

WINTER 2017
VOLUME 7 | ISSUE NO. 1



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Mike Willmets
NASTT EXECUTIVE
DIRECTOR

NASTT & ISTT TO PUT Global Spin On 2017 No-Dig Show

This year is already off to a great start! NASTT's 2017 Board of Directors kicked off with their first meeting of the year with our new chair, Frank Firsching, president of the Infrastructure Solutions Platform at Aegion Corp. at the helm. We have a lot of exciting things on the horizon here at NASTT including our upcoming annual No-Dig Show!

NASTT's 2017 No-Dig Show will be held in conjunction with the International Society for Trenchless Technology's (ISTT) 35th International No-Dig. ISTT was established in 1986 with the object "to advance the science and practice of trenchless technology for the public benefit..." In the years that followed, ISTT affiliated with regional trenchless societies throughout the world to advance these objectives globally. ISTT currently has 27 Affiliated Societies. We are very excited to join forces with ISTT in 2017 for a joint conference. This will bring a worldwide industry perspective to our educational programs and our exhibit hall sharing trenchless knowledge at a global level!

With more than 160 technical presentations, roundtable discussions with industry experts and pre- and post-course training classes, the educational aspect of NASTT's No-Dig Show is unsurpassed. The best and brightest in the trenchless industry come together for this premier event that is not something to be missed. If you want to stay up on the latest techniques and innovations in trenchless, D.C. is the place to be!

We are also eagerly anticipating the exhibition portion of the conference. Our exhibit hall will once again feature a sold-out floor brimming with activity! More than 185 organizations will be represented displaying their trenchless goods and services. If you are looking for the latest product or service, or have a special need for an upcoming project, we bet you will find what you are looking for on the exhibit hall floor.

Anyone who has attended NASTT's No-Dig Show will tell you that beyond the education, training and exhibits, the networking aspect of the conference is top notch. We kick things off with a lively breakfast event Monday morning. Not only will you be served a delicious meal, but you'll experience industry

awards presentations and excellent entertainment. This event really sets the tone for the upcoming week of excitement.

Later in the day on Monday evening, NASTT's 16th Annual Educational Fund Auction and Reception will knock your socks off with how much fun you'll have. This year's theme, *Heroes of the Underground*, is more than just a costume theme, by attending the event and bidding on fantastic auction items, you'll help us reach the \$1 million-dollar mark for the educational fund! Since 2002, NASTT has raised more than \$935,000 and used those funds in support of our many educational initiatives. Due to your generosity, NASTT is able to provide targeted trenchless training courses to the industry, publish trenchless resources manuals and sponsor university students' attendance at NASTT's No-Dig Shows, as well as award scholarships. This year, our goal is to surpass \$1 million and we'd love to have you help us.

The networking continues Tuesday evening at NASTT's Gala Awards Dinner. This festive affair is a time for us to recognize some of the true Heroes of the Underground with the presentation of NASTT's Hall of Fame induction, the Chair Award for Lifetime Service, the Abbott Innovative Product Award and the Ralston Young Trenchless Achievement Award. ISTT will also be presenting a very special award. This is the Oscars of the trenchless industry and you simply cannot miss this event!

This is just a sampling of the networking and entertainment you can expect when you attend NASTT's No-Dig Show. Year after year, industry veterans and new comers join together to truly celebrate this great industry that we all put our heart and souls in to. I hope you will join us in April in Washington, D.C. You won't be disappointed!

For more information on the Show, be sure to check out the following pages in this publication and also visit the conference website at nodigshow.com.

Michael J. Willmets

Michael J. Willmets
NASTT Executive Director



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Frank Firsching
NASTT CHAIR

Trenchless Technology Is a Thriving Industry

At the beginning of the year, I began my term as chair of NASTT's Board of Directors and I am looking forward to a very bright future for not only NASTT but for the entire trenchless industry. Last year was another excellent year for us, as we saw tremendous growth in our Society along with a record-breaking No-Dig Show. One measure of this growth was the addition of three new Student Chapters! We welcomed, the University of Massachusetts at Lowell, Montana Tech University and Oklahoma State University. This brings our Student Chapter roster to 18 chapters! It is an exciting time to see so many young people interested in trenchless technology and dedicating their professional lives to this industry and our communities.

Much of the success of NASTT's 2016 No-Dig Show was due to the leadership of the Program Chair and Vice Chair. Jeff Maier of C&L Water Solutions served as the 2016 Program Chair and Jennifer Glynn of RMC Water & Environment served as the Vice Chair. Both of these trenchless champions spent many personal hours to produce such a valuable technical program and conference. Thank you both and thank you to the volunteers of the Program Committee!

We have so much to look forward to at NASTT's 2017 No-Dig Show. Jennifer Glynn takes the helm as the Program Chair and Don Del Nero of Stantec joins her as Vice Chair. This year the International Society for Trenchless Technology (ISTT) is joining us for their 35th International No-Dig. We welcome the opportunity to host international delegates from all over the world that represent trenchless interests. This new element of the conference is sure to bring additional value and a global perspective to the event.

NASTT owes everything to our volunteers and the 2017 Board of Directors consists of some of the most paramount people in our industry. We strive to make sure our Board is comprised of an industry cross-section of trenchless technology segments. I'd like to introduce our newest Board members: Alan Goodman, National Sales Manager at Ham-



merHead Trenchless Equipment; Michelle Macauley, National Trenchless Technology Practice Leader at Jacobs Engineering; and John Matthews, Director of the Trenchless Technology Center at Louisiana Tech University. We know your expertise and leadership skills will enhance our organization greatly.

I'd also like to recognize the outgoing Board members who volunteered for six years to serve on the Board of Directors. Thank you, Jason Lueke, National Practice Leader, Trenchless Services at Associated Engineering. Jason also serves on many of our committees and is a dedicated volunteer. And thank you Jim Rankin, Application Engineer at Vermeer Corp. Jim is a tireless champion of our students among other causes and we are lucky to have him in our Society.

I would also like to thank Dr. Kimberlie Staheli, president of Staheli Trenchless Consultants, for not only her many years on our board but for serving as the Chair these past two years. Kim has been instrumental in the development of the No-Dig Show Municipal & Public Utility Scholarship and our Strategic Plan. Kim will continue to serve as an advisor in the Immediate Past Chair position. Last but not least, we owe so much to Derek Potvin, President of Robinson Consultants Inc., who has served as the Immediate Past Chair and has been an invaluable resource with his trenchless knowledge and his incredible leadership skills. We appreciate all of your time and commitment to so many NASTT committees and to the trenchless industry as a whole.

One of the features of our first issue of the New Year is highlighting and thanking our Board members, so please turn to page 20 and read about both the new and returning Board members who will offer their service in 2017.

As always, we are indebted to our members and volunteers. We truly thank you for your dedication.

Frank Firsching

Frank Firsching
NASTT Chair

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Michelle Hill

NASTT PROGRAM
DIRECTOR

There's an Association for Everything

NASTT PUTS ITS MONEY WHERE ITS MOUTH IS BY JOINING ASAE



When I tell people about my job, the most common response is “Man, there’s an association for everything”! I knew there were a lot of associations out there, but I never fully grasped the scope of the association world until I joined the American Society of Association Executives (ASAE).

ASAE is the premier source of learning, knowledge and future-oriented research for the association and nonprofit profession. The organization provides resources, education, ideas and advocacy to enhance the power and performance of the association and nonprofit community.

As someone who promotes the importance of joining NASTT, I thought it was imperative to learn from our member’s perspective and join ASAE. I guess you could say I was taking my own advice! ASAE’s networking group consists of over 21,000 people who live and breathe their association just like I do. What an amazing opportunity it has been to connect with these people to learn how to be a better Program Director for NASTT.

I will never forget the feeling I had attending my first annual conference. I remember calling up Jenna, NASTT Marketing Manager, bursting with excitement about how much I was learning. Her response still rings in my ears: “You are with your people”! It was so true. I was surrounded by all of these people who not only had the same type of job as I did, but who also had the same type of successes and struggles. Connecting with these folks for three straight days was invaluable. Now I know how attendees feel when they are at the No-Dig Show!

After attending the annual conference I knew I wanted more. I dove into ASAE’s on-

line resources which included a models and samples library, which is similar to NASTT’s online paper library. I also joined their online community called Collaborate. Collaborate offers over 100 specialized networking groups where you can post questions and discussion items. I review posts on a daily basis for a quick dose of education and inspiration. It’s definitely a goal of mine to one day have this type of networking platform on nastt.org.

Finally, as the coordinator of our largest committee, the Program Committee at 150 members strong, I knew I wanted to get more involved with ASAE. I applied to be a member of their Small Staff Association Committee and was awarded the position this summer. Since then I’ve worked with some really great people to develop the program for the Small Staff Online Conference and review documents in their model and samples library. I look forward to continuing my work with the committee to further develop my personal and professional skills.

Now when I talk to NASTT members about the importance of networking and training I can say it with even more passion and conviction. I know first-hand how vital membership with NASTT can be if you make the most out of the resources we provide. If you need help or a little motivation to get started give me a call at 888-993-9935 or email me at mhill@nastt.org. I can’t wait to connect!

Michelle Hill

Michelle Hill
NASTT Program Director

1996

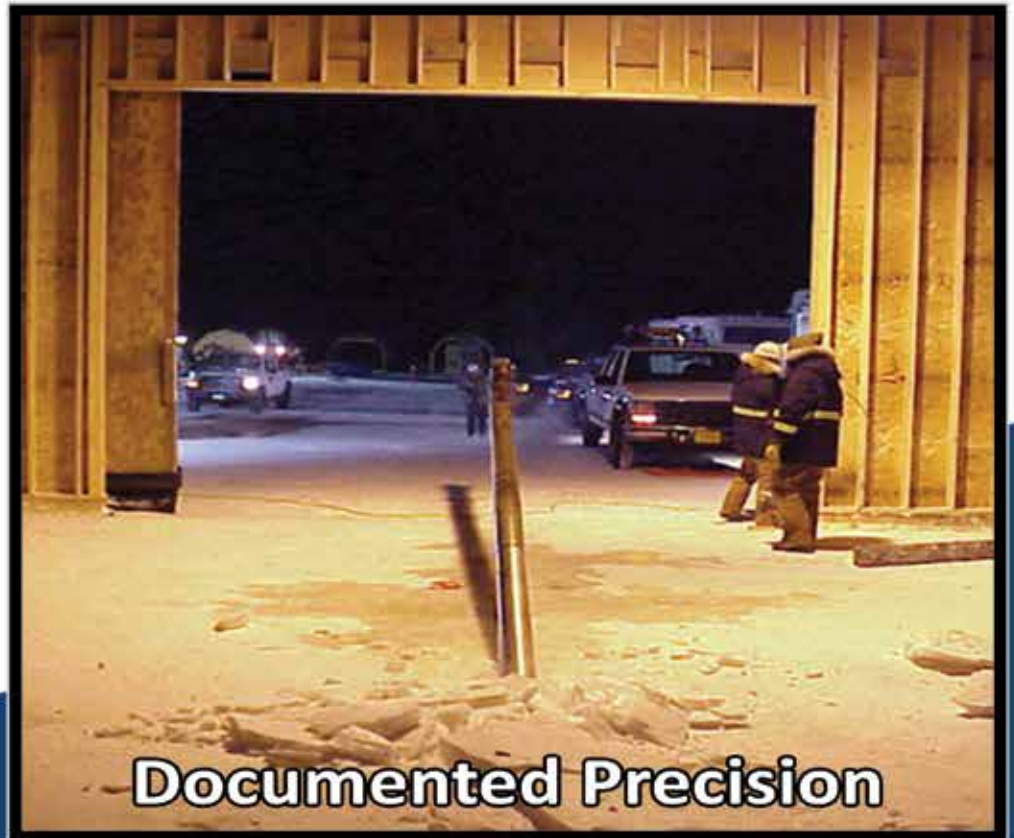
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NASTT Q&A

NORM JOYAL OF MCMILLEN JACOBS ASSOCIATES ON TRENCHLESS CONSULTING, THE EVOLUTION OF PROJECT DELIVERY AND PUBLIC-SECTOR EDUCATION



Norm Joyal
MCMILLEN
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ASSOCIATES

What first piqued your interest in engineering and construction?

It's not so much what piqued my interest, but how I ended up in the engineering and construction industry to begin with. Receiving an 'F' in my first architecture class at Cal Poly San Luis Obispo, known for its architecture program, prompted an immediate re-evaluation of my selected major – architecture. I was counseled to the Architectural Engineering program which provided my structural engineering background. My geotechnical professor exposed me to that aspect of the industry and he provided the impetus for my master's degree in engineering from UC Berkeley. That degree was my pathway to a geotechnical engineering career path that now encompasses engineering and construction.

Tell me about your introduction to the trenchless industry, specifically.

With degree in-hand from Berkeley, I transitioned through geotechnical firms before ending up a partner in a geotechnical engineering firm. The firm developed a geotechnical niche preparing geotechnical investigations for trenchless projects. This required an understanding of the different trenchless methods and recognizing how ground conditions influenced machine selection, tooling requirements, and tunneling approaches. The ever-changing and rapidly expanding trenchless industry in the mid to latter 1990's almost necessitated participation in national organizations, such as NASTT, which furthered the introduction to the trenchless industry.

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

From my perspective on the consulting/design/construction side of the fence, based on backlog, current workload, future work, and the uptick of trenchless proposals going across my desk, all the signs are positive that the state of the industry is healthy. Certainly, one trend that the industry and public entity end users are warming up to is having their projects constructed through the design-build procurement approach. I foresee this segment of the industry being teased with unique or signature projects to 'test the waters' of this relatively new procurement approach for the trenchless industry. I foresee more opportunities for alliances amongst trenchless designers, pipeline designers and trenchless contractors. Engineering firms with a strong trenchless group and a construction and CM group that can develop alliances with trenchless contractors stand the best chance of being highly successful on design-build projects.

What is the biggest challenge you see from the consulting side?

The biggest challenge we face is attracting new engineers to the trenchless side of the business. Perhaps one detriment to that attraction is the need for strong background in geotechnical engineering because the methodologies are so dependent on soil-machine interaction. If that hurdle can be overcome, the next challenge is attracting young engineers to trenchless

projects that may not have the same appeal of bigger, higher profile projects. From the design and consultant perspective, one of the bigger challenges facing our industry is finding qualified candidates with the right the blend of skill sets.

How did you first get involved with NASTT?

My first exposure and involvement with NASTT dates back to the mid to late-1990s attending NASTT's annual No-Dig Shows. This was necessitated by the need to keep up with an ever-evolving and expanding industry to stay current with evolving designs, new tooling, and machine evolution. Ever since, I've made it a point to attend conferences when I can, make contributions via the presentation of papers and case studies, and more recently being an instructor for the New Installations Course.

Education has been a vital part of the trenchless industry's growth, and you've been involved on that end with NASTT. What do you see as the biggest needs in the area of trenchless education/training?

One of the biggest needs in the area of trenchless education and training is the ability to attract the public-sector clients who make up such a large percentage of the end-users who benefit from trenchless applications and make up one of the larger consumer segments of trenchless services. The exposure and participation of this consumer segment in the trenchless industries' education and training venues is essential to make sound and informed decisions regarding the deployment of trenchless technologies on their projects.

How has the acceptance of trenchless methods evolved?

The best way to judge the evolution in the acceptance of trenchless methods is to gauge the historical evolution of different trenchless methods. Looking back, there are trenchless methods presently being used that were not even talked about 10 to 15 years ago (e.g. The Pilot Tube Method, AXIS system). The impetus for the evolution of different trenchless methods is the overwhelming need to 'solve a problem,' 'build a better mouse trap,' or just plain entrepreneurship all fueled by a continuing acceptance that trenchless is the way to go. That acceptance ties right back in to the response above that the public sector needs to be attracted to education and training opportunities so that they are educated when accepting trenchless approaches to their projects. As the acceptance of trenchless methods has evolved so has the evolution of trenchless methods.

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

Variety as no two sites have the same ground conditions and no two projects have the same requirements. Every trenchless project is uniquely different from the other presenting challenges in understanding the ground conditions in which a project will be constructed and then applying that understanding to select the most practical and cost effective trenchless method for the eventual end user.



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In the Trenches

BY ANDREW FARR



Gregg Leslie

Gregg Leslie grew up around the construction business, and by the time he finished college, he had interest in pursuing a career in the foundations and concrete segment. But at that time, the people he worked with had another idea in mind for him.

"I was told by several of our suppliers that I would be a really good salesperson, which I scoffed at for several years," he jokes.

It wasn't long after that when Leslie realized his true calling was in equipment sales as he went to work for a rental company in the early 1990s. It was there that he became attracted to pumps and dewatering, mainline construction and pump-related and trench shoring safety equipment. Eventually, Leslie caught the attention of Godwin, a national manufacturer and distributor of dewatering pump equipment, which hired him in 1998. During this time he became heavily involved in bypass pumping for CIPP, selling and renting equipment out to contractors for projects all across the mid-Atlantic.

"I was fascinated with CIPP," he says, "that you could invert a liner in the middle of a metropolitan city center and not disrupt all the commerce in the middle of the night. I kind of gravitated toward those early contractors like Insituform and I built some relationships with smaller CIPP companies around the mid-Atlantic states.

"It sounds crazy, but I enjoyed staying

up all night and watching the work happen while my pumps were carrying the sewer around the work area."

Leslie would eventually leave Godwin for a short time but returned in 2013 as national accounts manager. In 2015, he began to lead Godwin's North American distribution channel (under Xylem, which acquired Godwin in 2010). Today, Leslie works with Godwin's key national accounts including contractors, power generation companies, pulp and paper companies, mining companies as well as its distributor network across the United States and Canada.

Leslie says from a technology perspective, the trenchless market has grown exponentially in recent years as new equipment has made difficult projects more seamless.

"You hear a lot from everyday consumers about disruptive technologies, and I think that's one of the things that's a plus for the trenchless industry," he says. "It's an area of construction where technology plays a major role.

"It seems like every time I pick up an issue of Trenchless Technology, there's a new world record for an HDD shot or a new record for the largest diameter liner that's ever been wet out. I think that technology allows us to push the boundaries of what the capabilities are."

Leslie first joined NASTT in 1998 shortly after joining Godwin, as he had worked closely with the late Joe Abbott, who was heavily involved in the association. "How powerful then network was



Gregg Leslie
GODWIN-XYLEM

and how loyal the members were was obvious to me," he says.

Leslie says one of the most important roles NASTT plays in the industry is to promote trenchless technology to young engineers who are much needed in the aging workforce.

"We talk a lot about the need for more young engineers to be involved in what we do and I think you would hear that from all the associate members who are manufacturers," he says. "The role we play is to promote and connect with engineering programs and get younger people involved and introduce them to the industry. So I think we need to continue to reach out to the student community and introduce them to the construction industry, specifically trenchless."

Within NASTT, Leslie has served on the Educational Fund Auction Committee for three years and is serving as vice chair this year. He's also participating on NASTT's No-Dig Show Program Committee for the first time this year.

Leslie has been inspired over the years to lend his time to NASTT initiatives by his friend Joe Abbott, whose passion for the trenchless industry, Leslie says, rubbed off on everyone around him. Abbott, for whom NASTT's Innovative Product Awards are named, is a 2017 NASTT Hall of Fame inductee. Leslie was integral in pushing for Abbott's induction which will become official at the Gala Awards Dinner on April 11 at NASTT's 2017 No-Dig Show.

"I imagine there will a strong show of support by Joe's friends and family and colleagues from across the industry to honor him at that dinner in April," Leslie says.

Jim Murphy

Recalling the early days of his interest in the construction field, Jim Murphy says he initially followed a friend of his into studying engineering in school, but soon after became convinced it was the right career path for him.

"Civil engineering, to me, offered opportunity to work in the field and move around the country a bit more, and that's worked out very well," he says, noting his travels around the world working on construction projects from Canada and the United States to South America and Australia. "Basically, I go where the work is," he jokes.

Early in his career, while working on his bachelor's degree during school, Murphy worked part time with contractor McNally and Sons in Toronto, working on the Toronto subway for a summer. It was his first introduction to a large-scale construction project. After graduating, he was hired full time by McNally and Sons and continued to work on large underground tunneling and trenchless projects, including a unique tunneling project in Ottawa that involved working under air pressure.

Murphy later obtained his master's degree in engineering and moved on to working for Golder Associates, which further advanced his interest in tunneling and soil mechanics. He says during this time, he gained a desire to move toward working exclusively on trenchless projects. Unfortunately, that wouldn't happen for another 17 years as he joined a company called Reinforced Earth, working across Canada, the

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Eventually in the late 1990s, Murphy assisted on a pipeline project in Calgary which he says reinvigorated his interest in trenchless, particularly horizontal directional drilling (HDD). A short time later, he joined an HDD contractor as a general manager in Edmonton, Alberta, and worked on several challenging projects including one in Pink Mountain, British Columbia, that involved horizontally drilling 1,300 meters, with 425 meters drilled vertically from the bottom to the top of a mountain. Murphy wrote a paper on the project and presented it at NASTT's 2005 No-Dig Show, which was his introduction to NASTT.

Today, Murphy is an independent consultant and currently a subject matter expert for UniversalPegasus International, specializing in trenchless engineering, specifically HDD, boring and Direct Pipe. He has submitted a paper for NASTT's No-Dig Show nearly every year since 2005, and this year, is serving on NASTT's No-Dig Show Program Committee and is also a session leader.

Murphy says he saw little interest in NASTT from Canada when he first got involved, but says that has since changed drastically. "I recognized that you're not only going to learn a lot, but it gives you the opportunity to present what you've done, which could mean advances to the industry," he says about NASTT's No-Dig Show. "Now, Canadians are going there regularly and the Canadian presence has really expanded."

Murphy says he sees the over-

all trenchless industry as a revolving door of various facets of the industry facilitating the growth. He says on one hand, manufacturers are recognizing the need for new tools and equipment to make difficult projects possible, while owners are coming up with bigger projects to be completed.

"All of a sudden we're drilling further, we're drilling longer, we're tunneling larger diameters and through much more difficult terrain," he says. "I'm not exactly sure where this starts, whether it's the owners having the requirements or whether it's the industry seeing that the requirement is coming up. But it's kind of a circular thing the way the industry is advancing."

Murphy also notes that with regard to HDD specifically, target steering equipment including optical gyro tools now offer accuracy that has never before been possible on HDD projects, including the ability to do intersect drills consistently and accurately.

"What I've always told my clients is that a good contractor is able to deal with all the different challenges that happen on a daily basis and deal with them efficiently," he says. "To me, every day is exciting working in the trenchless industry because you never know what's going to happen. Different projects come in that have different challenges.

"What I like about working in soil and rock mechanics is that every project is going to be different because soils are different. You need to know how soil and rock is going to react.

"It's more of an art than a science."



Jim Murphy
UNIVERSAL
PEGASUS
INTERNATIONAL

Stephanie Nix

Stephanie Nix doesn't mince words when explaining how she got into the construction world. "I know that I am an engineer primarily because my dad told me I couldn't do it. And, I was okay at math, of course," she says, laughing.

Nix is president and CEO of Claude H. Nix Construction. The Utah-based contractor has been in business since 1974, but in 2002, the began specializing almost exclusively in trenchless construction.

Nix's parents founded the business, which originally specialized in large diameter sewer, water and storm drain repair. Nix notes that the company was built on the mantra of "doing the tough jobs that no

one else wanted." Nix now manages the business with her brother, Jon, who serves as vice president and COO. She says even though the company has shifted its focus to trenchless, the same mantra can be applied to the company today, noting the day-to-day challenges that trenchless projects can present. But for Nix, it's in her blood. "When you grow up with it, you're just kind of used to it," she says. "But I like it."

Nix graduated from Utah State University in 1984 with degrees in civil engineering and business administration. Today, Nix is a registered professional engineer and has more than 30 years of experience working in construction in various facets. After finishing college, Nix spent time working as an engi-

neering consultant and also with state government until re-joining the family business in 2000.

Claude H. Nix Construction specializes in multiple areas of trenchless construction, from inspection services to rehabilitation and new construction. Nix says sliplining has been a focal point for the company in recent years, accounting for about half its revenue in the past year. She also notes that the company completed a pilot-tube microtunneling project in 2004, which opened the door for similar projects in the region. Nix says underground construction in the region is driven by the housing market in that developed areas impact the demand for new water and sewer infrastructure work. She says overall, the trenchless industry, despite its constant evolution, is in a growth period.

"I tend to be an optimist, but if I'm being realistic, I think the trenchless industry is growing," she says. "I think there's a lot of opportunity for trenchless design and construction. Whether we're doing the job or not, we get a lot of questions. Our goal is to be a go-to company in the state for trenchless questions and we get lot of inquiries about it."

Nix is also heavily involved in NASTT's Rocky Mountain Chapter, currently serving as treasurer, and also helps to coordinate many of the chapter's events in Utah.

Nix says she enjoys working in the trenchless industry because of the challenges and potential unknowns that can occur on projects. She says trenchless projects require contractors to sometimes adapt and improvise to overcome unexpected challenges.

"You can be creative," she says. "You can work as a team with the engineer and owner to figure out the best way to approach their project. And nobody really knows, which is another reason NASTT is so cool. NASTT provides a whole list of professionals you can call, and most likely, somebody someplace else has probably done something similar. It's a creative learning environment.

"It's not always cut and dry. We get to make it up as we go."

ANDREW FARR IS THE ASSOCIATE EDITOR OF NASTT'S TRENCHLESS TODAY.



Stephanie Nix
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NASTT's 2017 No-Dig Show & ISTT's 35th International No-Dig Show

NASTT's No-Dig Show is back, and this year, it's bringing a global element to the nation's capital.

In April, the North American trenchless technology community will join trenchless professionals from around the world as NASTT's 2017 No-Dig Show will be held in conjunction with the International Society for Trenchless Technology's (ISTT) 35th International No-Dig Show at the Gaylord National Convention Center in Washington, D.C.

This year's program will focus on maximizing investment in trenchless technologies, services and applications in an industry that continues to possess an enormous need for infrastructure improvement. The joint conference, which will represent the largest trenchless conference in the world in the calendar year, will no doubt present a unique opportunity for attendees to engage the international community for a broader perspective on trenchless construction.

In 2016, NASTT's No-Dig Show eclipsed the 2,000-attendee mark for the second straight year and attracted a record number of exhibitors with 185, reinforcing the considerable growth of the conference in recent years. This year, the attendee count is expected to continue the upward trend and more than 180 exhibitors are already confirmed.

"I am so excited for this year's show!" says Jennifer Glynn, NASTT's 2017 No-Dig Show Program Chair. "Besides our stellar technical presentations, this year we are featuring three new roundtable panel discussions where we hope to ignite a lively discussion on relevant topics including pressure pipe inspection and rehabilitation, CIPP – past, present, and future, and improving design documents – views from industry contractors. And, don't forget the fun networking events, people!

Technical Program

NASTT's 2017 No-Dig Show Technical Paper Program has already scheduled more than 160 peer-reviewed technical papers to be presented, focusing on a wide range of trenchless topics, including horizontal directional drilling (HDD), cured-in-place pipe (CIPP), microtunneling, inspection, asset management, pipe jacking and ramming, water and sewer rehabilitation, inspection and project planning. The papers cover subject matter from a variety of angles including trenchless research, case histories and best practices. No-Dig papers are presented in a six-track schedule and are grouped mostly by subject matter so attendees can choose to attend six paper presentations at any given time.

"We have a golden opportunity again this year to promote the trenchless marketplace, exhibit cutting-edge technologies and bring together experts from all walks of our industry," says Don Del Nero, NASTT's 2017 No-Dig Show Program Vice Chair. "Couple this opportunity with a strategic location like Washington, D.C., the hub of federal public policy, and top-of-the-line venue facilities will make this show an exemplary event. Don't miss out!"

Popular Events & Tracks

The conference gets under way with its annual Kick-Off Breakfast from 7:30 to 9:15 a.m., Monday, April 10. During the breakfast, NASTT will introduce its incoming Board members for 2017 and preview the show for attendees. The formal presentation of *Trenchless Technology* magazine's 2017 Person of the Year will also be made. Following the Person of the Year presentation, the winners, runners up and honorable mentions for *Trenchless Technology's* 2016 Projects of the Year for Rehabilitation and New Installation will be formally recognized. Rounding out the breakfast



Washington, D.C. | April 9-13, 2017

awards are NASTT's 2016 Outstanding Papers in Rehabilitation and New Installation Awards.

Later that night, NASTT's 16th annual Educational Fund Auction & Reception will be held from 5:30 to 7:30 p.m. This fundraising event benefits NASTT's educational initiatives and the efforts this year have been coordinated by Auction Chair Tim Peterie. And of course, the best part about the auction is its theme! This year, get ready to dress up as your alter ego superhero with our theme "Heroes of the Underground!" As always, the event will feature a costume contest, the tropical vacation raffle and 50/50 raffles.

"Always secretly wondered what your personal superpower would be?" asks Glynn. "Now's your chance to find out at our annual auction where you are encouraged to dress as your favorite superhero. The auction promises to be a lot of laughs while raising funds for a great cause – trenchless education. Hope to see you all there!"

Since 2002, the Educational Fund Auction has helped raise nearly \$930,000 in support of trenchless initiatives, such as funding NASTT training courses, resource manuals, university students' attendance at NASTT's No-Dig Show and student scholarships.

On Tuesday, April 11, NASTT will host its annual Gala Awards Dinner. Over the past several years, this event has been considered the headlining act to the No-Dig Show as NASTT will induct its sixth

"I am so excited for this year's show! Besides our stellar technical presentations, this year we are featuring three new roundtable panel discussions where we hope to ignite a lively discussion on relevant topics...and don't forget the fun networking events, people!"

Jennifer Glynn
NASTT's 2017 No-Dig Show Program Chair

Hall of Fame Class: the late Joe Abbott, Dr. Tom Iseley and the late Rod Sutliff (see more on page 30). The event will also feature additional awards presentations, notably NASTT's Abbott Innovative Product Awards and NASTT's Chair Award for Outstanding Lifetime Service, the Ralston Award for Young Trenchless Achievement and more.

As in recent years, Wednesday, April 12, will be dedicated to Gas Industry Day and will feature a full day of education and networking specifically for the gas industry. This popular track is becoming a growing area of focus for NASTT as the Society continues to educate the industry not only on the benefits of trenchless construction but also its various applications across multiple industry segments. The day will start with gas-related track sessions followed by an afternoon of the Gas Good Practices Course focusing on good practices for Horizontal Directional Drilling (HDD), Cured-In-Place-Pipe (CIPP) and Pipe Bursting.

For the second year, NASTT's No-Dig Show will feature special roundtable sessions throughout the week covering a variety of trenchless topics. These roundtables will consist of a moderator and a panel of trenchless experts who will speak to attendees on various issues relating to a particular topic. The roundtables will each be roughly an hour long and are aimed at encouraging attendee participation and discussion. This year, topics to be covered include



Interactive roundtable discussions were a highlight of NASTT's No-Dig Show Technical Program in 2016, facilitating great dialogue between attendees the expert panels that covered a variety of trenchless topics.

pressure pipe inspection, pipe rehabilitation and the past, present and future of CIPP and more.

The No-Dig Show Closing Luncheon will be the final event for NASTT's 2017 No-Dig Show. This great networking luncheon will provide a recap of NASTT's initiatives going forward as NASTT's next Program Chair, Don Del Nero of Stantec, will preview the NASTT's 2018 No-Dig Show in Palm Springs, California.

NO-DIG PREVIEW

“We have a golden opportunity again this year to promote the trenchless marketplace, exhibit cutting-edge technologies and bring together experts from all walks of our industry.”

Don Del Nero

NASTT's 2017 No-Dig Show Program Vice Chair

Be Prepared!

Be sure to download NASTT's No-Dig Show smart phone app prior to this year's conference so you can get involved with the No-Dig community! Everything you need to make the most of your time at the show can be found on the interactive app, which also allows you to share photos and “like” and comment on other app users' posts throughout the conference. Until then, for more information on NASTT's 2017 No-Dig Show, please visit nodigshow.com.

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NASTT'S 2018

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Call for Abstracts

The North American Society for Trenchless Technology (NASTT) is now accepting abstracts for its 2018 No-Dig Show in Palm Springs, California at the Palm Springs Convention Center on March 25-29, 2018. 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, 2017: 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

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

Submissions Deadline: June 30, 2017

Questions? Please contact:

Michelle Hill
NASTT Program Director
E: mhill@nastt.org
P: 440-638-4647



The 2018 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 Board of Directors coordinates the activities and events of the organization on behalf of the membership. The Board is made up of 20 officers and directors from across North America who are elected by the Society's members each fall. Ending their tenure on the Board in 2016 were Derek Potvin of Robinson Consultants, Jason Lueke of Associated Engineering and Jim Rankin of Vermeer. NASTT wishes to thank Derek, Jason and Jim for their outstanding contributions to the Board and looks forward to working with them in other facets of the Society. At the same time, NASTT is very excited to welcome Alan Goodman, National Sales Manager at HammerHead Trenchless Equipment, Michelle Macauley, National Trenchless Technology Practice Leader at Jacobs Engineering and John Matthews, Director of the Trenchless Technology Center at Louisiana Tech University, to the Board. Meet NASTT's Board of Directors for 2017!

BOARD OF DIRECTORS ■ ■ ■



NASTT'S 2017 OFFICERS & BOARD OF DIRECTORS

Trenchless Industry Growth Reflected in
Society's Diverse Leadership

NASTT'S 2017 OFFICERS



CHAIR & INTERNATIONAL REPRESENTATIVE

Frank Firsching

President, Infrastructure Solutions Platform, Aegion Corp.

Frank Firsching is president of Aegion's Infrastructure Solutions Platform, which is comprised of the global businesses of Insituform Technologies, Fyfe Co., Fibrwrap Construction Services, MTC and Underground Solutions.

Prior to this, Frank served as executive vice president, general manager and executive vice president of sales for Underground Solutions. Before joining Underground Solutions in 2006, Frank worked for USFilter Corporation as President of the \$1B Water and Wastewater Systems Group with responsibility for USFilter's global process equipment and technology divisions. Frank also held the positions of Executive Vice President of the Process Water Group, West Regional Manager and General Manager during his 13 years at USFilter. Prior to joining USFilter he worked at Deloitte & Touch Management Consulting and at GE Corporation. He received an MBA at the Wharton School Business and a B.S. in Mechanical Engineering from the University of Virginia.



VICE CHAIR

Ed Saxon, P.E.

General Manager, Beaufort Jasper Water & Sewer Authority (BJWSA)

Ed Saxon, P.E., is the general manager of the Beaufort Jasper Water & Sewer Authority (BJWSA) in South Carolina. A native of South Carolina, Ed earned a bachelor's and master's in mechanical engineering from the University of South Carolina. He worked for DuPont and Conoco for 13 years before moving to Beaufort in 1989 to join BJWSA as the chief engineer. Under Ed's leadership, BJWSA has been utilizing trenchless technologies since the late 1980s to expand service to the island communities and to rehabilitate aging sewer system. BJWSA has employed different contracting methods to share risk as innovations in the trenchless technology industry are introduced.

Ed is active in many water/wastewater and engineering professional organizations and is the current president of the South Carolina Water Quality Association. Along with being NASTT's Vice Chair, he serves as the Chair of the Young Trenchless Award committee. Ed is also extremely community minded as past president of the local Rotary Club; former Board Member and Campaign Chair for the United Way; and former member of Beaufort Chamber Board and Economic Alliance Board. Ed enjoys golfing, boating and fishing in the local saltwater creeks.



SECRETARY

Joe Lane
President,
HEBNA Corp.

Joe Lane is President of HEBNA Corporation, a global pipeline rehabilitation company specializing in the rehabilitation and protection of new and existing pipelines from internal corrosion and abrasion through the fabrication and installation of high-density polyethylene (HDPE) pipe liners custom engineered to fit specific project needs. HEBNA serves the energy, mining and municipal markets.

Joe holds a bachelor's degree in Biology from the University of Northern Colorado and is a graduate of the University of Michigan School Of Business Management and the Leadership Program of the Rockies.

Prior to joining HEBNA in 2014, he spent over 24 years with SAK and Insituform Technologies, Inc. in progressively increasing roles of responsibility in business development, training, operations and executive management. Joe was responsible for developing and implementing formal education programs training hundreds of

employees, participated in the development and advancement of numerous innovative trenchless technologies, successfully grew and led multiple \$100M+ business units and managed some of the largest municipal infrastructure upgrade programs in North America.

Joe is a regular speaker and instructor at numerous industry & educational associations such as the Water Environment Federation, American Public Works Association and the North American Society for Trenchless Technology to advance the knowledge and use of trenchless technologies. He is an Executive Board Member and serves as Secretary for the North American Society for Trenchless Technology and is the Chair of the Rocky Mountain Chapter of NASTT.



TREASURER

Kevin Nagle
National
Accounts
Manager, TT
Technologies Inc.

Kevin Nagle is a civil engineering graduate from the University of Illinois, earning his B.S. in Civil Engineering in 1997. He worked for six years as a design engineer for a structural engineering firm before moving on to work for TT Technologies in Aurora, Ill., a manufacturer of a wide range of trenchless tools and equipment. As part of the TT team, Kevin works in and out of the office in an effort to grow the trenchless market through education, training and marketing. He has worked at an industry level to help move the trenchless industry forward through organizations such as NASTT (No-Dig Show Program Committee), the Midwest Society of Trenchless Technology (board member), International Pipe Bursting Association (member of

Marketing Committee) and UCA (member of the Construction Materials Methods and Specifications Committee). Kevin has gained firsthand trenchless field experience in the pipe bursting, pipe ramming, horizontal directional drilling and horizontal boring processes.



IMMEDIATE PAST CHAIR

**Kimberlie
Staheli,
Ph.D., P.E.**

President, Staheli

Trenchless Consultants

Dr. Kimberlie Staheli is the president and founder of Staheli Trenchless Consultants in Seattle, Washington, a trenchless engineering consulting firm specializing in the design and construction management of all types of high risk trenchless projects for over 20 years.

Kim has a B.S. in Mechanical Engineering from Rensselaer Polytechnic Institute, a M.S. in Civil Engineering from Mississippi State University and a Ph.D. in Geotechnical Engineering from Georgia Institute of Technology. She is a Registered Professional Engineer in Washington, Oregon, California, Colorado, Ohio and Florida

Kim has specialized in trenchless design and construction working for contractors, performing trenchless research and working as a consultant. She is particularly interested in minimizing the risks of installation techniques including micro-tunneling, directional drilling, pipe ramming, auger boring and large diameter tunneling. Kim has focused on risk reduction through the development of geotechnical baseline reports as well as pro-active construction risk management. She has vast experience in trenchless forensics and post construction claims analysis and provides expert testimony.

NASTT'S 2017 BOARD OF DIRECTORS



**Erez Allouche,
Ph. D., P.Eng.**

Tunneling and Trenchless Practice Technology Leader – Trenchless Technologies, Stantec

Dr. Erez Allouche is the trenchless technology leader for the Tunneling and Trenchless Technology Practice at Stantec, specializing in the condition assessment and rehabilitation of large diameter pipes, as well as the design of complex HDD crossings. Prior to joining Stantec, he was an associate professor of Civil Engineering at Louisiana Tech University, the Director of the Trenchless Technology Center and the holder of the T.L. James Eminent Scholar Chair in Civil Engineering.

For the past 16 years, Allouche has served as the PI and Co-PI of research projects in buried infrastructure totaling more than \$14 million. He supervised 50 graduate students in this

field, many of whom are practicing professionals or educators in the fields of municipal engineering or construction management. Allouche is the inventor or co-inventor of 17 patents in the area of trenchless technology and the author or co-author of more than 260 publications in the fields of buried infrastructure management and trenchless techniques, including 64 peer-reviewed journal papers. He is also the co-founder of two start-up companies based in Ruston, La. He is also an associate editor of the ASCE Journal of Pipeline Systems.



**Michael Davison,
P.Eng.**

Product Director, Aqua-Pipe Division, Sanexen Environmental Services Inc.

Michael Davison, P.Eng., is product director for the

Aqua-Pipe division at Sanexen Environmental Services Inc. in Montreal, Canada. Since 2002, he has been involved in the design and manufacturing of the Aqua-Pipe product, the creation and maintenance of installation operation procedures, training of operators and licensees, development of QA/QC procedures, planning and management of the largest Aqua-Pipe projects to date and improvements through research and development. Mike is currently the lead for all technical aspects within the Aqua-Pipe team.

A graduate of McGill University in civil engineering, Mike is an active member of the NASTT No-Dig Show Program Committee and is a technical session leader. He is also involved in ASTM International standard committees and is the Chair of the AWWA standards and M28 CIPP subcommittees. Mike is a member of ASCE and also works locally to improve the

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trenchless industry with the Bureau de Normalisation du Québec (BNQ). Outside of the office, Mike is an avid hockey player, coach and fan. Outside of the office, Mike is an avid hockey player, coach and fan.



**Don Del Nero,
P.E., C.D.T**

Tunneling &
Trenchless Practice
Leader, Vice
President, Stantec

Don has more than 27 years of experience including planning, studies, design and construction management in the areas of tunnel and trenchless engineering. Don obtained his MS in Geotechnical Engineering from Syracuse University and his B.S. in Civil Engineering from Clarkson

University. His project experience covers over 60 projects, over 50 miles of tunnel and trenchless installations, worth over \$1.8 Billion in construction value. He has been involved in a variety of trenchless technologies for sanitary sewer, storm sewer, raw water, finished water, and recycled water, SSO and CSO wastewater tunnels, highway tunnels, pedestrian tunnels, caverns, raw water intake tunnels, raw water tunnels and large diameter piping in sensitive areas. His tunneling experience is in a wide-array of geotechnical conditions across the US, Canada, and abroad, is heavily involved in client and project risk mitigation, has provided dispute resolution services for several clients, and has developed expertise in mining in cobbles and boulders.

Don is a member of and/or in-

involved in the Dispute Review Board Foundation, Underground Construction Association of the Society for Mining, Metallurgy and Exploration, Tunneling Association of Canada, and the British Tunneling Society. He has been very active on the NASTT No-Dig Conference Program Committee for several years and has written several articles for *Trenchless Technology* magazine.



Alan Goodman
National Sales
Manager, Hammer-
Head Trenchless
Equipment

Alan Goodman has more than 15 years of experience in the underground construction industry. Alan started his career working in

the auger boring industry as a sales representative and is currently employed with HammerHead Trenchless Equipment as the national sales manager in the United States and Canada. Fluid in Japanese, Alan studied abroad in Japan and served as the ambassador for the rotary exchange group. He completed his education with a B.A. in International Business from the Stephen F. Austin State University in East Texas.

During his tenure at HammerHead Trenchless Equipment, Alan has worked closely with municipalities, engineering firms, and contractors around the world providing customer training, technical support, pre-project planning, project specifications, and installations for pipe ramming, pipe bursting, cured-in-place pipe (CIPP) and other trenchless projects.

Alan was recently selected as the vice chair of NASTT's South Central Regional Chapter. He is also an active member of the National Utility Contractor's Association (NUCA), Alliance

for PE Pipe, NASSCO, International Pipe Bursting Association (IPBA), the American Gas Association (AGA), the Pipe Line Contractors Association (PLCA) and the Pipe Line Contractors Association of Canada (PLCAC).



Tony Hranicka, P.E.

Senior Project Manager,
ULC Robotics (ULCR)

Tony currently works for ULC Robotics managing projects and working closely

with engineering teams to develop robotics systems ranging from concept to commercialization for the utility/energy industry. He plays a key role in the R&D department to support all facets of the development of new products and services, work closely with ULCR's management team, administrative staff, and engineers to ensure projects are performed on time, on budget and at the highest level of quality.

Tony previously worked at the Gas Technology Institute (GTI) as a senior engineer in the Delivery Sector working on infrastructure improvement research projects. Prior to that, he was project manager responsible for evaluating and implementing new technologies that increase the efficiency and effectiveness for Gas Operations within the Con Edison service territory in and around the New York City area.

Tony has a very diverse background in gas distribution engineering and operations during his 34-year career in the utility industry. He has been a member of the American Society of Mechanical Engineers since college and has held a professional engineering license in New York State since 1989. Tony is the recipient of the American Gas Association 2007 Gas Industry Research Award for commercialization of the CISBOT program (Cast Iron Joint Sealing live robotic system). He received his bachelor's in mechanical engineering from Manhattan College in 1980. He also com-



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pleted a master's in engineering from Manhattan College 1985 and a second from the New York Institute of Technology in 1997.



Larry Kiest, Jr.
President, LMK
Technologies, LLC

Larry Kiest Jr. is an innovator, inventor and entrepreneur who has worked in the underground and trenchless utility industry for more than 30 years. Larry started his career as a Licensed Master Plumber in Ottawa, Ill., in the early 1980s, and in 1993, founded LMK Technologies. Throughout his career, Larry has grown as an internationally respected leader and speaker in the trenchless industry and holds 117 patents issued throughout North America, Europe and Australia for the innovative solutions and products he has developed. He is personally responsible for the issuance of ASTM standards F2561 and F2599 and is currently balloting two additional ASTM standards.

In 2013, Larry was honored as *Trenchless Technology* magazine's Person of the Year. In 2014, LMK was named a top 10 winner of the prestigious Chicago Innovation Awards and Larry was featured on "Bootstrapping in America," a live online TV interview in October. Larry is a member of NASTT's No-Dig Show Program Committee and an Advisory Board member for the Trenchless Technology Center at Louisiana Tech University. He is also involved in other industry associations like NASSCO, ASCE, ASTM and WEF. Larry has had technical papers published in ASCE Pipelines Journal, *NASTT's Trenchless Today* and in NASTT, ISTT and UCT conference proceedings.



Brenda Kingsmill
Project Manager,
Regional Municipality of Halton

Brenda is a

graduate of Sault College and the British Columbia Institute of Technology. Initially working in the private sector for eight years, Brenda joined Halton Region in 1986 where she became a design supervisor. Now a Project Manager, Brenda is responsible for environmental assessments, plus design and construction administration of numerous linear and facility projects. Brenda has experience in managing projects using a wide variety of trenchless technologies and is currently involved in the construction of three large diameter tunnels and pump station and the design of a pump station and forcemain using trenchless installation. Always a willing volunteer, Brenda is a long-term member of the NASTT Program Committee and has served as a Session Leader and Moderator since 2009.



Gerard P. Lundquist, P.E.
Director, Gas Construction, National Grid

Gerry is a director with National Grid, an International Electric and Natural Gas Transmission and Distribution Company. He is the director of gas construction for New York State and has more than 30 years of experience in all phases of construction, design, engineering and project management. His responsibilities include the execution of the capital work plan while also insuring the safety, security and reliability of the natural gas distribution system. Prior assignments have included Project Manager for the JFK Airport Cogeneration Facility, and the Stony Brook Cogeneration Facility. He integrates innovative technologies to reduce costs and increase operational efficiencies.

Gerry has a bachelor's in civil engineering from The Cooper Union, a master's in business administration from Adelphi University, and a master's in economics

and finance from NYU. He is a registered professional engineer in New York State.

His affiliations include serving on the on the Board of Directors for the (NEGDC) Northeast Gas Distribution Council, consisting of natural gas utilities throughout the northeast, an active member of the (NSPE) National Society of Professional Engineers, and (ASCE) American Society of Professional Engineers. He is a Member of the (APWA) American Public Works Association and serves on the (UPROW) Utility and Public Right of Way Technical Committee, and Chair of the Construction Practices Subcommittee. He also is on the NASTT Program Committee.



Michelle L. Macauley, P.E., LEG
National Trenchless Technology Practice Leader, Jacobs Engineering

Michelle Macauley is a geotechnical engineer and the national trenchless technology practice leader at Jacobs Engineering based out of its Bellevue, Wash., office. She earned her B.S. in Geological Sciences from the University of Washington and her M.S. in Geological Engineering from the University of Alaska, Fairbanks. She is a licensed professional engineer in Washington, Oregon, Alaska, California and Texas, and a licensed engineering geologist in Washington.

Michelle has more 18 years of experience in geotechnical engineering, with a particular emphasis on trenchless feasibility, design and constructability. Prior to joining Jacobs, Michelle was a senior geotechnical engineer specializing in trenchless design and construction with GeoEngineers and Staheli Trenchless Consultants. She has been involved in projects using horizontal directional drilling, microtunneling, pipejacking, auger-boring, pipe ramming, and

pilot-tube microtunneling — just to name a few.

Michelle has been involved with NASTT since 2006. During that time, Michelle has been involved with the Pacific Northwest Chapter both as a chapter president and an organizer of the chapter's inaugural trenchless technology symposium. She has been a contributor to the PNW Chapter Trenchless Review (bi-yearly publication) and is a regular speaker, attendee and program committee member for No-Dig. As the national practice lead for Jacobs, Michelle is looking forward to bringing her experience and passion to bear on the national level as part of the NASTT Board of Directors.



Jeff Maier, P.E.
Director of Engineering,
C&L Water Solutions,
Inc.

Jeff Maier, P.E., is the director of engineering at C&L Wa-

ter Solutions in Littleton, Colo. Prior to joining C&L, Jeff worked for more than 10 years as an engineer with the Metro Wastewater Reclamation District (MWRD) in Denver and was most recently the owner/principal of Colorado Trenchless Consulting LLC, a niche engineering firm that specialized in water/wastewater infrastructure condition assessment, inspection and trenchless corrosion rehabilitation solutions. He is a Colorado registered professional engineer and a graduate of the University of Michigan – College of Civil & Environmental Engineering.

Jeff has more than 17 years of project management and engineering design experience, primarily in the water and wastewater industry. He is recognized as an expert in the fields of condition assessment and trenchless rehabilitation of pipelines, manholes and wastewater facility structures. He developed and successfully managed wastewater pipeline and manhole condition assessment and rehabilita-

tion programs for the MWRD and was the co-founder of the MWRD Concrete Rehabilitation Product Evaluation Program.

Jeff is actively involved in NASTT's Rocky Mountain Chapter. He is NASSCO PACP/MACP/LACP certified, a NACE Certified Coating Inspector – Level 3, and is a certified NASSCO CIPP rehabilitation inspector. In his free time, Jeff enjoys skiing, cycling, hiking and playing golf.



John Matthews, Ph.D.
Director, Trenchless
Technology Center
& Associate Profes-
sor, Louisiana Tech
University

Dr. John Matthews has more than 12 years of experience in the rehabilitation and inspection of infrastructure systems. He currently serves as the Director of the Trenchless Technology Center (TTC) and as an Associate



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Professor of Civil Engineering and Construction Engineering Technology at Louisiana Tech University. Prior to rejoining the TTC, he served as the Pipe Renewal Service Line Manager at Pure Technologies providing their clients with guidance on the selection and use of trenchless rehabilitation technologies. Prior to joining Pure, he served as Battelle's Water Infrastructure Management Lead, where he led multiple water and sewer infrastructure research studies. Prior to joining Battelle, he led multiple projects at the TTC relating to the development of automated decision support systems for technology selection. He was also involved in projects relating to condition assessment technology selection and field evaluation of trenchless rehabilitation technologies. He also has experience as a field inspector on numerous rehabilitation and replacement projects.

He has given more than 90 conference presentations and authored more than 135 publications in the area of trenchless technology for which he has received two International Society for Trench-

less Technology (ISTT) No-Dig Awards (2005, 2012) and a North American Society for Trenchless Technology (NASTT) Outstanding Paper Award (2015). He has been an active member of NASTT since 2003, serving on the No-Dig Program Committee and Quality Control Subcommittee. He also serves as a NASTT Course Instructor for both the Laterals Good Practices and Intro to Trenchless Technology – Rehabilitation Good Practices Courses. In 2013, he was awarded the NASTT Trent Ralston Award for Young Trenchless Achievement. He is also an active member of the American Society of Civil Engineers (ASCE) and American Water Works Association (AWWA) and he currently serves on the Editorial Advisory Board for *Trenchless Technology* magazine.



Craig Vandaele
Tunneling Manager,
Michels Corp. &
Michels Canada Co.

Craig Vandaele is the tunneling manager for Michels Corp. and Michels Canada

Co. In his current role, he oversees business development, estimating and assists with the overall management of the tunnel operations in the United States and Canada. Craig has more than 16 years of experience in the North American tunneling and trenchless technology industries. His vast experience includes design, inspection, construction and construction management of trenchless projects throughout North America.

Craig has a deep understanding of the complexities of trenchless projects. In his eight years at Michels, he has served as the project manager on many significant tunneling, HDD and cured-in-place pipe (CIPP) rehabilitation projects. Among them are the McOrmond Drive Sanitary and Storm Sewer Trunks in Saskatoon, Saskatchewan, Canada; Big Lake Offsite Gravity Portion (W14) in Edmonton, Alberta, Canada; Vancouver City Central Transmission Project, Vancouver, British Columbia, Canada; and Upper Northwest Interceptor Sections 3 & 4 in Sacramento, Calif. He has worked on projects that include conventional tunneling, microtunneling, slurry

shield tunneling, pipe jacking, pipe bursting, CIPP and shaft construction of various types and sizes.

Craig is also active in many industry organizations and is chair of the North American Society for Trenchless Technology's Northwest Chapter. He has co-authored papers for several No-Dig conferences and has won awards for his projects and papers.



Matthew Wallin, P.E.
Partner and Senior Project Manager, Bennett Trenchless Engineers

Matthew Wallin is a partner and senior project manager with Bennett Trenchless Engineers (BTE) in Folsom, California. BTEs' engineering practice is focused entirely on trenchless technology design, construction management, and claims assistance with clients and projects located throughout California, as well as Texas, Florida, Nebraska, Iowa, South Dakota and Tennessee.

Matthew holds both a bachelor's and a master's degree in civil engineering from Case Western Reserve University in Cleveland, Ohio. He began his career working for URS in Oakland, California in 2001 in its geotechnical group. Since that time, Matthew has focused his practice on geotechnical engineering and the design and construction management of new pipeline projects using horizontal directional drilling, microtunneling, open-shield pipe jacking, pipe ramming and auger boring.

Matthew has been a member of NASTT since 2002 and has participated in the organization in many capacities.

He has been an active member in the Western Chapter (WESTT) since 2003 and has served as a member of the Board of Directors and as the Chapter Treasurer since 2008. He joined NASTT's No-Dig Show Program Committee in 2010 and has acted as a session leader for NASTT's No-Dig Show since that time. Matthew is also an instructor for NASTT's HDD Good Practices Course as well as the Introduction to New Trenchless Methods Course, each of which are taught annually at the No Dig Show and at other off-site venues throughout the year.



Dennis Walsh, P.E.
Senior Project Manager, Horizontal Directional Drilling, PSE&G

Dennis M. Walsh, P.E. is a senior project manager – horizontal directional drilling for Public Service Electric & Gas in New Jersey. Dennis is a 1972 graduate of the University of Dayton, Ohio with a B.S. in Civil Engineering and a 2002 graduate of the Polytechnic University of New York with a M.S. in Technology. He retired from KeySpan Energy Company in 2005 after a 28-year career in the gas utility field with a background in engineering, operations, construction, Quality Assurance and HVAC. He led KeySpan's efforts to expand the use of trenchless technology in the early 1990's to decrease its main and service installation costs. Prior to joining PSE&G, he was a consulting engineer for various consultants in the natural gas industry.

Dennis is a member of the Society of Gas Operators, and the North

American Society for Trenchless Technology. He is a Board member for the NASTT Mid-Atlantic Chapter and on the Annual No-Dig Committee. He has designed numerous HDD installations for various utilities; including a 1,800 foot 30 inch steel HDD under a tidal basin in Brooklyn, NY; a 2,000 foot 12 inch HDD under an environmental sound in south NJ; and a 400 foot long Jack & Bore installation in Newark, NJ. When he is not involved in trenchless projects, he enjoys traveling and playing golf.



Dan Willems, P.Eng.
Special Projects Manager, City of Saskatoon

Dan Willems is the special projects manager with the City of Saskatoon Transportation & Utilities Department's Major Projects division. Dan holds a bachelor's in civil engineering from the University of Saskatchewan in Saskatoon. Since 2001, he has worked for various municipal government and private consulting organizations across the Canadian Prairie Provinces. Throughout his career, Dan has been involved in several trenchless construction projects, including CIPP lining, microtunneling, case boring, tunneling, directional drilling and pilot-tube microtunneling.

Dan has been heavily involved in the Northwest Chapter of NASTT since 2005 and has also been a regular contributor at NASTT's annual No-Dig Show. He is actively working with the Northwest Chapter and local industry in Saskatchewan and Manitoba to expand NASTT's presence across the Prairie Provinces.



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NASTT's 2017 *Hall of Fame Class*

Trenchless Legends of Past & Present to be Honored at No-Dig Show

NASTT has announced the inductees of the Society's sixth Hall of Fame class: Joseph L. Abbott Jr., Dr. Tom Iseley and Rod Sutliff.

Abbott's distinguished career in the sewer rehabilitation industry was highlighted by his work with Godwin Pumps, beginning in 1989 when he joined as national sales manager and continuing on for 20-plus years as he helped grow Godwin's presence throughout the United States and Canada. Iseley is known as one of the pioneers of trenchless technology, inspired from an early age to pursue a career in civil engineering, culminating in his founding of the Trenchless Technology Center at Louisiana Tech University in 1988. Sutliff's journey to NASTT's Hall of Fame was actually attributed to most of the work he completed later in his career, remarkably founding his company R.S. Technical Services after coming out of retirement.

The careers of the 2017 Hall of Fame class will be celebrated on the night of April 11 when they will be formally inducted at the Gala Awards Dinner at NASTT's 2017 No-Dig Show in Washington, D.C. The new inductees will join an already elite group of industry pioneers who have helped transform the industry and pave the way

for the current generation of trenchless professionals.

"The lifelong dedication of these individuals has made innovative trenchless technology practices acceptable and sustainable, not only for today's infrastructure solutions but for those of the future," said Mike Willmets, NASTT executive director. "Their commitment to trenchless technology has been pivotal to the growth of the entire industry and has impacted infrastructure management in countless communities throughout North America."

NASTT's Hall of Fame was created by the NASTT Board of Directors to celebrate the Society's most outstanding and accomplished members who have made a lasting impact on the trenchless industry. The Hall of Fame allows the outstanding work and dedication of these members to be recognized, honored and preserved. Members may be elected from all five NASTT membership categories: Manufacturers and Suppliers; Engineers and Consultants; Municipal and Utility Employees; Contractors; and Academia. The NASTT Board of Directors met last year and voted these trenchless icons as members of the 2017 class. Congratulations to our new inductees!

Joseph L. Abbott Jr. (1953 - 2010)



Joseph L. Abbott Jr. had a distinguished career in the sewer rehabilitation industry, beginning when he received his Bachelor of Science from Saint Joseph's University in Philadelphia. He married his best friend, Stephanie, and they shared three children; Molly, JJ and Megan.

Joining Godwin Pumps in 1989 as national sales manager, Joe brought his sales and manufacturing expertise to the New Jersey-based pump rental startup. Armed with a station wagon filled with accessories and a 6-in. pump in tow, Joe earned the nickname of "Showy Joey" for introducing the concept of tow and show to Godwin. As primary sales contact with consulting engineers, he worked on hundreds of large and small bypass operations.

Joe collaborated with trenchless excavation compa-

nies to create cross functional business opportunities and worked hand in hand with CIPP contractors and boiler truck manufacturers to improve wet out processes and capabilities.

In the ensuing 20 years, Joe helped build Godwin's distribution network throughout the United States and Canada. He played an instrumental role in the development of Godwin's marketing and sales efforts, including his activities in numerous professional organizations. Recognized as one of NASTT's seven charter members, he also served on the Board of Directors from 2003 to 2010.

It was Joe's passion for people that defined him as an industry leader, trusted partner and friend. His wisdom, knowledge and leadership is missed, but he'll never be forgotten for what he taught us about success in work and life. Above all else, Joe cared about the people he worked alongside. The trenchless community will be forever grateful for the mark he left.

David T. "Tom" Iseley, Ph.D., P.E.



Tom Iseley has a difficult time establishing when he was first introduced to the underground infrastructure industry, since his father and grandfather were water and sewer pipeline contractors based in Burlington, N.C. However, he does remember when he first was officially employed as laborer

on a sewer pipeline project. It was at the age of 12 when he and his brother assisted their father in building brick manholes in Alabama. At that time, Tom was not all that thrilled to spend his summer tossing brick at his father while his friends were playing games; but now he realizes what an honor it has been to have his career begin working with his father and grandfather. After high school, he followed his grandfather's recommendation to pursue civil engineering. This was accomplished at the University of Alabama in Birmingham (UAB) while working for a consulting engineering firm which specialized in the design of water and wastewater treatment plants and pipeline conveyance networks. Tom's education was interrupted due to required

military service during the Vietnam War.

Tom served four years in the U.S. Coast Guard (USCG) and later returned to UAB to complete the BSCE program and MBA program. He and his father formed a utility construction firm just before a national economic downturn which provided an opportunity for Tom to transition to an academic position at Mississippi State University (MSU). After four years as an assistant professor at MSU, he moved to Purdue University where he obtained a Ph.D. in civil engineering and begin to focus on trenchless technology. In 1988, he accepted a faculty position at Louisiana Tech University with a vision to establish an industry/academic/government cooperative research center – the Trenchless Technology Center (TTC). After serving as director of TTC, he served in other academic and industry positions including as a senior advisor to the commissioner of the Department of Watershed Management for the City of Atlanta. In July 2014, he returned to TTC to serve as the director. He has established a strong program for TTC in China and recently was appointed for a three-year adjunct professorship at the Xi'an Jiaotong University.

Rod Sutliff (1934 - 2014)



It's not a surprise to people who knew Rod Sutliff that he was responsible for nearly a dozen game changing innovations in the CCTV pipeline inspection industry. He cultivated these innovations after retiring from a variety of entrepreneurial ventures. He began in his parent's garage repairing the family television. In high school, Rod won first prize in the 1951 national Industrial Arts Awards sponsored by Ford Motor Company. The following year, he won the Coast Electronic Supply Contest by building a 20-in. television set. In his early 20s, Rod taught college electronics with just his high school diploma. One of his notable endeavors was engineering harnesses for NASA's Jet Propulsion Laboratory at CalTech. He was also a pioneer in solar heating and cryogenics, which spawned numerous innovations and patents.

One afternoon, in the spring of 1984, Rod's son, Tom – currently an RST distributor – approached him with a problem. His customer desperately needed a CCTV inspection camera and his current supplier couldn't manufacture the product by the deadline. Although most people might consider this request for help a tall order for any engineer, Tom knew his fa-

ther could never resist a challenge. He also knew that the demand for CCTV inspection systems was on the verge of rapid growth. That day, Rod came out of retirement, formed R.S. Technical Services and began to revolutionize the CCTV industry.

His keen understanding of what the industry needed to be successful lead to a string of innovations including the first mainline color camera featuring internal lights (and sturdy filament-type bulbs), the first true pan-and-tilt camera with tracking lights, a cable reel with electrical gear selection, and many others. Rod also developed a steerable storm drain tractor and an explosion-proof camera.

As an innovator, Rod looked ahead as he developed his equipment, knowing that there would be an increasing need for more functionality. He stepped away from convention and developed his equipment using Single Conductor Technology, which delivers multi-function capability, power, video and RST's trademark durability. Rod was a member of NASTT since 2006.

Sadly, Rod was taken from his family and the industry suddenly in August 2014. While his family will miss his presence and zest for life, they will continue his quest for innovation at RST and carry the company forward.

Joe Abbott Jr., Tom Iseley and Rod Sutliff are NASTT's sixth Hall of Fame class. To learn more about NASTT's Hall of Fame and its inductees, visit nastt.org/no-dig-show/hall-of-fame. NASTT's 2017 No-Dig Show will be held April 9-13 at the Gaylord National Hotel & Convention Center in Washington, D.C. For details, visit nodigshow.com.



NASTT'S EYE ON THE INDUSTRY

OUR MEMBERS IN ACTION



Robbins' new TBM digs Atlanta

After an Onsite First Time Assembly (OFTA) lasting just 2.5 months, Atlanta, Georgia's newest tunnel boring machine (TBM), dubbed "Driller Mike," made its initial startup on Oct. 13, 2016, and ramped up to full production two weeks later. Atlanta Mayor Kasim Reed and city officials gathered with local and national media to celebrate the occasion. The 3.8 m (12.5 ft) diameter Robbins Main Beam TBM is now boring the 8.0 km (5.0 mi) Bellwood Tunnel after being walked forward 100 ft into a starter tunnel. The Bellwood Tunnel path will travel from an inactive quarry and run below a water treatment plant and reservoir before ending next to the Chattahoochee River.

The project was green-lighted by the City of Atlanta's Department of Watershed Management due to the city's current emergency water supply shortage. The PC/Russell JV, the project's construction manager at risk, sub-contracted with the Atkinson/Technique JV to operate the TBM and will oversee construction of various intake and pumping shafts as well as final lining operations. The project is of utmost importance for the City of Atlanta, explained Bob Huie, Sr. Project Manager for the PC/Russell JV.

Electro Scan announces integration with Innovyze's InfoMaster for Sewer



Electro Scan Inc. has completed data integration between its flagship sewer condition assessment solution and the Innovyze InfoMaster for Sewer product. Electro Scan's breakthrough technology evaluates 360-degrees of a pipe wall to accurately locate and measure defects in gallons per minute (GPM) or liters per second (l/s).

Recent studies indicate that 70 to 100 percent of defects are typically not found by legacy inspection techniques, such as closed-circuit television (CCTV) inspection, smoke testing, dye flood testing, laser profiling and acoustic sensors. Recommended to assess and certify pre- and post-rehabilitated pipes, a new chapter was recently added on Electro Scanning Inspection to the industry's leading training manual, Operation and Maintenance of Wastewater Collection Systems, Seventh Edition, Volume One (2015), in accordance with ASTM F2550.

"We are delighted to integrate our game-changing pipe condition assessment solution with the leading business analytics solution for the wastewater industry," states Chuck Hansen, Founder and CEO, Electro Scan Inc.

"The Innovyze family of smart network modeling and asset management solutions continues to be the standard platform for existing and emerging diagnostic tools," added Paul F. Boulos, Ph.D., BCEEM, Hon.D.WRE, Dist.D.NE, Dist.M.ASCE, NAE, president, COO and chief innovation officer of Innovyze. "We look forward to offering this new layer of condition assessment data to help our clients in their sewer rehabilitation decisions."

Electro Scan's Critical Sewers cloud application allows for up-to-the-minute monitoring of sewer evaluations, lining projects, point repairs and new construction projects while crews are still in the field. Clients can easily identify pipe-specific problems before rehabilitation project acceptance. Wirelessly transmitted to the company's award winning cloud application, defect flows are reported in minutes and incorporated into Innovyze InfoMaster for Sewer product for display and analysis.

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HammerHead releases first of next-generation winches



HammerHead Trenchless Equipment, a Charles Machine Works company, has introduced the powerful, new HammerHead HydroGuide HG1200 winch, optimally designed to be more efficient and easy to use in pipe-bursting, slip-lining or slitting applications. This new iteration of the popular HydroGuide line of winches features a patented, self-deploying

hydraulic downrigger, improved performance and additional safety features.

While other winches on the market require manual assembly of heavy, bulky components, the HG1200 makes setup easy with its industry-changing hydraulic downrigger. With the touch of a button, users are able to automatically deploy the boom down hole and can fine-tune the depth up to 18 ft without having to jack up the machine. With the hydraulic boom, setup and teardown take just minutes, which saves valuable time on a jobsite.

A key feature of the new HG1200 winch is its precision controls. Not only can users adjust the boom to any depth, but they also have total control of the line speed and pressure. Pull force can be set anywhere between 0.5 to 12 tons, and the line speed can be set anywhere between 0 to 111 feet per minute.

"We know job conditions and specifications can vary greatly so we created a machine that can be infinitely adjusted within its parameters to fit each individual job exactly," said Josh Hood, HammerHead product line manager. "This level of control is critical to the success of gasoline slitting applications, which was a driving factor in the improvements we made from the previous version. We worked to create a winch with the necessary power and agility for a wide range of situations to ensure customer success."

The HG1200 winch is powered by the Kubota D1105, a vertical, water-cooled, four-cycle diesel engine that complies with Tier 4 emission regulations. This lightweight, dependable engine increases the unit's performance and fuel efficiency. The radial piston motor provides a smoother, more consistent pull.

Woodard & Curran acquires RMC Water and Environment



In November, Woodard & Curran announced that it acquired RMC Water & Environment an environmental engineering company focused on developing solutions to the complex challenges of using and protecting water.

The acquisition of RMC, a 125-person, California-based firm, expands Woodard & Curran's national footprint to 26 offices in 12 states and 48 clean water facilities across the country. The combined firm represents 1,000 engineers, scientists, planners, treatment facility operators, and support staff who expect to deliver more than \$200 million in projects this year, strengthening its position as one of the top wastewater firms in the country and elevating it into the top 20 for water resources and supply.

"This marks an important milestone in Woodard & Curran's history," explained Woodard & Curran CEO Douglas McKeown. "We have grown steadily since the firm was founded, maintaining our focus on supporting and empowering our people, working side-by-side with our municipal and private sector clients on some of the most important water and environmental challenges. We are thrilled to be able to bring the people of RMC into the Woodard & Curran team, and to be able to leverage their expertise and experience to benefit our employees and clients."

"We were at a critical point in our growth," said RMC President Alyson Watson. "Joining forces with Woodard & Curran allows us to expand our capabilities and offer more to our existing clients, and it gives us a national platform to deliver our expertise in water resources to many new clients."

The firms will integrate capabilities beginning immediately, but in the near-term, RMC will retain its focus on serving its clients in California. RMC will operate under a co-branded identity through 2017 and then transition to operating as Woodard & Curran in 2018.



Vac-Tron introduces new 'CV' series

Vac-Tron Equipment recently introduced a new line to its vacuum excavation equipment with the new Competitive Vac (CV) Series. This series offers the performance customers have come to expect from Vac-Tron Equipment while keeping the cost of operation to a minimum. The new models include the following features:

CV GT models: Powered by 27 HP Kohler EFI gas engine, 580 cfm @ 15 Hg, Wet/dry filtration with cyclonic separation, 500 or 800-gallon debris tank, 7 Series Claw Door, Hydraulic rear door with auto engage safety latch, 200 – 300-gallon water capacities, 3500 psi @ 4 gpm, Water knife and clean-up wand, 30' x 3" vacuum hose.

CV SGT High CFM models: Powered by a 37 HP Kohler gas engine, 1000 cfm @ 15 Hg, Wet/dry filtration with cyclonic separation, 500 or 800-gallon debris tank, 7 Series Claw Door, Hydraulic rear door with auto engage safety latch, 200 – 300-gallon water capacities, 3500 psi @ 4 gpm, Water knife and clean-up wand, 30' x 4" vacuum hose.

Optional reverse pressure is also available. For more information about the CV Series, contact Vac-Tron Equipment at 888-822-8766 or visit us at vactron.com.

Hydra-Flex welcomes new sales director



Hydra-Flex, Inc. is pleased to announce that Jonathan Kingsbury has joined the organization as its new director of sales. In this key leadership role, Kingsbury will bring more than 16 years of commercial expertise to strengthen the company's sales team effectiveness, drive new market expansion and execute strategic sales plans.

Kingsbury's experience comes from a broad background of sales and marketing leadership roles within the commercial cleaning industry. Most recently, he held senior-level roles with global manufacturer Nilfisk-Advance, Inc. leading its U.S. Commercial Dealer Sales channel and North American Marketing and Strategy teams.

"We are thrilled to welcome Jonathan to our team and are excited to introduce him to our customers and strategic partners," said Hydra-Flex CEO Jaime Harris. "His proven leadership capabilities, combined with his deep and relevant industry experience, will be key in our efforts to increase market share, customer satisfaction, and innovation for Hydra-Flex and our partners."

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NASTT Chapter News



BRITISH COLUMBIA

Happy New Year from the British Columbia Chapter (NASTT-BC)! It was another great year in beautiful British Columbia in 2016, and 2017 is looking even better.

This year will see the return of the *Trenchless Technology* Roadshow to British Columbia. The Road Show is the result of a joint collaboration between the Centre for Advancement of Trenchless Technologies (CATT), Benjamin Media Inc. and NASTT-BC. The Road Show will be held at the Sheraton Vancouver Airport Hotel in Richmond, Sept. 25-27. This event has grown substantially since its last visit to the West Coast. Courses on the first day will offer four options to attendees and the next two days of technical presentations will offer three tracks running concurrently.

With the change in venue also comes a bigger and better exhibit hall that will be filled with the latest and greatest from the world of trenchless technology, offering great networking opportunities with industry peers. More information is available at roadshow2017.cattevents.ca.

for NASTT programs, including the Municipal Scholarship Program, silent auction and student scholarships. The GLSLA Chapter would like to congratulate GLSLA members who were awarded a municipal scholarship for NASTT's 2017 No-Dig Show.

In coordination with NASTT, GLSLA hosted a very successful CIPP Good Practices course in Hamilton on Jan. 18, 2017 with more than 25 attendees. Thank you to our two trainers, Chris Macey and Kevin Bainbridge, for a great session. GLSLA will be hosting another CIPP Good Practices course in Halifax on May 10, 2017 in partnership with NASTT and ACWWA. Stay up to date on training opportunities and other events at glsla.ca.

GLSLA's annual magazine is scheduled for release in September 2017. Please visit the website for more information. The Chapter is also looking for interesting project articles, so if you have been involved in a trenchless project, please consider writing an article about it so that others can benefit from your experience.

For more information on GLSLA, events and training sessions, or to contact us if you wish to publish an article, please visit glsla.ca.



GREAT LAKES, ST. LAWRENCE & ATLANTIC

The Great Lakes, St. Lawrence & Atlantic Chapter's (GLSLA) Board of Directors and member volunteers are continuing to work to provide value to its members through training, publications and website. GLSLA also continues to provide important support



MID ATLANTIC

The Mid Atlantic Chapter (MASTT) held a Trenchless Technology, SSES and Buried Asset Management seminar, Sept. 14, 2016 in Newark, N.J., which included a day of presentations on trenchless technology methods and best practices for attendees. The

Mid Atlantic Chapter is currently planning events for the 2017 calendar year. Please visit www.nastt.org or contact Leonard Ingram, executive director, to find out how you can learn more about chapter events, at leonard@engconco.com.



The Midwest Chapter (MSTT) held a Trenchless Technology, SSES and Buried Asset Management seminar, Dec. 14-15, 2016. This event was held at the Hilton St. Louis Union Station Hotel in downtown St. Louis, Mo. Two days of trenchless technology methods were presented to the attendees. A presentation entitled "Trenchless Technology – A Critical Component of the MSD Capital Construction Program" was given by Allen Muehlher, P.E., program manager of the Metropolitan St. Louis Sewer District (MSD) Construction Division. The Midwest Chapter is planning on two events for the 2017 calendar year. For more information, visit mstt.org.



MSTT's Trenchless Technology, SSES and Buried Asset Management seminar in December drew a full group of attendees to St. Louis to take part in the technical sessions covering trenchless methods, best practices and case studies.

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NORTHEAST

The Northeast Regional Chapter had a very successful first year publishing a *Journal of Trenchless Practices*, starting a student chapter at the University of Massachusetts at Lowell, and hosting a successful first annual conference attended by more than 160 attendees. The Board of Directors is building on this momentum and is busy preparing a second annual *Journal of Trenchless Practices* and are busy planning its second annual conference in upstate New York. The Chapter is also seeking to start other student chapters in the region and is currently having discussions with several universities.



NORTHWEST

The Northwest Chapter held its 20th annual Northwest Trenchless Conference, Nov. 9-10, 2016 in Edmonton, Alberta, Canada. Registration for the 2017 Northwest Trenchless Conference will open in July 2017 and the location is currently being determined.

The application period for the 2017 Municipal and Utility Scholarship Program will also open shortly. The program is intended to subsidize attendance of municipal and utility employees at the 2017 Northwest Trenchless Conference. If you are a trenchless professional in the Canadian provinces of Alberta and British Columbia, Canada or Washington state and are interested in applying for this scholarship, please visit nastt-nw.com.

Congratulations to the TransCanada Corp., CCI Inc., and Michels Canada on being awarded the 2016 Northwest Trenchless Project of the Year for the Northern Courier Pipeline project. For more information, visit nastt-nw.com.



PACIFIC NORTHWEST

The Pacific Northwest Chapter held its bi-annual Short Course and Symposium in January 2017. The event had a wonderful turnout for its New Installations Short Course on the first day of the conference.

The chapter was excited to welcome Dr. Glenn Boyce and Dr. Kimberlie Staheli as instructors for this advanced 8-plus hour course.

On the second day of the conference was a symposium and tradeshow. The tradeshow had 15 great exhibitors, most of which not only support the chapter, but also NASTT at the national level. The attendees were very interested in networking with the exhibitors and fellow attendees. Along with the tradeshow, the symposium featured nine speakers made up of both engineers and equipment manufactures mainly highlighting a technology or product via case studies of projects within the chapter's region. At this two-day event, the chapter also held its annual meeting and nominated and approved two director positions as well as a couple of empty board positions.

The Pacific Northwest Chapter is excited about the level of interest in trenchless technology in the area and is very confident the newly elected leaders will do a great job and continue to expand membership and education throughout the region.



ROCKY MOUNTAIN

The Rocky Mountain Chapter of NASTT wrapped up a busy and successful 2016 highlighted by our two day "Trenchless Elevated" conference in Salt Lake City, Utah, in October. The chapter is looking forward to 2017, which promises to be a big year, due entirely to a great group of board members, committee members and volunteers. Planning is under way for educational jobsite visits, young professionals and outreach committee events, sporting clays tournaments and our annual conference this fall in Colorado. Look for these events and more in the near future. As always, the Rocky Mountain Chapter is looking for new volunteers and members and would love to see YOU get involved!



SOUTH CENTRAL

NASTT's South Central Chapter started out with a very successful 2016. The chapter had its first event on Aug. 23, 2016 at the University of Texas at Arlington, where it had 86 individual registrations and 24 exhibi-

tors and sponsorships. This event captured a broad group of individuals ranging from project owners, engineers, water and sewer municipalities, gas companies and underground contractors. Overall, the chapter received great feedback with many attendees requesting a second event. Having that said, the chapter has set its 2nd NASTT South Central event for Tuesday, June 20, 2017 at the University of Texas at Arlington.

The goal for 2017 is to double the attendance of 2016 and bring a wealth of knowledge and expertise to the local chapter. If anyone is interested in being a part of NASTT's South Central Chapter, please contact Molly Margosian at mmargosian@nastt.org for more information.



SOUTHEAST

The Southeast Chapter (SESTT) held a Trenchless Technology, SSES and Buried Asset Management seminar in Miami, Fla., Nov. 16-17, 2016. The chapter is currently planning events for 2017. Please plan to support and attend the seminars to enjoy the networking and learning. Visit sestt.org for more information or contact Leonard Ingram, executive di-

rector, at leonard@engconco.com to find out how you can get involved with chapter events in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Puerto Rico.



WESTERN

It was another busy year for the Western Chapter (WESTT) in 2016. In October, the chapter held its annual two-day conference in Las Vegas, Nev. The event featured a full day of technical presentations and exhibits. Attendees came together to learn from and network with their peers. The second day featured NASTT's New Installation Methods and Pipe Bursting Good Practices Courses, taught by industry experts and volunteer instructors.

WESTT will hold its Annual Membership and Board of Directors meeting at NASTT's 2017 No-Dig show on April 9, 2017, at the Gaylord National Hotel and Convention Center in National Harbor, Maryland. The chapter will elect its officer for 2017 and will begin planning its annual conference. More information on the chapter and upcoming events can be found on the website at westt.org.

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Mortimer's TRENCHLESS ACADEMY

How the industry is implementing training initiatives to educate the workforce on trenchless best practices, technology and methods

Portland Leverages Its Future in Trenchless Technology Training

By Mark Hutchinson

The City of Portland, Oregon, is currently in the middle of its \$250-million large scale pipe rehabilitation program. At the same time, our seasoned staff is retiring. Many of them started work in the 1990s to work on our combined sewer overflow system, which is now complete and mostly paid for, enabling us begin work on our early 1900s pipe, which has been falling apart for some time.

One would think that having a pipe rehabilitation program budgeted at \$70 million per year is a good thing. The challenge is we need new engineers to get the work designed and many of them don't have 30 years of experience to learn by trial and error like many of the 'old-timers' have.

We have a couple of options to develop our up and coming engineers: 1) We could have the old 'gray hairs' tell them what they should be doing. Everyone likes to be told what to do, right? Not! 2) Or, we could provide training from nationally-known experts and let them learn for themselves and build a network of resources at the same time, hopefully helping us deliver our projects quicker and with less problems.

Since this has been a challenge for us over the years, I've been looking for cost effective ways to bring more training to our staff. I attend NASTT's No-Dig Show each year and had signed up for a cured-in-place pipe (CIPP) Good Practices class at the 2016 show in Dallas.

Before the course, I actually found myself wondering if I really wanted to spend a sunny day indoors learning about CIPP. After all, I had been using CIPP since the 1980s and had even written a paper on it. Well, once the class started I found out there was a lot I didn't know. I could hardly take notes quick enough during the class to capture ideas and new tricks. The instructors NASTT has are national industry experts who make themselves available for questions and coaching.

When I got back from Dallas, I lobbied our organization, urging them to bring in more training for our staff. We asked local consultants if they were interested and found there was more interest than we had seats available in our auditorium. I was able to find some budget left for training at the end of our fiscal year, and from my notes, I was able to convince management to make this happen. To make things better, the cost per indi-



Pipe bursting has been a large part of Portland's \$250-million pipe rehabilitation program to improve the city's aging sewer system.

vidual was a fraction of what it would cost to send our staff to the No-Dig Show.

This year, we are planning to have the NASTT Pipe Bursting Best Practices come to teach Portland staff. We don't have a lot of money for training, but in Portland, we are dealing with increasing regulations regarding street restoration and rising paving costs, coupled with miles of pipe bursting needed to complete our projects. And with a 20 percent increase in new staff, it's a no brainer to invest in providing the training.

Mark Hutchinson, P.E., is the construction division manager for the Portland Bureau of Environmental Services.

APRIL 10, 2017 | 5:30 PM - 7:30 PM | WASHINGTON, D.C.



NASTT'S 16TH ANNUAL EDUCATIONAL FUND AUCTION AND RECEPTION

The Annual Educational Fund Auction helps raise money for very worthy causes. Since 2002, NASTT has raised nearly \$930,000 and used those funds in support of our many educational initiatives. Due to your generosity, NASTT is able to provide targeted trenchless training courses to the industry, publish trenchless resources manuals and sponsor university students' attendance at NASTT's No-Dig Shows, as well as award scholarships.



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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

Kieran Field, Chair
Phone: (604) 990-4800
E-mail:
kieran.field@opusdaytonknight.com
Website: nastt-bc.org

ELECTED OFFICERS

Chair - Kieran Field
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, Chair
Phone: (905) 304-0080
E-mail: 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

Richard Thomasson, Chair
Phone: (703) 842-5621
E-mail: rthomasson@arcadis-us.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

Jeff Boschert, Chair
Phone: (314) 229-3789
E-mail: jeffboschert@yahoo.com
Website: mstt.org

ELECTED OFFICERS

President - Jeff Boschert
Vice President - Chris Schuler
Secretary - John Milligan
Treasurer - Gary Smolinski



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

Dennis Doherty, Chair
Phone: (603) 320-6331
E-mail: ddoherty@haleyaldrich.com
Website: nastt-ne.org

ELECTED OFFICERS

Chair - Dennis Doherty
Vice Chair - Ian Mead
Secretary - Walter Fromm
Treasurer - Babs Marquis

NASTT CHAPTERS



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

Craig Vandaele, Chair
E-mail: cvandael@nastt-nw.com
Website: nastt-nw.com

ELECTED OFFICERS

Chair - Craig Vandaele
Secretary - 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

Chris Sivesind, Chair
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Website: pnwnastt.org

ELECTED OFFICERS

Chair - Chris Sivesind
Vice Chair - Brendan O'Sullivan
Secretary - Brandon Simonds
Treasurer - Matt Pease



ROCKY MOUNTAIN

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

CHAPTER CONTACT

Joe Lane, Chair
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E-mail: jlane@hebna.com
Website: rmnastt.org

ELECTED OFFICERS

Chair - Joe Lane
Vice Chair - Chris Larson
Secretary - Benny Siljeborg
Treasurer - Stephanie Nix-Wille
Past Chair - Bo Botteicher



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

Larry Johnson, Chair
Phone: (800) 856-7473
E-mail: ljohnson@hobaspipes.com
Website coming soon!

ELECTED OFFICERS

Chair - Larry Johnson
Vice Chair - Alan Goodman
Secretary - Luis Cuellar
Treasurer - Josh Kercho, P.E.



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

Jerry Trevino, Chair
Phone: (877) 462-6465
E-mail: jerry@mechanicaljobbers.com
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

Cindy Preuss
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Website westt.org

ELECTED OFFICERS

Chair - Cindy Preuss
Vice Chair - Brian Avon
Secretary - Lisa Arroyo
Treasurer - Matt Wallin

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NASTT STUDENT CHAPTERS

NASTT Student chapters are involved in a number of activities throughout the academic year including field trips, seminars and fundraisers. Members of student chapters also 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 a NASTT student chapter – scholarships, networking opportunities, education and career opportunities to name a few. To learn more about NASTT's 18 student chapters, visit nastt.org/about/student-chapters.

**ARIZONA STATE UNIVERSITY**

Tempe, Arizona
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**BOWLING GREEN STATE UNIVERSITY**

Bowling Green, Ohio
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**CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA**

Pomona, California
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**CLEMSON UNIVERSITY**

Clemson, South Carolina
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**CONCORDIA UNIVERSITY**

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**INDIANA UNIVERSITY - PURDUE UNIVERSITY
INDIANAPOLIS**

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**LAVAL UNIVERSITY**

Quebec City, Quebec
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**TRENCHLESS TECHNOLOGY CENTER/LOUISIANA TECH
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**MCGILL UNIVERSITY**

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**MONTANA TECH**

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**QUEEN'S UNIVERSITY**

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**OKLAHOMA STATE UNIVERSITY**

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**RUTGERS UNIVERSITY**

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**UNIVERSITY OF ALBERTA**

Edmonton, Alberta
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**UNIVERSITY OF MASSACHUSETTS AT LOWELL**

Lowell, Massachusetts
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**UIRE/UNIVERSITY OF TEXAS AT ARLINGTON**

Arlington, Texas
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**VANDERBILT UNIVERSITY**

Nashville, Tennessee
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**VIRGINIA TECH UNIVERSITY**

Blacksburg, Virginia
 Advisor: Dr. Sunil Sinha
 E-mail: ssinha@vt.edu

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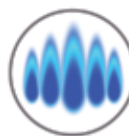


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What Happens When a Microtunnel Passes through Mixed Face Ground with Hazardous Gas and Encounters Unexpected Reinforced Concrete, Timber Piles and a 10-in. High-Pressure Gas Main

RORY P.A. BALL

Mott MacDonald, Cleveland, Ohio

RICH LEON

*Orange County Sanitation District (OCSD),
Fountain Valley, California*

MARTIN DIX

*Orange County Sanitation District (OCSD),
Fountain Valley, California*

MARK BRIGGS

Brown & Caldwell, Irvine, California

This paper presents a harrowing story of a microtunnel that abruptly ended when the microtunnel boring machine (MTBM) collided with a 10-in. (254-mm) high-pressure active gas main under the bustling Pacific Coast Highway in Newport Beach, California. Starting from a shaft located in the median strip of the highway, the MTBM passed under multiple travel lanes in a particularly congested area of the city. The paper discusses how an explosive disaster was averted, lessons learned from microtunneling through gassy mixed face ground in a tidal environment, and how the project team dealt with unexpected debris, reinforced concrete and timber pile obstructions.

This two-phase project improved the sewer conveyance force mains located along Pacific Coast Highway between Dover Drive and the OCSD Bitter Point Pump Station. Microtunneling, cured in place pipe and open cut methods were used to install the 32-in. (813-mm) HDPE pipeline. On the microtunnel segment, a 42-in. (1070-mm) diameter machine mined approximately 690 feet (210 meters) before striking the gas line; 340 ft (104 meters) shy of the receiving shaft. Multiple project stakeholders imposed tight logistical and other work restrictions, compounding the difficulties experienced during the drive. Difficulties on the job were managed effectively through the project team's pro-active collaboration and communication with everyone involved.

DESIGN PHASE

A 1,000-ft (305-meter) pipeline reach of the Project's first construction phase required replacement with a new south barrel force main of a minimum 30-in. (762-mm) internal diameter passing through or around the interchange of PCH and the SR-55 Newport Boulevard Bridge Overpass as shown in Figure 1.

In order to meet the requirements of constructing this reach, the design team performed an exhaustive research and record drawing collection. This effort included public utility, transportation department (Caltrans) and City of Newport facilities and improvements to define all potential alignments for both tunneling and open cut work. Geotechnical and dewatering experts were engaged to determine conditions and identify methods that would be required to construct the various alternatives identified by the engineering team. Coordination with the jurisdictional agencies and stakeholders took place to identify constraints for work areas, traf-

fic control concepts and working hours to be observed as part of a constructible, permittable and maintainable solution. Regrettably, the city limited the number of soils borings and utility potholes to be performed during design and construction, preferring not to inconvenience the community. This decision would ultimately impact all stakeholders during construction.



Figure 1 – Tunnel alignment along Pacific Coast Highway in Newport Beach, California.

A potential dig and replace solution was evaluated for the south barrel in its existing location which abuts the south side of the overpass bridge. However, the complex and unusual pipeline geometry and poor hydraulics, difficult construction, impact on utilities and structures, as well as impact on the community and traffic made it undesirable. This left the team with the challenge of identifying a solution for passing under the bridge on PCH, which has a vertical clearance of only 17 ft (5.2 meters) and limited width needed for traffic through lanes as seen in Figure 2.

Open cut as well as several tunneling technologies were considered by the team for the pipe alignments. These trenchless technologies included auger bore and jack, Horizontal Directional Drilling (HDD) and microtunneling. Cured-in-place pipe (CIPP) was used in several other locations of the project, but was not applicable to the portion shown in Figure 1. Criteria for implementing each method stressed protection-in-place of the bridge and utilities and avoidance of known abandoned facilities such as old bridge pier/abutment foundations. Placement of the new piping longitudinally directly above or below existing utilities would not be allowed.

The team eventually determined a tunnel on the order of 1,000 ft (305 meters) long would be needed to “clear” the interchange area between acceptable locations for launching and receiving shafts. The use of HDD and auger boring were deemed unsuitable due to the required machine pressures, preventing inadvertent returns potential, handling of groundwater, and reducing ground loss in flowing sands and mixed face conditions. This left slurry microtunneling as the most viable solution. A two-pass methodology [48-in. (1220-mm) steel casing plus 32-in. (813-mm) HDPE carrier pipe] was identified and also found to be acceptable to Caltrans.



Figure 2 – View down the tunnel alignment from the launch shaft on Pacific Coast Highway.

GEOTECHNICAL CONDITIONS

Geotechnical exploration along the alignment was limited to locations adjacent to the proposed tunnel due to strict limitations imposed by regulatory agencies during design. Because of this limitation, anticipated geotechnical conditions below Newport Boulevard Bridge at tunnel depth were extrapolated from available exploration and inferred from geology of the area.

Regional geology and geomorphology of the site area is an expression of complex interactions between the Santa Ana River, coastal processes and the Newport-Inglewood fault. Groundwater elevations fluctuate with the tidal cycle along the alignment. The generalized stratigraphic conditions for the tunnel alignment consisted of following:

- Launching the MTBM into a full-face of the siltstone bedrock of the Capistrano Formation;
- Transitioning to undulating mixed face conditions of rock and soil; and
- Finishing the drive in a full face of soil.

Siltstone bedrock was determined to be unweathered to weathered, medium- to high-plasticity, and soft near the contact and joints, becoming increasingly harder and less weathered with depth. Very thin to thin interbedded sandstone and sand layers exist within the siltstone unit. Mining in the fresh, hard, medium to high plasticity siltstone bedrock was baselined

as possibly creating clogging problems at the MTBM face and slurry ports.

The nature of the contact between the soil and underlying siltstone bedrock is erosional and therefore undulating. Granular soil (marine sediment) with five percent coarse-gravel to cobble-sized material was encountered near the contact. Tunnel mining in mixed-face conditions would present challenges associated with MTBM steering and potential overmining of cohesionless units at the heading.

CONSTRUCTION PHASE

In April 2014, the contractor was given notice-to-proceed. A series of meetings and work plan workshops were held almost immediately to underscore the contract requirements regarding considerations necessary to gain the approval of neighboring stakeholders and permitting agencies. Three of the key considerations for permits were the (typical) lengthy turnaround time for Caltrans' permit review, the summertime construction moratorium set by the city, and the limited lane closures allowed by both agencies. In regards to the Caltrans permit, the team sought to help the contractor submit a comprehensive application to increase the likelihood of approval in one round of Caltrans' review. This all-inclusive package needed the following items completed prior submitting the permit:

- Any changes to the contract or Value Engineering (VE) proposals would need to be submitted, reviewed, revised and approved;
- All tunneling-related submittals would need to be submitted, reviewed, revised and approved;
- The permit would need to be created and sent to the owner prior to Caltrans; and
- The owner and their reps would need to review the permit and provide a certified peer review of the final submittal package.

INSTRUMENTATION & MONITORING

One of the first activities was for the contractor to install settlement monitoring points along the alignment. Instrumentation and monitoring points are critical to observe tunneling induced effects on the surrounding environment and unearth problems early to proactively address operations. These monitoring points must be located within the influence zones of the shafts and tunnel, and laid out such that the information being read is not masked in any way (e.g. hard layers between the measurement point and the zone of ground loss). On this project, the highway shown in Figure 2 over the tunnel alignment in-

cludes pavement thicknesses up to 24 in. (610 millimeters) along with suspected buried remnants of a former military tank road located approximately 24 to 36 in. (610 to 1200 millimeters) below the ground surface.

This buried tank road was estimated to be 12 in. (305 millimeters) thick, 40 ft (12 meters) wide and comprised of unreinforced and reinforced concrete. Either one or the combination of these existing roads would reduce the effectiveness of settlement monitoring points if they did not penetrate from the surface, through the roads, to the ground above the tunnel crown. In this case, the appropriate engineering practice was to install sheathed extensometers from the surface to depths that leave native ground between the instrument's tip and the tunnel crown. These extensometers were needed at regular intervals along the tunnel alignment to monitor movement within the highway's travel lanes. Preventing excessive settlement of the highway was a major concern; therefore, the instrumentation plan built into the encroachment permit focused on monitoring the MTBM performance against the tight settlement requirements for utilities and roadways set by Caltrans. Unfortunately, the city did not support the need for these points as they would cause traffic impacts during installation and subsequent daily readings. Monitoring points would only be allowed by the city off the center of the alignment, and outside of the travel lanes or off/on ramps. The construction team had to work between these competing requirements to keep the project moving forward.

PRE-LAUNCH AND LAUNCH OF THE MTBM

Ventilation and monitoring systems were necessary to mitigate the hazards posed by natural gas and hydrogen sulfide at the MTBM launching and receiving shafts. Additionally, gas monitoring was performed at the separation plant where entrained gasses in the slurry would vent into open air. Nauseous odors that could be emitted from the gas would be controlled by odor mitigation fans that dispersed chemical agents above the separation plant. All spoil removal, slurry treatment, and dewatering systems were designed for the potential impacts of natural gas in all phases of construction. Once the requirements of developing the shafts and preparing the MTBM were completed, tunnel excavation was underway starting on Feb. 16, 2015, leaving 97 days left before the construction moratorium.

Soon after launching the machine, the team noted the performance feedback from the MTBM indicated one of the vital

on-screen pressure readings, slurry bulkhead pressure, was faulty. Because the MTBM's small diameter prevented face access, and surface access was not tolerable to stakeholders, the pressure sensor could not be fixed. Tunneling proceeded, and the construction team focused on effective slurry composition and management to safely mine through mixed face conditions of hydrostatically charged granular conditions over bedrock.

DEBRIS FIELD AND IMHOFF TANK

While mining through native ground, the MTBM sent back leather pieces, shells, wood, plastic, concrete, brick and gravel. These separation plant observations raised concern about the potential for obstructions. Shortly thereafter, the MTBM overtorqued several times each minute and cutterhead contact pressure fluctuated abnormally between 5.5 to 33 U.S. tons (5 to 30 metric tons). Within a short distance, the MTBM jumped up and to the left before it came to a complete stop. All parties agreed there may be an obstruction and a rescue shaft was required.

In a difficult location, the immobile MTBM was situated within the highway's travel lanes, right before a major intersection, and next to a busy off-ramp as seen in Figures 1, 2 and 3. Its exact position had to be verified and marked out on the surface by surveys; this led to the first set of temporary lane closures the city had been trying to avoid. Additional instrumentation points were added in the vicinity in anticipation of the subsequent pothole and rescue shaft effort to document adjacent settlement. Trying to understand what lay in front of the machine, the construction team installed a series of 30-in. (760-mm) diameter exploratory holes in front of it. These holes uncovered the debris seen in the separation plant as well as chunks of clay, wood planks, large pieces of timber, clay pipe, and concrete pieces up to 12 inches (300 millimeters) long. A plan was devised to remove the debris from the pathway of the MTBM and conduct additional exploratory potholes in front of the MTBM's path until there was no more debris found. Unluckily, these additional exploratory holes found a buried concrete structure.

Traffic control plans for temporary lane closures to access the MTBM allowed for a limited win-

dow of overnight work between 8 p.m. up until 11 a.m. or later if, at the city's daily discretion, traffic was not backing up. Actual exploratory work was reduced within this time period after accounting for the following activities: setting traffic control; removing traffic plates; establishing sump pumping; changing personnel; reestablishing traffic plates; and removing traffic control. As the rescue shaft was excavated, the contractor struggled to prevent soil from flowing into the pit and undermining the pavement. One sump was installed and two vac-trucks alternated to remove water from inside the excavation. These large vac-trucks filled in only 10 minutes as groundwater rapidly rebounded to approximately 7.0 ft (2.1 meters) below ground surface when only the sump was used. An adjacent gas line and a 20-in. (508-mm) diameter concrete pipe in the corner of the pit added significant amounts of water from the backfill around the pipes. When the MTBM was finally uncovered, it was revealed that a reinforced concrete wall extended to about 1-ft (305-mm) below the bottom of the cutter head with the MTBM resting on a concrete floor; likely the remnants of an abandoned Imhoff sewage tank foundation shown in Figure 3.



Figure 3 – Rescue shaft (left) to remove reinforced concrete obstruction (middle) and debris (right) from tunnel alignment.

UNDERGROUND FOREST

During the effort to clear the debris field and Imhoff tank obstruction, the construction team made the decision to take advantage of the highway lane closures to pothole utilities ahead of the MTBM. These utility location excavations underneath the bridge revealed existing timber lay within the path of the MTBM. Additional excavations were performed to determine the extent of this timber, but the effort was hindered by the short working time for lane closures, the flowing ground, and the limited headroom and width underneath the bridge. In the meantime, the MTBM cleared past the Imhoff tank debris

and began re-mining two days after this timber was discovered. Soon it was revealed the timber pieces were actually 12-in. (305-mm) diameter battered timber piles from an unknown old bridge foundation. Unfortunately, there was only 126 ft (38.3 meters) of mining until the MTBM would arrive at the piles.

Exposing the piles became a battle as the contractor fought through flowing soil conditions and significant volumes of water. Ground Penetrating Radar (GPR) was performed concurrently in the area to enhance the team's knowledge of how far the excavation needed to extend. As the excavation lengthened, the construction team joked that every update from the field seemed to include the discovery of more and more piles; this dubbed the area to be known as the "underground forest." After eight days of trenching and breaking apart existing concrete pile caps, it was revealed there were four rows of piles within the vicinity of the tunnel on 4-ft (1.2-meter) centers (see Figure 4). In total, 16 piles had to be removed to clear the tunnel horizon at an enormous impact to traffic. Ground conditions only allowed the excavation to safely proceed deep enough to expose the top 3-4 ft (0.6-1.2 meters) of piles.



Figure 4 – Pile obliteration trench (left); exposed battered timber pile tips (middle); timber pile (right).

HIGH-PRESSURE GAS MAIN

Simultaneous to the timber pile extraction operation, additional potholing ordered by the construction team continued towards the reception shaft. Although city stakeholders had only allowed utility location excavations to be dug off alignment before these issues, potholing was now done directly over the alignment with the flexibility ceded from lane closures related to the pile extraction. Of particular interest to the team were adjacent and traversing gas lines along the alignment. The contractor and the gas company had previously located utilities around Station 67+50 before the start of tunneling, but only off the center of the alignment as allowed by the city. This previous ef-

fort revealed the top of a steel casing at 4.5-ft (1.4-meter) depth which was 9.5 ft (2.9 meters) above the MTBM crown. This utility was reported to be the high-pressure gas line noted on the contract documents as being within the general area. Because of the difficulties with the prior obstructions, the construction team undertook additional potholing at the centerline of Station 67+50 utilizing the active traffic control.

On the night of April 13, the contractor excavated from the surface near the alignment, to a depth of 13 ft (4.0 meters). However, flowing ground conditions hindered the effort. This excavation stopped two feet (0.6 meters) above the crown of the MTBM because the pavement was being undermined and the lanes needed to be open for traffic the next morning. Shoring was difficult due to the number of crisscrossing utilities near the surface that also drained addition water into the excavation. As the effort continued the following night, the gas company marked a line at 33 inches (838 millimeters) depth to be the sought after 10-inch (254-mm) high-pressure gas line at this location. This was reported to be a non-redundant line providing gas to the affluent Balboa Peninsula located across the harbor from the construction operation.

On April 14, the MTBM operator was mining at the maximum operational speed of 9.8 in/min (250 mm/min) in favorable sandy ground conditions. At Station 67+50, the MTBM suddenly showed spikes in contact (earth) pressure and torque, which led to the MTBM operator to immediately stop the mining. These spikes, like at the Imhoff tank, indicated a hard material or object. Because the MTBM was within the vicinity of the gas line, the team met and decided not to advance and grind away at the obstruction as they were unsure of the accuracy of the gas company's assessment. The team now feared there could be a deeper gas line or other unknown structure associated with a gas line. Alongside the contractor, the gas company worked to excavate at this location from the sidewalk to across the alignment.

On the second night of potholing, work started with sawcutting pavement for a larger excavation. Excavation on this night reached approximately 11 feet (3.4 meters), a few feet short of the MTBM crown. An 8-inch (203-mm) wrapped steel pipe running perpendicular to the tunnel alignment was found at a depth of 5 feet (1.5 meters). This line was tapped and found to be an abandoned line not part of the gas transmission, but it was noted that the pipe added noise in the electronic sounding. Before the excavation could proceed further, the operation

was ceased to reopen highway's lanes. A weak sand-slurry backfill was added to stabilize the highway and remediate the pavement undermining that had occurred.

During the third night, three vacuum trucks were mobilized but could not reach any deeper than the previous night. This effort was hindered by additional groundwater flowing into the excavation from granular backfill around the crisscrossing utilities. Time ran out on the shift and the excavation was again back-filled with sand-slurry before steel plates were placed over the excavation.

On the fourth night, the arduous effort finally made it to tunnel depth. It was observed that the MTBM was in direct contact with the now-dented steel casing that housed the high-pressure gas line. The concern for the construction team was the effect of the MTBM's collision on the gas line. To find out, the gas company would need a larger, more stable excavation to open the casing and assess the pipe. With the moratorium only 33 days away, it was decided the battle was over and the MTBM would need to be extracted. A large excavation had to be extended to the back of the machine in this problematic location. Only one highway lane could remain for this work, with occasional complete closure in the north-bound direction.



Figure 5 – Rescue shaft in the middle of Pacific Coast Highway (left) to access the MTBM that indented the steel casing (middle) housing the high-pressure gas main (right).

In the end, it took 11 days to extract the machine using six dewatering wells and a 20x8-ft (6.1x2.4-meter) sized excavation. It took another seven days for the gas company to assess damage to the gas line and repair this section. As seen in Figure 5, both the casing and the actual gas line were affected by the MTBM cutterface. This was a serious near-miss. With the “no work” deadline approaching, the team raced to place the new south force main back into service. After the gas line repair, it took another 14 days for the sewer pipe to be rerouted above this gas line, open cut the remainder of the way to the reception shaft, and to repave the surface. In the end, the team performed repair work 21 days past the summertime moratorium.

LESSONS LEARNED

All tunnel projects have their challenges. Microtunneling this project was particularly difficult in the tough ground conditions, with tight logistical constraints, and considering the three major obstructions encountered. In review of the chain of events, the authors offer the following reflections:

- Confirm every known utility, existing foundation, or abandoned structure is clear of the alignment, prior to tunneling. If appropriate, extend pothole excavations below tunnel depth if the obstruction cannot be found. If this type of operation were permitted during design of the Project, more information would have been gained about the existing buried tank road, buried utilities and possibly the underground Imhoff tank.
- Had there been evidence of buried wooden piles within the path of the tunnel during design, the owner could have chosen other options to attempt to avoid or remove the obstructions as part of the bid documents.
- Install instrumentation points at appropriate depths along the alignment for an important source of feedback regarding MTBM performance. When alarm values are reached, take appropriate action.
- Slurry composition and slurry management is critical to reducing ground loss in mixed face and granular soil conditions.
- Geophysical studies that are calibrated with actual potholing information can be very useful in the right environment.

Throughout the entire effort, communication was key. Meetings were held at daybreak between OCS, the tunnel consultant, the design consultant, and the contractor. Close communication was also held with the gas company. OCS acted in a decisive manner after considering the available options each day. Having a tunneling specialist who represented the owner in the MTBM control cab was important for assisting the interpretation of data and proactively forecasting potential issues that endangered the project. The combination of a vigilant MTBM operator and the efforts of the third party tunneling specialist mitigated the potentially disastrous outcome at the gas line.

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