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NASTT's
TrenchlessToday
Educate - Train - Research - Publish

Keeping the Momentum Going

Attendee, Exhibitor Numbers Surge as NASTT's No-Dig Show Rolls through the West Coast

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Mike Willmets
NASTT EXECUTIVE DIRECTOR

NASTT's 2018 No-Dig Show Shines Brightly in the California Sunshine

THE SUMMER OF 2018 IS PROVING TO BE A BUSY and productive time for us. We've wrapped up NASTT's 2018 No-Dig Show held in Palm Springs, California and we couldn't be happier with the quality of the training, education and networking opportunities provided this year. NASTT's No-Dig Show visited the West Coast for the first time since 2013 and the welcome we received from the Golden State was truly spectacular. Now we're ready to start planning for our much-anticipated return to the Midwest for NASTT's 2019 No-Dig Show in Chicago next spring!

NASTT's Gala Awards Dinner is an event that I look forward to each year. I cherish the opportunity to induct the newest members to NASTT's Hall of Fame. The 2018 inductees were Chris Brahler of TT Technologies, Ian Doherty of Trenchless Design Engineering Ltd. and George Ragula of Public Service Electric & Gas.

There is no shortage of exemplary professionals in our industry to induct into NASTT's Hall of Fame and all three of these trenchless champions embody the traits we wish to honor with our highest award. Please visit *nastt.org/hall-of-fame* to learn more about these three fine gentlemen as well as all the past Hall of Fame inductees.

Along with honoring colleagues that have spent their careers dedicated to the trenchless industry, we also had the privilege to recognize some future leaders with the Ralston Award for Young Trenchless Achievement. The recipients of the awards this year were Matthew Smith, Manager of Direct Pipe at Michels Corporation and Charles Tripp, Project Manager at Kleinfelder. Congratulations to these exceptional young professionals!

Each year NASTT recognizes companies with state-of-the-art products in either new installation or rehabilitation with the Abbott Award for Innovative Products & Services. These awards are named in honor of the late Joseph L. Abbott, Jr. who was an active member of the society since its inception in 1990, a respected champion of innovation and one of the 2017 Hall of Fame inductees. This year we received 12 qualified nominations and the volunteer Awards Committee members took on the very difficult task of reviewing all the submissions and interviewing company representatives. The 2018 Abbott Innovative Product Awards winners were LaValley Industries for its TONGHAND exit side wrench and QuickConnect for its Universal QuickConnect Pull Head. Congratulations to these industry leaders and thank you for your innovations!

NASTT owes so much to all the dedicated volunteers that make our show such a success every year. NASTT's 2018 No-Dig Show Program Chair, Don Del Nero of Stantec and Vice Chair, Cindy Preuss of HydroScience Engineers, dedicated hours of their personal time to make the conference the prestigious event that it is. Don and Cindy worked closely with our Program Committee that is comprised of over 100 volunteer members to peer review every technical paper in the schedule. Several of our Program Committee members also served as Session Leaders who dedicated additional hours working with the paper authors. I want to recognize the dozens of event sponsors and loyal exhibitors that make all this possible.

We sincerely thank you for your continued support of our industry, our not-for-profit Society and our NASTT No-Dig Show.

Michael J. Willmets
NASTT EXECUTIVE DIRECTOR

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Frank Firsching
NASTT CHAIR

RIDING HIGH ON OUR SUCCESS AND

Planning for the Future of Trenchless

WE'RE STILL RIDING HIGH ON THE MANY successes of NASTT's 2018 No-Dig Show in Palm Springs in March, and we're looking forward to planning for the future of our organization and our industry this summer. With more than 2,000 attendees and a sold-out exhibit hall at this year's conference, it was a busy and productive week for all the attendees, including the 145 university students from 16 of our 18 student chapters and more than 100 Municipal Scholarship recipients from all over North America.

Thank you to our Program Committee members and the 2018 No-Dig Show Chair, Don Del Nero of Stantec, and Vice Chair, Cindy Preuss of HydroScience Engineers. We owe our success to our volunteers!

At the conference, we celebrated during NASTT's 17th annual Educational Fund Auction. This event is always a hit and we have a great time while we raise money for our educational initiatives. Thank you to our Auction Committee members, Committee Chair, Gregg Leslie of Xylem Dewatering, and Vice Chair, Dennis Walsh of PSE&G, for all your hard work behind the scenes. I'd also like to say thank you to George Ragula for selling the majority of the 1,000 vacation raffle tickets, and thank you to Vermeer for sponsoring the vacation raffle. The raffle helps us raise up to $25,000 each year! And to all the bidders, donors and sponsors who helped us raise nearly $100,000 in one night: Thank you! Since 2002, we've raised more than $1 MILLION. These are the funds we use to sponsor our university students, fund our Municipal Scholarship Program, publish industry training manuals and more. We couldn't do any of this without our generous supporters.

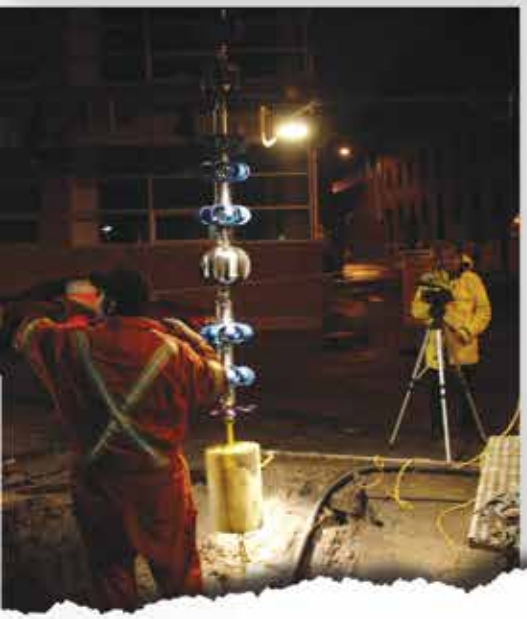
During NASTT's No-Dig Show Gala Awards Dinner, I had the privilege of recognizing and honoring my friend and colleague, Dr. Kimberlie Staheli of Staheli Trenchless Consultants, with NASTT's Chair Award for Outstanding Service. Kim has been a devoted volunteer and tireless supporter of the trenchless industry for her entire career. She served on NASTT's Board of Directors for many years including two years as Chair and is currently serving as the Immediate Past Chair. She also serves on the Program Committee, is an instructor for our New Installations Best Practices Course and was the champion behind NASTT's Municipal & Public Utility Scholarship Fund. Kim is not only a brilliant engineer but she's also a dedicated advocate for our trenchless family. Thank you, Kim, for all your years of dedication and friendship!

NASTT's 2018 No-Dig Show was a wonderful success and we are already in the planning stages for next year in Chicago. This summer we are also embarking on another Strategic Plan study. Five years ago, we surveyed our membership and listened to your feedback. We created a multi-tiered plan that we've worked hard to execute over the years. We've grown and changed as a Society just as our industry has. Now it is time to review our progress and touch base with our membership once again. Please watch your email for the opportunity to complete our member survey and have your voice heard. We plan to take your feedback to our Strategic Planning meeting in July and incorporate it into our growth and development plans. This Society exists to serve our membership and we are thrilled for the opportunity to continue to do so.

Frank Firsching
NASTT CHAIR

GOOD DECISIONS START

WITH GOOD INFORMATION



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Michelle Hill
NASTT PROGRAM DIRECTOR

I Believe We Have a VOLUNTEER

The Best Ways to Get Involved with NASTT's No-Dig Show

HAVE YOU EVER HEARD OF THE WORD, "VOLUNTOLD?" My friend used it a few months ago when we were signing up for Preschool PTA (yes, that's a thing) volunteer shifts. She joked that I'm always the first one to sign up, but she has to be voluntold. I thought the word was absolutely hilarious, and then I thanked my lucky stars that I don't have to do too much *voluntelling* here at NASTT.

Our society is built on volunteers, many raising their hands multiple times, to help us serve our mission. I've said it once and I'll say it again, we wouldn't have an organization without our volunteers.

The same is true when it comes to our No-Dig Show. There are multiple opportunities to get involved and be a part of this growing event, and it's a unique way to continue to educate yourself when it comes to the trenchless industry. Here are a few ideas:

Present a Paper

That's right. Our speakers at each No-Dig Show are volunteers. They spend countless hours preparing both a 10-page paper (which can all be downloaded on nastt.org) and a 25-minute PowerPoint presentation. It's safe to say without these volunteers we wouldn't have an educational element to our trade show. If you are interested in presenting at NASTT's 2019 No-Dig Show please submit an abstract online at nastt.org/abstractsubmission.

Join the Program Committee

Every year in July, we ask our 140-member strong Program Committee to review all of the abstracts submitted for the following No-Dig Show. These volunteers spend weeks reviewing 250-word abstracts to determine the best of the best for our attendees. The committee also meets in October, January and onsite at the No-Dig Show to discuss ideas and network.

Be a Track Leader

After the Program Committee selects the 160+ papers and presentations for the conference, each track of 4-5 presentations are assigned to a Track Leader. As experts in their field, these Track Leaders review both the papers and presentations for quality and non-commercialism. They help the authors stay on track (get it?) with deadlines and support them throughout the entire process.

Outbid Your Co-Worker

One of the best events at NASTT's No-Dig Show is the Educational Fund Auction. Not only is it a great party with a different theme every year, but it raises a lot of money for NASTT's educational initiatives. As an Educational Fund Auction Committee member, you assist in getting auction items donated, and support with executing the event onsite.

Judge a Student Poster or Presentation

The students are a big part of our conference (they are volunteers too!), and we keep them busy while they are onsite. We're always looking for volunteers to help with judging the student poster competition and the student presentations. It's a great way to connect to our future industry leaders.

Hang in the Newbie Lounge

This area was created for folks who are new to the show so they could meet other first-timers, or to network with some of our seasoned volunteers. This is a great way to connect with people new to the trenchless industry and let them know all it has to offer.

Evaluate New Products

Every year we honor our exhibitors for developing new products to advance the industry. The Abbott Innovative Product Award Committee is a group of volunteers who tour the exhibit hall and listen to presentations on these new products and services. They then judge the products and award a winner in both the new installation and rehabilitation industries.

This is just a snippet of the opportunities that are available at NASTT's No-Dig Show. If you are looking to connect with trenchless professionals at our educational event send me an email or give me a call at 888-993-9935 to discuss our committees. I promise you'll be excited about putting your hand up, and you won't be voluntold.

Michell Hill
NASTT PROGRAM DIRECTOR


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Q&A with Enrico Boi

Enrico Boi

This month, NTT sat down with Enrico Boi, president of IDS Georadar North America and Chairman of the International Society for Trenchless Technology, to discuss today's challenges in the trenchless industry and opportunities in trenchless construction across the globe.

What first piqued your interest in the construction business?

As far as I remember I was always fascinated by engineering and construction. Going back in time I remember being only 6 years old and spending hours watching a construction crew laying down a sewage main in front of my house, it was more fan than any cartoon or other possible game.

In time my interest switched into technology and the use of it to improve process, and while I was studying engineering in college I clearly understood that that was my passion.

Tell us about your first introduction to the trenchless technology industry.

I was still in college and while preparing for an exam I come across some white papers on trenchless, specifically on HDD. Besides the technicality of the process and the "numbers" (engineering speaking) torque; thrust; pullback, etc. ,my attention was caught by the fact that besides all the effort on preparing for a job, the drilling was mostly done without a proper knowledge of the existing utility layout. In that moment I understood that after college I would have given myself time to look into this particular field. After few decades, I am still working in this side of trenchless.

What are your thoughts on the current state of the industry? What are the trends on the engineering side? What areas do you see evolving?

One of the reasons why I am still fascinated by trenchless technology is because it is an industry that is in continuous evolution. I have the fortune to attend may conferences and exhibitions in different parts of the world and whenever I go I see the evolving trend. It is curious to note that some part of the world do things in a different way than others, sometimes because of codes and regulations, sometimes because of strong influence by local manufacturers, but even in this case, year after year you see a clear evolution of many all the different fields of trenchless.

What is the biggest challenge facing the global trenchless industry today? Has acceptance of the technology improved?

It really depends on where you actually live, or you do business. Globally speaking we find very different scenarios from one side of the world to the other. Trenchless technology has spread taking the lower hanging apples, in North America, Europe, Japan, Australia, China, and some other countries, trenchless technology is known and accepted, while in other it is struggling to enter the construction industry.

This effort is one of the responsibilities of ISTT with its outreach program that it is actually under review right now to better tackle both the new markets, but also to open more the market in the countries that already apply this technology.

How did you first get involved with ISTT? Briefly summarize some of your activities.

My company was a member of the Italian Association for Trenchless Technology (IATT), and I was the company representative in the association. IATT was very active with promotion and conferences and I was naturally attracted by this activities, and thanks to the fact that I was involved with business internationally, I ended up as a the international representative of IATT. In 2009 Paolo Trombetti, chairman of IATT asked me if I was interested on running for the election of ISTT Executive Sub Committee member, I gave it a try and I was elected, than I was honored to be chosen for the position of Vice Chairman that leads to the position of Chairman that I will hold until this coming October when during the Board Meeting in Cape Town, prior the No Dig International, I will hand it over to Jari Kaukonen for his term as ISTT Chairman.

Do you see any particular needs in the way of education/training? Is the industry doing a good job of promoting the benefits of trenchless methods? What is different about the international community vs. the North American industry?

Again, it depends on where you are. The North American market is probably the most evolved with regards of education and training on trenchless. In North America this effort is shared across several organizations. NASTT plays a critical role with all the different programs and activities, but the education system has also a very important role with several universities providing trenchless programs like ASU or Louisiana Tech just to mention few. Internationally, things can be different with countries where trenchless technologies are mostly unknown.

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

Continuous innovation is for sure on of the reason why I really enjoy this field, but probably what I like the most is the passion that you see and feel in this industry. After some years spent in conferences and talking with people from all over the world, I feel I belong to a family, the trenchless family.

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UVIEWER

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uViewer can import detected targets from **Ground Penetrating Radars (GPR) as well as non-GPR technologies** (i.e. cable locators) and highly enhances data visualisation to take utility detection and mapping to the next level. The uViewer software is designed to operate on site with any GNSS positioning systems as well as maximise user experience and intuitiveness through smart devices (i.e. phones and tablets). In particular, the application leverages:

- Visualisation of underground detected objects in **2D and 3D**
- Visualisation of underground detected objects in **Augmented Reality** – with overlapping soil images recorded by smart device built-in camera;
- **Pipe Finder functionality** – Software guides users in the field to pinpoint the exact position of a previously detected target (including distance, direction, and depth);
- **Digital cartographic map** with coordinates and updated information on targets.

Visualisation of underground detected objects in Augmented Reality

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In the Trenches

BY ANDREW FARR

MANY NASTT MEMBERS AND VOLUNTEERS are experts in their respective disciplines in trenchless technology. NASTT takes pride in their contributions to the industry, and while there's not nearly enough space here to encapsulate their careers and full range of accomplishments, here's a glimpse at Tiffanie Mendez, Benny Siljenberg and Greg Tippett. Each of these three individuals has had a fascinating career path that has led them to success in the trenchless industry. In addition to their everyday responsibilities at their respective companies, these individuals also go the extra mile to give back to the industry through their contributions to NASTT.

Tiffanie Mendez

SUNBELT RENTALS

Tiffanie Mendez began her journey into the trenchless construction industry when she worked in the agricultural irrigation industry as an irrigation store manager in the late 1990s.

"In addition to farmers, we had contractors that would walk in to buy pipe, fittings and valves," she explains. "Sometimes they would also want to rent ag pumps and ag pipe for moving water around their jobsites."

One day a contractor asked Mendez about wellpoint dewatering services. She began researching how to do it and learning how to apply the principles of pipeline hydraulics to construction services. Her first wellpoint dewatering job was for a foundation in Yuma, Arizona.

"That work opened the door to other construction and industrial work in the Desert Southwest, and my job morphed from agricultural irrigation store manager to outside sales for design/build liquids handling systems of all types," she says.

Mendez's first introduction to trenchless came in 2001 when a sinkhole near Tucson, Arizona, necessitated an emergency response sewer bypass pumping effort. The project resulted in what was — at the time — the longest high flow sewer bypass system installation ever constructed in North America. The project became *Trenchless Technology's* Project of the Year in 2001.

At the time, Mendez was employed by the company that constructed the bypass and was still in the early stages of learning the industry. "After the completion of that project, I was given an opportunity to learn from the successful outcome of that project and then work at the office that was opened in Tucson following the bypass," she says. "I then had the opportunity to further develop in the industrial liquids handling and sewer bypass pumping business in the Tucson-El Paso market."

Today Mendez is a 23-year veteran of the specialty rental and environmental construction business and serves as a regional sales director, western sales, for Sunbelt Rentals.

"Trenchless is big and getting bigger," she says of the trenchless industry today. "The environmental and economic impact of open trench construction is seen more and more by civil engineers as an unnecessary disruption to the local economy. Sophisticated impact studies can now predict the entire cost of an infrastructure project, including tax revenue impact to surrounding businesses, and can model the best, least intrusive methods of rehabilitation and replacement."

Mendez says the biggest challenge facing the trenchless industry is a similar challenge facing almost every facet of construction — workforce development.

"I believe it is our generation's duty to recruit, hire and train the next generation of trenchless pioneers," she says. "The industry is evolving and growing, and we need to create awareness and a path to a career for up and coming engineering, chemistry, business and environmental science students. The message they need to hear is there is opportunity in this field and a meaningful career worth building in trenchless."

Mendez first got involved with NASTT when she attended local NASTT chapter conferences to represent Sunbelt Rentals Pump and Power Services. After attending RMNASTT and WESTT shows in 2016, she became more involved on a national level. She also sits on the Student Committee for NASTT and participates and assists with the student chapters.

What she likes about NASTT: "The relationships I've forged with colleagues in the industry, and the way the NASTT association encourages collaboration amongst groups of complementary firms and friendly competitors. Every committee meeting and event is like an industry reunion for me; the longer I participate the more I look forward to the networking, future opportunity and camaraderie that is built at each event."

Mendez agrees that the level of education impacts the future of the industry but says that it starts with getting young people interested in construction at an earlier stage in their lives.

"More education is needed in our engineering and business colleges and universities on trenchless technology and practices," she says. "Students need to know that trenchless is a viable career path in infrastructure business pursuits. The future of trenchless technology, I believe, lies with creating awareness through education and training of our next-generation leaders."

Benny Siljenberg

LITHOS ENGINEERING

Benny Siljenberg has been passionate about construction since he was a kid, and today, he's not afraid to tell you his favorite part about it: "The toys and the people!" he says. "As a pseudo-gearhead who enjoys the specifics of how things work, this industry is a big kid's playground."

Siljenberg's first experience in construction was helping his father and his fellow masons mix mortar, haul blocks and clean up jobsites. "That early exposure fueled my curiosity for how things were built," he says.

When he was in his early 20s, Siljenberg was working as a Union Local #3 sheet metal apprentice when he suffered a career changing accident. After healing from a broken pelvic bone, he chose to focus on the design side of construction projects and his interest in underground work grew further after he visited a tunneling project.

"Picture a young man about to graduate civil engineering who loves construction equipment, civil projects and the mystery of the underground and stumbles onto a tunneling project for first time," he recalls. "I was in awe and knew that this was the industry for me."

Early in his career, Siljenberg's primary focus was on design and construction experience with civil structures such as pipelines, water and wastewater treatment plants and

reservoirs. He eventually landed a position with a geotechnical and trenchless consulting firm in Denver, where he worked on a variety of new installation trenchless projects from 4-in. diameter to 120-in. diameter. He says the challenge of matching the suitable equipment and procedure to all mighty and ever-changing ground conditions fascinated him.

Siljenberg now has 15 years of progressive experience in a variety of geotechnical, tunneling engineering and construction projects where he has provided consulting to project owners, contractors and prime engineer teams. His background has given him the foundation to take on a variety of roles as vice president and owner of Lithos Engineering, which he formed with his business partners in 2010.

"In the last 10 years, the industry's knowledge and demand for trenchless technology has grown while the risks associated have become more manageable," he says of the state of the trnehcless industry today. "The exponentially increased success rate of trenchless project provides project owners the comfort to allow new techniques not previously used for their infrastructure improvement. "The promotion of trenchless projects through social media has also aided the awareness and acceptance of trenchless.

Siljenberg's first involvement in NASTT was newly formed Rocky Mountain Chapter in 2009. He says he was fascinated by the breadth of areas that the term "trenchless" covered – he knew he'd be a long-term member. Since then, Siljenberg has remained an active participant of NASTT and currently serve as the Rocky Mountain Chapter's vice chair and project site visit lead. In 2017, he chaired the Rocky Mountain Chapter's regional conference which set a record for attendance. On the national level, Siljenberg serves on NASTT's No-Dig Show Program Committee.

"People are excited about trenchless technology and the variety of solutions that can be provided with its use," he says about the outlook for the industry in the near term. "From the engineer's point of view, we are seeing more project owners opening up and wanting to learn about

trenchless technology, or at a minimum, engaging qualified consultants who can provide them with trenchless design services."

Siljenberg says he enjoys keeping up to date on the latest advancements — a must for those who want to enjoy the benefits of the technology. "The creativity and out-of-the-box thinking, that trenchless professionals bring to the industry really make it a fun industry to be part of," he says.

Greg Tippett

STANTEC

As far back as he can remember, Greg Tippett always wanted a career in the engineering realm.

"I've always been very intrigued in how everything works and how things are constructed," he says. "I greatly enjoyed getting my hands dirty and completing the hands-on items." Knowing early in his life that he wanted hands-on knowledge of the industry he was going into, Tippett completed his Technologist Diploma and spent time in the field prior to returning to university to finish studying engineering.

Throughout his studies in college and university, Tippett became fascinated with tunneling. His first introduction to the tunneling world came when he had the opportunity to tour a 3-meter (10-ft) finished diameter tunnel that was under construction. The tunnel was more than 20 meters deep and was being undertaken by an open face conventional tunnel boring machine. "From the time we began our descent into the shaft to the time we made it back to the surface, I was like a kid at Disneyland, just 'wow!'" he recalls thinking. "From that point forward, I was hooked."

Today Tippett is a principal and regional discipline leader for Stantec, based in Edmonton, Alberta. "I thoroughly enjoy working in this industry just because of all new the advancements that come out every year," he says. "It is just outstanding the amount of research and entrepreneurship that is ongoing in this industry."

In terms of engineering and construction techniques, Tippett notes that the trenchless industry is still quite young. "The biggest trend throughout North America is infrastructure rehabilitation; the majority of our underground infrastructure is either past or approaching its service life. Trenchless rehabilitation has grown substantially over the past years and I see it just growing exponentially in the near future."

On the other side of the discussion, Tippett says he view risk and maximizing industry knowledge as the biggest challenges facing the specialty trenchless market.

"With the growth of the industry, we have new entries into the field, either engineers, clients and contractors," he says. "The challenge to the industry is to ensure everyone has the knowledge required to undertake these projects including the mitigation of project risks, the design nuances for each technique and the requirement for continency funding.

"If these projects go wrong, it can be quite expensive — directly to the project's bottom line and also indirectly due to the disturbance to the surrounding business and residents."

Tippett joined NASTT in the mid 2000s and became involved in NASTT's Northwest Chapter in 2009 with the Northwest Trenchless Conference planning committee. Since then, he has been a member of the planning committee for all conferences located in Edmonton. In 2014, he joined the Northwest Chapter board and has served as secretary, vice chair and, beginning at the 2018 No-Dig Show, took the position of chair. He says that while NASTT does a fantastic job of promoting industry education and connecting it with members, the big push right now is to ensure everyone has the access to staff training to ensure the industry is actually utilizing the advanced techniques now in the toolbox.

"The acceptance here is Western Canada has been based on need from both the oil and gas sector and the municipal sector," he says. "It was first required due to regulatory requirements and/or difficult site conditions for traditional methods, but this acceptance and growth has now switching due to the amount of rehabilitation required and the limitation of traditional methods."

Tippett notes that while trenchless construction experiences similar challenges to other niche construction markets, collaboration between project teams is one aspect that makes it unique.

"The first reason why I was attracted to the trenchless technology field was the challenging nature of the projects that you get to work on," he says. "For every project that I have had the pleasure to be involved in, it has brought a new challenge to the team, these challenges are either during the design or during the construction phase of the project. The partnerships between the engineers and the contractors to solve these challenges are one of the best parts of the field."

ANDREW FARR is the associate editor of *NASTT's Trenchless Today*.

2018 EDUCATIONAL FUND AUCTION & RECEPTION

In conjunction with NASTT's No-Dig Show

THANK YOU FROM NASTT

This year's auction raised nearly **$100,000!** Since 2002 we have raised well over **ONE MILLION DOLLARS!** These funds will be directed toward educational and outreach activities offered by NASTT to provide targeted trenchless training courses to the industry, publish trenchless resource manuals and sponsor university students' attendance at NASTT's No-Dig Shows, as well as award scholarships. *This fund would not be possible without the generous donations made by the following organizations:*

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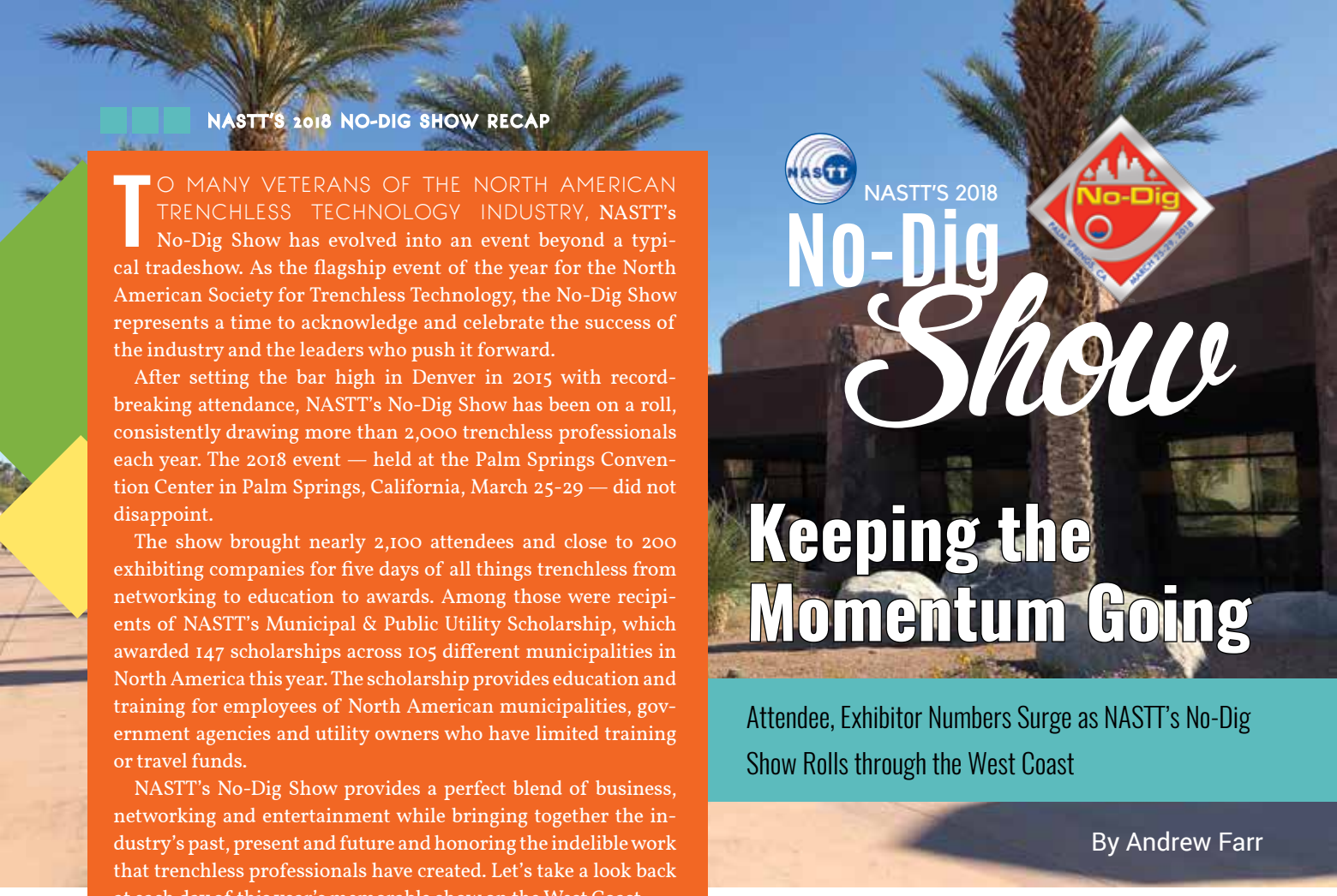


Attendee, Exhibitor Numbers Surge as NASTT's No-Dig Show Rolls through the West Coast

By Andrew Farr

TOO MANY VETERANS OF THE NORTH AMERICAN TRENCHLESS TECHNOLOGY INDUSTRY, NASTT's No-Dig Show has evolved into an event beyond a typical tradeshow. As the flagship event of the year for the North American Society for Trenchless Technology, the No-Dig Show represents a time to acknowledge and celebrate the success of the industry and the leaders who push it forward.

After setting the bar high in Denver in 2015 with record-breaking attendance, NASTT's No-Dig Show has been on a roll, consistently drawing more than 2,000 trenchless professionals each year. The 2018 event — held at the Palm Springs Convention Center in Palm Springs, California, March 25-29 — did not disappoint.

The show brought nearly 2,100 attendees and close to 200 exhibiting companies for five days of all things trenchless from networking to education to awards. Among those were recipients of NASTT's Municipal & Public Utility Scholarship, which awarded 147 scholarships across 105 different municipalities in North America this year. The scholarship provides education and training for employees of North American municipalities, government agencies and utility owners who have limited training or travel funds.

NASTT's No-Dig Show provides a perfect blend of business, networking and entertainment while bringing together the industry's past, present and future and honoring the indelible work that trenchless professionals have created. Let's take a look back at each day of this year's memorable show on the West Coast.

DAY 1

The first day of NASTT's 2018 No-Dig Show featured familiar activities with a new mix of top-notch awards and recognitions. Though there were pre-conference educational sessions on Sunday, March 25, the first official event was the annual Kick-Off Breakfast on the morning of Monday, March 26. The breakfast was opened by NASTT Chair Frank Firsching and this year's No-Dig Show Program Committee Chair Don Del Nero.

New board members and NASTT's 2018 Outstanding Papers of the Year Awards in Rehabilitation and New Installation were recognized. In the rehabilitation category, the winning paper was "Quality Control for Sewer Lateral Rehabilitation," by Kevin Bainbridge, Robinson Consultants; Harry Krinas, City of Hamilton, Ontario; Patrick Moskwa, Robinson Consultants; and Roy Vanstone, Robinson Consultants. The winning paper in the new installation category was "The Devil in the Details," by Kathryn Wallin and Dr. David Bennett, both of Bennett Trenchless Engineers.

Motivational speaker Derreck Kayongo was the featured entertainment at the Kick-Off Breakfast. Kayongo told the story of his upbringing in Uganda and how it inspired him to launch the Global Soap Project after he immigrated to the United States in the late 1970s.

Trenchless Technology editors Jim Rush and Sharon Bueno presented the winners of the 2017 *Trenchless Technology* Projects of the Year for New Installation and Rehabilitation. John Grennan of Ward and Burke and Paul Headland of Aldea Services were presented the Project of the Year for New Installation for the Rebecca Trunk Wastewater Main project. Andrew Costa of Insituform accepted the Project of the Year Award in Rehabilitation for the West Palm Beach Force Main Rehabilitation project.

The 2018 *Trenchless Technology* Person of the Year was formally presented to AP/M Permaform's Bill Shook — an industry veteran who has dedicated his 40-plus year career to the trenchless rehabilitation industry. Considered the highlight of the Kick-Off Breakfast, Shook took the stage to a standing ovation by his industry peers as he was recognized as the 2018 Person of the Year.

Day one at NASTT's 2018 No-Dig Show continued with the opening of the exhibit hall, giving attendees the opportunity to meet and network with exhibiting companies. The morning of day one also marked the start of the technical program.

The day's events concluded with NASTT's 17th annual Educational Fund Auction and Reception. The fundraising soirée — benefiting NASTT's educational initiatives — is a themed event. For 2018, the theme was the "Get Retro" — a fitting theme for a town the Rat Pack used to play and stay. As always, attendees

were encouraged to dress accordingly in 1950s-themed attire. Marilyn Monroe was seen walking around, as were Ricky and Lucy Ricardo from I Love Lucy, as well as Grease's Pink Ladies. The event also featured its annual costume contest, the tropical vacation raffle and 50/50 raffles. Winners of the costume competition were George Ragula and Louisiana Tech University student Tristan Morgan.

The 17th annual Educational Fund Auction and Reception raised nearly $100,000. Since 2002, the fund has raised $1.1 million total. Professional auctioneer Butch Graham volunteered his time and talents as the official auctioneer for the popular No-Dig event; a silent auction was also held. During the auctions, a wide range of items were donated and bid on from jewelry and electronics to sporting event tickets and trenchless tools and equipment. Once again, the popular Morty the Sewer Rat was up for bid and the winning bidder for Morty's services was BTrenchless. In NASTT's Tropical Vacation Raffle (announced at the Closing Luncheon and donated by Vermeer), the winner was Dave Wickersham of Progressive Pipeline Management in New Jersey.

DAY 2

On Tuesday, March 27, the show continued with technical sessions and exhibit hall time.

NASTT's No-Dig Show hosts a highly-acclaimed technical program, which this year featured 167 peer-reviewed technical papers presented through six tracks, in addition to roundtable discussions covering topics from water main CIPP to owner differing site conditions claims. A Gas Industry Track followed on Wednesday, March 28. The exhibit hall also included nearly 200 exhibiting companies displaying the latest in trenchless technologies and equipment.

Each year, NASTT recognizes technological advancements through the Abbott Innovative Product Awards. Annually, two companies with state-of-the-art products are chosen as recipients of this honor. The Innovative Product Awards were handed out for the top technology in the industry on March 27 and recognized at the annual Gala Awards Dinner.

Quick Connect LLC received the Innovative Product Award for its Quick Connect Universal Pull Head. This was designed to save time and money by eliminating fusing in the hole, engineered for multiple applications and withstanding forces of more than two times maximum pull.

LaValley Industries received the other Innovative Product Award for its TONGHAND exit side wrench, a technological step forward in large bore HDD work.

The highlight of day two is undeniably the induction of NASTT's new Hall of Fame Class at the Gala Awards Dinner. This year, NASTT inducted its seventh class of Hall of Famers: Chris Brahler, president and CEO of TT Technologies; Ian J. Doherty, B.A.Sc., P.Eng., president of Trenchless Design Engineering Ltd.; and George Ragula, distribution technology manager at PSE&G.

Brahler has been a leader in the underground and trenchless construction industries for more than 40 years. As president and CEO of TT Technologies, Brahler has worked tirelessly with water, wastewater and gas utilities, plumbers, telecommunication companies, engineers and contractors to promote the value of trenchless technology and help build the market in North America.

Doherty's introduction to trenchless was the 1988 ISTT No-Dig Show in Washington, D.C., roughly 30 years ago. By 1995, he incorporated Trenchless Design Engineering and for the last 22 years, has focused solely on the trenchless rehabilitation of existing pipelines with the exception of a few directional drilling and pipe bursting projects in the early years.

Ragula is a recognized leader in the industry and has spent the last 31 years of his 40-year career in the gas industry committed to the ever-growing technologies in trenchless construction. Ragula, a past chairman of NASTT, has a diverse background in gas distribution engineering and operations during his extensive career in the gas industry.

Other awardees at Tuesday night's Gala Awards Dinner included Kimberlie Staheli of Staheli Trenchless Consultants, who received NASTT's Chair Award for Outstanding Lifetime Service. Also receiving recognition at the Gala were recipients of the Ralston Award for Young Trenchless Achievement: Matt Smith, manager for Direct Pipe at Michels Corp., and Charlie Tripp, project manager with Kleinfelder.

DAY 3

On Wednesday, March 28, day three commenced with more technical sessions and exhibit hall time in the morning. As in recent years, the technical program on day three also included a Gas Industry Track, highlighting new concepts, trenchless methods and challenges facing gas construction.

For the third year, one of the big hits at the conference was the interaction on the No-Dig Show mobile app, which allowed attendees to stay connected with other users while sharing and commenting on photo posts (turn to the next page to check out some of the photos shared on the No-Dig app this year!).

The annual Closing Luncheon gave everyone a chance to network one last time before heading for home. The luncheon also gives attendees a preview of what's in store when the trenchless community gathers in 2019 in Chicago for the next NASTT No-Dig Show. Program Committee Chair Don Del Nero handed the reigns over to Cindy Preuss, who will serve as the 2019 Program Committee Chair.

Flip through the following pages and check out all the great photos from the pre- and post-conference courses, as well as all the events and activities from Monday through Wednesday at NASTT's 2018 No-Dig Show. Flip to page 28 for more on next year's show.

ANDREW FARR is the associate editor of *NASTT's Trenchless Today*.

Getting Started

University students assemble for a group photo on Sunday, March 25 at NASTT's 2018 No-Dig Show at the annual Student Orientation Meeting.

The Municipal Scholarship Reception, held on Sunday, March 25, allows NASTT leadership and members the chance to mingle with recipients of NASTT's Municipal & Public Utility Scholarship. This year, 147 scholarships were given out as 105 different municipalities across North America were represented.

APP PHOTOS

NASTT's Argent Memorial Student Scholarship recipients gather for a photo with NASTT Board member Craig Vandaelle (center). This year's recipients were (l-r): Yezen Swaies, Vanderbilt University; Sarah Sargent, Oklahoma State University; Ashly Rieman, IUPUI; Robert Cichocki, Queen's University; Ryan Laborde, Louisiana Tech; and Johnathan Grill, Montana Tech. The scholarship winners were announced on Sunday, March 25 during the student orientation and presented on Monday.

Students pack the room at NASTT's annual Student Orientation Meeting on Sunday, March 25 to catch an overview of all things NASTT and what to expect at the No-Dig Show.

Officers of the Western Chapter of NASTT (WESTT) gather for a group shot at a reception for WESTT members on Sunday, March 25. NASTT Regional Chapters held meetings throughout the day and the WESTT Chapter, which represents the state of California, served as the host chapter of NASTT's 2018 No-Dig Show.

KICK-OFF BREAKFAST & ENTERTAINMENT

2018 *Trenchless Technology* Person of the Year Bill Shook (center) takes a photo with longtime friend and colleague Larry Kiest Jr. of LMK Technologies (left) and friend Bernie Krzys, publisher of *Trenchless Technology* (right).

John Grennan of Ward and Burke speaks to the crowd at the Kick-Off Breakfast after accepting the 2017 *Trenchless Technology* Project of the Year Award in New Installation for the Rebecca Trunk Wastewater Main project.

NASTT's Board of Directors gather for a photo before the Kick-Off Breakfast on Monday, March 26 at the 2018 No-Dig Show.

EXHIBIT HALL OPENING

(L-R): NASTT Vice Chair Craig Vandaelle, 2018 Program Chair Don Del Nero and NASTT Chair Frank Firsching cut the ribbon, officially opening the exhibit hall for NASTT's 2018 No-Dig Show.

Perma-Liner Industries was once again a platinum sponsor of NASTT's 2018 No-Dig Show.

Some folks from platinum sponsor Aegion Corp. grab a quick photo at the booth after the exhibit hall opening on Monday, March 26.

Members of the TT Technologies team pose for a photo in the booth on Day 1. TT Technologies again served as a platinum sponsor of the 2018 No-Dig Show.

The featured entertainment at the Kick-Off Breakfast was Derreck Kayongo, a Ugandan immigrant who told the story of his upbringing and his inspiration for launching the Global Soap Project.

Trenchless Technology editors Sharon Bueno and Jim Rush present Andrew Costa of Insituform (right), with the 2017 Project of the Year Award in Rehabilitation for the West Palm Beach Force Main Rehabilitation project.

NASTT's 2017 No-Dig Show Program Chair Jennifer Glynn presents Kathryn Wallin (right) of Bennett Trenchless Engineers the Outstanding Paper Award in the New Installation category.

Kevin Nagle (left) of TT Technologies accepts NASTT's Leadership Award from NASTT Chair Frank Firsching at the Kick-Off Breakfast.

Kevin Bainbridge of Robinson Consultants accepts the Outstanding Paper Award in the Rehabilitation category.

NASTT'S 17TH ANNUAL EDUCATIONAL FUND AUCTION

A mix of greasers, Rydell High students and Elvis tributes took over the guys' costume contest at the 17th annual Educational Fund Auction & Reception.

The ladies were also rockin' the 1950s style!

BT Construction was the winning bidder for Morty the Sewer Rat this year.

A couple of Pink Ladies aka Michelle Hill (left) and Jenna Hale (right) of NASTT pose for a photo with a Rydell High student at the auction.

EXHIBIT HALL

NASTT's No-Dig Show drew more than 190 exhibiting companies to Palm Springs in 2018!

The excellent networking opportunities around the exhibit hall is one of the hallmarks of NASTT's No-Dig Show.

No-Dig Sh
opportunity
technology,
providers fro
industry.

GALA AWARDS DINNER

No-Dig attendees unwind at the Pre-Gala Awards Dinner Reception before the headlining event of the evening – the Gala Awards Dinner.

NASTT's 2018 No-Dig Show Program Chair Don Del Nero and his wife, Wendy, take a photo before NASTT's Gala Awards Dinner on Tuesday, March 27.

This year's Ralston Award for Young Trenchless Achievement recipients: Charlie Tripp (left) of Kleinfelder and Matt Smith (right) of Michels.

ow attendees have the to network with expert equipment and service m across the trenchless

⬆ LaValley Industries received the Innovative Product Award for its TONGHAND exit side wrench, a technological step forward in large bore horizontal directional drilling work.

⬆ Quick Connect LLC received the other Innovative Product Award for its Quick Connect Universal Pull Head.

⬆ NASTT's 2018 Hall of Fame Class (l-r): George Ragula, distribution technology manager at PSE&G; Ian J. Doherty, B.A.Sc., P.Eng., president of Trenchless Design Engineering Ltd.; and Chris Brahler, president and CEO of TT Technologies.

➡ Dr. Kimberlie Staheli, NASTT Immediate Past Chair, receives NASTT's Chair Award for Outstanding Lifetime Service from NASTT Chair Frank Firsching at the Gala Awards Dinner.

Day 3

EXHIBIT HALL

⬆ The vibrant exhibit hall offers attendees an opportunity to connect with service providers, equipment manufacturers and technology innovators at NASTT's No-Dig Show.

⬆ Did we mention this year's show drew nearly 200 exhibitors to Palm Springs?

⬆ NASTT is all about education and allowing conference participants – from municipal representatives to consultants, vendors and contractors – the chance to exchange ideas and information.

CLOSING LUNCHEON

⬆ NASTT's 2017 No-Dig Show Program Chair Jennifer Glynn (left) with 2018 No-Dig Show Program Chair Don Del Nero.

⬆ Program Committee Member Kaleel Rahaim (far left) and Ian Mead of NASTT's Northeast Regional Chapter (far right) present the awards for NASTT's Student Research Poster Competition. They are (middle l-r): 2nd Place – Greta Vladenau, Louisiana Tech University; 3rd Place – Haitao Lan, Queen's University; and 1st Place – Srinath Kumar, Purdue University.

⬆ Amana Arayan (middle) of NASTT's Young Professionals Committee presents the first place award for NASTT's Student Chapter Presentations to students from Louisiana Tech University.

The No-Dig Show exhibit hall features companies that specialize in technologies for a range of trenchless solutions – from HDD, microtunneling and auger boring to pipe bursting, CIPP and manhole rehabilitation.

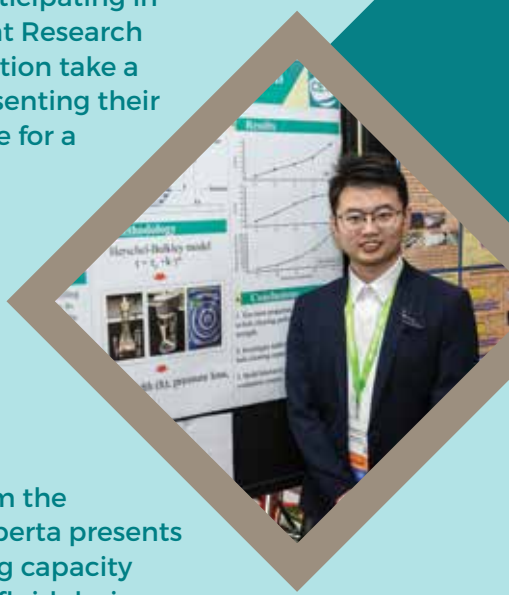
IN THE CLASSROOM

Attendees gather in a meeting room for a session on Wednesday, March 28.

Swirvine Nyirenda, principal engineer of the City of Aurora, Colorado, presents during a session. Nyirenda was a Municipal Scholarship recipient this year.

STUDENT POSTER COMPETITION

Students participating in NASTT's Student Research Poster Competition take a break from presenting their research to pose for a group photo in the exhibit hall.



Sai Deng from the University of Alberta presents on hole cleaning capacity of HDD drilling fluid during the Student Research Poster Competition.

Wednesday's technical program featured a Gas Industry Track, dedicated solely to trenchless technology applications in the gas utility market.

Trenchless in the Windy City

A Glimpse of NASTT's 2019 No-Dig Show in Chicago

THE RIVER WILL BE DYED GREEN FOR ST. PATRICK'S DAY FESTIVITIES when NASTT's 2019 No-Dig Show kicks off in the Windy City. NASTT will host its annual conference in Chicago, March 17-21, at the Donald E. Stephens Convention Center.

In the past four years, NASTT's No-Dig Show has been growing considerably. It set an all-time mark for total attendance in 2015 and has reached maximum exhibitor totals, drawing about 200 technology manufacturers and service providers each year since.

Aging water and sewer systems continues to be the biggest challenge facing the underground infrastructure market in the United States today. With major pipeline challenges, such as contaminated drinking water and lead service lines coming to national attention in recent years, the decision to replace old, ineffective pipe systems is critical. Furthermore, replacement is costly and may not always be the best option. Trenchless technology offers both innovative rehabilitation and replacement options for communities looking for cost-effective, non-disruptive and environmentally-sound infrastructure solutions.

For more than 25 years, the goal of NASTT's No-Dig Show has been to increase awareness and acceptance of this technology. The benefits it provides can be substantial for municipalities. As the 2019 No-Dig Show heads to the midwest, NASTT looks forward to continuing its momentum in advocating trenchless technology all across North America.

Call for Abstracts Deadline: June 30!

NASTT's 2019 No-Dig Show will once again offer six tracks and more than 160 peer-reviewed, non-commercial presentations. The Call for Abstracts for the 2019 conference is out. Prospective authors are invited to submit a 250-word abstract outlining the scope of their paper and the principal points of benefit to the trenchless industry. The abstracts must be submitted electronically by June 30, 2018. NASTT's all-volunteer Program Committee will meet later this summer to review the abstracts and select the papers that will be presented at the 2019 No-Dig Show.

NASTT's 2018 Program Committee Chair, Don Del Nero of Stantec, will hand the reigns over to Cindy Preuss of HydroScience Engineers, who will serve as the 2019 Program Chair.

For more information on how to submit an abstract for 2019 or for more on NASTT's No-Dig Show, visit *nodigshow.com*.

Cindy Preuss of HydroScience Engineers will serve as NASTT's 2019 No-Dig Show Program Chair while Joe Lane of Aegion will take the role of Program Vice Chair.

2019 NASTT's NO-DIG SHOW

March 17-21, 2019 | Chicago, Illinois

CALL for Abstracts

Submissions Deadline: June 30, 2018

The North American Society for Trenchless Technology (NASTT) is now accepting abstracts for its 2019 No-Dig Show in Chicago, Illinois at the Donald E. Stephens Convention Center on March 17-21, 2019. Prospective authors are invited to submit a 250-word abstract outlining the scope of their paper and the principal points of benefit to the trenchless industry. **The abstracts must be submitted electronically at NASTT's website by June 30, 2018: nastt.org/no-dig-show.**

Abstracts from the following subject areas are of interest to the No-Dig Show Program Committee:

Potable Water and Pressure Systems
- Pipeline Inspection, Locating, and Condition Assessment
- Pipe Rehabilitation
- Pipe Bursting
- Emerging Technologies
- Case Studies

Wastewater, Storm water, and Non-pressure Systems
- Advanced Pipeline Condition Assessment
- I&I and Leak Detection
- Pipeline and Laterals Rehabilitation
- Pipeline Inspection, Locating, and Condition Assessment
- Cured-in-Place Pipe Lining
- Sliplining
- Pipe Bursting
- Spray Applied Linings
- Grouting
- Manhole Rehabilitation
- Case Studies

Energy Pipeline Systems
- Pipeline Inspection, Locating, and Condition Assessment
- Aging System Rehabilitation
- New Trenchless Installation
- Standards and Regulations

Trenchless Research and Development
- University and Industry Initiatives
- Education and Training

Industry Issues
- Subsurface Utility Engineering
- Submittal Requirements and Quality Assurance/Quality Control
- Project Budgeting and Prioritization
- Funding for "Green" Technologies
- Selection Criteria for Contractors
- Social Costs and Impacts
- Carbon Footprint Reduction
- Sustainable Construction Practices
- Industry Trends, Issues and Concerns
- Differing Site Condition Claims

New Installations – Tunneling, Boring and Pipe Ramming
- New Concepts or Trenchless Equipment, Materials and Methods
- New Applications for Boring Techniques (Auger Boring and Pipe Ramming)
- Pilot Tube Boring (Tunneling)
- Case Studies

Horizontal Directional Drilling (HDD)
- New Concepts and Applications for Horizontal Directional Drilling Equipment, Materials and Methods
- Case Studies

Microtunneling
- New Concepts and Applications for Microtunneling Equipment, Materials and Methods
- Case Studies

For more information visit NODIGSHOW.COM

Questions? Please contact:

Michelle Hill | NASTT Program Director
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P: 888-993-9935

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

NASTT'S
EYE ON THE INDUSTRY
OUR MEMBERS IN ACTION

Hydromax USA acquires Miller Pipetech

IN MARCH, HYDROMAX USA ACQUIRED MILLER PIPETECH, an environmental services company specializing in pipeline condition assessment for wastewater and natural gas utilities.

The acquisition of Miller Pipetech's technical service division will enable Hydromax USA to increase its capacity to deliver on its high-demand, suite of service solutions for both critical gas cross bore identification and sewer condition infrastructure assessment programs.

Throughout the country, cross bores continue to be a cause of concern as more and more stakeholders are addressing the problem and associated risks. Cross bores, unintended intersections of utilities, pose a threat to public safety and industry workers alike. All types of cross bores can cause damage, however the intersection of natural gas lines in sewer pipes are considered the highest threats.

"The completion of this acquisition opens new opportunities for our clients, our employees and the communities in which we serve," said Jeff Griffiths, director, east region for Hydromax USA. "We are very excited to begin to introduce our enhanced services to the Miller Pipetech client network and we look forward to a smooth transition as we add Miller Pipetech's technical service assets and experienced personnel to our team."

According to Hydromax, the acquisition will also strengthen the company's footprint in the Eastern and Midwestern United States, enabling Hydromax to extend the capabilities of its state-of-the-art Louisville Data Center to current clientele of Miller Pipetech.

NASTT announces board changes; welcomes new director


Melvin

NASTT ANNOUNCED IN THE SPRING some changes to its 2018 Board of Directors. Craig Vandaelle of Michels Corp. has been appointed to Vice Chair of the Board, while Matthew Wallin of Bennett Trenchless Engineers has been appointed to the position of Officer-at-Large. In addition, Rick Melvin of TT Technologies has joined the Board as a director.

Melvin is a national product specialist for TT Technologies, Inc. He has been involved in a variety of underground construction applications for more than 20 years including the sales and servicing of pipe ramming, horizontal directional boring machines and pipe bursting systems.

Melvin has also been heavily involved in pursuing overall growth of the trenchless technology market. He has assisted in educating engineers and contractors on the extensive benefits of various available trenchless technologies and trenchless equipment techniques.

To learn more about NASTT's Board of Directors, please visit *nastt.org/board-of-directors*.

Hutchinson, Moore join Staheli Trenchless Consultants

STAHELI TRENCHLESS CONSULTANTS HAS ANNOUNCED that Mark Hutchinson and Brad Moore have joined the firm. Hutchinson joins as senior technical advisor while Moore takes the role of vice president and principal engineer.


Hutchinson

Hutchinson has more than 38 years of experience in the design and construction of municipal stormwater, wastewater and CSO projects, most notably with the City of Portland. "Mark's energy, passion for trenchless technology and zest for life make him a pleasure to work with," Staheli Trenchless noted in a press release.

As construction division manager for the City of Portland for more than 13 years and project manager for another 20 years, Hutchinson oversaw completion of its CSO program and the transition to 20-plus miles a year of pipe rehabilitation utilizing CIPP, pipe-bursting, sliplining, open cut and spot repair. He has developed, led or facilitated teams of engineers, technicians and inspectors to safely deliver high quality, functional projects under budget and on time throughout his career.


Moore

Brad Moore has extensive experience as a civil and water resources engineer with project management experience on numerous, multi-disciplined teams for municipal infrastructure projects including planning, design and construction of waterlines, storm and sanitary and CSO conveyance systems. He has experience in managing multi-disciplined pipeline design teams including conventional open excavation and trenchless construction methods. Moore has 30-plus years of experience with more than 25 of those years working on numerous public infrastructure projects including more than 15 major pipeline projects in Oregon and Washington.

Hutchinson and Moore will both be working out of both Staheli's Lynnwood, Washington and Portland, Oregon offices.

Robbins Main Beam breaks records in China

IN JILIN, ONE OF THE THREE PROVINCES OF NORTHEAST CHINA, a 7.9 m (26 ft) diameter Robbins Hard Rock Main Beam TBM has achieved a national record for 7 to 8 meter (23 to 26 ft) machines: 1,423.5 m (4,670 ft) in one month. The record tops a previously-set achievement on the same project from earlier in 2017, when the TBM advanced at a rate of 1,336.8 m (4,386 ft) in one month.

The world record for the size class is held by another Robbins machine, set more than 20 years ago at the Tunnel and Reservoir Plan (TARP) in Chicago, Illinois, USA, for 1,482 m (4,862 ft) in one month. However, given the differences in rock conditions this Jilin project record is very significant. At TARP the rock was relatively homogeneous dolomitic limestone averaging 145 MPa/21,100 psi with occasional rock bolts; at Jilin the rock types were rated from 35 to 206 MPa UCS (5,100 to 30,000 psi), and identified as tuff, granite, sandstone, and andesite with multiple fault zones—conditions requiring nearly continuous ground support.

Despite the difficult conditions, the Jilin machine has achieved an average monthly advance rate of 708.3 m since the start of boring in March 2015 — more than three times the average monthly rate of a Drill & Blast operation on another section of the project. "It is now very evident that well-equipped, open-type Main Beam TBMs with specialized features for difficult ground can traverse faults and large water inflows much faster than conventional tunneling methods. This fact, coupled with the high-performance capabilities as demonstrated at Jilin, lowers the cost and time to complete long tunnels in difficult ground," said Robbins President Lok Home.

The Jilin Lot 3 tunnel, which is being bored as part of a water conservation

project, will be 24.3 km (15 mi) long when complete. Under contractor Beijing Vibroflotation Engineering Co. Ltd. (BVEC), the machine has excavated 14 km (8.7 mi) of the tunnel as of January 2018.

The Jilin Lot 3 tunnel is part of the Jilin Yinsong Water Supply Project, which will convey water to the central cities of Jilin Province. The large-scale, trans-regional water diversion project is the longest water supply line, measuring 263.5 km (163.7 mi), with the largest number of recipients benefiting from it in the history of Jilin Province. Tunneling is expected to be complete in late 2018.

Michael Byrne Mfg.

Making Its Mark in Auger Boring and Industry Education

MICHAEL BYRNE MFG. HAS BEEN a key player in the underground construction market for decades. Founded in 1966 by Mike Byrne in a garage, the Mansfield, Ohio-based manufacturer custom builds horizontal earth boring machines, tunneling equipment, augers, dirt and rock cutting heads, screw conveyors, speed reducers and other related products for use in underground settings.

Today, Michael Byrne Mfg. continues to serve the underground construction industry after more than 50 years. Thanks to its in-house design, engineering and manufacturing team, the company has built countless extreme heavy-duty auger boring machines and cutting heads, delivering on time and providing quality service to its customers.

The company has also been integral in initiatives to help grow the market it serves, including industry education and advocacy efforts. In 2017, Michael Byrne Mfg., along with contractor Iowa Trenchless, split the winning bid for Morty the Sewer Rat at NASTT's annual Eduacational Fund Auction at the No-Dig Show.

"One of our great honors has been to host NASTT's Morty the Sewer Rat at our factory and on jobs over the last six months," says Jim Weist, CEO and president of Michael Byrne Mfg., who has been a leader in the company's industry development efforts also through his role as director of NUCA of Ohio.

For Weist, NASTT's Educational Fund serves an important function, as he views educating the next generation of underground construction professionals as key to long term industry growth.

"Something that both ourselves and our customers believe in is educating today's industry on safety, new techniques and new methods being used for underground construcution," Weist says. There needs to be more. Being a ditchdigger today is a lot different from being a ditchdigger 50 years ago. That's all part of the process of the educational fund – not just college or technical courses and programs. It's getting at the root of the problem and promoting construction as a job that doesn't have to be a second, third or fourth option as a career."

In 2017, Weist, along with Jason Clark, owner of Iowa Trenchless, was determined to win Morty at the auction and secure him for his travels from March 2017 to March 2018. Weist says the tradition of bidding for Morty continues to inspire generous donations for the much-needed educational fund to enhance the workforce development plans of NASTT.

"Michael Byrne was proud to be a sponsor for Morty and his mission to continue to promote education, safety and new technology," Weist says. "Best wishes to Morty and BT Construction, his new sponsors for 2018-19."

To learn more about Michael Byrne Mfg., visit *byrnegroup.com*.

GeoEngineers principal to lead Direct Pipe Manual of Practice


Robison

GEOENGINEERS, INC. HAS ANNOUNCED THAT PRINCIPAL JONATHAN L. ROBISON, P.E. has been chosen by the American Society of Civil Engineers (ASCE) to lead the Task Committee creating a Manual of Practice about the trenchless method Direct Pipe. The committee will be comprised of engineers, contractors and equipment manufacturers and suppliers from across North America and Europe.

A manual in this ASCE series contains information useful to the average engineer in his or her everyday work, in this case Direct Pipe. Robison has been providing geotechnical, trenchless, geohazard, construction and geophysical project management and engineering services since 1997, and he is a registered Professional Engineer in 15 states. He has led the development of GeoEngineers' Direct Pipe design process since the technology emerged. GeoEngineers staff, led by Robison, has completed engineering and construction services on numerous successfully completed Direct Pipe projects in the United States and Mexico. He is a member of ASCE and has presented seven technical, peer-reviewed papers on Direct Pipe engineering topics at industry conferences.

Robison is also involved in the trenchless pipeline industry as a member of the North American Society for Trenchless Technology, in which he also serves on the annual No-Dig Conference Program Committee. In addition, he currently represents GeoEngineers on the Industrial Advisory Board for the Trenchless Technology Center at Louisiana Tech University. He works from GeoEngineers' location in Springfield, Missouri, and he earned his master's and bachelor's degrees in civil engineering at University of Missouri, Rolla (now the Missouri University of Science & Technology or Missouri S&T).

GeoEngineers, founded in 1980, specializes in crafting unique environmental, geotechnical, and ecological solutions for the energy, transportation, water and natural resource, federal, and development sectors, and it is currently ranked #223 in the 2017 Engineering News Record Top 500 National Design Firms survey and 23 of the 2017 *Trenchless Technology* Top 50 Engineering Firms.

SippTech, SAK Construction enter into installer agreement

SIPP TECHNOLOGIES LLC. (SIPPTECH) CEO/CTO KENT WEISENBERG has announced an agreement with SAK Construction, LLC. (SAK) for exclusive installation rights of its SippSteel robotic lining technology. Pursuant to the agreement, SAK is the sole national installation contractor for SippTech's multidimensional, robotically installed, composite pressure pipe lining system.

"SippTech is honored to partner with SAK. Their knowledge, experience and innovative thinking in the pipeline rehabilitation industry offers the 'perfect storm' of opportunity for SippSteel," Weisenberg said.

SippSteel is a novel, three-component composite lining system that entirely overcomes the limitations and inconsistencies present in prior SIPP technologies. This is made possible by utilizing a combination of specific and cooperative machine learning technologies, including computer-vision, LIDAR ultrasound, RF, Wi-Fi, gyroscope, and accelerometer, to precisely navigate and apply the SippSteel composite inside of the pipe. The result is the installation of a structurally independent lining system.

"This unique, cutting-edge technology truly has the capability to change the entire dynamic of the pressure pipe rehabilitation industry," stated Charlie Kuhnmuench, vice president of business development for SAK. "We look forward to working together with SippTech to expand this technology throughout the United States." Please visit *sipptech.com* for more info.

British Columbia

As of early 2018, the British Columbia Chapter (NASTT BC) is continuing its efforts to introduce trenchless technologies into educational institutes. The chapter has had very promising meetings with the University of Victoria and the British Columbia Institute of Technology. Stay tuned for more information.

NASTT BC has also developed an online Carbon Calculator to identify the reduction in greenhouse gases that can be realized using trenchless technology. The Carbon Calculator is the basis for a more sophisticated calculator being developed in conjunction with NYSEARCH, the R&D arm of several gas companies across North America. For more information, please visit *utilitycarboncalculator.com*.

Great Lakes, St. Lawrence & Atlantic

The Great Lakes, St. Lawrence & Atlantic (GLSLA) Chapter held its second CIPP good practices course in 2017 in Halifax, in partnership with NASTT and ACWWA. The course was well attended with more than 20 participates. The GLSLA Chapter would like to thank ACWWA for its partnership in presenting the course and it looks forward to continuing to promote the trenchless industry in Atlantic Canada with ACWWA. For more information on GLSLA, events and our training sessions, please visit *glsla.ca*.

Mid Atlantic

The Mid Atlantic Society for Trenchless Technology (MASTT) held its annual Board of Directors and membership meeting on March 25 in Palm Springs, California, at NASTT's 2018 No Dig Show. Board members were elected for the two-year term of 2018-2019.

The Board decided to change from the two-day format to a one-day format for the "Trenchless Technology, SSES and Buried Asset Management" seminars in order to allow more municipal representatives, engineers, contractors and manufacturers to attend. This decision is aimed at allowing more people to attend the seminar given just the one-day consideration. MASTT is planning a "Trenchless Technology, SSES and Buried Asset Management" seminar for Pittsburgh on July 19, 2018, and another in Virginia Beach, Va., Sept. 26, 2018. Please plan to support and attend the seminars to enjoy the networking and learning.

The MASTT Journal of Trenchless Technology 2018 was scheduled to be published in May. The journals have had numerous excellent Mid Atlantic project articles, messages and advertisements. "Thanks!" to everyone who has participated and supported the journal. Please visit mastt.org to review the journal, seminar schedule, MASTT Board members and much more about MASTT.

Midwest

The Midwest Society for Trenchless Technology (MSTT) held its annual Board of Directors and membership meeting on March 25 in Palm Springs, California, at NASTT's 2018 No Dig Show. Board members were elected for the two-year term of 2018-2019. MSTT welcomes new Board members Kerry Koressel of IPEX America, Steve Matheny of Logan Clay Products and Tod Michael with Vermeer Corp.

The Board decided to change from the two-day format to a one-day format for the "Trenchless Technology, SSES and Buried Asset Management" seminars in order to allow more municipal representatives, engineers, contractors and manufacturers to attend. This decision is aimed at allowing more people to attend the seminar given just the one-day consideration. MSTT is now planning "Trenchless Technology, SSES and Buried Asset Management" seminars for Des Moines, Iowa, on Aug. 15 and Minneapolis/St. Paul on November 8.

The MSTT Journal of Trenchless Technology 2018 is scheduled to be published in September. The journals have had numerous excellent Mid Atlantic project articles, messages and advertisements. "Thanks!" to everyone who has participated and supported the journal. Please visit mstt.org to review the journal, seminar schedule, MASTT Board members and much more about MASTT.

Northeast

The Northeast Regional Chapter of NASTT is busy planning its 2018 annual conference, scheduled for Nov. 13 in Mystic, Connecticut. A welcome reception will be held at Mystic Pizza on the evening of Nov. 12. The spring edition of the Northeast Journal of Trenchless Technology Practices was released at NASTT's No-Dig Show in March, and the chapter is looking forward to the fall edition, as well. The Northeast Chapter is also working with its student chapter at UMass Lowell to identify potential presentations and field trips to engage the next generation of trenchless experts. Please visit our website *nastt-ne.org* for more information, and please join us!

Northwest

The Northwest Chapter is also commencing the planning of the 2018 Trenchless Conference. This year's conference will be a national focus and will be presented in partnership with TAC. The conference will take place in Edmonton, Nov. 7-9, at the Fantasy Land Hotel at West Edmonton Mall. The Conference will be a three-day event and will include a short course on Nov. 7 followed by the conference on Nov. 8-9 and a TAC Awards Gala. Please watch the chapter's webpage for upcoming announcements. For more information, email *gtippett@nastt-nw.com*.

Pacific Northwest

The chapter is also in early talks regarding an NASTT training event this fall. The biennial symposium is a year away and will be held in Portland, Ore., in January 2019. The chapter is currently seeking volun-

teers to join the Planning Committee for this event. If you are a PNW member and interested in getting involved, please contact a PNW Chapter board member. More information is available at *pnwnastt.org*.

Rocky Mountain

The Rocky Mountain Chapter (RMNASTT) is hosting its annual Regional Conference on Nov. 1. The chapter is looking to have another record year and expect to generate new interest from our newly added territory. Our territory now covers Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah and Wyoming. The board and its volunteers are actively reaching out to the areas outside of Colorado and Utah to find champions to foster new relationships and garner interest into RMNASTT and NASTT in general. RMNASTT hosted a unique field trip and lunch/learn this year in Utah and had excellent attendance with superb feedback. Altogether, the RMNASTT team is excited about the path forward.

The Rocky Mountain Chapter hosted a field visit in Utah in March where an auger boring demonstration was led by BT Construction.

South Central

The South Central Chapter is in the process of preparing the first annual publication of the chapter, titled "Texas and Oklahoma Trenchless Report," to be released in late Summer 2018. This will be the only regional publication dedicated exclusively to trenchless technology in the South Central United States and will serve to educate local governments, utilities and other end-user groups on the benefits and practice of utilizing trenchless technology. The new magazine will also highlight member achievements and promote the NASTT South Central Chapter throughout the region. For information regarding this publication, please contact Justin Taylor at justin.taylor@cciandassociates.com or call 832-210-1032.

The chapter is also looking forward to hosting the 3rd annual Trenchless Technology and Pipe (TTP) Conference

this fall, which will be a great opportunity for learning and networking, where the chapter will be looking to hand out scholarships for a few deserving young professionals with interest in being the future of the trenchless industry.

Southeast

The Southeast Society (SESTT) held its annual Board of Directors and membership meeting on March 25 in Palm Springs, California, at NASTT's 2018 No Dig Show. Board members were elected for the two-year term of 2018-2019. SESTT welcomed to the board, Troy Stokes of Akkerman, Dr. John Matthews of Louisiana Tech University and Kaleel Rahaim of Interplastics Corp.

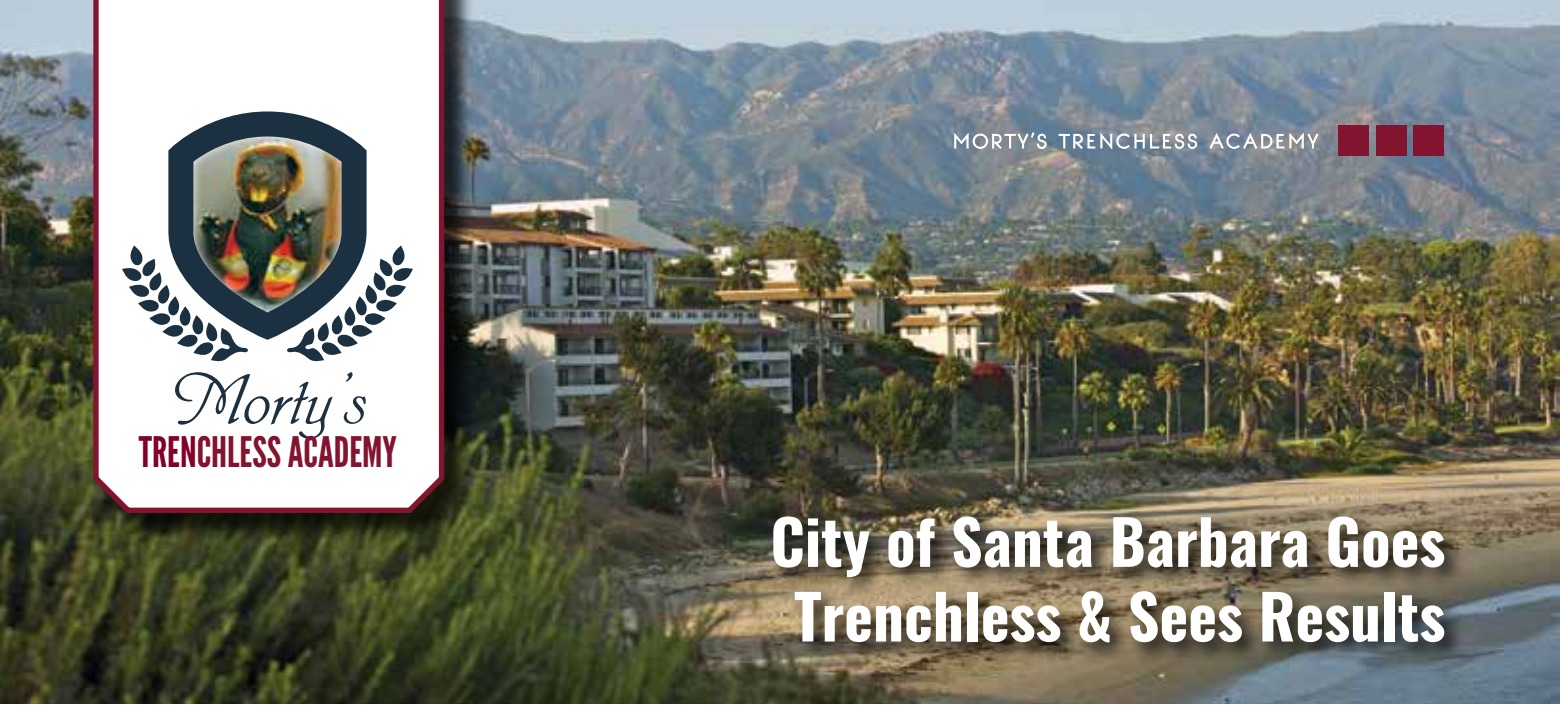
The Board decided to change from the two-day format to a one-day format for the "Trenchless Technology, SSES and Buried Asset Management" seminars in order to allow more municipal representatives, engineers, contractors and manufacturers to attend. This decision is aimed at allowing more people to attend the seminar given just the one-day consideration.

SESTT hosted a "Trenchless Technology, SSES and Buried Asset Management" seminar in Atlanta on May 9, 2018 with guest presenters from the U.S. EPA. The seminar was a great success and SESTT is planning a similar seminar for Tampa, Florida, on Dec. 12, 2018. Please plan to support and attend the seminars to enjoy the networking and learning.

The SESTT Journal of Trenchless Technology 2018 is scheduled to be published in mid-November of 2018. The journals have had numerous Southeast articles and case studies. "Thanks!" to everyone who has participated and supported the journal. Please visit sestt.org to review the journal, seminar schedule, MASTT Board members and much more about SESTT.

Western

The Western Chapter (WESTT) held Board and Chapter meetings at NASTT's national No-Dig Show in Palm Springs, California, in March. The Board elected new officers for the 2018-2019 year, including new chair, Brian Avon, new vice-chair, Lisa Arroyo, returning treasurer, Norm Joyal, and new secretary, Kate Wallin. To celebrate hosting the annual conference within the Western Chapter area, WESTT held a cocktail reception for its members after the educational auction. The reception was attended by more than 120 WESTT members, including representatives from municipalities, engineering, manufacturers, students and contractors.



Morty's TRENCHLESS ACADEMY

City of Santa Barbara Goes Trenchless & Sees Results

THE CITY OF SANTA BARBARA PROVIDES WATER AND SEWER SERVICES to approximately 92,000 residents along the central coast of California. It is sometimes referred to as the American Riviera, and with its beautiful beaches, majestic mountains and colorful culture, Santa Barbara is a premier resort destination.

Currently, Santa Barbara's water resources engineers are focused on renewing water and sewer pipelines dating back to the 1900s. With a nearly $2 million annual sewer pipeline rehabilitation and repair budget, and a $4.7 million annual water main replacement budget, our engineering team is hard at work designing and constructing these critical infrastructure projects.

In 2015, I attended my first WESTT conference in San Diego and signed up for the cured-in-place pipe (CIPP) Good Practices class. The city had been using CIPP for over a decade and I quickly discovered we could do a lot more to improve the overall success of our projects. The course was led by NASTT instructors, who are experts in the industry and make themselves available for questions. I have been actively involved in WESTT since 2015 and have attended NASTT's No-Dig Show the last three years. Each year, I find myself learning more about the trenchless industry and I bring this information back to the city for implementation.

Recently, there have been staffing changes to our Water Resources Engineering team, leaving newer and less experienced engineers to deliver capital projects. As a municipal agency, Santa Barbara is always looking for cost-effective ways to train its staff. This was especially true for wastewater infrastructure, as the city's main method for sewer main renewal is CIPP. Therefore, when NASTT's No-Dig Show came to Palm Springs in 2018, four engineers applied for and received municipal scholarships. It was a cost-effective way to bring trenchless technology multiple engineers, and all four engineers stayed for the Good Practices classes after the conference.

However, we all know that engineering input is not the only aspect required for a successful project. The operational side is often overlooked. One of the important elements to NASTT's No-Dig show is the collaboration, instruction and networking between engineers, contractors and operational professionals. Santa Barbara has recognized the importance of the operational side, so an additional three wastewater operations staff attended this year's No-Dig Show, and all three attended the Good Practices classes. The benefits of sending operational staff to No-Dig and the Good Practices classes have already been recognized through better dialogue between the operators and designers during the scoping phase of work, and an improvement to the quality control portion of the specifications.

Each time city staff returns from a No-Dig Show or NASTT Good Practices class, we go through some form of self-reflection or debrief, where we process what we have learned and look to find ways to improve our projects. Most recently after NASTT's No-Dig Show in Washington D.C in 2017 and Palm Springs in 2018, we discovered that technology has matured enough to address the city's sewer lateral issues. Our goal was to bring the same benefits the city gains from rehabilitating sewer mains using trenchless to our community, where private property owners are responsible for their sewer laterals. Two of our staff members attended the Good Practices Sewer Laterals class and are developing the tools for a successful lateral rehabilitation program.

Through public outreach and a strong desire to share our knowledge from NASTT's No-Dig Show and NASTT Good Practices classes, city staff have been working to open up the door for more trenchless work. Our passion for trenchless construction methods provides the citizens of Santa Barbara cost effective and less disruptive construction methods to address aging public and private infrastructure.

This article was contributed by **LISA ARROYO, NASTT BOARD MEMBER AND WASTEWATER SYSTEM MANAGER FOR THE CITY OF SANTA BARBARA PUBIC WORKS IN CALIFORNIA.**

nastt chapters

NASTT has a network of 11 regional chapters throughout the United States and Canada. With a single NASTT membership, you're automatically enrolled in the national organization, the international organization (ISTT) and also in your regional chapter. Regional chapters offer valuable educational and networking opportunities in your local area. Share your ideas, network with colleagues and find solutions to your everyday challenges.

British Columbia

The British Columbia (NASTT-BC) Chapter was established in 2005 by members in the province of British Columbia, Canada.

Chapter Contact
Charlotte Wong
nasttbc@gmail.com
Website: nastt-bc.org

Elected Officers
Chair - Karl Mueller
Vice Chair - Gloria Grill
Treasurer -
Preston Creelman

Great Lakes, St. Lawrence & Atlantic

The Great Lakes, St. Lawrence & Atlantic (GLSLA) Chapter was established in 1995 and represents the Eastern Canadian perspective of the trenchless technology marketplace. GLSLA members are from Ontario, Quebec and the four Atlantic provinces.

Chapter Contact
Kevin Bainbridge
Phone: (905) 304-0080
kbainbridge@rcii.com
Website: glsla.ca

Elected Officers
Chair - Kevin Bainbridge
Vice Chair - Anna Polito
Secretary - Gerald Bauer
Treasurer - Derek Potvin

Mid Atlantic

The Mid Atlantic (MASTT) Chapter was established in 2004 by members from the states of Delaware, Maryland, New Jersey, Pennsylvania, Virginia, West Virginia and the District of Columbia.

Chapter Contact
Leonard Ingram
Phone: (888) 817-3788
leonard@engconco.com
Website: mastt.org

Elected Officers
Chair -
Richard Thomasson
Vice Chair -
Michael Delzingaro
Secretary - Dennis Walsh
Treasurer - Tom Wyatt

Midwest

The Midwest (MSTT) Chapter was established in 1998 to promote trenchless technology education and development for public benefit in Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio and Wisconsin.

Chapter Contact
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jeffboschert@ncpi.org
Website: mstt.org

Elected Officers
President - Jeff Boschert
Vice President - Chris Schuler
Secretary - John Milligan
Treasurer - Ryan Poertner

Northeast

The Northeast Chapter was established in 2015 by members in the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont.

Chapter Contact
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Phone: (508) 754-2201
IMead@tighebond.com
Website: nastt-ne.org

Elected Officers
Chair - Ian Mead
Vice Chair - Babs Marquis
Secretary -
Marshall Gaston
Treasurer -
Eric Schuler

Northwest

The Northwest Chapter was established in 1995 by members in the provinces of Alberta and British Columbia, Canada, and in Washington state. In 2005, the members in BC established the NASTT-BC Chapter. In 2009, members in Washington state established the Pacific Northwest Chapter and the Northwest Chapter adjusted the geographic area to include members in the provinces of Manitoba and Saskatchewan.

Chapter Contact
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greg.tippett@stantec.com
Website: nastt-nw.com

Elected Officers
Chair - Greg Tippett
Treasurer -
Keith Moggach

Pacific Northwest

The Pacific Northwest Chapter was established in 2009 by members in the states of Alaska, Idaho, Oregon and Washington.

Chapter Contact
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brendan.o'sullivan@murraysmith.us
Website: pnwnastt.org

Elected Officers
Chair - Brendan O'Sullivan
Vice Chair - Carl Pitzer
Secretary - AJ Thorne
Treasurer -
Heidi Howard

Rocky Mountain

The Rocky Mountain Chapter was established in 2009 by members in the states of Colorado, Utah, Montana and Wyoming.

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clarson@clwsi.com
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Elected Officers
Chair - Chris Larson
Vice Chair -
Benny Siljenberg
Secretary -
Swirvine Nyirenda
Treasurer -
Stephanie Nix

South Central

The South Central Chapter was established in 2015 to serve the members of NASTT from Texas and the south central area of the United States.

Chapter Contact
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justin.taylor@cciandassociates.com

Elected Officers
Chair – Alan Goodman
Vice Chair –
Jonghoon "John" Kim
Treasurer – Josh Kercho

Southeast

The Southeast (SESTT) Chapter was established in 2001 to serve the members of NASTT from Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Puerto Rico.

Chapter Contact
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Website: sestt.org

Elected Officers
Chair - Jerry Trevino
Vice Chair - Ed Paradis
Secretary - J. Chris Ford
Treasurer - Kelly Derr

Western

The Western (WESTT) Chapter was established in 2003 by members from the states of Arizona, California, New Mexico, Nevada and Hawaii.

Chapter Contact
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WESTTchapter.org@gmail.com
Website: westt.org

Elected Officers
Chair - Brian Avon
Secretary -
Kate Wallin
Treasurer -
Norman Joyal

nastt student chapters

Members of NASTT's Student Chapters attend and participate in NASTT's No-Dig Show where they present trenchless research posters, participate in competitions and provide event support monitoring the technical paper sessions. There are many benefits for students who belong to an NASTT Student Chapter – scholarships, networking opportunities, education and career opportunities to name a few. To learn more about NASTT's 20 Student Chapters, visit *nastt.org/student-chapters*.

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Bowling Green State University
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Virginia Tech University
Blacksburg, Virginia
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E-mail: ssinha@vt.edu

NASTT'S 2019 NO-DIG SHOW

MUNICIPAL & PUBLIC UTILITY SCHOLARSHIP PROGRAM

NASTT's 2019 No-Dig Show Municipal & Public Utility Scholarship Award has been established to provide education and training for North American municipalities, government agencies and utility owners who have limited or no travel funds due to restricted budgets.

Selected applicants will be awarded complimentary **full conference registration** to NASTT's 2019 No-Dig Show in Chicago, Illinois, March 17-21, 2019. One day conference registrations will also be available. Registration includes full access to all exhibits and technical paper sessions… all you have to do is get yourself to the conference! Selected applicants will also be eligible to receive overnight accommodations. Selection based on responses to the application as well as need.

Apply today!
Application deadline is November 1, 2018.

APPLY FOR COMPLIMENTARY REGISTRATION, HOTEL ACCOMMODATIONS AND MORE!
VISIT: NASTT.ORG/MUNICIPALSCHOLARSHIP TODAY.

North American Society for Trenchless Technology | 14500 Lorain Avenue #110063 | Cleveland, Ohio 44111

Quality Control for Sewer Lateral Rehabilitation

Kevin Bainbridge
ROBINSON CONSULTANTS, HAMILTON, ONTARIO

Harry Krinas
CITY OF HAMILTON, HAMILTON, ONTARIO

Patrick Moskwa
ROBINSON CONSULTANTS, HAMILTON, ONTARIO

Roy Vanstone
ROBINSON CONSULTANTS, HAMILTON, ONTARIO

IN RECENT YEARS THE INSITU REHABILITATION OF LATERALS using Cured In Place Pipe (CIPP) has been significantly increasing with utilities and cities across North America investing in sewer lateral rehabilitation. The City of Hamilton, like many other cities, was under pressure due an increasing number of sewer lateral failures and costs associated with reactive open cut lateral repairs. As a result, the rehabilitation of laterals was recognized as an increasingly important initiative by the city and prompted the development of their rehabilitation program in 2008. Since 2008 over 4600 laterals have been rehabilitated and the program has continued to evolve with updated specifications and QA/QC practices based on industry best practices; however the quality control of the lateral installations continued to be a challenge. Unlike the installation of CIPP in mainline sewers the ability to collect samples is much more challenging and costly. Despite the challenges, the City recognized the importance of quality control for the long-term success of the program and initiated the development of QA/QC practices.

Working with the city and the contractor, Robinson Consultants developed quality control procedures, including sample collections to ensure a good population of samples were being tested. In addition to the sampling procedure, good site inspection practices were also reviewed and improved. The city has had successes and challenges with the sampling process and continues to make improvements to the process to increase the accountability for quality installation.

This paper will outline the City's process for the QA/QC of CIPP lateral installations, including sample testing, site inspection and reporting.

Introduction

The use of CIPP for the rehabilitation of sewer lines has been well established in North America for several decades. In more recent years Cities and utilities has begun expanding the use of CIPP for the rehabilitation of other underground pipes, including sewer laterals. While sewer laterals are very similar in many was to mainline sewers, lateral rehabilitation using CIPP can be much more challenging.

There are several factors that make the use of CIPP more challenging for laterals. Primarily these factors are access, size and quality control of installations.

This paper will discuss the challenges and some practices currently in use by the City of Hamilton for the quality control of lateral installations.

It is important to appreciate that the collection of a CIPP sample from the actual installed lateral liner is extremely challenging without incurring significant cost and disruption (i.e. excavation of a portion of lateral), yet the importance of obtaining a sample is the same as with mainline sewer CIPP.

To the author's knowledge, a cost-effective way of obtaining samples from the actual installed liners has not been identified. Many utilities and municipalities simply don't collect samples for testing. While we are limited in our ability to obtain direct sample pieces from the installed line, there are alternative methods in achieving some level of quality control through inspection and sample testing of the CIPP product being used.

Hamilton's Lateral Lining Program

The City of Hamilton's lateral lining program was initiated in 2008 and set as a three-year performance-based contract. The contract was subsequently re issued in 2011to continue with lateral rehabilitation for another three years. In 2014 the contract was overhauled to allow the city to extend the work to a five term, through to the end of 2019 with an annual budget of approximately $5 million capable of achieving between 650 and 700 rehabilitated laterals annually. The contract prefers that laterals are CIPP lined completely from within the mainline sewer without the requirement to install a cleanout or entering private property for any component of the process (CCTV, cleaning, prep, installation, etc.). The lateral liners are required to be one-piece integrated lateral pipe liners and connection liners referred to by the city as Lateral Liners Including Sewer Connection (LLISC) with sound engineering designs associated with both the tube liner and connection liner. The contract requires rehabilitation lengths up to 25 metres or to the property line and be capable of lateral installation sizes of 100mm to 200mm with in mainline sewer sizes of 200mm to 900mm).

QA/QC Specification Requirments

As with mainline sewer CIPP rehabilitation there are two primary methods to help validate good quality CIPP installations, including CCTV video inspections and product sample testing. Video inspections are required both after the cleaning and preparation of the lateral,

known as a V2 and after liner installation known as a V3.

The V2 inspection is completed after the cleaning and preparation of the lateral pipeline and its mainline sewer connection have been completed. The inspection includes the full length of the lateral pipeline to be lined, the full area inside the mainline sewer over which the rehabilitation will extend and the opening into the mainline sewer.

This CCTV inspection is used to determine that the cleaning and preparation is in good order and meets the requirements of the liner installation and design.

The V3 inspection is completed after liner installation. The inspection includes the full length of the lateral pipeline lined, the full area inside the mainline sewer over which the rehabilitation extends and the rehabilitated opening into the mainline sewer.

The city uses CCTV to inspect and monitor the performance of lateral CIPP installations performed at the early stages of the program. In 2016 approximately 50 laterals that were installed in 2009 were visually inspected. There were no indications of deterioration observed both to the tube liner and the connection flange. As mentioned, the quality control of CIPP lateral installations is as important and beneficial as it is for sewer mains, however the ability to acquire samples for testing is much more challenging. The city of Hamilton has developed a method of obtaining what is referred to as a "proxy" sample of the CIPP liners being installed.

Liner samples are taken approximately every 15-20 liner installations and are produced above ground at an actual installation site. The above ground restrained samples are made within a PVC (or other suitable material) pipe of the same size as typically installed under the City's program and are a minimum of 2 m in length. The CIPP materials (resin, tube, etc.), curing method, installation procedures, quality assurance and quality control (QA/QC) procedures are identical to those used for actual installations. An insulation blanket or other approved heat retention method may be used to better simulate a buried environment, particularly during cold outdoor ambient temperatures. Once

the sample is completed two 1 m samples are cut from the 2 m sample. The city

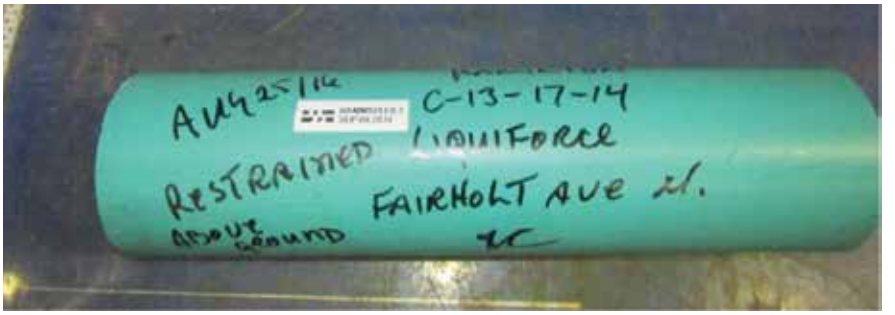

Figure 1: Cured Sample

retains one of the samples while the contractor retains the sample for a period of 1 year or as otherwise directed by the city. Each of the 1 m samples must be identified, dated and signed by the city's inspector prior to leaving the project site (see sample identification criteria below). It is also important that the samples are made in the presence of the city's inspector. Samples are delivered to the City immediately after curing has been completed.

In order to establish sample integrity, it is important that the samples are properly identified. There are several key pieces of information which are required to ensure the integrity of the test sample, including:

- Installation Date
- Street Name
- Contract Number
- Contractor Name
- Contractor Crew
- Special Design (if applicable)
- Street Name
- Inspectors signature

Refer to Figure 1 for a visualization of a cured sample with all of the necessary information recorded on the sample itself.

In the case where sample test results indicate that the initial design requirements have not been met, further investigation is undertaken to determine if the liner will still perform adequately within the specification requirements for the particular installation.

In many cases this cannot be determined solely based on the test sample results, but requires a design reconciliation to be completed which involves the input of the actual field conditions and tested physical properties into the design calculations. Where the design reconciliation provides a liner sample that meets the installed design requirements, the liner sample is not be deemed deficient.

The retention of the second half of the liner sample by the contractor provides the opportunity for secondary testing in circumstances where initial test results fail to meet the specification requirements or present other issue(s).

Onsite Inspection

Given that direct sample pieces cannot be obtained from lateral CIPP installations, the importance of onsite inspection and installation records for every installation becomes much more important. The City of Hamilton requires the contractor to keep detailed specific installation records for each installation. Installation records include the following information:

i. Street name
ii. Liner size
iii. Mix ratio
iv. Resin lot numbers
v. Resin volume used
vi. Roller separation
vii. Inversion pressure
viii. Cure pressure
ix. Resin Mix time
x. Resin Gel time (if applicable)\
xi. Cure temperature log, including:
  (i.) Exothermic temperature
  (ii.) Truck temperature
  (iii.) Ambient temperature at the invert of the mainline sewer MH used for installation
  (iv.) Steam temperature (if applicable)
  (v.) Water temperature (if applicable)
  (vi.) Outside weather temperatures during installation.

It is also important for on-site observation of installation processes, including

Figure 2: Lateral sample creation on site with thermocouple for temperature monitoring

QA/QC processes so these can be observed to be the same processes used for the creation of the proxy sample liner for testing (see figure 2 below). Any unnecessary changes to these processes relative to the creation to the proxy sample liner should be avoided and documented if they occur.

At the time of installation, it is the contractor's responsibility to document all pertinent information for each lateral liner installation. The City's inspector conducts their own site inspection that acts as an audit record of the contractor's compliance with the specifications. It is important for the inspector to be on site at the time of installation to establish that the required information is being documented at the time of installation. These audits validate the contractor's records for accuracy and completeness in compliance with the specifications.

The information collected in these installation records holds significant value when analyzing the overall quality of lateral liner installations and in determining the cause (or most likely cause) of sample test failures. Without installation records the ability to monitor installation quality and take corrective action in a timely manner is significantly reduced.

CIPP Sample Testing

Testing of liner samples is completed to determine the flexural strength, flexural modulus, thickness and any other relevant properties of the cured liner as represented by the samples. Test results must meet the values of flexural modulus and flexural strength used in the Contractor's liner design along with the design thickness. This applies to both standard design liners and special design liners.

When samples are transferred from the onsite inspector to the testing agency, a Chain of Custody form is completed. The form ensures that the sample undergoes the proper tests along with safeguarding against samples getting lost or misplaced.

Samples are tested for flexural modulus and flexural strength as per ASTM D790 and thickness as per ASTM D5813-04(2008). The provision of testing services allows for obtaining test reports within 10 days of delivery of the sample to the testing agency. The regular submission of test results is important to ensure that any issues with liner properties as identified in the test results can be addressed in a timely manner. The City provides the test agency with the design parameters for the liner sample: Flexural Strength Short-term; Flexural Modulus Short-term; and Original Design Thickness. The testing agency's report references to these values as the specified values.

Sample Test Result Annalysis

Lateral samples collected are tested for three physical properties; flexural Strength, Flexural Modulus, and thickness. These test results are reviewed in consideration of the installation design, tender specifications, and overall trends in tested properties. It is important to recognize that trend analysis is far more important than just the individual test results because samples are not taken from the actual installed liner rather, but rather independently created.

Lateral CIPP test results (typically 4 to 5 samples) are reported monthly and provide analysis of the physical properties and thickness's relative to design along with design reconciliation as required. The reports track the historic trending of test results monitoring the standard deviation in the properties (flexural modulus, flexural strength and thickness).

The City's specifications include minimums for physical properties including flexural modulus and flexural strength, along with these it states the determination of tested wall thickness, per ASTM D5813, that must be satisfied for each liner sample. The thickness must satisfy two requirements, including:

1. The average wall thickness of Types I, II, and III CIPP shall not be less than the specified thickness.
2. The minimum wall thickness at any point shall not be less than 87.5% of the specified thickness when measured in accordance with 8.1.2.

Example Lateral Lining Sample Results

Each test report undergoes an initial review and a secondary reconciliation review should the initial review identify any issues. The initial review considers the flexural modulus, flexural strength and thickness against the liner design. If one or more of these properties does not match the design properties, the initial review will indicate a failure related to the appropriate property or properties. In these cases, design reconciliations (redesign using tested properties) will be completed to establish if the liner still meets the required performance.

Table 1 provides an example of a summary chart for five samples received and

Table 1: Lateral Liner Sample Review Results

Report Number	Sample Location	Initial Review Passed	Reconciliation Passed
HAMM5008.0.2	Fairway Dr.	No	Yes
HAMM5008.0.3	Lottridge St	Yes	Yes
HAMM501.0.1	Westway St.	Yes	Yes
HAMM5010.0.2	Colombia Dr.	Yes	Yes
HAMM5010.0.3	West 17th St.	Yes	Yes

Legend:		
	Sample passes	Yes
	Sample fails	No

analyzed. In this selection four of the samples had an average flexural modulus and thickness values that met the required (design) specification, with one sample that did not. The sample that did not pass initial review proceeded to reconciliation design and was found to be compliant with the specification.

In addition to the review of each sample test report, the City also tracks all test report results to establish trends in the results. Figure 3 is an example of the tracking chart utilized to organize all of the tested samples for analysis. These trends consider the standard deviation of physical properties (flexural modulus and thickness) in order to monitor the contractor's ability, control the variability in the physical properties from installation to installation. Again, this becomes particularly important because test samples are proxy samples and are not taken directly from the installed liner. The trend in sample test results is monitored and related to the standard deviation and average results. This relation is conducted in order to identify if the deviation is becoming too large or the average is falling close to the minimum requirements.

A large deviation and/or a low average form the proxy samples would indicate that an increased risk exists where the actual installations may be failing to meet the performance requirements (i.e. the liners physical properties or thickness would be to low).

While it is the average of the physical properties that determine if the sample passes specification, it is equally important to review the range in flexural modulus that is present in the test reports for each of the sample specimens. Ideally the range recorded within each specimen's flexural modulus should be within a reasonable tolerance. A large range in the values for flexural modulus should raise concerns with the consistency of the liner performance capabilities.

In the sample tracking chart (figure 3) it can be seen that a cell has been colour coded red. This sample is the corresponding sample that did not pass initial review but passed reconciliation design in Table 1. Due to the difficulty in analyzing the information compiled in Figure 3, a graph was created that helps visualize the sample test results (Figure 4). There are multiple sets of data shown within the trend analysis graph. The coloured lines in the graph display Flexural Modulus (MPa), the red line being the specified design minimum and the blue line being the actual tested values. The other data set in the graph as displayed by the bars is the ambient air temperature (oC) in Hamilton, the green bar being the maximum temperature of the day and the orange bar being the mean temperature over the course of the day. It is important to record and review the ambient air temperature in conjunction with the flexural modulus due to the resins mechanism of cure. The resin used in the city's lateral lining

program is ambient cure. While it is not clear if the degree to which the ambient air temperature affects the quality of cure, it is tracked to identify any correlation between air temperature and sample test results. While the city has been tracking these trends for the past year, no conclusions have been made regarding the impact of ambient air temperature relative to liner properties achieved. However, as previously mentioned it is common for insulation blankets to be used during cold temperatures.

Conclusion and Ongoing Improvement

Approximately 637 laterals were lined in 2016 with a total of 24 samples collected. The ongoing production and testing of proxy samples allow for improved trend analysis and monitoring.

The proxy above ground sample test results collected to date suggest that the liners in the ground have been installed to meet the requirements of the contract. To help substantiate the results of the above ground proxy samples, the City to considering opportunities to obtaining a number of samples from an actual installation through the excavation of lined laterals.

While the quality control of lateral CIPP installations is more challenging than mainline sewer CIPP, it is equally important in establishing that the installations are achieving the required performance. As with all trenchless technologies, continual improvement in the processes and methods in the use of CIPP continues to evolve. It is vital that the same level of effort is put towards the processes and methods for their quality control.

The city is continuing to sustain its lateral CIPP testing in order to monitor the quality of the product being installed and to date has found good trends in the physical properties (flexural modulus) and thickness. Observed trends provide the city with confidence in the performance capability of the liners that are being installed.

It is clearly understood that the current QA/QC practices being undertaken are in the early stages of use and the city is continually reviewing these practices and methods to find opportunities to improve the ability to establish sound practices. This includes investigating the benefits of using plate samples for testing and how they could be created to more accurately reflect the lateral CIPP installations.

This paper was edited for style and space for publication in *NASTT's Trenchless Today*. To view the complete version of paper MM-T3-02, please visit *nastt.org/technicalpapers*.

calendar

FUTURE NASTT EVENTS

July

22
NASTT's 2019 No-Dig Show Program Committee Meeting
Chicago, Illinois

24
Mid Atlantic Society for Trenchless Technology (MASTT) Trenchless Seminar
Pittsburgh, Pennsylvania

August

26-28
APWA's PWX 2018
Kansas City , Missouri

September

17-18
14th Annual Western No-Dig Conference and Exhibition
Scottsdale, Arizona

November

1
Trenchless Elevated 2018
Denver, Colorado

8-9
2018 TAC/NASTT-NW Tunneling and Trenchless Conference
Edmonton, Alberta

For more information, visit *nastt.org/training/events.*

locations

FUTURE NASTT'S NO-DIG SHOWS

NASTT's 2019 No-Dig Show
March 17-21
Donald E. Stephens Convention Center | Chicago, Illinois

NASTT's 2020 No-Dig Show
April 5-9
Colorado Convention Center | Denver, Colorado

NASTT's 2021 No-Dig Show
March 27-31
Orange County Convention Center | Orlando, Florida

NASTT's 2022 No-Dig Show
April 9-13
Minneapolis Convention Center | Minneapolis, Minnesota

ad index

NOMINATIONS BEING ACCEPTED FOR NASTT'S HALL of FAME Class of 2019

NORTH AMERICAN SOCIETY FOR TRENCHLESS TECHNOLOGY

In 2010, the NASTT Board of Directors voted to create a Hall of Fame in order to ensure that the Society's most outstanding and praiseworthy members received due recognition. The intent of NASTT's Hall of Fame is to preserve the outstanding accomplishments of these exceptional individuals and to honor their contributions to the advancement of both the trenchless industry and the Society. Members may be elected from all NASTT membership categories: Manufacturers and Suppliers; Engineers and Consultants; Municipal and Utility Employees; Contractors; and Academia.

Nominee _____

Birth Date _____ Year NASTT Membership Started _____

Nominee or Next-of-Kin Contact Information

Name _____

Business Name (If applicable) _____ Business Phone _____

Business Address _____

Home Address _____

Home Phone _____ Email Address _____

Summary of Outstanding Achievements

Please state in 3-4 sentences the contribution(s) made by this nominee that justifies his/her induction. You may also attach a document to this application if you need more space.

_____

_____

_____

_____

_____

Contact Information for the Principal Nominator

Name _____

Business Phone _____ Email Address _____

Completed applications along with (3) letters of recommendation and biographical information on the nominee should be directed electronically to Michael Willmets, NASTT Executive Director at mwillmets@nastt.org and must be received no later than August 1, 2018.

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