



NASTT's *Trenchless Today*

Educate - Train - Research - Publish



Summer 2015 | Volume 5 | Issue No. 2



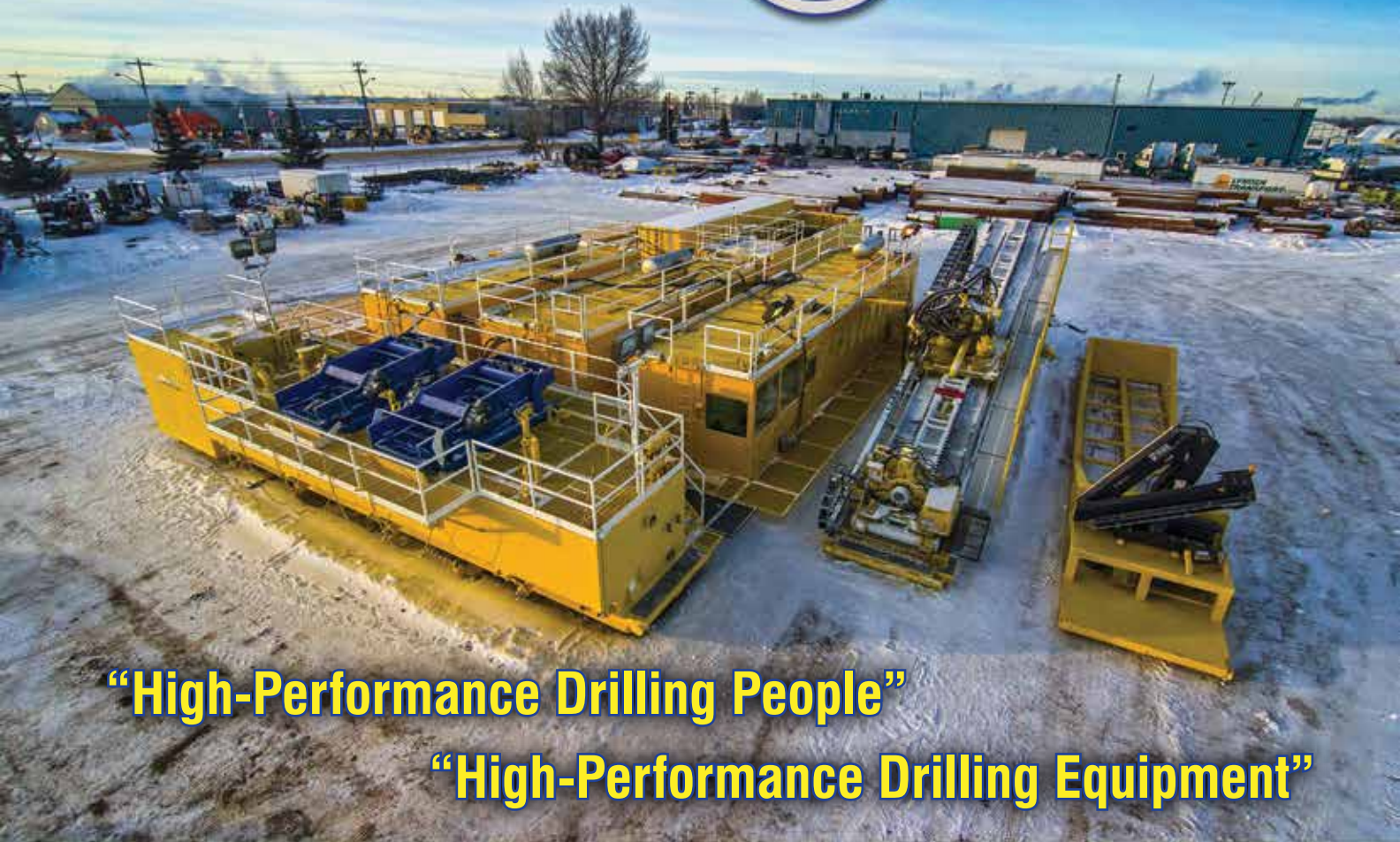
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 Simply put, the best No-Dig Show ever. We take a look back at our record-breaking event in Denver and all the things that continue to make NASTT's No-Dig Show the best trenchless technology conference in the world.

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The Premier Trenchless Event... Undisputed.



We're only halfway into 2015 and what a fantastic year it has already been!

As many of you know, NASTT's 2015 No-Dig Show in Denver was hugely successful. We broke our attendance record by hundreds of registrants and our exhibit hall was completely sold out. We asked why you come to the No-Dig Show, and we learned more than we could have hoped for. You came for the first class exhibit hall, for our peer-reviewed technical paper sessions, for effective networking opportunities and for a chance to socialize with your trenchless industry peers. We are thrilled that NASTT's No-Dig Show can be a one-stop shop for trenchless professionals from all over the world.

This year we proved that we are, without a doubt, the premier trenchless conference.

A highlight of our show, and an event that is near and dear to my heart, is our Gala Awards Dinner. The NASTT staff had the great honor of inducting the 2015 Hall of Fame Class. This year's inductees included the late David Magill, Jr. (1943-2014), Ron Halderman and Kaleel Rahaim.

David Magill, Jr. was a pioneer in the chemical grout industry and was the first president of Avanti International, a company that he championed for more than 30 years. In 1990, David was one of the seven Charter Members of NASTT providing the initial funding to start our Society. David's son, Daniel Magill, accepted this honor for his father.

Ron Halderman graduated from the Colorado School of Mines and for the past 35 years has been working in the drilling industry. For 27 of those years, Ron has been a leading figure in the HDD industry. He has helped innovate many of the procedures currently being used by HDD

contractors and consultants throughout the world. Ron is a registered professional engineer and is the director of HDD for the Mears Group.

Kaleel Rahaim is a graduate chemical engineer from Mississippi State University. He has experience in many different aspects of engineering such as project and process engineering and has been involved in the thermoset polymer industry for more than 30 years. A true trenchless champion, Kaleel is the business manager for pipeline remediation polymers of the Thermoset Resins Division of Interplastic Corp. and is a tireless volunteer instructor for NASTT's CIPP Good Practices Course.

All three of these fine men embody the spirit we look for in Hall of Fame inductees, and it was our privilege to honor them during the Gala Awards Dinner.

Along with honoring professionals who have spent their careers dedicated to the trenchless industry, we also had the privilege to recognize the future leaders of the industry with the Trent Ralston Award for Young Trenchless Achievement. The recipients of the award this year were Dr. Alison St. Clair and Dr. Alireza Bayat.

Alison has a bachelor's from the University of Pittsburgh at Johnstown, a master's from Pennsylvania State University and a Ph.D. in civil engineering at Virginia Polytechnic and State University. Today, Alison is a project engineer for Gibson-Thomas Engineering Co., located in Pennsylvania, where she serves as the water distribution and wastewater modeling and management specialist. Alison continues her NASTT volunteerism by assisting in the coordination of No-Dig Show student activities and serves on the NASTT Young Professionals Committee.

Alireza is a faculty member at the University of Alberta and Director of the Consortium for Engineered Trenchless Tech-

nologies (CETT) – the unique research initiative in Western Canada. Ali is also a Board Member of NASTT's Northwest Chapter and the advisor for the University of Alberta NASTT Student Chapter.

NASTT annually recognizes two companies with state-of-the-art products in either new installation or rehabilitation for their achievements in advancing the trenchless industry. We received many applications for the Joseph L. Abbott Innovative Product Awards. It's always a difficult, yet very exciting task to review all the new products and narrow down the finalists to two winners. This year was no exception as all the products deserved the recognition. The awards committee selected the PipePlug from Source 1 Environmental and the Grundopit-K Keyhole Mini-Directional Drill from TT Technologies. Congratulations!

In closing, I would like to thank all of the many volunteers who made our show not only possible, but such a resounding success. Our 2015 Program Chair, Richard (Bo) Botteicher of Underground Solutions and Vice Chair Jeff Maier of C+L Water Solutions put in hours and hours of volunteer time to help bring you this record-breaking conference. Bo and Jeff worked closely with our Program Committee, comprised of more than 100 volunteer members, to peer review every technical paper presented. Many of our Program Committee members also served as Session Leaders and dedicated even more time working with the paper authors to fine tune the presentations.

Lastly, I would like to recognize the dozens of event sponsors that make all of this possible. We thank you for your continued support of our industry, the Society and the annual NASTT No-Dig Show.



Mike Willmets
NASTT Executive Director

OUT OF SIGHT, OUT OF MIND

INFILTRATION IS OUT OF CONTROL

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Denver Delivers No-Dig To Remember



NASTT's 2015 No-Dig Show was my first show as the Chair of the NASTT Board of Directors, and I'm thrilled with the results. Downtown Denver proved to be the perfect location to host this record-breaking event.

More than 2,300 trenchless professionals from all over the globe attended the conference for training, networking and fun. We started off with the Kickoff Breakfast on Monday morning where we were able to recognize many of our devoted volunteers and members. This list included the Board of Directors, our 2015 No-Dig Show Program Committee, event sponsors and our 2015 Program Chair, Richard (Bo) Botteicher of Underground Solutions and Vice Chair, Jeff Maier of C+L Water Solutions.

We were excited to be able to host nearly 100 Municipal and Public Utility Scholarship winners again this year. The scholarship program was developed in 2013 to help municipal and utility employees who might not otherwise be able to attend our event due to budget cuts and travel restrictions. It is important that our cities, counties and public utilities hear the trenchless message, and we are working hard to spread the good word.

We also recognized some of our bright student members who are the future of trenchless technology. We are happy to support the trenchless leaders of tomorrow through our Michael E. Argent Me-

morial Scholarship Program. Each year NASTT awards scholarships to exceptional members in our student chapters. These students have demonstrated success both inside and outside the classroom. This year we recognized Amanda Kerr of Arizona State University and Andrew Wallin of Vanderbilt University.

The technical sessions are always a main highlight of the conference, and this year was no exception. We had 160 peer-reviewed technical papers covering dozens of topics over the course of six tracks and three days. This year, we hosted the first-ever Pipe Bursting Forum moderated by Program Chair Bo Botteicher. The panel of industry experts discussed the past, present and future of pipe bursting technologies and answered questions from the audience during this lively discussion.

Monday night we celebrated during an event that is always a blast – the 14th annual Educational Fund Auction and Reception. This year's theme was Totally Rad Slopes, a 1980s ski party! We enjoyed drinks, appetizers, some great social networking and of course, raised money for a great cause! Since 2002, we've raised more than \$815,000 and used those funds in support of our educational initiatives. With these resources we are able to sponsor students' attendance at NASTT's No-Dig Shows, award scholarships, publish trenchless resources and provide targeted training

courses to the membership.

During Tuesday night's Gala Awards Dinner, I had the privilege of honoring my friend and a truly exceptional man, Dave Krywiak of Stantec Consulting, with NASTT's Chair Award for Outstanding Lifetime Service. Dave has been an active participant and avid supporter of the trenchless industry at the local, regional and national levels since attending his first No-Dig conference in Toronto in 1995. He is one of the founding members of NASTT's Northwest Chapter, and his involvement in NASTT at the national level has included vital roles on the NASTT Board of Directors (2009 through 2014) and the No-Dig Show Program Committee for many years running. He served as the NASTT Treasurer for the past three years as well. Dave is certainly the embodiment of Outstanding Lifetime Service.

Even though NASTT's 2015 No-Dig Show was a resounding success in every way, we're ready to top it next year. Please make plans to join us March 20-24 at the Gaylord Texan Convention Center in Dallas, Texas, for NASTT's 2016 No-Dig Show where we will once again learn about the latest and greatest trenchless developments, network with top professionals in our industry and have a great time.

I hope we will see you in Dallas!



Dr. Kimberlie Staheli
NASTT Chair

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So True, So False

Get the Facts about NASTT's No-Dig Show Paper Schedule

I don't know about everyone else, but I'm still on cloud nine thinking back to NASTT's 2015 No-Dig Show. This issue of *NASTT's Trenchless Today* is packed full of stats and photos from the conference, and it makes me reflect on how we got to this point.

An incredible amount of work goes into each and every element of the conference, but I'm of course most proud of the educational offerings. Ever wonder how we pack in 160 educational sessions in just three days? Do you think you might be interested in presenting next year? Lucky for you, I've got the inside scoop on education here at NASTT. Inspired by none other than E! News, I bring you the So True, So False of NASTT's No-Dig Show Program Schedule.

Is it true that the papers and presentations from NASTT's No-Dig Show are reviewed by a Program Committee of more than 100 volunteers?

So true! The NASTT Program Committee is more than 100 volunteers strong, and this committee reviews each and every abstract that is submitted for consideration. An extensive, online scoring system is used to get initial feedback, and then every summer the committee meets in person to discuss the abstracts. Once the abstracts are scored and reviewed they are placed into topic tracks to create the three day paper schedule.

Is it true that once an abstract is accepted, the author is on their own to write the paper and prepare their PowerPoint presentation?

So false! Once an author has been accepted into the paper schedule, he or she will be contacted by their volunteer Session Leader. Session Leaders are Program Committee members who are experts in their field. Each Session Leader peer reviews one track, which includes four to five papers and presentations. They go above and beyond to make sure that papers and presentations are the best they can be. Session Leaders are considered the silent heroes of NASTT's No-Dig Show.

Is it true that NASTT strives to present non-commercial material?

So true! One of the big qualifiers that every Program Committee member is looking for is an educational paper and presentation free of commercial content. We have a 90,000 sq-ft exhibit hall where people can sell their hearts out, but in the classroom we like to keep it strictly educational.

Is it true that people have to take a ton of notes in their onsite notebook during a session because you can't get the information anywhere else?

So false! We definitely encourage people to take notes during the presen-

tations, but if you missed something, you can always download the full paper from our online library. The library holds more than 2,000 files and is the home of every paper ever presented at NASTT's No-Dig Shows. What's even more exciting is that members can download the papers for free!

Is it true that there is still time to submit an abstract for NASTT's 2016 No-Dig Show?

So true! NASTT is accepting abstracts for the 2016 conference up until June 30, 2015. Check out the Call for Abstract ad in this issue or visit nastt.org/abstract-submission for more details.

Now that you have the facts, it's time to get involved! Submit an abstract, join the Program Committee or better yet, volunteer to be a Session Leader. You won't be disappointed.

OUR APOLOGIES

In the Winter 2015 edition of *NTT*, the Education Update recognized several of NASTT's dedicated webinar volunteers and instructors. Don Del Nero's company was incorrectly identified. Don works for Stantec.



Michelle Hill
NASTT Program Director



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NASTT's Q&A with Chris Brahler



Technology and equipment is a market driver in any field, and in the trenchless industry, perhaps no one has witnessed the progression like TT Technologies President & CEO Chris Brahler.

What was your introduction to the construction industry?

When I got out of college, I took a job in Minnesota as a management trainee working for Condux International selling cable plows. We were working on a job for a local telephone company and they were looking for a way to get around plowing through roadways. We found that there was a Russian company, a Polish company and a German company (Tracto-Technik) all making piercing tools in Europe. There really wasn't much domestically at that time, so we started going over to Europe to figure out how to bring these tools to North America. We eventually started purchasing the tools from the German company.

Was this when you first became familiar with trenchless technologies?

Yes. It was around 1978 when we started bringing those tools over from Germany, which we found to be the most accurate. We ordered a bunch of the tools to sell over here but soon realized that nearly every one of the tools we initially sold had broken down. We learned that Europeans do almost twice-a-day daily maintenance, so they were servicing the tools more frequently. We then launched an R&D program for the next three years with Tracto-Technik to develop tools for the North American market and developed what became the North American version of the Grundomat. It was essentially a different tool only it was bulletproof as far as needing service. It didn't require the same maintenance, had U.S. dimensions instead of metrics, etc. Condux International had an equipment division Vibra King Inc., selling vibratory plows and we brought this in as a product to distribute with that.

At that time, did you feel there was real potential/momentum with this industry?

What we learned each time we had gone to Europe was that all types of equipment was emerging for similar types of basic trenchless work because of the old infrastructure. The Germans were telling us about rammers and pipe cracking, and we started learning more about the piercing tools and even developed some rammers for North America similar to what we did with the piercing tools. Directional drills were also starting to emerge in Europe and the United States, and there was an explosion in all forms of trenchless around the late 1980s and early 1990s in ramming, pipe bursting and HDD. It's not very often you see a revolution in construction where the methods change so dramatically as they have since the late 1980s.

Following up on that, how do you characterize the growth of the manufacturing side of trenchless? It seems equip-

ment and technology is a huge driver for any industry, especially trenchless. Do you feel that's still the case?

Well, the promotion and education of piercing tools went well because they were easy to demonstrate, low cost and solved big problems. But from that point forward, you really had to create the market at the municipal level and get engineers educated. There was a tremendous amount of effort in creating those markets for the companies making these pipe crackers, pipe rammers and piercing tools. But once Ditch Witch and Vermeer got into it, it wasn't very many years before America overtook the rest of the world in quality and capabilities of the drill rigs. It's really the creativeness of American contractors that invented this and drove it forward, which is terrific.

Tell me about how you first got involved in NASTT. How would you characterize its growth?

We were still up in Minnesota with Condux/Vibra King when it started so we didn't become members right away, but became members within the first two or three years of NASTT's inception. We found NASTT was the natural place to be because that's where engineers and municipalities were coming together to create the market. NASTT really fulfilled a nice purpose back in those days and continues to today. What's getting very good about the No-Dig Show is that the technical program involves a lot of case studies that are presented from the engineers, the utilities and the contractors involved in the projects. There's such a high-quality and non-commercial set of case studies.

It seems a lot of people in this industry are familiar with your contributions. Do you feel you've reached a high point in your career, or do you want to achieve more in this industry?

I never really think about myself, but I will say at TT Technologies we really have a great group of people. And our customers, some of them are really good friends. Without the municipalities, the engineers and the utilities all working together, we would be nothing. Really, the work ethic of the North American workforce has been outstanding in its acceptance of trenchless technology and pushing the manufacturers to grow it even more. To me, we're just doing what we need to do to service the customers in our industry.

How did it feel to receive the Chair Award for Lifetime Service at the 2014 No-Dig Show?

You know, I tried to talk them into giving it to someone else! I told Derek [Potvin, then NASTT Chair], "Come on, I could name a handful of other people you could give it to." But Derek advised I was getting the award. After receiving it, when I came back to our office at TT Technologies, we had a sales meeting and I showed it to everyone in the room and I told all our guys that I don't want anyone to feel like it's just me. We're all playing a role in growing the company and growing the industry.

Few would question that TT Technologies has been a leader in the trenchless industry, and as a company, you're still developing innovative products and systems like your Grundopit K-keyhole drill. What do you see for the future?

Well, the market is still continuing to grow and there are still an awful lot of people out there who don't know what trenchless technology is yet. We're also getting back into the re-education process. So many entry level people come into the industry and they don't even know what a piercing tool is. You know, we actually thought the piercing business would decline when HDD became as strong as it is, but it's just the opposite. The piercing tool business has picked up dramatically and people have really figured out how to use tools economically. But we're still spending a lot of time educating and re-introducing technologies. That's why I'm such a big believer in NASTT and education.

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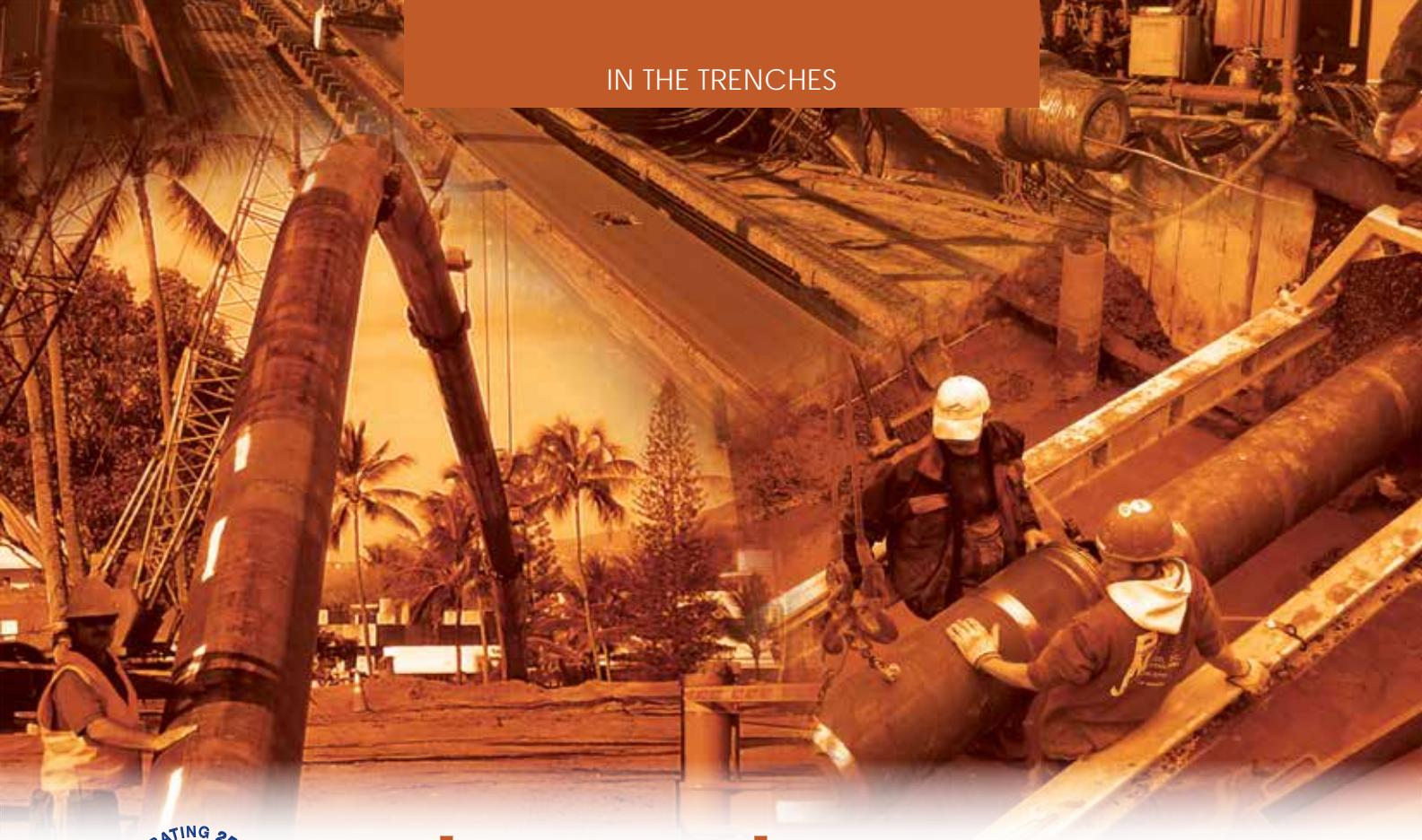


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In the Trenches

By Andrew Farr

Many NASTT members and volunteers are experts in their respective disciplines in trenchless technology. NASTT takes pride in their contributions to the industry, and while there's not nearly enough space here to encapsulate their careers and full range of accomplishments, here's a quick look at Erez Allouche, Glenn Duyvestyn and Tony Hranicka, and a few of the ways they are driving the industry forward.

Erez Allouche Stantec



Even though Dr. Erez Allouche is an engineer, he's also been an architect of the trenchless technology industry's future through his accomplishments in research and education.

Up until last year, Allouche served as an associate professor of civil engineering and director of the Trenchless Technology Center (TTC) at Louisiana Tech University. He has supervised more than 50 graduate students in the field of buried infrastructure, many of whom are now practicing professionals or educators in the field of municipal engineering.

Allouche earned his Bachelor's in Civil Engineering and Master's in Structural Engineering from Queen's University. From the time the fields of engineering and construction first piqued his interest in school, trenchless technologies and methods have remained his specialty. In fact, Allouche was awarded the first student scholarship from NASTT in 1998 and traveled to Albuquerque, New Mexico, to attend the No-Dig Show.

"That was when I got a much wider exposure to trenchless technology and I got very interested

in lining technology," he says. "I found trenchless technology to be a fascinating combination between construction methods, design methods and material science. That ability to innovate and develop new technologies and new products truly fascinated me."

Allouche later completed his Ph.D. in Construction Engineering and Management at the University of Alberta in 2000, and since then, has held a number of positions in the research and academic arena. Throughout his career, he has been the inventor or co-inventor of 17 patents in various areas of trenchless technology including a multiple-port sampler for the collection of soil samples from directionally-drilled boreholes.

In 2003, Allouche joined Dr. Ray Sterling as co-director of the TTC, also working closely with Dr. Rob McKim, and took over as the sole director in 2011. During that time, Allouche was integral in expand-

ing the accessibility of the TTC, helping to bring in more research revenue and managing more student and faculty research.

"At that time, we were able to secure several large grants that really allowed us to bring a lot of innovation into the market," he says. Among the most notable technology the TTC brought to the market during this time, Allouche says, was the FutureScan condition assessment technology currently being used by CUES. Allouche says the TTC also spent a lot of time on research for geopolymer liners.

Allouche is the author or co-author of more than 240 publications in the fields of buried infrastructure management and trenchless techniques, including 60 peer-reviewed journal papers. He is also the co-founder of two start-up companies based in Ruston, La., and served as an associate editor of the ASCE Journal of Pipeline

Systems.

Professionally, Allouche had spent his entire career working on the academic side of the industry until last year when he joined Stantec as the trenchless technology leader for its Tunneling and Trenchless Technology Practice. He currently focuses on the condition assessment and rehabilitation of large diameter pipes, as well as the design of complex HDD crossings.

"I spent all my life in academics, and in a sense, I felt like after 24 years it's time to graduate," he jokes. "It took me about 24 years to figure out I need to get a real job. Over the years, I've trained hundreds of undergraduate students, and really, I wanted to have an opportunity to have exposure to consulting, particularly in design. I have a strong desire to work on large projects and fortunate now to have the opportunity to do so."

**Glenn Duyvestyn
Hatch Mott MacDonald**



Glenn Duyvestyn, Ph.D., P.E., P.Eng., is one of the foremost authorities in North America in trenchless technologies, and says his interests started as a child.

"As a kid I loved looking at construction sites and seeing big, heavy equipment," he says. "What kid wouldn't love that?"

Even today, Duyvestyn says he likes being hands-on. "I love the challenges," he says. "I like getting into the nitty-gritty, fine details of projects doing technical evaluations and being on-site, watching the work being done and helping to right the ship."

Duyvestyn received his doctorate degree in civil engineering from the University of Waterloo in Ontario.

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He says it was during a research opportunity at the university when he first started studying about pipe integrity and capabilities of pipelines for new construction that piqued his interest in the field. He says through his master's program, he got involved in the NASTT student chapter at the University of Waterloo, which exposed him further to the world of trenchless technology. While studying for his Ph.D., he focused his research on horizontal directional drilling (HDD) and ground movements.

Since receiving his doctorate, Duyvestyn has worked in a variety of engineering consulting positions and is now a senior trenchless specialist with Hatch Mott MacDonald. He says working at Hatch Mott MacDonald has allowed him the opportunity to work on both smaller projects and large projects, while at times, pushing the limits on the larger ones.

"Hatch Mott MacDonald does it all," he says. "They have a huge tunneling group that designs massive tunnels, new construction with direction drilling, microtunneling and Direct Pipe right through to pipe bursting and other rehab methods."

As far as pushing the limits, Duyvestyn has been involved in numerous projects that fall into that category. One example is the Empire Connector Extension Project in Corning, N.Y., for which Duyvestyn served as principal project manager and chief engineer for Hatch Mott MacDonald. The project involved difficult and unique use of directional drilling for a 2,643-ft, 24-in. diameter natural gas line crossing beneath major obstacles including the Chemung River. It also involved the first-ever North American use of Direct Pipe methods for installation of large-diameter containment casing for HDD and was named *Trenchless Technology's* 2013 Project of the Year for New Installation.

Duyvestyn says it's the combination of innovative projects and the growth of educational initiatives in the trenchless industry that are

helping it to rapidly develop.

"HDD is massive nowadays," he says. "The energy sector is driving a lot of that work, but we're putting pipelines in where we never thought we could put pipelines in using trenchless. Look at the proceedings [at NASTT's No-Dig Show]. HDD used to be two time slots. Now every day there's an HDD track. That just shows the growth and I don't see that slowing down."

Duyvestyn serves on NASTT's No-Dig Show Program Committee and is an instructor for NASTT's Good Practices courses for HDD and pipe bursting. Two years ago, he assisted ASCE in updating its Manual of Practice for HDD. He has presented at NASTT's No-Dig Show nearly every year since 2000. He has evolved from a student presenting research to an industry expert presenting technical papers. Duyvestyn says the No-Dig Show has evolved in this area over the years, and the variety and quality of technical papers is what keeps the show getting bigger and better.

"Every so often there's a year where the papers focus on different applications for methods that discuss, 'We've done it that way, now let's try it this way.' I think this year is one of those years. You see a lot more papers where people are trying to apply methods where they haven't been applied before. I think that everybody's evolving as the technology evolves."

Tony Hranicka Gas Technology Institute



The trenchless technology industry in North America has so often benefitted from advancements in technology and methods closely tied with the municipal water and sewer industry. Nevertheless, the gas industry remains an ever-evolving market for trenchless applications, and Tony Hranicka, P.E., has seen the

evolution firsthand.

For 33 years, Hranicka worked for Con Edison in the service territory within and around New York City. Most of his time there was spent as a project manager responsible for evaluating and implementing new technologies to increase the efficiency and effectiveness of gas operations. For about half of his time with Con Edison, Hranicka was involved in the development and application of trenchless technologies to help rehabilitate the aging gas system.

Up until recently, Hranicka has spent most of his professional career working on the utility side. Before then, he attended Manhattan College where he received his bachelor's in mechanical engineering in 1980. He also completed a master's in engineering from Manhattan College 1985 and later, a second master's from the New York Institute of Technology in 1997.

Early in his tenure with Con Edison, Hranicka was required to work in various assignments across the utility, but later opted to join the gas operations group where he grew his expertise in gas engineering and construction.

Eventually, he transitioned into a role in construction administration and inspection where he spent time overseeing third-party contractors working on sewer and water line rehabilitation. Hranicka's job was to oversee the protection of gas and electric lines and relocate them as necessary.

"I learned about gas engineering and construction, but also what needed to be done to protect the infrastructure," he says. "That was always very interesting and exciting especially in the NYC environment."

Hranicka says techniques and methods for the rehabilitation of gas lines don't really differ much from working with water and sewer lines.

"A pipe is a pipe," he says. "Just the same [as water and sewer], you need to get through logistical jobsite aspects, and the repair and

rehabilitation technology needs to transcend whatever you find in pipes. You need inspection and cleaning methods, you need removal of protrusions, you need rehab methods to be able to seal through elbows and re-open services. Gas is very analogous to water and sewer in many of those respects.”

After his 30-plus years with Con Edison, Hranicka joined the Gas Technology Institute (GTI) earlier this year as a senior engineer in its Delivery Sector. He works in both project management and principal investigation helping develop new technologies and innovative products.

GTI is a leading research, development and training organization that has been addressing global energy and environmental challenges by developing technology-based solutions for nearly 75 years.

Hranicka had interacted with GTI for many years as a member

of the Operations Technology Development, NFP (OTD) Technical Project Committee (TPC). GTI is contracted by OTD to provide overall program management for the member-controlled company where participants leverage research funding and steer the direction of projects related to gas operations and infrastructure.

Hranicka 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. He is the recipient of the American Gas Association 2007 Gas Industry Research Award for commercialization of the Cast Iron Joint Sealing live robotic system (CISBOT) program.

Recently, Hranicka has also become heavily involved in NASTT. He is a current member of the Board of Directors, a member of the No-Dig Show Program Committee as well as a session leader

and moderator.

“We do see a lot of benefits for the natural gas industry to use more trenchless techniques to substantially decrease excavation and restoration costs, as well as reduce public inconveniences and increase safety. I think NASTT recognizes the huge potential for growth in gas applications and the opportunity to educate utilities as to how, where, why, and when trenchless technologies should be used in gas main and service rehabilitation.

“There could be some really powerful collaboration between NASTT and GTI from a research perspective. If there’s a technology gap that needs to be filled, GTI can assist in identifying and developing a solution that can be disseminated to the gas utilities so that it can be properly applied.”

Andrew Farr is the associate editor of NASTT's Trenchless Today.

TRENCHLESS DEMOLITION PIPEPLUG SYSTEM

Winner of the 2015 NASTT Innovative Trenchless Product of the Year Award, PipePlug seals laterals and bulkheads at the main line prior to demolition. This termination eliminates groundwater infiltration and the need for traditional excavations, resulting in an economical and effective solution for cities that are looking for a trenchless system. PipePlug is a faster, stronger and more powerful tool to be added to your trenchless technology toolbox.

Pillow Repair System 2015 NASTT Innovative Trenchless Product of the Year Award Finalist

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Why Go to No-Dig?

NASTT's 2015 No-Dig Show Answered in Record-Breaking Fashion

Construction tradeshow – regardless of attendance, however vast the exhibit hall or however many drink tickets for the reception are included with an attendee badge – can get bland. Sometimes it's the location, sometimes it's the poor quality of technical sessions and sometimes it's just a lack of zest in networking events.

NASTT's No-Dig Show is not that.

It's unique. Intimate. And each year, it's as much an educational opportunity for trenchless professionals as it is a celebration of the industry that perhaps only those who are a part of it can truly understand and appreciate.

Last year, NASTT staff, along with our partners and friends at Benjamin Media, began a campaign to promote the 2015 No-Dig Show, as we do every year, to bring a unique theme to the conference. This year, we wanted to do something different. We wanted to not only communicate the trenchless message and the value of the No-Dig Show, but we wanted to get to the heart of why people attend. We asked the question, "Why do you go to No-Dig?" The responses were wide-ranging and reaffirming.

So, as part of our theme/campaign for this year's show, we shared those real-life views. We wanted to remind people that we represent an expanding industry still starved for information and growth, and that the No-Dig Show provides many avenues for that growth.

If you're an NASTT member or in the trenchless industry, then you may have heard this year's No-Dig Show in Denver shattered attendee and exhibitor records. The best we've had so far.

Perhaps our theme struck a chord. Maybe not. Either way, our question was answered and there really are numerous reasons people come to NASTT's No-Dig Show. At one point during the 2015 show, rumors were swirling around the conference that attendance was through the roof. At that moment, the success of the No-Dig Show became a testament to where we are as an industry.

It has taken the work of countless pioneers and leaders to help develop the North American trenchless technology industry. It's also taken the followers – the next generation – to help mature and modernize it. It's been a long journey to get to this point. We don't take any of it for granted.

LEADERSHIP & AWARDS

Looking back on this year's show, Denver turned out to be a fitting host city for NASTT's 2015 No-Dig Show, March 15-19. The State of Colorado is a major engineering hub and is home to many companies in the trenchless technology industry. In case you're wondering about those numbers, attendance was nearly 2,400, along with 173 exhibiting companies.

The festivities began on Monday, March 16, with the annual Kick-Off Breakfast. NASTT recognized the Society's leaders – the 2015 Board of Directors including new Board members Michael Davison, product director at the Aqua-Pipe Division of Sanexen Environmental Services Inc.; Gerald Lundquist, director of gas and construction for New York for National Grid; and Ed Saxon, general manager for the Beaufort Jasper Water & Sewer Authority.

The Kick-Off Breakfast also recognized NASTT's 2014 Outstanding Papers. For the Rehabilitation category, the Outstanding Paper Award was presented to Paul Pasko, P.E., James Wojcehowicz, Mark Kilheffer, Brad Marquardt and Dave Wasserburger for the paper, "The Three C's of Water Main Rehabilitation: Cooperative Agreements, Cured-in-Place Pipe Lining and Competitive Bidding." In the New Installation category, the award went to Marc Gelinis, Shu He, John Grennan and Armenio Martins for the paper "Microtunneling Overcomes Design and Construction Challenges to Accomplish Three Notable Firsts."

Later, Dan Liotti, CEO of Midwest Mole, was formally presented the 2015 *Trenchless Technology* Person of the Year award. The winners of the 2014 *Trenchless Technology* Projects of the Year were also recognized. Attendees were then treated to entertainment by Craig Karges, a nationally-recognized speaker, author and award-winning entertainer for his mind-reading skills.

EXHIBITS, EDUCATION & AUCTION

Year after year, NASTT's No-Dig Show continues to be popular for its well-respected Technical Program. This year there were 160 peer-reviewed papers presented across six tracks. Headlining the Technical Program this year was a Pipe Bursting Forum and a track devoted entirely to trenchless construction in the gas industry. The exhibit hall is another attraction of the No-Dig Show, in



NASTT's 2015 Board of Directors were welcomed on stage during the Opening Kick-Off Breakfast at No-Dig on March 16.

which attendees can see first-hand the latest technology helping to drive the trenchless industry's place in utility construction.

On Monday night, the 14th Annual Educational Fund Auction and Reception was held. The auction is one of the most popular networking events at the No-Dig Show and one that is often valued by attendees after a busy first day. This year's auction raised more than \$70,000, which goes toward financial support for NASTT's 15 student chapters and other educational initiatives. Since 2002, the auction has raised more than \$800,000.

Among the many items that were donated and bid on this year, the popular Mortimer the Sewer Rat once again stole the show. The winning bidder was Akkerman, which means Mortimer will spend the next year traveling with the Akkerman team.

In an effort to tie-in the auction with some local flavor – Denver's popular skiing attractions – the auction had a fun 1980s skiing theme. Many in the crowd were decked out in their best day-glow neon, leg warmers and puffy jackets, taking part in the annual costume contest. Taking first place was Jim Rankin of Vermeer for his ski resort hot tub costume and Vicki Miner of Benjamin Media for her version of skiing on Pike's Peak in Colorado. In NASTT's Hawaiian Vacation Raffle

(announced at the Closing Luncheon), the winner was Wally Armstrong of Liberty Sales and Distribution.

GALA AWARDS DINNER

NASTT's No-Dig Show takes pride in bringing together the industry's past, present and future, honoring the enduring work trenchless professionals have created. Since its inception, NASTT's Hall of Fame ceremony continues to be one of the most prestigious events of the No-Dig Show, where inductees are honored at the Gala Awards Dinner. This year, the Hall of Fame inducted the late David Magill Jr., Avanti International; Ron Halderman, Mears Group; and Kaleel Rahaim, Interplastics Corp.

Dave Krywiak of Stantec Consulting received NASTT's Chair Award for Outstanding Lifetime Service. Alison St. Clair of Gibson-Thomas Engineering and Dr. Aliraza Bayat, director of the Consortium for Engineered Trenchless Technologies at the University of Alberta, both received the Trent Ralston Award for Young Trenchless Achievement.

With technology driving the market in the trenchless industry, NASTT's No-Dig Show is the place to unveil the latest innovations. There were many new products in both rehabilitation and new installation in the exhibit hall in Denver. This year, the annual Jo-

seph L. Abbott Jr. Innovative Product Awards were presented to Source One Environmental for its PipePlug System and to TT Technologies for its Grundopit-K Keyhole mini directional drill. Source One and TT Technologies were recognized at the Gala Awards Dinner.

MORE THAN RECORDS

For NASTT and the trenchless community, the 2015 No-Dig Show was certainly one to remember. Breaking records is a great accomplishment, but we also recognize that people don't go to the No-Dig Show just to add to our attendee count. They go because they recognize that all across North America, infrastructure is aging, failing or in need of serious attention and that looking for cost-effective, innovative technology and methods to address these problems isn't just an option, but more often a necessity.

They go because they want to learn more. They go because they believe in an industry that's on the rise.

In 2016, the 25th annual No-Dig Show will be held in Dallas, March 20-24 at the Gaylord Texan. The deadline to submit an abstract for the technical program is June 30, 2015. Flip to page 26 for more on next year's show.

Complied by NASTT's Trenchless Today staff.



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1 A record 173 trenchless companies filled the exhibit hall at the Colorado Convention Center.

2 Jeff Urbanski (left) and Mike Moore (right) of Source One Environmental. The company was awarded the Joseph L. Abbott Jr. Innovative Product Award for its PipePlug System.

3 The TT Technologies team poses for a photo after being awarded the other Innovative Product Award for the company's Grundopit-K Keyhole mini directional drill.

4 (L-R): NASTT Chair Dr. Kimberlie Staheli, 2015 No-Dig Show Program Chair Bo Botteicher, and NASTT Vice Chair Frank Firsching getting ready to cut the ribbon and officially kick off the 2015 No-Dig Show.

5 The exhibit hall at NASTT's No-Dig Show is the ideal place to discuss trenchless methods, technology and facilitate exhibitor-attendee interaction.

6 Live demos such as this one at Perma-Liner Industries' booth take place throughout the day in the exhibit hall.

7 Picote Solutions presents its pipe cutting tools to the Innovative Product Committee Tuesday in the exhibit hall.

8 Global Machinery describes its underground cable pulling machine to members of NASTT's Innovative Product Committee.



4

“As the trenchless industry has grown, so has the No-Dig Show – and the 2015 No-Dig Show in Denver truly smashed the record books. There were 20 percent more attendees this year than any other year. More exhibitors and exhibit space than any other year. There is a palpable, steadily-increasing interest in trenchless technologies and the Rocky Mountain region definitely demonstrated this fact as the No-Dig Show visited the area for the first time.”

RICHARD “BO” BOTTEICHER, NASTT'S 2015 NO-DIG SHOW PROGRAM CHAIR



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- 1 The crowd gathers at the pre-Gala Dinner reception on Tuesday, March 17. Apparently only a few were in the St. Patrick's Day spirit.
- 2 Daniel Magill delivers a heartfelt speech at the Gala Awards Dinner, talking about his Dad, the late David Magill, Jr., and accepting the NASTT Hall of Fame induction on his behalf.
- 3 NASTT Chair Dr. Kimberlie Staheli gives Ron Halderman a Hall of Fame pep talk while pinning his Hall of Fame pin to his jacket before the Gala Awards Dinner.
- 4 Kaleel Rahaim reflects on his incredible career in the resin industry and thanks his supportive wife and family during his formal induction into NASTT's Hall of Fame.



2

- 5 Dr. Aliraza Bayat, director of the Consortium for Engineered Trenchless Technologies at the University of Alberta, receives the Trent Ralston Award for Young Trenchless Achievement.
- 6 Alison St. Clair of Gibson-Thomas Engineering receives the other Trent Ralston Award from Dr. Kimberlie Staheli and Frank Firsching.
- 7 Dave Krywiak cracks a smile during his speech after accepting the Chair Award for Lifetime Service.
- 8 The entertainment surprised everyone with a sneak peak performance at the Gala Awards Dinner. Dr. Kimberlie Staheli really fooled us with those microphone shenanigans!
- 9 The Gala Awards Dinner is great event to sit back, enjoy all the prestigious awards and enjoy dinner with some great entertainment.



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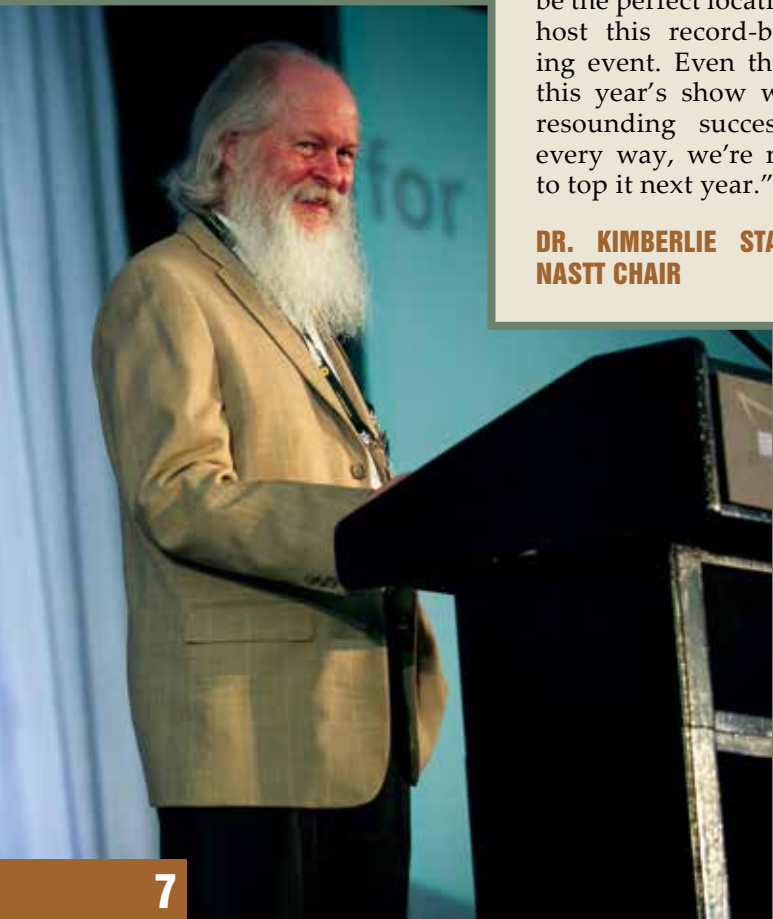
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“NASTT’s 2015 No-Dig Show was my first show as the Chair of the NASTT Board of Directors, and I’m thrilled with the results. Downtown Denver proved to be the perfect location to host this record-breaking event. Even though this year’s show was a resounding success in every way, we’re ready to top it next year.”

**DR. KIMBERLIE STAHELI,
NASTT CHAIR**



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- 1 The educational tracks at NASTT's No-Dig Show are second to none in the world of trenchless.
- 2 The Pipe Bursting Forum offered attendees a comprehensive look at the pipe bursting market in North America and its growth in recent years.
- 3 Alan Ambler of the City of Casselberry, Fla., poses a question to the panel during the Pipe Bursting Forum.
- 4 Marc Gelinas accepts the Outstanding Paper Award in the New Installation category from Dan Willems (left) and Kevin Nagle (right).
- 5 The Outstanding Paper Award in the Rehabilitation category was presented to (from left) Paul Pasko, James Wojcehowicz, and John Richmond.
- 6 Attendees talk trenchless during a technical session.
- 7 Chris Macey of AECOM is one of the many volunteer instructors who teach NASTT's Good Practice Courses at the annual conference.
- 8 (L-R): NASTT's 2015 Educational Fund Auction Committee Volunteers Brenda Kingsmill, Michelle Beason, Jackie Haas, Bernie Krzys, Cindy Preuss, Joe Lane and Brian Avon.
- 9 During the Educational Fund Auction, attendees bid on a wide range of items including jewelry, electronics, sporting event tickets and trenchless tools and equipment.



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“Common in the technical sessions I attended was rooms full of copious notetaking and eager attendee participation with Q&A. I cannot seem to walk away from a session without at least one solid gem of information imparted through the lessons learned on case studies presented. No-Dig delivers every time!”

**CINDY PREUSS,
HYDROSCIENCE ENGINEERS**



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1 Auction Committee volunteer Michelle Beason encouraging attendees to bid.



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2 NASTT's 2015 No-Dig Show Program Committee Chair Bo Botteicher displays Mortimer the Sewer Rat during the auction. Mortimer ended up with the Akkerman team.



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3 (L-R): Joe Lane, Jim Rankin, Jeff Maier, Bo Botteicher and... yes, George Ragula in the snowman costume, took some time to display auction items for the bidders.



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4 While Richie Bros. Auctioneers conducted the live auction, a silent auction was also held which included a wide range of items up for bid. To date, NASTT's Educational Fund Auction has raised more than \$800,000 for NASTT's educational initiatives.



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“Since attending my first No-Dig Show as a student just beginning, to now as a professional, every show has benefited me with new networking opportunities. The show has brought me excitement year after year with new opportunities to learn about new engineering feats.”

**ALISON ST. CLAIR,
GIBSON-THOMAS ENGINEERING**



3

- 1** Stephen Welling (middle) presents the most enthusiastic team award in The Amazing Trenchless Race to the Trenchless Tigers from Clemson University.
- 2** Jim Rankin (far left) and Matt Pease (far right) award students from Louisiana Tech University first place in the Student Chapter Presentations.
- 3** NASTT sponsored 65 students from 11 different Universities so they could attend this year's conference and learn more about the trenchless industry.
- 4** The Charles P. Lake Rain for Rent Scholarship is presented to Leo Schlinger (left) of Arizona State University.



4



A Look Ahead to NASTT's 2016 No-Dig Show

The World's Largest Trenchless Technology Conference Turns 25



Shah Rahman of Northwest Pipe Co. speaks at the 2015 No-Dig Show Closing Luncheon about the new South Central regional chapter, which will serve as host chapter for the 2016 No-Dig Show in Dallas.



Jeff Maier of C&L Water Solutions will serve as the 2016 No-Dig Show Conference Chair. He was already in Texas mode at the auction!

Texans have a saying that everyone knows: "Everything's bigger in Texas." Expectations will be no exception for NASTT's 2016 No-Dig Show when it rolls into the Gaylord Texan Convention Center, March 20-24 in Dallas next year.

And that's the way it should be. Expectations should be sky high after the show's record-breaking turnout in Denver this past March, and NASTT staff and conference organizers will be looking to capitalize on the tremendous momentum the show has garnered in recent years. Next year's show will also be a special one.

"The 2015 No-Dig Show in Denver was a resounding success with record breaking attendance and a sold out exhibit hall," says Jeff Maier, director of engineering for C&L Water Solutions and 2016 No-Dig Show Conference Chair. "As the Conference Chair for 2016, I am absolutely thrilled to see the growth of the No-Dig Show over the past several years and look forward to carrying this momentum into Dallas next year."

To help support the much-anticipated follow up to Denver, NASTT's newest regional section, the South Central Chapter, will serve as the host chapter. This chapter is still in its infancy but will be working hard to spread the word around Texas and the South Central United States about the No-Dig Show and all things trenchless in order to gain even more regional support. Shah Rahman, director of trenchless technology and pipe rehabilitation for Northwest Pipe Co., will serve as Chapter Chair and will be providing updates to NASTT's Trenchless Today in upcoming issues.

NASTT is now accepting abstracts for NASTT's 2016 No-Dig Show. Prospective authors are invited to submit a 250-word abstract outlining the scope of their paper and the principal points of benefit to the trenchless industry. The abstracts must be submitted electronically by June 30, 2015.

NASTT's all-volunteer Program Committee has grown to nearly 100 members. These industry experts will be meeting in Dallas on July 22 and reviewing every abstract that is submitted. Authors will be contacted in late August regarding the status of their acceptance in NASTT's 2016 No-Dig Show Technical Program. For more information, visit nastt.org.

NASTT's 2016 No-Dig Show Call for Abstracts



March 20-24, 2016

Gaylord Texan Convention Center
Dallas, TX

Submission Deadline: June 30, 2015

The North American Society for Trenchless Technology (NASTT) is now accepting abstracts for its 2016 No-Dig Show in Dallas, Texas at the Gaylord Texan Convention Center on March 20-24, 2016. 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, 2015: nastt.org/abstractsubmission.**

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

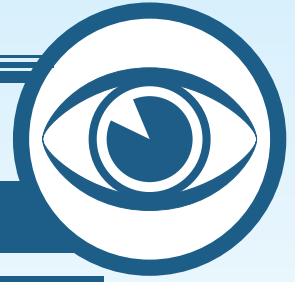
Questions? Please contact:

Michelle Hill
NASTT Program Director
E: mhill@nastt.org
P: 440-638-4676

The 2016 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.



For more information visit
nodigshow.com



NASTT'S EYE ON THE INDUSTRY

OUR MEMBERS IN ACTION

Mosquito Pass Cable Conduit Install

Universal HDD
San Juan Island – HDD

Universal HDD supplied drilling equipment and operational training on a horizontal directional drilling (HDD) project – the Mosquito Pass Cable Conduit Installation Project for the Orcas Power and Light Cooperative on San Juan Island.

The San Juan Islands are an archipelago located in Washington State between the U.S. Mainland and Vancouver Island, British Columbia, Canada.

The Mosquito Pass Cable Conduit Installation required a directional drilling installation of approximately 2,000 lf of 8-in., HDPE SDR 7 pipe – the majority in solid rock formations, from San Juan Island, under Mosquito Pass, to Henry Island. The purpose of the new 8-in. pipe was to provide a casing to replace a failing electric underwater power cable and provide an option for future Internet and water services to Henry Island.



The trenchless contractor, Trenchless Construction Services LLC, purchased a new Universal HDD 250 X 400 Directional Drill and Off-board Mud Pump System. Universal HDD general manager Alex Veytsman was instrumental in providing the new 250 X 400 Directional Drill and Off-board Mud Pump System to meet the construction schedule. Universal HDD also provided operational training of trenchless employees and assisted with the initial jobsite set-up.

Pearl City to Ford Island Waterline Crossing

Underground Solutions, Inc.
Pearl City, Hawaii – HDD

In late 2014, the Pearl City Peninsula to Ford Island Waterline Crossing Project was completed, replacing approxi-

mately 3,800 lf of deteriorated 24-in. cast iron water main. The new pipeline will serve as a primary artery connecting the existing Pearl Harbor Complex with its primary potable water source in Waiawa. The project supports the mission of COMNAVREG (Commander, Navy Region) Hawaii by supplying an efficient and safe transmission line to provide potable water and fire protection to Ford Island, the Pearl Harbor Naval Shipyard and Hickam Air Force Base.



Approximately 3,500 lf of the new waterline was installed using horizontal directional drilling (HDD), with the balance installed by open-cut. The HDD alignment crossed under the Naval Special Warfare (NSW) Compound and the Pearl Harbor channel before surfacing on Ford Island. HDD offered a feasible and cost-effective means of installing the pipe through the very soft harbor sediments. Directional drilling has been used successfully on previous underwater crossings in Pearl Harbor for both sewer and water pipelines.

Miami-Dade WASD I/I

Electro Scan Inc.
Miami, Florida – Inflow/Infiltration

Recently, the Miami-Dade Water & Sewer Department (WASD) was experiencing problems with wastewater infiltration and exfiltration from sanitary sewers and into the groundwater table. Anywhere groundwater is able to seep into the pipes, then wastewater is able to escape the pipes. Untreated wastewater contaminating the groundwater is an obvious environmental and public health concern.

To address these challenges, Miami had been in search of an effective method for locating defects in their sanitary sewer system. In the city's search for effective I/I location methods, Miami found

one such innovative technology to find its worst sewer defects in Electro Scan.

The Electro Scan probe releases a focused array of low-voltage high-frequency electrical current, of only 10 volts and 40 milliamps, which locates and quantifies all defects in non-conductive sewer mains and laterals. Most sewer pipe materials are electrical insulators. A defect in the pipe that leaks water will also leak electrical current. For a constant applied voltage, the larger the defect, the greater the electric current recorded. This is also the case for water in that for a given water pressure, the larger the hole, the greater the flow.



With the high-visibility of the technology and its data throughout the county, the decision was made within county management to present the technology to AECOM, the selected consultant, for inclusion into Miami-Dade's three-year, 3 million-mile Sanitary Sewer Evaluation Study (SSES) program. Specifications have been written to include Electro Scan inspection and reporting to meet Miami-Dade's unique applications.

Arizona Water Rehab

Warren Environmental Inc.
Mesa, Arizona – Water Relining

As part of its role in providing clean and safe drinking water to residents and business, the City of Mesa, Arizona's Water Resources Department regularly inspects water delivery infrastructure to monitor its condition and facilitate prioritization of maintenance and improvement projects. As part of this process, the city discovered that a 42-in. diameter pre-stressed concrete cylinder pipe (PCCP) waterline for the Pasadena Reservoir – which fills the reservoir from the Val Vista Treatment Plant – suffered from deterioration in the segment that passes through a development.

The contractor proposed a trenchless option using the Pressure Infusion Lining System developed by Warren Environmental Inc. of Carver, Mass. The Pressure Infusion Lining System involves epoxy combined with a carbon fiber lining to create a structural rehabilitation. The system eliminates the need for wet-out facilities, over the road transport of weight restricted materials, refrigeration concerns and the need for steam or boiler trucks. The NSF epoxy is much safer for over the road transportation and is mixed at the application head.



The first step of the rehab process involves lining the interior of the existing pipe with a layer of epoxy – Warren S-301, which is NSF-approved and has a 30-year history in the water and wastewater industry. The epoxy can be spray-applied by an operator or applied using a robotic “spincaster.”

The Pressure Infusion Lining System can operate in pipes ranging from 2 in. to 10 ft in diameter and in lengths ranging from 10 to 700 lf. The Mesa project, which involved a length of 30 ft of 42-in. pipeline, marked the first installation of its type. The result was a great success.

TransCanada Pipeline Project

Michels
Fort McMurray, Alberta – HDD

Michels has completed the first winter portion of HDDs on the TransCanada Northern Courier Pipeline project. The work is a series of large diameter drills that will make up a portion of the pipeline linking an oil sand mine in northern Alberta with a tank farm near Fort McMurray.



Michels Canada has been contracted to execute six 42-in. diameter HDDs as well as a 42-in. Direct Pipe installation north of Fort McMurray, Alberta. The 42-in. diameter projects span a combined 24,000 ft under rivers, lakes and tributaries. The Direct Pipe project stretches 1,007 ft under Highway 63. The 42-in. pipe is a casing pipe that will protect a 24-in. hot bitumen line.

The HDD projects are critical parts of the Northern Courier Pipeline, a 55-mile route. The entire route, including the HDD and Direct Pipe crossings, has been carefully planned to maximize safety

and constructability while minimizing environmental impact. Through March, two of the 42-in. installations have been completed.

Planning started long before Michels broke any ground on its portion of the Northern Courier project. Comprehensive planning is a key component of Michels’ HDD process that includes developing strategies and contingencies for all components of the HDD process, including equipment, mobilization, weather, environmental protection, geotechnical conditions and personnel.

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NASTT CHAPTER NEWS

British Columbia



Year by year, the BC Chapter of NASTT is continuing to develop programs to fulfill the mandate of NASTT, which is to promote, through education, the benefits of trenchless technology. In 2015, the BC Chapter is joining forces with the University of Waterloo and *Trenchless Technology* magazine to host a three-day Trenchless Road Show. Join us for this event in November 2015 in Richmond, BC.

Great Lakes, St. Lawrence & Atlantic



The Great Lakes, St. Lawrence & Atlantic Chapter of NASTT is busy working on its fall conference. The event will be held at the Hilton Niagara Falls on Oct. 15-16, 2015. The first day will consist of a full day of sessions along with an exhibit area and networking events. On the second day, NASTT's CIPP and Laterals Good Practices Courses will be available. For more information please visit www.glsla.ca.

Mid Atlantic



The Mid Atlantic Chapter (MASTT) had its Annual Membership and Board of Directors meeting at the NASTT's 2015 No-Dig Show in Denver at the Colorado Convention Center on March 15. MASTT also plans to publish its inaugural issue of the *Mid Atlantic Journal of Trenchless Technology 2015*. The journal has numerous Mid Atlantic project articles, messages and advertisements and can be seen online at www.mastt.org.

MASTT plans to host a Trenchless Technology, SSES and Buried Asset Management seminar in Mt. Laurel, N.J. on June 24-25, and another in Virginia Beach, Va., on Oct. 21-22. Please plan to support and attend the seminars to enjoy the networking and learning.

Please go to www.mastt.org/proposed_seminar.html to view MASTT's 2015 Proposed Seminar Schedule. Seminar locations and dates will be updated as the seminar dates, venues and programs are finalized. To participate in any of the seminars, please contact Leonard Ingram, MASTT Executive Director, at leonard@engconco.com for more information.

Midwest



The Midwest Chapter (MSTT) conducted a Trenchless Technology, SSES and Buried Asset Management seminar on May 7-8 in Council Bluffs, Iowa, at the Mid-America Center. The guest presenters were Jim Theiler, P.E., CSO manager for the City of Omaha Public Works, presenting "Trenchless Technology and Omaha's CSO Program" and Matt Cox, P.E., City of Council Bluffs city engineer, presenting "Trenchless Technology and Vacuum Sewer System in Council Bluffs." ASCE's Iowa and Nebraska sections were the co-sponsors for the seminar.

MSTT plans to have a "Trenchless Technology, SSES and Buried Asset Management" seminar in Indianapolis, Sept. 16-17. There will be a lot of networking and learning at the seminar, so please plan to support and attend the seminar if possible.

Also in September, MSTT plans

to publish and distribute the third annual issue of the *Midwest Journal of Trenchless Technology*. After the mail out, the journal can be seen online at www.mstt.org.

MSTT had its Annual Membership and Board meeting at NASTT's 2015 No-Dig Show in Denver at the Colorado Convention Center on March 15.

Please go to www.mstt.org/proposed_seminar.html to view MSTT's 2015 Proposed Seminar Schedule. Seminar locations and dates will be updated as the seminar dates, venues and programs are finalized. To participate in any of the seminars, please contact Leonard Ingram, MSTT Executive Director, at leonard@engconco.com for more information.

Pacific Northwest



The Pacific Northwest Chapter held its 2015 PNW Trenchless Symposium at Cedarbrook Lodge in SeaTac, Wash., on May 4-5. On Monday, trenchless professions attended NASTT's Pipe Bursting Good Practices Course and on Tuesday the chapter hosted a variety of presentations along with an exhibit area.



The Pacific Northwest Chapter held its 2015 PNW Trenchless Symposium in SeaTac, Wash., May 4-5.

Northwest Chapter



The Northwest Chapter is starting 2015 in typical fashion. Technical lunches are continuing in both Edmonton and Calgary with very good attendance.

The chapter will host its 19th annual Northwest Trenchless Conference this year. The 2015 conference is being held in at the Coast Plaza hotel in Calgary on Nov. 18-19. New Installation and Rehabilitation NASTT Short Courses will be held on Nov. 18 with the symposium and tradeshow on Nov. 19. This year, municipal scholarship opportunities to attend the conference will once again be available. Please check our website at www.nastt-nw.com for further information on these events.

As a follow-up from our success of last year, we were once again able to start off this year by contributing to the worthwhile programs within NASTT. As such, we were able to donate \$5,000 to the NASTT No-Dig Municipal Scholarship Program as well as \$2,500 to the No-Dig Educational Fund Auction, all which was very well received and appreciated.

The Northwest Chapter also recently completed elections for 2015, and we must congratulate Craig Vandaele

of Michels Canada and Siri Fernando of the City of Edmonton, for being re-elected to the Board of Directors for another two-year term. Greg Tippet of Stantec was also elected as a new Board member for a two-year term, and Alan Miller was re-elected for a one-year term as Chapter Chair. Once again, our Board is well positioned for further success in 2015, and we look forward to your continued support.

Rocky Mountain



The Rocky Mountain Chapter (RMNASTT) was very pleased and proud to host NASTT's record-breaking 2015 No-Dig Show at the Colorado Convention Center in Denver, March 15-19. Not only was the world's premier trenchless technology conference within our borders this year, but the Rocky Mountain region demonstrated its thirst for all things trenchless – obliterating the previous attendance record for the show largely based on the regional attendees who turned out in droves. RMNASTT chapter board members were busy interacting with all the local attendees who expressed interest in learning more about what is happening on a regional level with NASTT.

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NASTT CHAPTER NEWS



The RMNASTT chapter sponsored a lateral lining field demonstration along with the City of Boulder, Colo., on April 23.

There are several events already slated for the Chapter throughout the rest of 2015. The RMNASTT Chapter sponsored a lateral lining field demonstration event along with the City of Boulder, Colo., on April 23.

The RMNASTT Chapter will also hold its annual regional conference at the Inverness Hotel and Convention Center in the Denver Tech Center (south Denver), Nov. 4-5, 2015. After taking a year off in preparation for the No-Dig Show this spring, RMNASTT hopes to build off of the momentum of that record-smashing event with a full day of regional paper presentations, exhibitors and networking opportunities on Nov. 4. The Nov. 5 agenda will feature an NASTT promulgated Short Course. The conference dates will also coincide with the yearly release of the *Rocky Mountain Trenchless Journal*, which will complement the conference content as well as showcase local trenchless technology organizations and purveyors.

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For more information on RMNASTT, upcoming events and how to get involved, please visit www.rmnaastt.org, or contact Bo Botteicher at bbotteicher@ugsi.us.

Southeast



The Southeast Chapter (SESTT) plans to conduct a Trenchless Technology, SSES and Buried Asset Management seminar in Birmingham, Ala., Aug. 5-6 and in Shreveport, La., on Dec. 2-3. Please plan to attend and support these seminars if possible.

In December, SESTT plans to publish and distribute the second annual issue of the *Southeast Journal of Trenchless Technology*. After the mail out, the journal can be seen online at www.sestt.org. SESTT had its Annual Membership and Board of Directors meeting at NASTT's 2015 No-Dig Show in Denver at the Colorado Convention Center on March 15.

Please go to www.sestt.org/proposed_seminar.html to view SESTT's 2015 Proposed Seminar Schedule. Seminar locations and dates will be updated as the seminar dates, venues and programs are finalized. To participate in any of the seminars, please contact Leonard Ingram, SESTT Executive Director, at leonard@engconco.com for more information.

South Central



Help shape the future of trenchless in Texas and the South Central United States! NASTT is excited to announce the newly created South Central Regional Chapter. If you would like to get involved and volunteer to lead the charge in this new region, contact us at info@nastt.org.

Western



The Western Chapter of NASTT is putting together the final details for its fall conference which will be held in October in San Diego, Calif. For more information on the chapter and upcoming events please visit our website at www.westt.org.

NASTT's Trenchless Today Wants To Hear From You!

If you're involved with one of NASTT's 10 regional chapters, we want to hear about all your events and activities. Send write-ups and photos to associate editor, Andrew Farr, at afarr@benjaminmedia.com.

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NASTT REGIONAL CHAPTERS

N

ASTT has a network of 10 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
Vice Chair - Rod Loewen
Secretary - vacant
Treasurer - Preston Creelman



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
Phone: (507) 567-2261 x155
E-mail: csivesind@akkerman.com
Website: pnwnastt.org

Elected Officers

Chair - Chris Sivesind
Vice Chair - Brendan O'Sullivan
Secretary - Brandon Simonds
Treasurer - Melissa Staheli



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: nasttglsl.on.ca

Elected Officers

Chair - Kevin Bainbridge
Vice Chair - Vacant
Secretary - Gerald Bauer
Treasurer - Derek Potvin



Rocky Mountain

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

Chapter Contact

Bo Botteicher, Chair
Phone: (303) 521-2618
E-mail: bbotteicher@undergroundssolutions.com
Website: rmnastt.org

Elected Officers

Chair - Bo Botteicher
Vice Chair - Ken Matthews
Secretary - Chris Larson
Treasurer - Joe Lane



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@pirnie.com
Website: mastt.org

Elected Officers

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



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

Shah Rahman, Chair
Phone: (817) 529-8134
E-mail: srahman@nwpipe.com

Elected Officers

If you are interested in becoming an officer, contact Shah Rahman at srahman@nwpipe.com



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

Chair - Jeff Boschert
Vice Chair - Larry Kiest, Jr.
Secretary - Randy Fries
Treasurer - Bill Shook



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



Northwest

The Northwest Chapter was established in 1988 by members in the Canadian provinces of Alberta and British Columbia, Canada, and in Washington state. In 2009, the Chapter adjusted the geographic area to include the members in the provinces of Manitoba and Saskatchewan, Canada.

Chapter Contact

Alan Miller, Chair
E-mail: amiller@nastt-nw.com
Website: nastt-nw.com

Elected Officers

Chair - Alan Miller
Vice Chair - vacant
Secretary - Ben Campbell
Treasurer - Keith Moggach



Western

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

Chapter Contact

Craig Camp, Chair
Phone: (619) 881-0407
E-mail: craig.camp@hatchmott.com
Website: westt.org

Elected Officers

Chair - Craig Camp
Vice Chair - Cindy Preuss
Secretary - Cory Street
Treasurer - Matt Wallin



NORTH AMERICAN SOCIETY FOR TRENCHLESS TECHNOLOGY

NOMINATIONS BEING ACCEPTED FOR NASTT'S HALL of FAME Class of 2016

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

Nominee _____

Birth Date _____ Year NASTT Membership Started _____

Nominee or Next-of-Kin Contact Information

Name _____

Business Name (if applicable) _____ Business Phone _____

Business Address _____

Home Address _____

Home Phone _____ Email Address _____

Summary of Outstanding Achievements

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

Contact Information for the Principal Nominator

Name _____

Business Phone _____ Email Address _____

Completed applications along with (3) letters of recommendation and biographical information on the nominee should be directed electronically to Michael Willmets, NASTT Executive Director at mwillmets@nastt.org and must be received by no later than July 1, 2015.



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 student chapters, visit www.nastt.org/student_chapters.



Arizona State University
Tempe, Arizona
Advisor: Dr. Samuel T. Ariaratnam
E-mail: samuel.ariaratnam@asu.edu



McGill University
Montreal, Quebec
Advisor: Dr. Mohamad A. Meguid
E-mail: mohamed.meguid@mcgill.ca



Bowling Green State University
Bowling Green, Ohio
Advisor: Dr. Alan Atalah
E-mail: aatalah@bgnet.bgsu.edu



Queen's University
Kingston, Ontario
Advisor: Dr. Ian D. Moore
E-mail: moore@civil.queensu.ca



California State Polytechnic University, Pomona
Pomona, California
Advisor: Dr. Jinsung Cho
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Rutgers University
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Advisor: Dr. Nenad Gucunski
Email: gucunski@rci.rutgers.edu



Clemson University
Clemson, South Carolina
Advisor: Dr. Kalyan Piratla
E-mail: kpiratl@clemson.edu



CUARE/University of Texas at Arlington
Arlington, Texas
Advisor: Dr. Mo Najafi
E-mail: najafi@uta.edu



Concordia University
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Advisor: Dr. Tarek Zayed
E-mail: zayed@bcee.concordia.ca



Vanderbilt University
Nashville, Tennessee
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Indiana University - Purdue University Indianapolis
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Trenchless Technology Center/ Louisiana Tech University
Ruston, Louisiana
Advisor: Dr. Shaurav Alam
E-mail: shaurav@latech.edu



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NASTT

Since 2002 NASTT's Educational Auction Fund has raised over \$815,000. These funds will be directed toward educational and outreach activities offered by NASTT, including student scholarships, educational publications and developing new training courses. This fund would not be possible without the generous donations and sponsorships made by the following organizations in 2015:

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HydroScience Engineers	PTR Communications	WESTT Chapter of NASTT

For more information
about the auction visit: nastt.org/auction



McOrmond Drive Sanitary and Storm Trunks Project

Dave Krywiak
Stantec Consulting Ltd., Edmonton, Alberta

Craig Vandaele
Michels Canada Co., Nisku, Alberta

Dan Willems
City of Saskatoon, Saskatoon, Saskatchewan

Andy Heekin
CH2M HILL Canada Limited, Saskatoon, Saskatchewan

INTRODUCTION

The City of Saskatoon is located in central Saskatchewan, and has a population of 254,000, making it the province's largest city. Saskatchewan grows half Canada's major export crops: wheat, oats, barley, rye, flaxseed and canola. Saskatoon is at the heart of this market, providing a variety of services and products to the farm sector. Mining is also an important part of the economy. The Saskatoon region is the world's largest exporter of uranium, and nearly two-thirds of the world's recoverable potash reserves are located here.

Due to the strong economy being experienced throughout the province, Saskatoon has been experiencing significant growth in recent years, with the population expected to double within the next 30 years. The southeast area of Saskatoon has been targeted for development to eventually accommodate up to an additional 80,000 population.

In preparation for this growth, the city is extending their sanitary and storm trunk systems to allow for the continued servicing of the area as development proceeds. The sewer trunks are being extended along McOrmond Drive for a distance of over 1,500 meters (4,921 ft). The sanitary trunk sewer is 1,200 millimeters (47 in.) in diameter, with the storm trunk sewer is 2,400 millimeters (94 in.) in diameter. To maximize the future area that can be serviced by gravity, the trunk sewers will be installed at a depth of approximately 14 meters (46 ft).

The city decided to use a Design-Build (DB) project delivery method, based on recent positive experiences with this

procurement method on several major transportation projects. CH2M HILL was selected to be the Owner's Engineer and tasked with preparing the DB documents. This paper presents the process for completing the detailed design and moving forward through construction, and the challenges the team had to overcome.



Figure 1 - Locations for the proposed trunk sewers.

DESIGN-BUILD PROCESS

Prequalification and Bid Preparation Period

Due to the magnitude of the project, a request for prequalification of DB teams was prepared and issued in November 2011. Following the prequalification, the RFP was issued to the four prequalified contractor teams in February 2012. Proposals were received by the city on May 7, 2012 and City Council awarded the project to the Michels/Stantec team on July 5, 2012.

Even without knowing whether the Michels/Stantec team would be successful in winning the project, a number of significant decisions had to be made by the team during the proposal preparation. Due to the depth of the proposed trunk sewers and their alignment paralleling a busy arterial roadway through an existing residential subdivision, a trenchless installation was specified. For the sizes of the trunk sewers and minimal available grade, conventional tunneling and microtunneling were includ-

ed as options in the RFP documents. Based on the information included in the Geotechnical Baseline Report (GBR), Michels decided to base their bid package on using a two pass conventional tunneling approach with a tunnel boring machine (TBM).

Initial ground support would be provided by a steel rib and wood lagging system, with the carrier pipe installed and grouted into place following completion of the tunneling operations. HOBAS pipe was selected by Michels for the carrier pipe as it met the project requirements for corrosion resistance of the sanitary sewer without the need for liner installation. The decision to use a two pass system factored significantly in the overall success of the project, as will be seen in the following sections detailing the construction challenges encountered.

Design Period

One of the advantages of a DB project delivery approach is the involvement of the contractor right from the start of the design, allowing the design to be specifically geared towards the construction approach. Also, by including the designers on the contractor's team, adjustments to the design based on the actual conditions encountered during construction could be made quickly, mitigating potential project delays. The major constraints that the design had to address included:

- The locations provided for the existing sanitary and storm trunk stubs were only approximate;
- The existing sanitary and storm stubs had approximately 1.0 meter (3.2 ft) of clearance between them; and
- The downstream section of the trunks was to follow a curved alignment.

Based on the available working space along the proposed alignment and proximity to existing residences, it was determined that the launch/working shaft would be located at the upstream termination of the sanitary and storm trunk tunnels in an open field. Although tunneling downhill is not preferred, the minimal slope of 0.1 percent negated much of the negative aspects of this ap-



NASTT'S 2016 NO-DIG SHOW MUNICIPAL & PUBLIC UTILITY SCHOLARSHIP PROGRAM

NASTT's 2016 No-Dig Show Municipal & Public Utility Scholarship Award has been established to provide education and training for North American municipalities, government agencies and utility owners who have limited or no travel funds due to restricted budgets.

Selected applicants will be awarded complimentary **full conference registration** to NASTT's 2016 No-Dig Show in Dallas, Texas, March 20-24. One day conference registrations will also be available. Registration includes full access to all exhibits and technical paper sessions... all you have to do is get yourself to the conference! Selected applicants will also be eligible to receive overnight accommodations. Selection based on responses to the application as well as need.

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Application deadline is **October 30, 2015**.



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proach. The use of a two pass tunneling system also provided for some flexibility to adjust the invert of the carrier pipe within the initial tunnel support system, allowing for variation in the actual elevation of the stubs to be connected to.

In fact, when the stubs were uncovered and their exact locations confirmed, it was found that the storm sewer stub was approximately 3 meters (9.8 ft) south of the location shown on the as-built drawings. The sanitary stub was also 3 meters (9.8 ft) south and 0.5 meters (1.6 ft) closer to the existing storm sewer, as they had been constructed in a common trench. These discrepancies were able to be corrected within the tunnels by offsetting the carrier pipe from the center of the tunnel.

During the bid preparation period, two options for the sanitary and storm trunk configuration were considered: one tunnel with both the sanitary and storm trunks installed inside, and two separate tunnels. For a number of reasons, including cost and connections to the existing systems, the two separate tunnels option was selected. For the conditions presented in the GBR, it was decided that a minimum of 2 meters (6.6 ft) clear separation distance between the outside of the two tunnels should be used. This resulted in challenging geometry at the downstream connection location, which saw the alignment from the connection to the existing stubs go directly into a curved section. A transition from the 0.5-meter (1.6-ft) separation of the existing stubs to the 2-meter (6.6-ft) clear separation for the tunnels was required to be completed within the reception shaft.

After a thorough review of the pros and cons, including costs to construct, it was decided that the launch and retrieval shafts would be constructed large enough to accommodate both tunnels from the same shaft. As the tunnels both exceeded the 1,000-meter (2,380-ft) maximum distance stipulated between access points, an intermediate shaft was constructed on each tunnel near the midpoint.



Figure 2 – The initial layout of the launch shaft area.

The DB project delivery allowed construction to start prior to the design being finalized. The initial design effort focused on the launch and retrieval shaft configuration, allowing Michels to start construction of the shafts prior to the completion of the tunnel design. The first task in the design was to prepare a design basis memorandum for review and approval by the city and CH2M HILL. Also, all components of the project, both for temporary and permanent structures, were submitted for review prior to construction proceeding.

Construction Period

With the design underway, Michels was finalizing the project schedule, material procurement, TBM refurbishment, site preparation, and numerous other mobilization functions. One of the key activities at the start of the project was the selection of a Dispute Review Board (DRB), which was jointly chosen by

the city and Michels. The DRB is discussed in greater detail in the following sections.

Launch shaft construction commenced on Nov. 2, 2012, and was completed in early March 2013. The launch and receiving shafts are rectangular and both use an H pile and timber lagging ground support system, with the H piles reinforced with three levels of walers. The intermediate shafts use large diameter steel pipes for temporary ground support.

Due to the high ground water table at the launch shaft location, two dewatering wells were installed prior to excavating the shaft. The ground surface around the launch shaft area was also raised 1.3 meters (4.3 ft) as this low area is typically under water during spring snow melt.



Figure 3 – Launch Shaft

During the development of the risk register, Michels reviewed the two TBMs that were selected at the time of bid: a 2,280-millimeter (90-in.) Lovat EPBTBM for the sanitary sewer and 3,275-millimeter (129-in.) Lovat EPBTBM for the storm sewer. Upon review of the GBR and Geotechnical Design Report, and lengthy discussions internally with the project site management, superintendents, and TBM operators, the decision was made to upsize the 2,280-millimeter (90-in.) Lovat EPBTBM to a 2,640-millimeter (104-in.) Lovat TBM. These decisions lowered both the risks to the tunnel crew who were required to work within the tunnel for an extended period of time and risk of getting stuck due to large boulders as noted in the GBR.

The 3,275-millimeter (129-in.) Lovat TBM was also changed out for a 3,300-millimeter (130-in.) Lovat TBM based on the lessons learned from the 2,640-millimeter (104-in.) tunnel. As this project had the luxury of parallel lines, the review of conditions from the first tunnel was then translated over to the setup of the TBM on the second run. Settlement monitoring was required along the sanitary and storm sewer alignments, with a focus on the crossing of McOrmond Drive and College Drive and McOrmond Drive and Stensrud Road, two highly traveled intersections adjacent to the tunnel alignments. Settlement monitoring plans were developed and implemented by Stantec. Monitoring was conducted daily while crossing these important intersections, and every other day while the tunnels were being constructed within the landscaped boulevard along the east side of McOrmond Drive.

Dispute Review Board

Creation of a Dispute Review Board (DRB) was included with the RFP documents. Both the City and Michels proposed several candidates, who were then scored. The three highest scored candidates became the DRB. Quarterly meetings with the DRB, Michels, and city were held on-site to keep the DRB



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Figure 4 - Michels reviewed the two TBMs that were selected at the time of bid: a 2,280-millimeter (90-in.) Lovat EPBTBM for the sanitary sewer and a 3,275-millimeter (129-in.) Lovat EPBTBM for the storm sewer.

apprised of progress of the work and any issues that were encountered. The DRB team also toured the tunnels at appropriate times to have a firsthand understanding of the procedures being employed by the Michels construction team.

CONSTRUCTION CHALLENGES

Weather

All construction projects expect to encounter challenges that need to be overcome for a successful outcome. For our team, Mother Nature provided her challenges over the course of not one but two Canadian prairie winters. The winter of 2012 arrived during shaft construction and provided record snowfalls to the region. The following winter of 2013 saw record setting cold weather with the coldest day on-site during construction recording a wind chill temperature of -62°C (-80°F).

If you are familiar with the Canadian prairies, then you can relate to the wind often encountered in the region. To provide some relief, Michels was creative and set the site up to create as many wind breaks as possible. This included erecting a large tent, 30 meters long by 10 meters wide (98 ft x 33 ft), next to the launch shaft to provide a sheltered workspace for employees and a wind break next to the hundred ton crane that serviced the shaft.

Labor

Another major challenge was overcoming the local labor shortage. Saskatoon is currently the fastest growing city in Canada. With the booming potash mines in the region, and the nearby oil fields in Northern Alberta, finding and retaining a skilled work force proved to be harder than overcoming the technical aspects of the tunneling. During the course of the project, Michels, on average, saw in excess of 30 to 40 lost person days each month over the duration of the project. The high turnover rate for both operators and laborers greatly affected the production rate and resulted in an increased cost to Michels.

Excessive Boulders and Cobbles

During the tunneling of the 2,640-millimeter (104-in.) sanitary tunnel, Michels encountered an excessive number of boulders and cobbles – greatly exceeding the number identified in the GBR. This significantly impacted production and created excessive damage to the cutter head. The number of major boulders, greater than 2,100 millimeters (7 ft), also exceeded the GBR predictions on both the sanitary and storm tunnel

runs, stopping production while the boulders were broken up and removed. In one case along the 3,300-millimeter (130-in.) tunnel, a boulder measuring greater than 3,600 millimeters (12 ft) was encountered. Michels blasted through this boulder and walked the TBM through to continue tunneling without ever ingesting the boulder.

The selection of different TBMs during the risk register development, and again two thirds of the way through the first tunnel construction, proved to be the correct decision. The use of TBMs over microtunnel boring machines saved the cost of multiple rescue shafts, as the obstructions were able to be cleared by accessing the boulders through the TBMs. The boulders encountered on the tunnel for the sanitary sewer likely would have required the installation of at least three rescue shafts to remove the obstructions and repair the damage to the cutter head on a microtunnel boring machine.

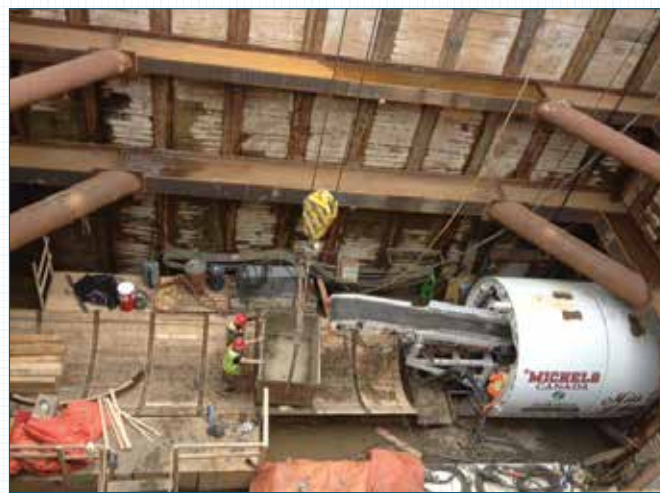


Figure 5 – Launching the 3,300-millimeter (130-in.) TBM.

In the early stages of the sanitary sewer tunnel, Michels experienced multiple equipment issues with the 2,640-millimeter (104-in.) Lovat TBM. Industry experts from across North America were consulted and flown to Saskatoon to help troubleshoot the problems. After an extended period of ongoing mechanical issues, Michels made the decision to pull the TBM mid-run. This resulted in the construction of one rescue shaft.

Michels constructed an interlocking sheet pile shaft and ex-



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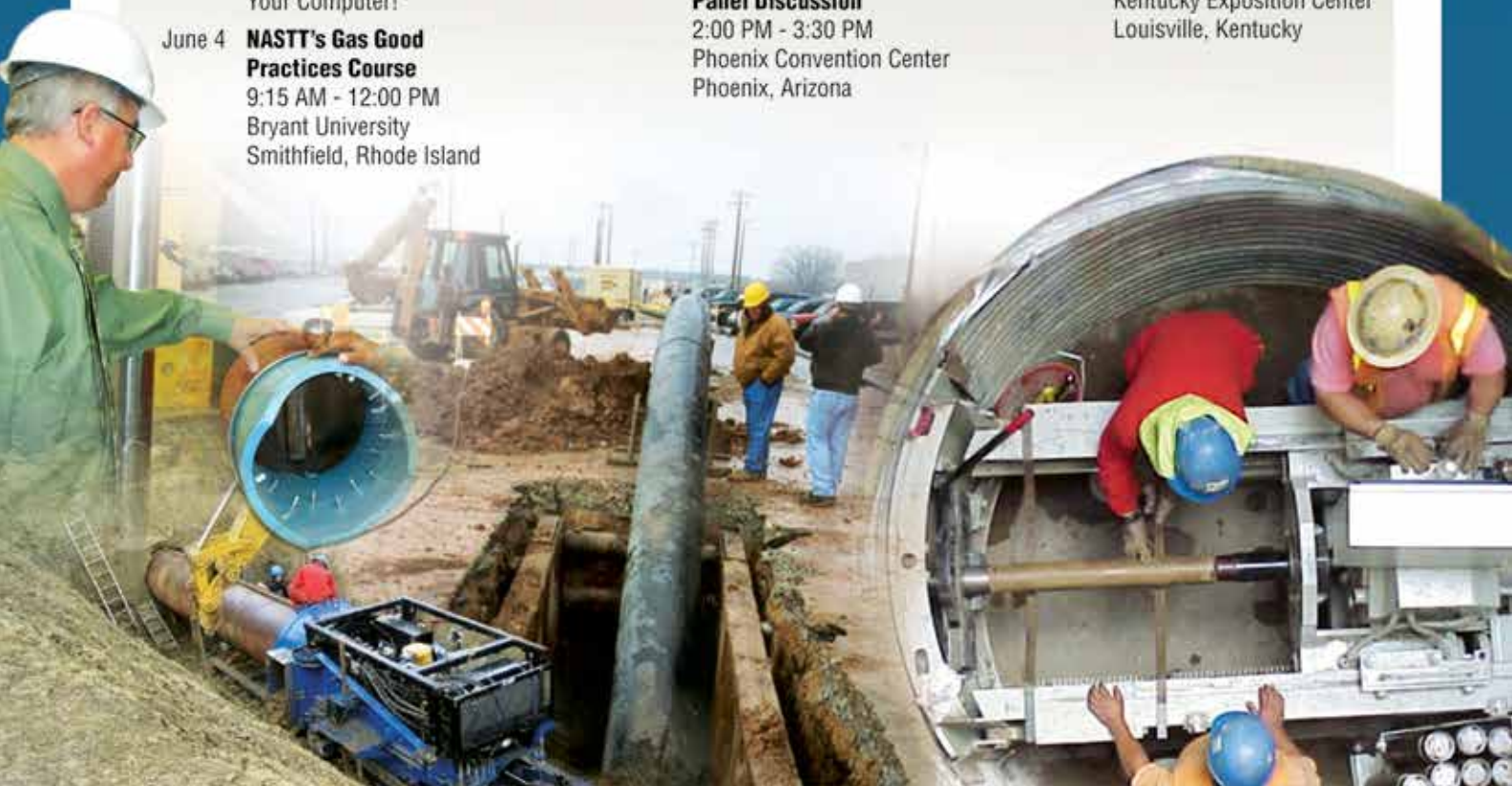
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humed the TBM. The TBM was trucked off-site to a Michels yard in Alberta where the main bearing was removed and replaced. Michels also took this opportunity to modify the tooling on the face of the TBM based on the ground conditions that were being encountered. The TBM was re-launched in late November 2013 and successfully completed its drive on April 4, 2014, with no major mechanical issues encountered post bearing change.

Coordination with Other Contractors

The extension of the McOrmond Drive sanitary and storm sewer trunks to the south of the project limits was tendered while the tunneling project was ongoing. Due to the depth at the connection location of approximately 15 meters (49 ft), the tender could be bid as either a conventional (deep) trenched installation or an extension of the tunnels being constructed under this contract. The contract was awarded on the basis of a trenched installation resulting in the need for a concerted cooperation and coordination effort between the two contractors working in such close proximity.

Issues overcome included pipe storage and laydown areas, deep excavations in close proximity to the launch shaft, material deliveries to the site, and numerous other potential conflicts on a daily basis. Michels and the other contractor were in regular contact and, in a number of instances, able to work together to solve issues to the benefit of both parties and the city.

PUBLIC OUTREACH

The DB contract had a significant public outreach program requirement. In addition to setting up a project specific web site to provide information on the project and emergency contact numbers, the main features included the below.

Open House

A drop-in format open house for local residents was held on Nov. 22, 2012 at a local elementary school, immediately prior to the commencement of site work. The intent of the open house was to inform residents of the project and answer any concerns they may have had regarding the work.

Construction Notices

Construction notices were delivered by both the city and Michels to all of the homes backing onto the sewer alignment. Pamphlets included information about the nature of the project and contact information for the Michels and city project managers.

Meetings with Residents

Meetings with concerned residents were conducted as required. Personal visits were completed with the residents in the immediate proximity of the reception shaft. These were conducted proactively to explain the need for a temporary noise wall. Michels went so far as to get these residents' input into a paint color for the wall to minimize the visual impact at the reception shaft.

Site Tours

Two very successful public site tours were hosted. The first prior to the launch of the first tunnel on April 2013 had close to 150 visitors. The second tour followed the launch of the second tunnel in July 2014, and saw over 200 people put through a site safety orientation before being provided safety gear for touring the larger storm tunnel to get a firsthand look at the tunneling process. Local television, radio, and newspaper media covered both events.

LESSONS LEARNED

There are many lessons to be learned on a project of this magnitude. Possibly the biggest key to success was the collaborative approach adopted by all parties involved: the city, Michels/Stantec DB team and CH2M HILL. The DRB noted that for a project with so many challenges, from equipment problems to changed ground conditions, the cooperative approach taken by all team members was a huge component of the successful completion of the project.

Possibly the biggest contributor to the successful conclusion of the project was the parallel tunnel alignments. The difficulties encountered on the sanitary tunnel provided detailed and accurate conditions to be expected on the storm tunnel, which provided an opportunity to incorporate modifications and changes to the process and equipment prior to its launch.

CONCLUSIONS

The DB approach is one of several methods available for project delivery. There are a number of reasons why a DB approach may be preferred, including projects that have more than one feasible option for construction. For the McOrmond Drive project, this was the case as both microtunneling and conventional tunneling was considered to be viable. The DB approach results in a design tailored to the construction methodology to be employed. The constructors work with the designers, starting during the bid preparation, to ensure the final design is suitable for the proposed construction method and meets the owner's project requirements. The DB approach also allows construction to start prior to the design being completed. For McOrmond, the design for the launch and retrieval shafts was completed, and construction of the shafts was initiated and ongoing while the design for the tunnels was completed.



Figure 6 - 3,300-millimeter (130-in.) TBM breakthrough into reception shaft.

The DB approach also provides for a quick response from the design team to the constructors to address issues that may arise due to changed conditions or potential for alternative approaches that may not have been considered at time of bid preparation. Each of these contributed towards the overall successful completion of the project.

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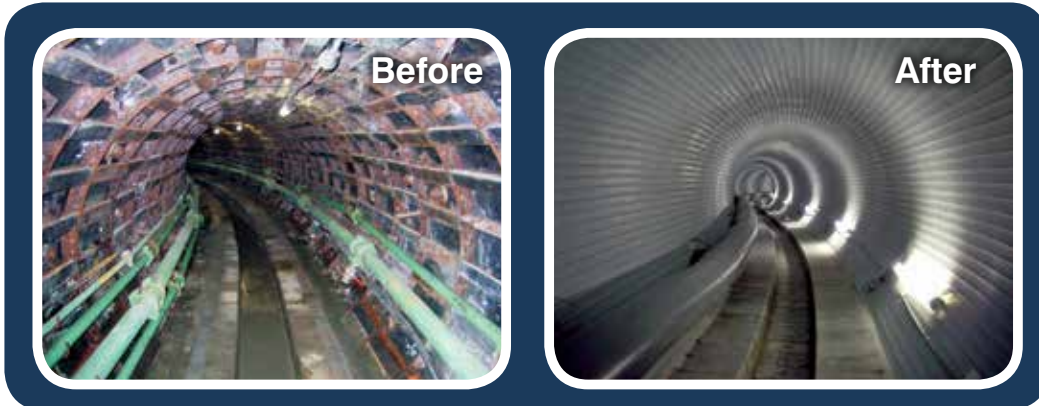
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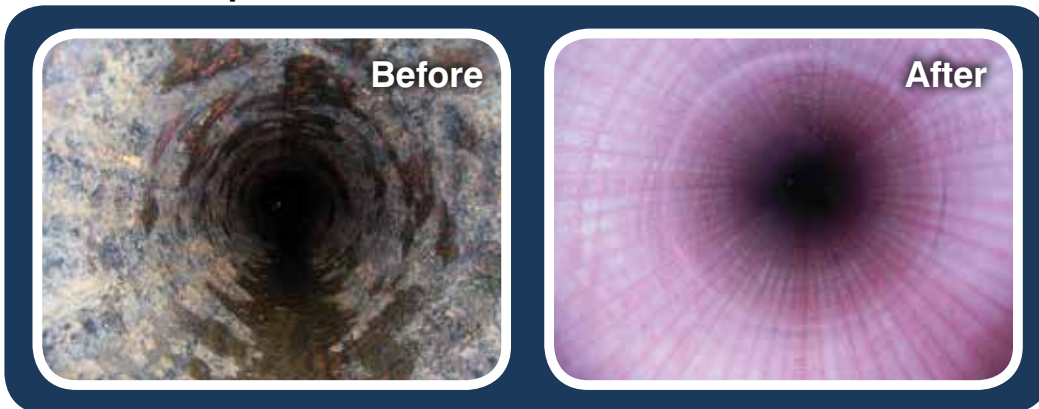
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