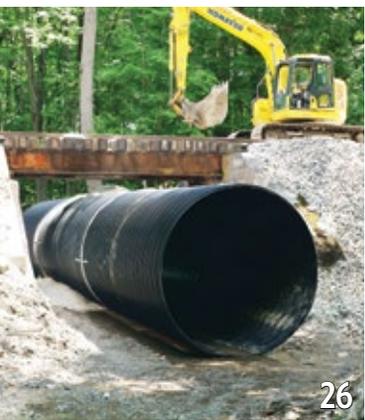
As one of the largest regional railroads in the country, Ohio-based Wheeling & Lake Erie Railroad Company has many 19th-century wrought iron train trestles within its 840 mile track network. One of these trestles was identified for repair and replacement and it was quickly determined that replacement was impossible due to the need to keep the track open. This article details the ensuing repair.

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# MESSAGE FROM THE PRESIDENT

Chris Schuler, MSTT President

Thanks to everyone for your support over the years. We are now celebrating the tenth annual publication of *Midwest Journal of Trenchless Technology*. We could not do it without the continued support of the many companies and individuals that comprise the MSTT community.

**About MSTT:** Established in 1998, MSTT is one of the oldest and the largest of the twelve NASTT Regional Chapters. MSTT encompasses the nine states of Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.

**2022 Seminars:** MSTT conducted two live, in person seminars in 2022. On May 17, we held a seminar in the greater Cincinnati area. It featured a presentation by Ms. Maureen Richard, PE, Principal Engineer, MSDGC Wastewater Collection Division, Asset Renewal Group (Repair/Rehab), City of Cincinnati OH. Her presentation: "MAINLINE SEWER REHABILITATION PROGRAM, MSD CINCINNATI" was very well received by our attendees from around the Midwest.

She provided great insight to their program. On October 26, we conducted a seminar in St. Louis at their historical Union Station. Our guest presenter, Mr. Allen Muehlher, P.E., Assistant Director of Engineering, Construction Management Division, St. Louis MSD highlighted several trenchless projects associated with the City's vast tunnels being constructed across the city. We appreciate our presenters, sponsors, and exhibitors who made both of these events tremendous successes!

## MSTT:

Advancing the science and practice of Trenchless Technology for the public benefit, to promote and conduct education, training, study and research in said science and practice for the public benefit.

**2022 No-Dig Show:** While the 2021 No-Dig Show was well attended both virtually and in person, on April 10-14, NASTT hosted our 2022 No-Dig in Minneapolis. It was nice to be back in person (mostly) with a robust attendance of intelligent and talented members of the trenchless community and many attendees looking to learn more about our industry. One of the great aspects of our industry is our willingness to share information with others. We look forward to No-Dig 2023 in Portland, Oregon.

While the impact of the pandemic was immense, maybe some good can come of it moving forward. Many of us learned to perform our work from remote locations, which can help. Additionally, we have learned to better communicate and developed many new tools for our toolboxes that may have been underutilized otherwise. I am honored to work in an industry that offers indispensable, essential services in an effort to improve the places we live.

We have faced many challenges over the last couple of years. We are working with a very tight labor market, we are still seeing the impact on supply chains that are affecting many of our projects, and COVID-19 still lingers in our

communities. Overcoming challenges is, however, what this industry is all about. The Trenchless Industry will continue to grow to meet the challenges that we will encounter. We will continue to find better ways and better methods to meet the demands of our aging infrastructure.

I was re-elected Chair of the MSTT in April 2021. I am thankful for the opportunity to serve and look forward to the bright future of our industry!

MSTT is your organization, and this is your publication, so please support us and let us hear what you think. To provide feedback, suggest a location for future events, place an ad, or submit an article for next year's journal; please contact Leonard, me, or one of our directors. Your support and involvement is critical to our success and the success of the Industry as newer faces enter and greater challenges present themselves.

Sincerely,

Chris Schuler  
President, MSTT  
317-653-5203  
[chris.schuler@millerpipeline.com](mailto:chris.schuler@millerpipeline.com)



MSTT SITE



# GREETINGS FROM THE MSTT EXECUTIVE DIRECTOR

Leonard E. Ingram, Sr., PWAM, Executive Director, MSTT

I am the Executive Director for the Mid Atlantic (MASTT), Midwest (MSTT) and Southeast (SESTT) Societies for Trenchless Technology. Coronavirus 19 has been a large factor in the last three years when trying to organize and conduct one of our “Trenchless Technology, SSES and Buried Asset Management” seminars. Municipal guest presenters, municipal attendees and others, sometimes, have not been allowed to attend and hotels have had layoffs and are now short of staff. I never thought I would call several hotels for a seminar venue and they would not return my call. Some are busy and some just do not have the staff to return the calls or no staff to support the seminar for a day. It is not like it used to be. But, when I do get someone in the sales and finalize a deal, I have been getting better deals for the seminars. And this is not to mention the airline problems

we have. Hotel and airline problems have gotten better this year.

So far this year, I have conducted successful seminars in Nashville, Cincinnati, Baltimore, Atlantic City, St. Louis and I am currently planning a seminar for Baton Rouge on December 7, 2022. The Cincinnati seminar had as the Guest Presentation, Ms. Maureen Richard, PE, Principal Engineer, MSDGC Wastewater Collection Division, Asset Renewal Group (Repair/Rehab), City Of Cincinnati OH, at The Radisson Hotel Cincinnati Riverfront, Covington, KY on Tuesday, May 17, 2022. Ms. Richard’s presentation was “Mainline Sewer Rehabilitation Program, MSD Cincinnati”. (See picture on page 44.) The networking and learning were terrific!

The most recent MSTT “Trenchless Technology, SSES and Buried Asset Management” seminar was in St. Louis on October 26, 2022 at the Hilton St. Louis

## Thanks for your support!

Union Station Hotel, St. Louis, MO. The Guest Presenter was Mr. Allen Muehlher, P.E., Assistant Director of Engineering, Construction Management Division, St. Louis MSD with the presentation “Trenchless Technology At St. Louis MSD”. (See picture on page 44.) The seminar was very well attended and there was a lot networking and learning about Trenchless Technology in the area.

**Thanks For Your Support!**

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

**PLEASE REVIEW THE MASTT, MSTT AND SESTT 2022 PROPOSED SEMINAR AND JOURNAL PUBLICATION SCHEDULE BELOW:  
The 2023 schedule should be available on each website by mid-January 2023.**

| SOCIETY       | LOCATION/PUBLISH                  | PROPOSED DATE      | STATUS    |
|---------------|-----------------------------------|--------------------|-----------|
| SESTT SEMINAR | NASHVILLE TN                      | MAR 23, 2022 – WED | CONDUCTED |
| MSTT SEMINAR  | CINCINNATI OH                     | MAY 17, 2022 – TUE | CONDUCTED |
| MASTT SEMINAR | BALTIMORE MD                      | JUL 20, 2022 – WED | CONDUCTED |
| MASTT JOURNAL | PUBLISH DATE (DEADLINE 08/5/2022) | SEP 2, 2022 – FRI  | PUBLISHED |
| MASTT SEMINAR | ATLANTIC CITY NJ                  | SEP 14, 2022 – WED | CONDUCTED |
| MSTT SEMINAR  | ST. LOUIS MO                      | OCT 26, 2022 - WED | CONDUCTED |
| MSTT JOURNAL  | PUBLISH DATE (DEADLINE (11/11/22) | NOV 23, 2022 – WED | PUBLISHED |
| SESTT JOURNAL | PUBLISH DATE (DEADLINE (12/02/22) | DEC 16, 2022 – FRI | PROPOSED  |
| SESTT SEMINAR | BATON ROUGE LA                    | JAN 25, 2023 - WED | PROPOSED  |

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# MESSAGE FROM NASTT CHAIR

Alan Goodman, NASTT Chair

## In Person Events are Back and Better Than Ever!

**H**ello Midwest 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.

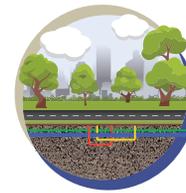
In the coming months we have many events planned to bring the underground infrastructure community together. This fall we hope you will join us in Toronto for the 2022 No-Dig North conference, October 17-19. No-Dig North is hosted by the Canadian Chapters of NASTT and offers two full days of training, education and networking. This is a must-attend event for trenchless training and networking in Canada. Visit [nodignorth.ca](http://nodignorth.ca) 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

Riding high on  
the success of the  
NASTT 2022  
NO-DIG Show!

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 [nastt.org/no-dig-show](http://nastt.org/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



**GREEN ABOVE.  
GREEN BELOW.**

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 [nastt.org/training/events](http://nastt.org/training/events).

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

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

*Alan Goodman*

NASTT Chair

# MSTT BOARD EXECUTIVE 2022-2023



## Chris Schuler - *President*

Chris Schuler joined Miller Pipeline in 1984 as a laborer in Indianapolis, Indiana. Over the next few years he served the company in many capacities, assuming the role of equipment operator in 1989 and foreman the following year. In 1998 Chris stepped into the role of superintendent over Kansas City and

Indianapolis until 2005 when he was promoted to project manager. In 2009 he assumed the role of general manager of the Municipal Services Division, in 2021 he was promoted to Vice President of Municipal Services Division where he currently oversees Miller Pipeline's water/wastewater trenchless rehabilitation operations. Chris attended Indiana University from 1983-1986 focusing on Economics and Business. He graduated from the University of Missouri with a B.A. in Commercial Economics in 2001. Chris serves as the current Miller Pipeline Representative for the Indiana Chapter of NUCA. He is also a member of the NASTT Program Committee in addition to his role as President of the MSTT Board of Directors.



## Ryan Poertner - *Vice President*

Ryan Poertner is a General Manager of Ace Pipe Cleaning, Inc. and lives in St. Louis, MO. Ryan's main focus is on the growing market involving trenchless rehabilitation. APC is a leader in the industry providing all types of rehabilitation solutions for municipalities in need. Ryan has spent

his 20+ years working in the water and wastewater rehabilitation fields. Ryan is a graduate of University of Missouri at Rolla with a degree in Engineering Management. Ryan is an active member of NASTT, NASSCO, WEF and local engineering organizations.

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# MSTT BOARD EXECUTIVE 2022-2023



## **Robert Martin - Secretary**

Robert Martin, P.E. has been with Jacobs Engineering Group since 2007 and has over 23 years of comprehensive underground engineering experience on projects including those for the rail transit, water supply, wastewater, and mining. Robert is the Past President of the ASCE Wisconsin Section Southeast

Branch and was a contributor of the ASCE/ UESI Manual and Reports on Engineering Practice No. 106, Horizontal Auger Boring Projects, Second Edition. Robert's experience includes construction feasibility assessments, design of soft ground and rock tunneling using various methods including; drill-and-blast, road header excavations, full-face tunnel boring machines in rock and soil, microtunneling, horizontal directional drilling (HDD) and other trenchless methods and has worked on projects all over the world. Robert is an active member of NASTT in addition to his role as Secretary of the MSTT Board.



## **Gary Smolinski – Treasurer**

Gary Smolinski is a Construction Manager and Partner at OHM Advisors (OHM) with over 30 years of experiential knowledge in the construction industry. He manages the construction phase of projects by working with contractors and technical staff, developing solutions to problems that inevitably arise in the field.

Gary is also a hiring manager at OHM, responsible for recruiting, hiring, and training future talent of field engineers, inspectors, and office technicians for OHM's Field Services (Construction) group. Using his expertise in the construction field, he works to continually enhance operational procedures, assigning and directing work accordingly to ensure the success of both the construction engineering teams and the client communities served.

Committed to advancing both his own technical knowledge and the use of trenchless techniques, Gary has continued to be an active member of the Midwest Society for Trenchless Technology (MSTT) since 2013, and is an active member of the North American Society for Trenchless Technology (NASTT).



## **Jeff Boschert - Past President**

Jeff Boschert, P.E. F. ASCE, is the President of the National Clay Pipe Institute (NCPI), a not-for-profit organization dedicated to research, education, and leadership in the vitrified clay pipe sanitary sewers industry for more than 100-years. Jeff joined NCPI from Missouri

DOT in 2004 to serve as the leader of the organization's trenchless initiatives. His initial research projects began almost immediately with CLSM bedding research.

Jeff has become a leading expert in the pilot tube method of guided boring. In 2012 he took on the added responsibility of leading NCPI and conducting educational outreach as the new president.

In addition to his work with NASTT, he represents the industry on multiple ASCE and ASTM committees. Jeff was one of the was one of the principal authors of the ASCE/ Utility Engineering and Surveying Institute (UESI) Manual of Practice (MOP No. 133) on Pilot Tube and Other Guided Boring Methods. He is the current Chairman of the ASCE/ UESI Pipelines Division Executive Committee (ExCom). Jeff is the current ExCom liaison and past Chairman of the UESI Pipelines Division Technical Committee -Trenchless Installation of Pipelines (TIPs). He served as conference chairman of the UESI Pipelines 2022 Conference held in Indianapolis this past August.

Under Jeff's leadership, NCPI has completed comprehensive updates of the Vitrified Clay Pipe Engineering Manual, the Vitrified Clay Pipe Installation & Inspection Handbook, and the Analyzing CCTV Inspection of Vitrified Clay Pipe Handbook. In 2020 NCPI introduced the VCP Operations & Maintenance Handbook, a first-of-its-kind, comprehensive manual for cleaning and maintaining a sanitary sewer collection system.

Jeff holds a Bachelor of Science in Civil Engineering from Missouri University of Science and Technology (S&T).

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# 2022 SEMINAR & JOURNAL SCHEDULE

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**MSTT - MIDWEST SOCIETY FOR TRENCHLESS TECHNOLOGY**  
**SESTT - SOUTHEAST SOCIETY FOR TRENCHLESS TECHNOLOGY**

| SOCIETY       | PROPOSED DATE       | LOCATION                           | STATUS    |
|---------------|---------------------|------------------------------------|-----------|
| SESTT SEMINAR | MAR 23, 2022 - WED  | NASHVILLE TN                       | CONDUCTED |
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| SESTT SEMINAR | JAN 25, 2023 - WED  | BATON ROUGE LA                     | PROPOSED  |

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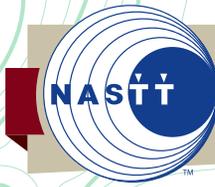
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Our 124 "Trenchless Technology, SSES and Buried Asset Management" seminars since 2001 have offered a lot of information, a lot of networking and a lot of learning. The journal and webinar are a great source for advertising, learning and teaching.



For registration and updated information on the 2022 "Trenchless Technology, SSES and Buried Asset Management" Seminars and Trenchless Journals, please visit:

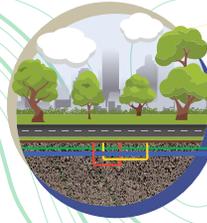
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APRIL 30-MAY 4 | PORTLAND, OR

**NO-DIG SHOW**

**2023**



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GREEN BELOW.**

# Save the Date

**NASTT 2023 NO-DIG SHOW | APRIL 30-MAY 4 | PORTLAND, OR**

## Educational & Networking Opportunities Await

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- **Technical papers & presentations**
- **Large exhibition hall**
- **Specialized trenchless training courses**
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*The No-Dig Show is owned by the North American Society for Trenchless Technology (NASTT), a not-for-profit educational and technical society established in 1990 to promote trenchless technology for the public benefit. For more information about NASTT, visit our website at [nastt.org](https://nastt.org).*

# WELCOME TO THE 10TH ANNUAL PUBLICATION OF THE MIDWEST JOURNAL OF TRENCHLESS TECHNOLOGY!



Jeff Boschert, PE,  
Past President, MSTT

Since this is our 10th annual MSTT Journal, I wanted to re-share the “story” of the Midwest Regional Chapter of the North American Society of Trenchless Technology which I first told in the inaugural publication:

The Midwest Society for Trenchless Technology (MSTT), founded in 1996 and established in 1998, is the oldest and the largest of the twelve NASTT regional chapters in the United States. The initial idea for this organization began at the innovative ISTT worldwide videoconference. An Indianapolis group was assembled and organized by Dr. Tom Iseley with a select group of just over 20 industry attendees. The germination of this chapter was just one result of this meeting. At the conclusion of the videoconference, Dr. Iseley proposed starting the MSTT chapter to the group, and asked Mr. Mark Bruce and Dr. Sanjiv Gokhale to take the lead.

Before the meeting was over, MSTT was formed encompassing the states of Michigan, Illinois, Kentucky, Ohio, and Indiana. Once the news was out, other NASTT members asked to join us, and Iowa, Minnesota, Missouri and Wisconsin were soon welcomed to our ranks.

MSTT was granted approval to operate as a chapter of NASTT. In the winter of 1996-1997, under the leadership of Bruce and Gokhale, the chapter conducted its first programs at university campuses in the cities of Indianapolis, Louisville, Saint Louis, Kansas City, Cincinnati, and Chicago. These early technical events were a great success with a total of 1,000 attendees.

Since the inception of the MSTT, we have conducted over 40 technical seminars on trenchless methods at various locations spread throughout the 9 states within our region. We now also have 10 annual publications which highlight trenchless solutions to underground pipelines and structures.

Our chapter’s purpose remains the same, which is to “*advance the science and practice of Trenchless Technology for the public benefit, to promote and conduct education, training, study and research in said science and practice for the public benefit.*”

Sincerely,

Jeff Boschert, P.E.  
Past President, MSTT

**“MSTT conducted its first programs at university campuses in the cities of Indianapolis, Louisville, Saint Louis, Kansas City, Cincinnati, and Chicago...”**

**- Jeff Boschert, PE, Past President, MSTT**

MSTT Seminar held in June 2019 at the Miller Pipeline facility is a stellar example of collaboration between the Chapter and industry



MSTT has now published 10 annual magazines promoting trenchless technology!

Jeff Boschert's original President's message from the very first MSTT publication in 2013



MSTT Seminars advance the science and practice of Trenchless Technology for the public benefit



# PRECISION LINE AND GRADE OVERFLOW PROJECT - ON-TIME & UNDER-BUDGET!

By: Ryan Haubenschild, Bore Master Inc.

The City of Milwaukee had a problematic sewer shed. The residents in the area were experiencing frequent basement backups during large rainfall events. The City hired Clark Dietz, Inc. to study the system and identify possible solutions. Installation of an overflow sewer was identified as the best option. It would reduce the hydraulic grade line, create greater capacity in the area and therefore minimize the probability of basement backups occurring in the system.

During design, the project had the expected challenges of figuring out how to install a deep sewer within a high-density urban area. The only location available within the already crowded corridor was in the parkway underneath a canopy of mature trees. The amount of tree removal that would be required, the cost involved in replacing those trees as well as the difficulties of installing sewers over 20 feet deep, ruled out installing the sewer by traditional open-cut methods. Trenchless installation was an especially attractive option for the project as the nature of an overflow sewer meant no laterals or extra connections were needed.

When trenchless options were explored, the largest hurdle was the slope of the proposed sewer. The design constraints required a slope of less than 1 percent due to the tie-in elevations of the existing sewer network. The Pilot Tube Method of Guided Boring (PTM) was the best solution for any project requiring this level of slope precision. In this case, it would also cause minimal disturbance to the residents in the project area during construction. Once the soil borings confirmed that PTM was an option for the area, the project was put out to bid in January 2022 with bids opened in February and project completion required by September.

Three contractors with PTM experience submitted bids on the project. Those bids ranged from \$2.2 to \$2.5 million.

“Pilot Tube installation is becoming the ‘go-to’ solution for crowded urban areas,” said Dave Gill, sales engineer with Logan Clay Products, the pipe supplier, “especially when designers need to avoid other utilities and municipalities need to maintain traffic flows.”

“Being able to rely on accurate drives gives system designers new options in the urban core,” according to Andrew Ashley, P.E. with Clark Dietz. “Projects with

**The Pilot Tube Method was the best solution for any project requiring this level of slope precision.**



*High-density housing was just one of the reasons for trenchless installation on this project*



The LED illuminated target is part of the steering mechanism for the pilot tubes

**“VCP-J is available in 8- to 24-inch diameters and is the predominant direct jacked product pipe due to its jacking strength, corrosion resistance, and longevity.”**

**- Jeff Boschert, PE, President, National Clay Pipe Institute**

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depth, space, and grade challenges are becoming commonplace and Pilot Tube installation is an approach I'll use again.”

The project consisted of six drives ranging from 220 feet to 435 feet in length. The jacking shafts were 26 by 12 feet with receiving shafts of 16 by 8 feet; the deepest shaft measured 25 feet.

Bore Master, the boring contractor, used an American Augers 36-600 auger boring rig with a 240A Akkerman Guided Boring Machine (GBM) mounted on the front to provide the guidance accuracy needed for the gravity flow sewer. They utilized 25-inch outside diameter steel casings which were manufactured by Bore Master. A good union was made with the thrust, torque, and speed of the auger boring rig, combined with the line and grade precision offered by the GBM.

Once the launch and reception shafts were constructed and shored, the auger boring rig was set up on tracks with the GBM mounted in front, secured to the track with adapter brackets. Line and grade were established by aligning the LED target, housed in the lead pilot tube which also included a soil-appropriate





*An installation depth of 25 feet was another reason that PTM was the best option for this job*

tube; no spoils were removed. Pilot tube line and grade can typically be maintained within a quarter of an inch at distances of approximately 500 feet in soil conditions under 50 blow count (Standard Penetration Test).

The GBM frame was then removed, and the auger boring rig assumed regular operation to install the 25-inch diameter temporary casings. Spoils were removed via auger retrieval. This second step followed the pilot tube installed in step 1 with a 25-inch reaming head and 25-inch temporary steel casing pipe. The reaming head contained a cutting edge that matched the O.D. of the 21-inch NO-DIG Clay Jacking Pipe. During this second step; as one section of casing was installed, a section of pilot tube was removed from the reception shaft.

Once the 25-inch diameter casings were installed from each jacking to receiving shaft, the auger boring rig and tracks were removed to accommodate a custom-built jacking frame. This frame was used to install 21-inch NO-DIG Vitrified Clay Jacking Pipe (VCP-J) which was supplied in 2-meter section lengths by Logan Clay Products.

“Twenty-one-inch NO-DIG pipe is rated for an allowable jacking force of 192 Tons which includes a 2.5 factor of safety,” according to Jeff Boschert, PE, President of the National Clay Pipe Institute. “This allowed the pipe to be direct jacked in the third step on this project. VCP-J is available in 8- to 24-inch diameters and is the predominant direct jacked product pipe material



*The American Augers 36-600 auger boring rig installing the 25-inch diameter by 10ft length temporary steel casings in the second step*

steering head. The camera and theodolite were mounted independently of the GBM frame for protection from movement during installation of the pilot tubes.

Operators accessed and controlled the progress of the target on a monitor mounted to the top of the GBM frame, above the controls area. The first step was completed with the pilot tube installation on line and on grade for the full drive length. The soils were displaced by the 4-inch diameter hollow steel pilot

in these sizes due to its jacking strength, corrosion resistance, and longevity which have yet to be matched by any other pipe material.”

This eliminates the need for a permanent external casing pipe. A pipe adapter was utilized at the end of the casings and in front of the lead jacking pipe section. No spoils were removed in this third step as the OD of the NO-DIG pipe was equal to the temporary casings installed in the second step. The 21-inch VCP-J pipe pushed and advanced the auger casings to the reception shaft where they were removed and cleaned to be ready for the next drive.

The process was complete when the carrier pipe entered the reception shaft, and the bore was lined with the 21-inch product pipe. The accuracy of the



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Given the high-traffic surroundings and the need for quick restoration, the backfill method of choice for the shafts consisted of a sand/gravel slurry mix

installation method meant Bore Master was able to tie the new alignment into the existing system as designed.

The tunnel shaft locations were designed for manhole (maintenance hole) construction after the completion of the sanitary sewer runs. Precast manhole structures 48 inches in diameter were set in place and connections were made with the 21-inch VCP pipe from the shaft face to the manhole. CLSM bedding was utilized for the pipe embedment and poured from the shaft bottom up to the top of pipe elevation. Once the CLSM embedment was set; a sand/gravel slurry was used as the complete shaft backfill. This eliminated the need for any compactive effort in these tight spaces while allowing final restoration to be completed immediately.

“Prior to submission of bids, Contractors were required to provide pre-qualification documents verifying their past experience with pilot tube guided boring using vitrified clay jacking pipe,” said Robert Seleen, Flood Hazard Mitigation Manager for the City.

“We felt confident given Bore Master’s 12 years of experience with PTM and parent company Globe Contractors, Inc. proven expertise with installing deep tunnel shafts for the City of Milwaukee.”

With the current stresses on supply chains, we were fortunate to have utilized Logan Clay Products which provided multiple shipments of VCP-J pipe with zero delays. This, in combination with great installation production rates and value engineering for final tie-in locations, meant we were able to complete this project on time and under budget. †

#### ABOUT THE AUTHOR:



**Ryan Haubenschild** is Operations Manager for Bore Master, Inc. specializing in trenchless construction throughout the Midwest. His 20 years of experience helps Bore Master tackle challenging projects in the water, wastewater, oil, and gas industries.



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# CASTING LIGHT ON THE FUTURE OF LATERAL REHABILITATION

By: Joseph Sullivan, Robinson Engineering, Ltd.  
Chad Wilson, Performance Pipelining, Inc.  
Thomas McGreevy, Performance Pipelining, Inc.

*An in-depth overview of the evolution of CIPP Lateral Lining and the unveiling of the new LED UV cured T-Liner®. Our objective is not only to illuminate the industry, but to educate it as well!*

## 1. INTRODUCTION

For over three decades, Robinson Engineering, Ltd. (REL), Performance Pipelining, Inc. (PPI), and the South Palos Township Sanitary District (SPTSD) have been working together to cost effectively rehabilitate the SPTSD sanitary sewer collection system. The venture started in the early 1990s with manhole rehabilitation and mainline sewer cured-in-place pipelining. This eventually fostered a discussion about sanitary service lateral lining which then led to the very first ever “Lateral Connection Liner” or “T-Liner” installation by Performance Pipelining, Inc. in 1998.

In the Spring of 2021, Robinson and Performance Pipelining set out to investigate this historical innovative T-Liner that was now a quarter century old to assess the condition. This exploration into the past allowed us to examine this critical piece of infrastructure and analyze its longevity and evaluate the technology. Good news! It was still in great condition and the technology withstood the test of time. You can read the full article about this adventure in “Unveiling the 1st T-Liner®; Nearly a Quarter Century Later”, *Midwest Journal of Trenchless Technology*, December 2021 (pp18-23) or at [www.MSTT.org](http://www.MSTT.org).

Shortly after the above-mentioned story was published, PPI’s Chad Wilson called and shared a “secret”. The secret was that LMK Technologies, and Waterline Renewal Technologies (WRT) had developed a brand-new version of the T-Liner, (the 7th generation unofficially) which was the LED UV cured T-Liner. Once Chad Wilson,

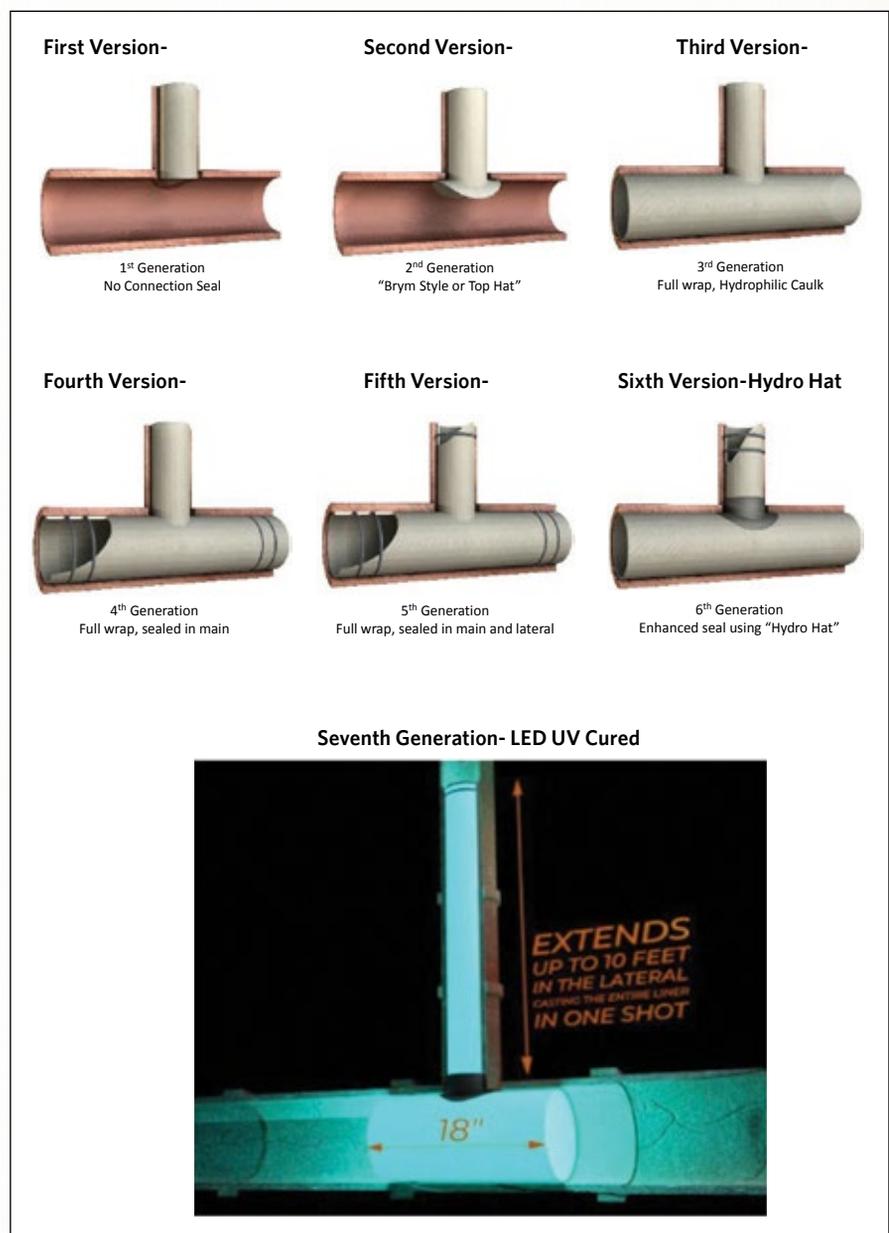


Figure 1: “Let there be Light” depicts the Lateral Liner/ T-Liner History and evolution.



Figure 2. Location of the first ever UV T-Liners in yellow

CEO, and Thomas McGreevy, President of PPI, shared this exciting news, we knew we wanted to once again be on the cutting edge of the collection system rehabilitation industry and install this new product in one of our client communities. While we had a few client communities in mind, one overriding thought was “Why don’t we put the first ever UV cured T-Liner in the same collection system that received the first ever T-Liner?”

## 2. EVOLUTION OF THE LATERAL LINER (T-LINER)

Before we get into this story and the results of the LED UV T-Liner installation, we first would like to help everyone understand the evolution of the LMK/WRT Lateral Liner as well as the LMK/WRT T-Liner®. LMK Technologies, founded in 1993, located in Ottawa, IL has been designing, producing, and pioneering

sewer rehabilitation technologies including service lateral renewal technology for the past 30 years. Waterline Renewal Technologies (WRT) is focused on trenchless products, technologies and services and brings the combined product offerings and solutions of numerous trenchless technology companies under one name. The images and descriptions shown in Figure 1 depict the Lateral Liner/ T-Liner history and evolution through the seventh generation LED UV T-Liner.



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Figure 3. Set up for first-ever installation

### 3. BACKGROUND

Robinson Engineering facilitated discussions with SPTSD and PPI, and both sides were open to a partnership for showcasing this new technology within the SPTSD sanitary sewer collection system. SPTSD had a history of exploring alternative rehabilitation methods and were eager to participate at the forefront of this innovative technology. When first asked about the possibility of setting up a demonstration of this new product in the SPTSD sanitary sewer collection system, Chad Wilson explained, “It’s the first ever UV-cured T-liner and we’d like to install it as a demo so we can shed light on this next generation of T-Liners. Our objective is to not only illuminate the industry, but also to educate it as well!”

Knowing that the South Palos Township Sanitary District (SPTSD) had successfully rehabilitated their sanitary sewer collection system over the years utilizing various trenchless technology methods, we began searching to see if there were any prospective connections in need of rehabilitation so that PPI could perform another product demonstration in the SPTSD. After a few conversations with PPI, they agreed to the concept of another demo project for the SPTSD collection system. After reviewing our extensive files and system records, we were able to locate a few areas that still had unlined and open service connections to the mainline. In total, there are about 50 out of the 750 laterals that had yet to

The translucent nature of the fiberglass material of the new T-liners lets both the installer and Owner/Engineer see behind the magic of the product.



Figure 4. UV T-Liner & hydro-hat being setup



Figure 5. Double Strand LED UV Light Train

receive a T-Liner. A few potential sites were chosen and agreed to by all parties and everyone was excited to begin the site investigation and preparatory work and watch the first ever UV cured T-Liner installation.

### 4. SITE INVESTIGATION AND PREPARATION

Now that a few target areas had been chosen, PPI had crews onsite for about two days, televising and lateral launching to find open laterals that were not previously rehabilitated in the past. Because SPTSD has been so aggressive and committed to rehabilitating their sanitary sewer collection system, an unlined lateral was proving elusive to find. It took several tries because much of the time PPI investigated a main line, everything was already

T-Lined. Finally, they were successful in finding two laterals within the targeted areas that needed connection liners. These laterals were both located in the same pipe segment on a quiet side street within the SPTSD service area.

The services identified at two homes on Poloma Drive were to receive a UV T-Liner each 5 feet in length. Both homes had existing cleanouts installed near the right of way line, and both had lateral liners previously installed in 1996 as part of a different Robinson designed project. These locations were some of the original PPI lateral liners that came before the development of the T-Liner.

At the time of that lateral lining in 1996, the field notes revealed that there was a small gap between the sanitary sewer mainline liner and sanitary sewer service lateral liner, which left a leaking joint and exposed clay

# SPTSD had a history of exploring alternative rehabilitation methods and were eager to participate at the forefront of this innovative technology.



Figure 6. The LightRay LED UV light system for curing the T-Liner

pipe. The preparatory televising done by PPI showed the leaks active at the joint on the day of install which revealed just how perfect these candidates were for the UV T-Liner.



Figure 7. T-liner, wrapped in a UV proof bag

## 5. EDUCATION AND TRAINING

On Thursday, October 7, 2021, a team meeting was held onsite which included team members from PPI, LMK Technologies, WRT, SPTSD and Robinson Engineering, Ltd.

The first portion of the day was spent on education with a bit of a show and tell with WRT research and development engineers & LMK product experts demonstrating the equipment needed for the UV T-Liner installations.

It was an interesting presentation and we all got to see and touch the proprietary double strand, cold LED light train. This piece of equipment requires no heat to cure the liner.

After some insightful explanations and correlations to existing installation practices, the PPI crews were confident in their ability to proceed with the installation of the first ever LED UV cured T-Liner. Even though the previous explanation had discussed the similarities between the old and new processes, watching it in person confirmed that this new process was very similar to “traditional” T-Lining. It was most impressive to note that a boiler was not needed onsite, the overall installation was more relaxed because it was less time and temperature dependent. In addition to this, the liners were non-volatile organic compound (VOC) and styrene free, which means no odor for the homeowners.

A notable difference in the liner material is that the UV T-Liner is translucent. This is because it’s a woven fiberglass fabric tube. The resin is a UV initiated vinyl ester resin. With this type of T-Liner the exact location of the hydrophilic O-rings in the lateral termination, as well as the molded



Figure 8. Sending the T-Liner in (from the manhole)

hydrophilic hat at the interface of the main to lateral connection could be clearly seen. This is an important evolution, because now the Owner/Engineer can see the defects being repaired behind the T-Liner, ensuring that the right location was repaired as well as that the extent of the damage was properly covered. This also ensures with visual confirmation, while looking through the T-Liner, that the correct hydrophilic O-rings and hydro-hat are also in place.

The LightRay LR3 system and double strand LED UV light train shown in Figure 5 is a patent pending LED UV system that provides the light for curing the UV T-Liners. This state-of-the-art technology was developed to reduce the time needed for installation when compared with both traditional T-Liners that use either thermosetting or ambient cure resins.

The LightRay non-VOC vinyl ester resin is pre-impregnated into the high-performance fiberglass T-liner and then arrives onsite thoroughly wrapped in a UV



Figure 9. UV curing process (View from the cleanout)

proof bag. Much like if you were handling 35 mm film, the prep crew handled the UV T-liner carefully to prevent any light from hitting the T-liner until it was safely lowered down into the manhole and time to begin the install.

## 6. INSTALLATION TIME

Once the install site was prepped and ready, it was expected that the overall casting time of these first two UV T-Liners would be approximately 15 minutes. This is a considerable time saving when compared to traditional methods of curing with steam and/or with ambient temperature cures.

The lateral tube within a translucent inversion bladder is placed inside a protective launching device. The mainline tube is then wrapped around the main bladder. The liner and launching device, then thoroughly wrapped in a UV proof bag, were carefully lowered down into the manhole. After removal of the UV proof bag by a crew member at the bottom of the manhole, the T-liner, bladder and launching device are positioned in the trough, attached to the winch and ready

for installation. The T-Liner, bladder and launching device are then winched into the existing sewer. PPI crews coordinate pulling the liner through the mainline until it is winched into place, properly positioned, and aligned with the lateral about to receive the T-Liner. Once proper alignment is achieved, the mainline liner bladder is inflated, and the lateral portion is inverted up the lateral by an inversion bladder. As the lateral liner inverts, the process is overseen from the cleanout through use of a push camera system. When the inversion process was completed, the UV-light curing process was begun. These initial UV cures for the first two UV T-liners was set at 20 minutes, to ensure that products were fully cured. Future installations will likely be set closer to 15 minutes for UV curing.

## 7. TESTING RESULTS

The first test that any Owner/Engineer will conduct is usually a visual test. How does it look after install, and what does the CCTV footage look like? Is the T-Liner positioned correctly? Does it cover up the defects that it was intended to cover? Are there any spots with wrinkles, deformation, bubbles, pinholes, discoloration, or delamination? Visually, we noticed right away that the UV T-Liner is translucent, and we were able to see O-Rings and Hydrophilic Hats and even the defects behind the T-Liner that have been sealed over. The translucent nature of the fiberglass material of the new T-liners lets both the installer and Owner/Engineer see behind the magic of the product.

Next typically comes the material testing to ensure the product being installed meets specifications. PPI & WRT sent in some early samples of the LED UV T-Liner and provided the results of those material tests to be included in this article here:

### Flexural Strength

Property ASTM Test Method: D790  
Polyester Resin System: 5,810 psi  
UV Vinyl Ester Resin System: 11,212 psi

### Tensile Strength

Property ASTM Test Method: D638  
Polyester Resin System: 3,000 psi  
UV Vinyl Ester Resin System: 9,815 psi



Figure 10. UV cured T-Liner (Installed)

### Flexural Modulus (Initial)

Property ASTM Test Method: D790  
Polyester Resin System: 268,000 psi  
UV Vinyl Ester Resin System: 433,165 psi

### Flexural Modulus (50 Yr)

Property ASTM Test Method: D790  
Polyester Resin System: 125,000 psi  
UV Vinyl Ester Resin System: 281,139 psi

## 8. CHECKING THE WORK

After successfully casting both T-Liners in 20 minutes, everybody was ready to review the results of the installations. The sewer connections were immediately televised. Because of PPI's exceptional lateral launch capabilities, the televising occurred from not only the existing outside cleanout but from the mainline as well. Figures 9 and 10 are from during the UV curing process and from the mainline post-video immediately after one of the services was UV T-lined)

As revealed in these Figures, which show both during and immediately after the UV curing process, both installations were a success! Four days later, on

Monday, October 11, 2021, the PPI crew came back onsite to conduct the formal post-video inspection for each LED UV cured T-liner installation.

Everyone at SPTSD, PPI, LMK, WRT & REL was appreciative for the collaborative effort to be on the forefront of this innovative technology, and we're all excited to come back in 25 years and review this product and write another article about its success!

All in all, this is a very innovating and exciting addition to the rehabilitation methods available for cities and contractors like PPI! As a company, PPI continues to lead the industry in service, innovation, and capability. Keep your eye on PPI for the next big thing in trenchless technology! 

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### ABOUT THE AUTHORS:



**Joseph Sullivan** is project manager with Robinson Engineering specializing in underground infrastructure. He graduated from Northland College with a B.S. in

Environmental Studies. His 32 years of municipal experience covers SSES inspections, I&I reduction and rehabilitation of sewers including open cut, manhole rehabilitation,

CIPP, and other trenchless methods in the Chicagoland area.



**Chad Wilson** is the CEO of Performance Pipelining Inc. With over 20 years of experience in CIPP, Construction, and municipal projects Chad not only has the expertise and know

how that is needed to get the Job done right, he takes pride in going above and beyond expectations! As CEO, you can expect Chad to continue growing PPI in order to meet the needs of our clients and to further the company's mission.



**Tom McGreevy** has been with PPI since 2011 and has more than decade of leadership experience in both operations and company organization. As PPI's President Tom not only

sets the company's standard by modeling it but also the industry's standard by never settling for second best in the services and products PPI offers as a team.



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By: Andrew M. Jenkins, Contech Engineered Solutions

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- Length: 60 LF

**Installation Date: June 23, 2021**

**T**he Wheeling & Lake Erie Railway Company (W&LE), privately owned, is the largest Ohio-based railroad and among the largest regional railroads in the country. Dating back to the 1880s, W&LE has a rich history in the rail industry. Over time, the railway has continued to service Northern Ohio, Western Pennsylvania, West Virginia, and Maryland by transporting various goods throughout the region, which include stone, farm, forest, steel, petroleum, and paper products. W&LE continues to move approximately 140,000 carloads annually along their service area of nearly 840 miles of track.

Many of their existing tracks include wrought-iron trestles. These train trestles were developed in the 19th century and were used primarily for the development of the railway network. While the technology, at the time, was revolutionary and allowed for larger loads to be carried over streams and embankments, the age of many of these trestles has warranted regular inspection to ensure that they are structurally sound and continue to perform as



*The DuroMaxx® SRPE Liner Pipe is set in place beneath the existing train trestle*

originally designed. W&LE regularly inspects track lines to make certain that they are operating as they should. Along portions of the W&LE track line located in Medina, Ohio, an original trestle was identified as in need of repair or replacement. It was quickly determined that whatever type of bridging structure was selected,



Each segment was properly aligned and honed for a tight fit prior to backfilling



Three 20 LF segments of 120-inch DuroMaxx were needed to reline the existing train trestle

its installation could not disrupt the normal rail traffic on the line. Ideally, the railway wanted to continue to maintain the line above and avoiding extended track closure was of utmost importance. Therefore, excavation, removal of the existing trestle and track, and replacement was not the preferred solution.

Bridge and culvert replacements are a common reality for all owners of drainage infrastructure and a routine part of maintenance and expansion projects on federal lands, roadways and railroads; state department of transportation (DOT) roadways; and at the local level with county, township and municipality owned transportation corridors. Fortunately, culvert rehabilitation via relining has gained momentum as a viable alternative to culvert replacement when dealing with aging drainage infrastructure. Whether an owner of a culvert wants to take a traditional design and delivery approach or conduct the work themselves, the construction methods of many relining options can be performed by parties whose normal work activities don't include relining construction. In addition, most methods can be performed by in-house maintenance teams or entities who do more traditional open cut drainage work.

W&LE engineers evaluated the site and concluded that a large-diameter DuroMaxx® Steel Reinforced Polyethylene (SRPE) liner pipe, manufactured by Contech® Engineered Solutions

LLC, would be ideal. Having had previous experience with this product, they knew that it was more than structurally sufficient to be used in a rail application and were comfortable working with the experienced Contech team. DuroMaxx® is manufactured to

**Culvert rehabilitation via relining has gained momentum as a viable alternative to culvert replacement.**

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## Avoiding extended track closure was of upmost importance.



Converting the original trestle to a buried DuroMaxx® SRPE culvert brought even greater efficiencies to the railway including minimal maintenance

have the track back in service. Contech was great to deal with and very easy to communicate with during the entire process.”

After the successful installation of the new liner pipe, backfill material was placed around the pipe and then properly compacted to finished grade. From this point, the timbers and older girders were removed, and the new rails and ties were set in place to reinforce the train tracks for an additional, estimated service life of 100+ years. This particular project was a unique reline in that no grout was necessary. Given the hydraulic efficiencies provide by the DuroMaxx® SRPE liner pipe, capable of Manning’s “n” of 0.012, a 120-inch diameter pipe was perfectly sized and easily fit beneath the existing girders. Converting the original trestle to a buried culvert brought even greater efficiencies to the railway including minimal maintenance which lowers overall life cycle cost as well as increased safety with no freeze concerns and deck maintenance.

Contech brings manufacturing excellence along with engineering support servicing all North America and has been an industry leader in thermoplastic pipe technologies since 1965. The development of DuroMaxx® SRPE pipe has provided the civil engineering industry with a long history of success across the country for use in sewer, belowground storage and segmental relining applications. Due to the unique design using high performance materials, SRPE provides a lightweight, strong and durable pipe technology for a wide variety of infrastructure challenges. This SRPE pipe is considered a flexible pipe type with a profile wall. However, with the incorporation of steel, it is no longer a traditional flexible thermoplastic pipe. Instead, it acts more like a steel or metal flexible pipe when buried.

W&LE has begun to convert many of these older train trestle bridges to buried culverts to ensure the lines are operating at their optimal performance levels while maintaining structural integrity. †

superior standards that are approved by the American Railway Engineering and Maintenance-of-Way Association (AREMA) for both direct-bury and reline applications. DuroMaxx® utilizes eighty (80) ksi steel reinforcement ribs to provide structural strength, while the pressure rated polyethylene pipe wall and rib encapsulation provides durability. Combined, these materials result in an extraordinarily strong and durable pipe.

It was determined that the reline of the existing trestle could occur over a single weekend. A local contractor, Cocklin Trenching Inc., was chosen to facilitate the onsite installation. Contech Engineered Solutions was also onsite to provide assistance and to ensure the success of the project. Due to the unique, efficient, and lightweight design of the SRPE pipe, the contractor was able to use a small track hoe to transport the pipe. The pipe was carried along the rail above the installation location, and then set below and pulled into place under the existing bridge. Three 20 LF segments of 120-inch DuroMaxx were needed to reline the existing train trestle. This was a key aspect for the installer in choosing DuroMaxx as the reline material. Each segment was placed, and the bell and spigot joints properly honed to ensure a tight fit. Per the project requirements, the SRPE liner pipe adhered to ASTM F2562 standards while the high-performance (HP) bell and spigot gasketed joints met the requirements of ASTM D3212. All three segments were set in placed and installed in just one day. Mark Cocklin from Cocklin Trenching Inc. stated, “We installed a 120-inch DuroMaxx pipe under an existing bridge for Wheeling & Lake Erie Railway in Medina, OH. The pipe was delivered with a short lead time and putting the pipe together was a smooth process. We were able to have it installed and take the bridge out within our time frame to

### ABOUT THE AUTHOR:



**Andrew M. Jenkins** holds a Bachelor of Science degree in Engineering from Missouri University of Science and Technology. Andrew’s experience comes from 25 years in Civil, Mining and Petroleum Engineering Industries. For the past 19 years, he has held multiple leadership positions at Contech. Most recently, Andrew was the Director of Plastics Division (PVC, HDPE, DuroMaxx SRPE) and Wastewater Treatment and now is the Pipe Area Manager for Great Lakes and Atlantic Regions.



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# THE BUSINESS CASE FOR AUTOMATED ARTIFICIAL INTELLIGENCE

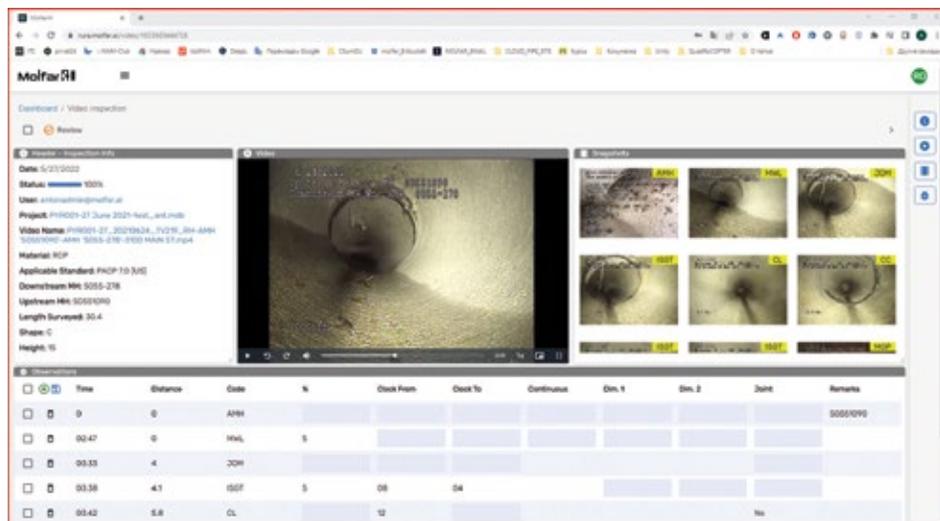
## The Old Way of Doing Things is Changing

By: Ron Moore, Molfar AI

The old way of doing things is changing. The manual process for assessing sewer conditions has been around since before cameras were advanced enough to film in sewers, but now there's a new technology available that will make this simpler and less laborious than ever before - without sacrificing quality or accuracy!

The CCTV sewer inspections are essential for assessing worldwide small and large-diameter pipe conditions. They are relatively inexpensive and supply visual information alongside the report data. Though sensor technology has evolved, one aspect of the process, manual footage review and analysis, has remained unchanged - and no one wants spend hours on end looking at inside a sewer line.

Molfar.AI, the cutting-edge Artificial Intelligence company that specializes in automating CCTV sewer inspections, is now making its way to America by deploying an AI solution for one of the early adopters. After two years helping design and beta-test the product, Ace Pipe Cleaning has passed in excess of 1.2 million feet of CCTV footage through Molfar's Software-as-a-Service cloud platform. This new platform has been deployed by Ace to process video from several U.S. cities - and they are already seeing great results.



Example of AI video inspection dashboard

Molar's AI-powered cloud solution improves productivity by identifying standard pipe faults and defects with a combination of cutting edge machine vision and artificial intelligence technologies. The system automatically extracts relevant snapshots for easy importing into an existing reporting environment and delivers a structured report with callouts including, clock references, percentage readouts and relevant distances as well the total length in feet or meters. Ethically designed, RURA, Molfar's proprietary platform, is

a productivity tool built to help humans, rather than take them out of this process.

With the help of a computerized analysis, certified operators are able to quickly review the report and verify the contents. They can then focus on what humans are best at - drawing conclusions and making decisions, instead of watching hours' worth of videos. The AI-generated report, created with machine learning algorithms and neural networks trained specifically for the assessment of sewers, provides officials with an easy way to review and validate the system's findings.

# Review of CCTV footage is a cognitive-repetitive task, which makes it a perfect candidate for automation.



do – drawing conclusions and making decisions on sewer rehabilitation as may be necessary. Whilst the cost of employing an operator for a day has increased over time, deploying AI for the CCTV footage analysis helps keep the costs of defect coding down. AI has proven to be successful in a variety of different fields and industries and one of technology’s inherent features is that it learns and improves over time, making it more effective the more it is used. No matter where you are located, AI can help your business improve efficiency and gross margin too. Signup for a free trial today – it only takes 3 minutes or less.

If you want to get in touch with us, please contact Ron Moore at

ron.moore@molpar.ai or phone 314-229-3713. Ron is based in St Louis, MO. We are always here for your needs and can be reached easily through Zoom video chat! 📞

## ABOUT ACE PIPE CLEANING, INC.:



**Ace Pipe Cleaning, Inc.**  
*(www.acepipe.com) is the premier provider of turnkey services in the Midwest to maintain critically important environmental infrastructure and help municipalities, utilities, and industrial companies comply with environmental regulations.*



Review of CCTV footage is a cognitive-repetitive task, which makes it a perfect candidate for automation. And automation is the key to efficiency and speed. A cloud-native system can scale to provide up to 100X the work done by humans, while being available 24/7 with no downtime or variation in quality. No two human operators will code the same video similarly, but AI consistently produces the same result.

## Business Case for AI

So what is the business case for AI? In a nutshell, it helps making quicker and better decisions and allows processing vast amounts of information quickly. It increases productivity and frees up the precious human capital to focus on what only a trained professional can

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# GETTING THE LEAD OUT!

## Triple E Water & Sewer Going Trenchless in St. Paul

By: TT Technologies

**W**hile there are many issues facing the integrity of potable water, lead infrastructure continues to be a problem for water systems in many parts of the country, including the Midwest. Triple E Water and Sewer, LLC of Crystal, MN is putting its skill and capability toward replacing lead service lines in Minnesota's capital city, St. Paul. While known for old, distinct and unique neighborhoods, St. Paul poses a particular challenge to contractors looking to update utilities.

Eric Erickson, Triple E founder and president said their background made them a good fit for the St. Paul job. He said, "Our minimally invasive approach saves retaining walls and landscaping which makes the homeowners happy because they don't have to deal with clean up or restoration. We're very proud to be working with St. Paul Regional Water on replacing old, unsafe lead water lines for residential customers on multiple projects across the city. This is an important program that will help provide clean, safe drinking water for more than 20,000 homes."

Triple E has been installing and replacing water services in the Twin Cities

for years with trenchless piercing tools. For the lead replacement project with St. Paul Regional Water Services, the company wanted to increase production, in the less than ideal ground conditions of the St. Paul area. For the project, a Grundopit pit-launched mini-directional drill from trenchless equipment manufacturer TT Technologies, Aurora IL.

TT Technologies Trenchless Specialist Mark Dorn said the drill is a good choice for the project. He said, "The unit is really compact at just 54 inches long, 43 inches wide and 57 inches tall. But at the same time it provides significant thrust and pulling force with typical bore lengths up to 150 feet and it's completely directional."

### Triple E: Honesty, Integrity, and Compassion

Triple E Water and Sewer (EEE), was founded in 2016 by Eric E. Erickson. Under the mentorship of his uncle, Eric worked as a pipe layer in the industry for 20 years. When his uncle retired Eric pursued creating a company based on his values of honesty, integrity, and



*Triple E Water and Sewer is utilizing pit launched HDD technology to replace lead water service lines in St. Paul, MN*

compassion. Using his family truck and renting equipment Erickson worked with his cousin to get the company off the ground.

Erickson said, "About 18 hours a day was the norm for the first two years of



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*The Grundopit pit launch directional drill from trenchless equipment manufacturer TT Technologies is just 54 inches long, 43 inches wide and 57 inches tall, making it ideal for the difficult St. Paul neighborhoods*

EEE. Now, years later, we manage 3-4 crews daily and have a full fleet of trucks and equipment to handle any job. While residential service is still our passion, our crews also install commercial utilities and stormwater management structures for schools, apartment complexes, churches, and more. Our staff are passionate and proud of the work that they do.”

## Water Services

Serving almost 450,000 customers, the Saint Paul Regional Water Services (SPRWS) has been supplying drinking water to the city of Saint Paul and surrounding areas since 1882. The water utility has capacity to treat and pump an average of 40 million gallons of water per day. The SPRWS is self-supporting entity and does not use taxes to support its operations.

The SPRWS has introduced a 10 year plan to replace all lead water service lines, at no cost to property owners. While the program will begin officially in 2023, a small pilot project is underway, coinciding with water construction projects in progress.

## Pit Launched Power & Accuracy

In order to tackle the challenging St. Paul neighborhood layouts, Triple E needed a steerable option. Dorn said, “Most of the houses are elevated above street level, on an incline. So you have the street, and then the house is sitting up on a hill. That’s

common in many Minneapolis and St. Paul neighborhoods. A pit launched, mini-directional drill is a good choice for installing water services in this type of jobsite layout. The units are compact and can operate in the cramped neighborhood setting. They can be transported on a pick-up truck and operated with a small crew complement. They function well in tight working conditions. You can start out drilling at the curb stop and then locate and steer the head all the way up the hill.”

Triple E crews needed the capability to steer around adjacent utilities and steer into a precise location in the customer’s basement in order to pull back the new service. Also needed was an equipment option that could handle a variety of soil conditions.

Dorn said, “So the interesting thing about this is in St. Paul and Minneapolis one block you could be in sand and rock, and then the next block you could be in clay. So the sand and rock are not nearly as conducive to using piercing tools. So what’s nice about the drill is, no matter what ground conditions you’re in, it will work. And it’s fully locatable and steerable.”

To further overcome difficult conditions, Triple E crews are using bentonite to assist during the drilling process depending on the soils encountered. The bentonite pump and

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Triple E crews are boring into customers basements and pulling back new copper services

delivery system sits on a trailer next to the jobsite. Fifty foot long hoses go down to the machine in the pit and delivery the bentonite slurry.

### Get the Lead Out!

Most of the work for the St. Paul project is being completed neighborhood to neighborhood. Dorn said, "Crews will be doing one lead replacement bore at one house, and then right next door or maybe two houses down, they have a crew that is digging a pit for the machine. So while the one pit has been established and work is underway, they're digging the next pit. They might have one lane of traffic that's coned off, but that's it for disruption."

Triple E crews are working from the curb stop up to the residence. They're digging a small coupon in the basement floor, approximately 2 feet wide by 2 feet long in size and about a foot deep. That is done first so that everything is established before drilling begins. Then crews drill up through the small coupon pit in the floor of the next to the home's main water valve.

At the curb, average depth of the water service is approximately 6 to 7 feet deep, with most machine pits measuring 4 feet wide by 5 feet long. Typical installation lengths range between 50 to 60 feet. But, from the pit at the curb to the basement of the house there is often between 20 to 30 feet of elevation.

Dorn said, "The person locating talks to the drill operator and they'll steer that head right into that small hole in the basement to make the connection. The operator and locator know exactly where the steering head is at all times in order to safely bore around adjacent utilities and into a small pit dug in the basement. And then they pull back."

Crews use cable pipe pullers wrapped around the new copper service. The cable puller attaches to a swivel and is connected to the steering blade of the drill stem. The whole configuration is then pulled back. Actual drilling takes about 45 minutes to an hour. Once complete, the pit launched HDD unit is moved to the next bore and then the restoration crew comes in.

Dorn said, "It's more or less the crew that digs the pit that does the restoration. The coupon hole in the basement is restored. They'll go back and backfill the machine pit after the connections made



Once installed, crews connect the new service and restore the basement area with minimal disruption

to the actual curb stop. So they kind of leapfrog each other back and forth. They're getting several houses done per day sometimes more." †

### ABOUT TT TECHNOLOGIES:



### TT TECHNOLOGIES

For more than 45 years, TT Technologies has been the worldwide leader in trenchless technology. Each year, more trenchless sewer, water, gas and electric rehabilitation and replacement projects are successfully completed with trenchless equipment from TT Technologies than any other. TT Technologies is the leader in trenchless!



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# FUSIBLE PVC SOLVES CORROSIVE SOIL CHALLENGES:

## Town of Dyer, IN

By: Sue Bazen, Underground Solutions

**T**he Town of Dyer is located in Lake County, Indiana and was incorporated as a town in 1910. Dyer is a suburb on the SE side of Chicago and is 30 miles from downtown Chicago. The Town of Dyer has established itself as a progressive community that maintains a vision of the future while building a strong foundation of past accomplishments.

Prior to 2021, Dyer received their potable water from the City of Hammond through the town of Highland. Dyer had a single transmission source of an 18-inch main that ran from Main Street to Calumet Avenue then to the pump station and storage facility. The line was installed in the early 1990s when the Town of Dyer first received potable water from Lake Michigan. In July of 2020, the Town of Dyer started experiencing many severe water main breaks. The majority of the issues were the result of pressure surges causing failure at the bell joints. Upon further investigation of the failures, it was determined they were caused by highly corrosive soils that compromised the existing pipe material. These breaks and the existing soil conditions made it apparent that it was time to consider redundant and alternate connections along with other planned system wide improvements. Due to Fusible PVC Pipe® being highly resistant to corrosive soils and it is a fused gasket less system, it was the chosen pipe material for this project.

The Town of Dyer decided to replace the entire 18-inch water main from the existing connection point on Main Street to Calumet Avenue. They also installed a new 16-inch transmission main with Hammond and Munster from Munster to the Calumet Avenue facilities and the installation of a new distribution main from the Calumet Avenue storage facility south to 213th Street. While the new main would follow the same path as the existing water main, different materials and technologies would be used in the corrosive soils.

Nies Engineering was the engineer who designed the project, Gatlin Plumbing and Heating was awarded the project and subcontracted all the directional drilling installation portions to RJ Underground. Much of the project was completed in the fall of 2021 and early winter of 2022. Underground Solutions provided the fusion services with the support of Gatlin Plumbing and Heating. In total, 6525 feet of 18-inch DR21 and 4455 feet of 16-inch DR21 Fusible PVC Pipe® was installed as the Town of Dyer's new watermain. After the pipe passed pressure and BAC-T testing, it was placed in service. Due to an effective design from



*New main followed the same path as the existing main. Over 11,000 LF of Fusible PVC Pipe® was installed*



*"The Fusion operation required additional forethought for layout but once installed the pressure test held like a drum"*  
 - AUSTIN RIDGE, ENGINEER, NIES ENGINEERING



*Fusible PVC Pipe® is highly resistant to corrosive soils*

Nies Engineering, Fusible PVC Pipe® provided a gasket less, fully restrained pipe system that is highly resistant to the challenging corrosive soils that the town of Dyer must deal with. †

**ABOUT THE AUTHOR:**



**Sue Bazen** is a Regional Sales Manager for Underground Solutions and is based out of Michigan. She has over 30 years of experience in the underground construction and municipal water industry. Sue has worked in municipal waterworks sales for 16 years and her territory includes Michigan, Ohio, Indiana, Kentucky and western Pennsylvania.

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# HDPE ELECTROFUSION PIPE JOINTS

## Pipe preparation is among the most important aspects of making a sound electrofusion joint

By: Camille George Rubeiz, P.E., F. ASCE, Plastics Pipe Institute, Inc. (PPI)

High-density polyethylene (HDPE) pipe has been used for municipal and industrial water applications for almost 50 years. HDPE's heat-fused joints create a leak-free, self-restraint, monolithic pipe structure. The fused joint will also eliminate infiltration into the pipe and exfiltration into the environment. HDPE pipe has other benefits including chemical, abrasion, fatigue, seismic and corrosion resistance, and is designed for water and wastewater applications meeting the latest AWWA C906 and ASTM F714 standards.

Heat fusion can be used to join sections of HDPE pipe, including high-performing PE 4710 pipe, while electrofusion is used to add couplings, tapping tees, branch saddles and other fittings. Proven to be an extremely reliable joining system, an electrofusion joint is heated internally, either by a

conductor at the interface of the joint or by a conductive polymer. Heat is created as an electric current is applied to the conductive material in the fitting.

### Typical Electrofusion Joint

All heat fusion joining methods require that there is no water flowing or standing in the pipe that can reach the fusion surfaces. Flowing water in contact with the fusion surfaces during the assembly or fusion cycle must be avoided as it can cause voids as the moisture turns into expanding steam during the fusion process. PE squeeze-off tools can be used to control the flow of water in cases where a valve is not present or will not shut off completely - refer to ASTM F1041.

Electrofusion fittings can be installed in ambient temperatures as recommended by the manufacturer. A typical qualified

temperature range for installation is 14°F minimum to 113°F maximum. Contact the fitting manufacturer to verify.

Improper pipe preparation is overwhelmingly the leading cause of unsuccessful electrofusion joint. The goal of pipe peeling is to remove a thin layer of the outer pipe surface to expose clean virgin material beneath.

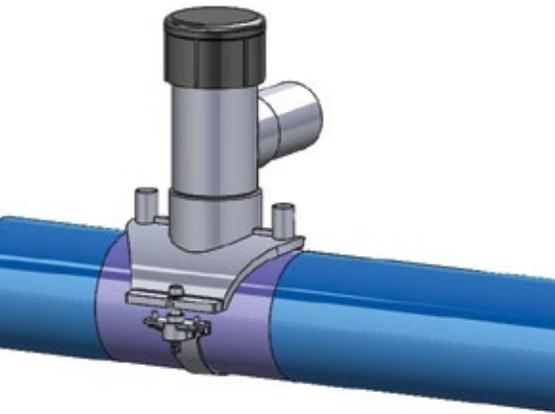
Pipe surfaces exhibit surface oxidation from the extrusion process, transportation, and outdoor exposure. This acts as a physical barrier and therefore those surfaces cannot be heat fused. Simply roughing the pipe surface is not sufficient. In order to achieve fusion, this layer must be removed. Even new pipe must be properly peeled before a fusion will be successful.

An adequate minimum amount of material that must be removed is just seven one-thousandths of an inch (.007")



*Electrofusion in Pit*





Saddle Electrofusion

- approximately the same thickness as two sheets of ordinary paper. Sandpaper, Emory cloth, or other abrasives should *never* be used to prepare a pipe surface for electrofusion. The only tools are those that are specifically designed for electrofusion peeling, which can peel the pipe surface to a controlled depth. Types of scrapers that are *not* recommended are “hand scrapers” such as wood rasps and metal files.

“Witness” marks should be made on the pipe surface prior to peeling with a permanent marker, such as a Sharpie® marker dries fast and contains no oils.

Avoid all possible recontamination of the prepared surface. This includes handling or even touching the peeled pipe surface or the inside of the coupling as body oils and other contaminants can affect fusion joint performance. If the surfaces become contaminated, clean thoroughly with a clean, lint-free towel and a minimum 90 percent concentration of alcohol isopropyl and allow to dry before assembling. Do not use alcohol with any additives other than water.

Gouges deeper than 10 percent of the pipe wall thickness require that the pipe section be cut out and replaced to maintain the maximum pressure rating of the pipe.

The *MAB Generic Electrofusion Procedure for Field Joining of 12 Inch and Smaller Polyethylene (PE) Pipe (MAB-01-2022)* guide has been updated by the Municipal Advisory Board (MAB) and is available as a free download from the MAB website: [www.plasticpipe.org/MABPUBS](http://www.plasticpipe.org/MABPUBS) 

**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.



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# MAINTAINING A SLOPE OF JUST 0.20 PERCENT:

## West Royster Creek Sewer Outfall Project

By: Steve Matheny P.E., Logan Clay Products LLC

As problems arise in older sewer systems, the challenges are becoming more and more common. A developed area with existing utilities, a need to maintain access to residences and businesses, mature trees and landscaping, and a need to replace and enlarge an existing collection line – these are some of the issues we are seeing more frequently. But the West Royster Creek Sewer Outfall project added a few extra challenges. One of the added challenges was the creek causing significant head-cutting near the existing pipeline.

The existing 12-inch main was originally placed in service in the 1970s prior to the annexation of the area by the city of Millington, TN. Since annexation, the city has invested in various stabilization efforts that proved to be short-term solutions. For the past ten years, the stream has been encroaching on the sewer main. The changes to the stream alignment have required that Millington provide short-term protection to the stream embankment in an effort to protect this sewer and the environment.



*Available right of way was limited to the roadway in many parts of the project*



Short (1-meter) VCP-J pipe lengths make the 8-foot shafts functional

They feared that this large stream would ultimately undercut the sewer. The line would need to be moved.

To further compound problems, the existing 12-inch sewer was not adequately sized to handle additional flows from new upstream development. Without additional capacity, new growth in the area would be stymied.

The lack of adequate room to install this new line between the existing high-density housing and the top of the creek bank required Fisher & Arnold engineers to explore alternative locations for the new sewer main with increased capacity. Installation using standard “open-cut” methods would be very disruptive to traffic patterns, existing utilities, and emergency access to the residents. Resurfacing the roadway would have also significantly impacted the final cost of the installation in this neighborhood consisting of fairly dense housing with sidewalks and mature trees on all lots. The best option was to install the new sewer within an existing roadway in an established neighborhood.

After eliminating an open-cut project from the methods under consideration, Tim Verner, P.E. with Fisher and Arnold explored trenchless installation methods. The goal was to identify the best installation method to address all the challenges presented. Using trenchless methods would allow the contractor to excavate shafts at 300 to 400-foot intervals. Different technologies require different shaft sizes, and some require a permanent casing to be installed.

Verner evaluated three technologies that could accommodate 20-foot depths and a minimal slope (0.20 percent) to maintain flow for the gravity sewer:

- Jack and Bore
- Pipe Bursting
- Pilot Tube Method (PTM)

**“The average compression strength of this clay pipe is 18,000 psi.”**

**- TIM VERNER, P.E. FISHER & ARNOLD ENGINEERS**

Jack and Bore would require large shafts (20 x 40-foot) and the installation of a permanent casing with the carrier pipe inside. Maintaining the required slope would require a larger casing to ensure the slope. The expense of the steel casing was a significant consideration.

Pipe Bursting would require large shafts to allow the final line to start at 20 feet below grade. To eliminate the traffic disruption this would cause, this pipe alignment would only replace the existing 12-inch sewer where it currently exists. Stabilization of the bank would become a major component of the project. Upsizing from 12-inch to 21-inch was determined to be beyond the practical limits of this technology given the challenges of this project.

PTM would allow limiting the size of shafts (8- to 12-foot in diameter) and the final installation would not require a permanent



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*The depth needed to tie in to the existing sewer was one of the challenges that made the Pilot Tube Method of guided boring the right choice for this project*

casing. PTM is a 3-step process that installs Vitrified Clay Jacking Pipe (VCP-J) on grade and on target.

Accurate control of the line and the small footprint required, led to the selection of PTM for this project. It was deemed the best value for the community, minimizing disruption to the residents, impacts on existing utilities, and restoration at the conclusion of the project.

After doing due diligence on both the installation method and the pipe material, Verner commented, “This is not the clay pipe that got the bad reputation for being brittle. The average compression strength of this clay pipe is 18,000 psi.”

In this neighborhood, the existing utilities included an 8-inch sanitary sewer, 36- and 18-inch storm drains, an 8-inch water main, and an 8-inch gas line. The depth of these utilities varied from just below the surface to 12 feet below grade.

Installation of the new pipeline would utilize just six access shafts at an average depth of 25 feet. The deepest shaft was 29 feet. Three of the shafts were round and 8 feet in diameter. The VCP-J pipe was ordered in one-meter lengths to make the smaller shafts practical. Memphis Road Boring (MRB), the contractor, was able to jack pipe in two directions from these shafts and in three directions from one shaft. Three of the shafts were used for reception only, and these shafts used 10 x 10-foot trench boxes. This arrangement lessened the impact on traffic circulation and maintained all existing services during construction. The ability to control the slope throughout the drive enabled MRB to achieve the specified 0.20 percent slope that minimized the required depth of the line.

The project was designed using PTM and went to bid in 2020. MRB had the winning bid of approximately \$2.6 million. The work was awarded in December of 2020 and completed in 2021 on time and on budget.

The Akkerman Guided Boring Machine (GBM) 308 system used for this project can operate in an 8-foot diameter shaft and can jack up to 21-inch VCP-J. The GBM includes a digital theodolite with an integrated camera mounted independent of the jacking frame, a battery-powered LED illuminated target housed in the slant-faced steering head, and a computer monitor screen. This guidance system gives the operator a “real-time” view of the location and steering head orientation of the pilot tubes. This “real-time” view, together with the ability to continuously make adjustments during the entire pilot tube drive, results in pinpoint accuracy. In a three-step installation process, driving the pilot tube to the next shaft is step one.

In the second step, a reaming head attached to the final pilot tube and in front of temporary thrust casings, cuts and removes soils. Thrust (auger) casings advance the pilot tubes to the reception shaft where pilot tubes are removed (pilot tubes are reused on future projects). The spoils are transported by the auger to the jacking shaft for removal. The thrust casings are temporary casings that maintain

# PTM would allow limiting the size of shafts (8- to 12-foot in diameter) and the final installation would not require a permanent casing.

the line while transporting any soils removed as the borehole is upsized from the four-inch pilot tube to approximately 11 inches.

Step three is installation of the carrier pipe. Taking advantage of the average compressive strength of VCP-J (18,000 psi) means that no casing is needed in the final installation. The pipe itself can resist the high jacking forces generated as the pipe is thrust through the ground, replacing the temporary casings and augers and eliminating the need for an external casing pipe. The carrier pipe is jacked with an additional power reaming head (PRH) in front of the pipe. The PRH matches the OD of the VCP-J and

removes excess soils in the area between the 11-inch hole created in step 2 and OD of the carrier pipe. The VCP-J pipe pushes the thrust casing to the reception shaft where it is removed. With a PRH, the augers within the casings are reversed and soils are transported to the reception shaft.

The project is complete when the carrier pipe enters the reception shaft. These shafts then become manholes (access holes) when the contractor has completed the sanitary sewer runs. The accuracy of the installation method meant MRB was able to tie the new alignment into the existing system at existing access holes.

Tommy Sander, P.E. of MRB said, "This project went seamlessly. We were able to install both 21-inch and 12-inch VCP in the middle of the streets, through a residential area, without 'open-cutting' the roadway while maintaining the slope specified of just 0.2 percent. NO resident was affected by this operation – meaning residents were able to use their streets and driveways throughout this project." †

#### ABOUT THE AUTHOR:



**Steve Matheny P.E.** is a sales engineer for Logan Clay Products. He is a Board Member for ASCE and has authored a number of papers and articles. He is currently consulting on multiple PTM projects. His bachelor's and master's degrees in civil engineering are both from Wayne State University. Steve is also a Board Member for the MSTT Chapter.



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MSDGC Wastewater Collection Division,  
Asset Renewal Group (Repair/Rehab),  
City of Cincinnati OH

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## MSTT Seminars Return Post-Covid with Two Successful In-Person Events in 2022

**T**renchless Technology seminars hosted by MSTT in locations across the Midwest have been a mainstay of trenchless technology outreach and education efforts across the region for nearly two decades. With a return to in-person events generally, in 2022 MSTT hosted two very successful seminars in Cincinnati and St. Louis.

Including the two seminars this year, MSTT has now held a total of 39 seminars since 2003 in 14 different cities across the Chapter’s nine state area. These seminars have engaged over 2000 underground infrastructure professionals in total over this period, facilitating meaningful direct networking between industry and owner groups.

As part of the MSTT mandate to “promote Trenchless Technology through education for the public benefit”, the seminar programs are designed to inform



*Mr. Allen Muehlher, P.E., Assistant Director of Engineering, Construction Management Division, St. Louis MSD discusses “Trenchless Technology at St. Louis MSD”*

public officials, engineers, utility company personnel, designers, and contractors involved with the construction, rehabilitation, and management of underground infrastructure assets, in the Midwestern states. They are great venues for educating decision-makers on the many social and economic benefits of using trenchless technology in their infrastructure renewal and new construction programs.

Re-initializing this long-standing tradition, MSTT conducted a very well-attended single-day seminar May 17, 2022 in Cincinnati OH, which featured Ms. Maureen Richard, P.E., Principal Engineer, MSDGC Wastewater Collection Division, Asset Renewal Group

(Repair/Rehab) with the City of Cincinnati, who gave a Guest Presentation outlining the “Mainline Sewer Rehabilitation Program, MSD Cincinnati”. There were ten other presentations by industry professionals on a wide range of trenchless technology topics, along with exhibits from industry suppliers.



*Ms. Maureen Richard, P.E., Principal Engineer, MSDGC Wastewater Collection Division, delivers a presentation on the “Mainline Sewer Rehab Program”*





MSTT seminars are excellent learning opportunities. Professional Development Hours certificates are given to participants

## Promote Trenchless Technology through education for the public benefit.

On October 26 2022, MSTT held another successful one-day seminar in St. Louis at the Union Station Hotel. The seminar was hosted in conjunction with the Engineers' Club of St. Louis, and featured a well-received Guest Presentation on "Trenchless Technology at St. Louis MSD" by Mr. Allen Muehlher, P.E., Assistant Director of Engineering, Construction Management Division, at the St. Louis MSD. Along with this informative presentation, nine other industry professionals gave talks on a variety of trenchless technology topics.

Due to the Covid-19 outbreak, only one MSTT seminar was conducted in 2020, and it was hosted in Kansas City March 11, just ahead of the lockdowns and restrictive measures that swept across North America in early March. MSTT also managed to squeeze in a one-day seminar on August 25, 2021 in Milwaukee.

This was a very good year for MSTT to resume its effective in person Trenchless Technology, SSES and Buried Asset Management Seminars in locations across the Midwest. A bright future for trenchless technology outreach is just ahead as MSTT resumes its program of trenchless technology outreach across the Midwest.

Special thanks to MSTT seminar exhibitors, sponsors, presenters and attendees for all our seminars.

**THANKS FOR YOUR SUPPORT!!!** †



Attendees at the St. Louis seminar. MSTT Trenchless Technology seminars are excellent networking and educational opportunities

For information dates and locations of future MSTT Trenchless Technology, SSES and Buried Asset Management seminars and virtual webinars planned for the Midwest, visit:

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