



NASTT's *Trenchless Today*

Educate - Train - Research - Publish



SUMMER 2011

ISSUE No. 2





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Message from the Executive Director



That's a Wrap!

The 2011 No-Dig Exceeded All Expectations

Welcome to the second edition of *NASTT's Trenchless Today*! This issue is about the success of NASTT's 2011 No-Dig Show but, I'm also very pleased to report on the welcoming response to this new publication. Thank you to the many NASTT members who sent feedback on our inaugural issue and offered excellent ideas for future articles. Very special thanks to the many sponsors who make the magazine a reality. Remember, this is a publication "about the membership and for the membership," so please feel free to send in your suggestions or even volunteer your time.

No-Dig on the Potomac

Cherry blossom season in the Washington, D.C.-area is a very special time of year, and I like to think that it was even more special this year with the No-Dig Show at the Gaylord National Hotel and Convention Center along the scenic Potomac River. For the more than 1,800 people who attended, trenchless technology was in full bloom with new ideas, creative thinking, quality information and the solid value that our annual No-Dig Show is known for.

Fortunately, as the No-Dig Show continues to grow, so does the event sponsorship. Many thanks to our premium level sponsors and valued exhibitors for their very welcomed generosity. It is only through their support that NASTT is able to promote the trenchless industry to the extent we do.

To the credit of the 2011 Program Committee, led by Jack Burnam of CH2M Hill, we once again presented 140 peer-reviewed technical papers, with many of the session halls at standing-room capacity. The quality of our technical program continues to impress, making the progress of selecting the winning papers even more challenging. At this year's Kick-off Breakfast, the 2010 Outstanding Paper Award for New Construction was presented to Craig Prout of the Mears Group, and the Award for Rehabilitation went to the City of Los Angeles Public Works staff: Brad Jensen, Yasmin Hafeez, Yoon Cho and Ed Gobaton. Congratulations to these exceptional authors. Portions of their winning papers can be seen in the back of this magazine issue.

The 10th annual NASTT Educational Fund Auction exceeded all expectations, smashing last year's contributions with a record \$75,500 collected. These funds go directly to support the NASTT Good Practices Program and toward our Student Chapter activities. Remarkably, in 10 years our Educational Fund Auction has raised more than \$430,000. This speaks volumes about the character of the NASTT membership. Thank you and congratulations to the entire Auction Committee.

The NASTT Gala Awards Dinner was once again a sold-out event with fine dining and first-class entertainment. The Gala is NASTT's testimony to exemplary service and the showcase for rising stars. Jim Hoggatt of South Tahoe PUD received the Chairman's Award for Lifetime Achievement and Kathryn Wallin of Bennett Trenchless Engineers was the recipient of the Trent Ralston Award for Young Trenchless Achievement.

For the second time, NASTT was proud to grant five NASTT Student Chapter members with the Michael E. Argent Memorial Scholarship. In order to further their education, each student will receive \$5,000 in direct financial assistance. Bios on each winner are in our Chapter News section. The scholarship program benefits from the continued support of the NASTT Board of Directors who have championed investment in the next generation of trenchless experts.

It is no secret that volunteerism drives NASTT and our No-Dig Show. Without the enormous commitment of our Regional Chapters and the collective membership, much of what our not-for-profit society represents would not be possible. Thank you for allowing your talents to be tapped and for your enthusiastic support. I hope to see you at the 2012 No-Dig Show in Nashville, Tenn.

Best regards,
Mike Willmets
NASTT Executive Director



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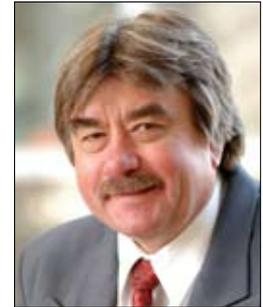
Chairman's Message

A Global Connection

NASTT Benefits from its International Involvement

It was a busy spring! After an excellent No-Dig event in Washington, D.C., I attended the ISTT No-Dig in Berlin, May 2-5. It was great to be involved in another successful event where professionals could learn and share their expertise on trenchless projects, products and processes on a global scale. I think it is wonderful that our membership in NASTT includes an automatic membership to ISTT. It provides all NASTT members with an added bonus that should be taken advantage of.

There were more than 180 exhibiting companies representing our industry at the International No-Dig. The technical program had 50 peer-reviewed papers from 16 countries. A highlight for me was the city's Building Site Day, which showcased trenchless construction in action. Having No-Dig co-located with Wasser Berlin International 2011 brought an added dimension to the event by exposing trenchless techniques to an even broader audience from around the world.



George and NASTT Executive Director Mike Willmets at the ISTT No-Dig in Berlin in May.

ISTT has 26 affiliated societies spanning six continents. NASTT is the largest of these societies with our continuously growing membership. After attending an ISTT meeting in Berlin, I believe it is clear that NASTT is leading the pack in our unique and proactive approach to growing the trenchless community, through publications, training, education, student interaction and more. We are leading and not following due to the successful leadership through our members and board of directors. Hats off to you all!

Without a doubt, after attending NASTT's No-Dig in Washington, D.C., and ISTT's No-Dig in Berlin, I cannot help feeling extremely excited for the future of our industry. We continue to raise the profile of trenchless technology on a worldwide scale, while expounding the numerous benefits trenchless has to offer.

The German Society of Trenchless Technology (GSTT) hosted the ISTT No-Dig and did a great job. I wish to personally congratulate the ISTT leadership, especially Chairman Dr. Samuel Ariaratnam, Vice Chairman Derek Choi, and Executive Director John Hemphill for another successful ISTT event and for their hospitality in hosting myself and other members of NASTT while in Berlin. Since the mid-1980s, ISTT has been instrumental in educating and promoting trenchless all around the world through international and regional conferences, and this year's event proved no different.

Although we are from different countries with different needs and constraints, we are nonetheless of one worldwide trenchless community, committed to innovative construction and rehabilitation methods that are the most cost-effective, have the least amount of impact on the environment and provide the greatest degree of safety.

Next year's ISTT conference will be in Sao Paulo, Brazil, and Chairman Ariaratnam is already off to a great start. I look forward to the 2012 event and the chance to network with those who share a common and worthwhile goal – advancing trenchless globally.

Have a great summer,

George Ragula
NASTT Chairman

We continue to raise the profile of trenchless technology on a worldwide scale, while expounding the numerous benefits trenchless has to offer.



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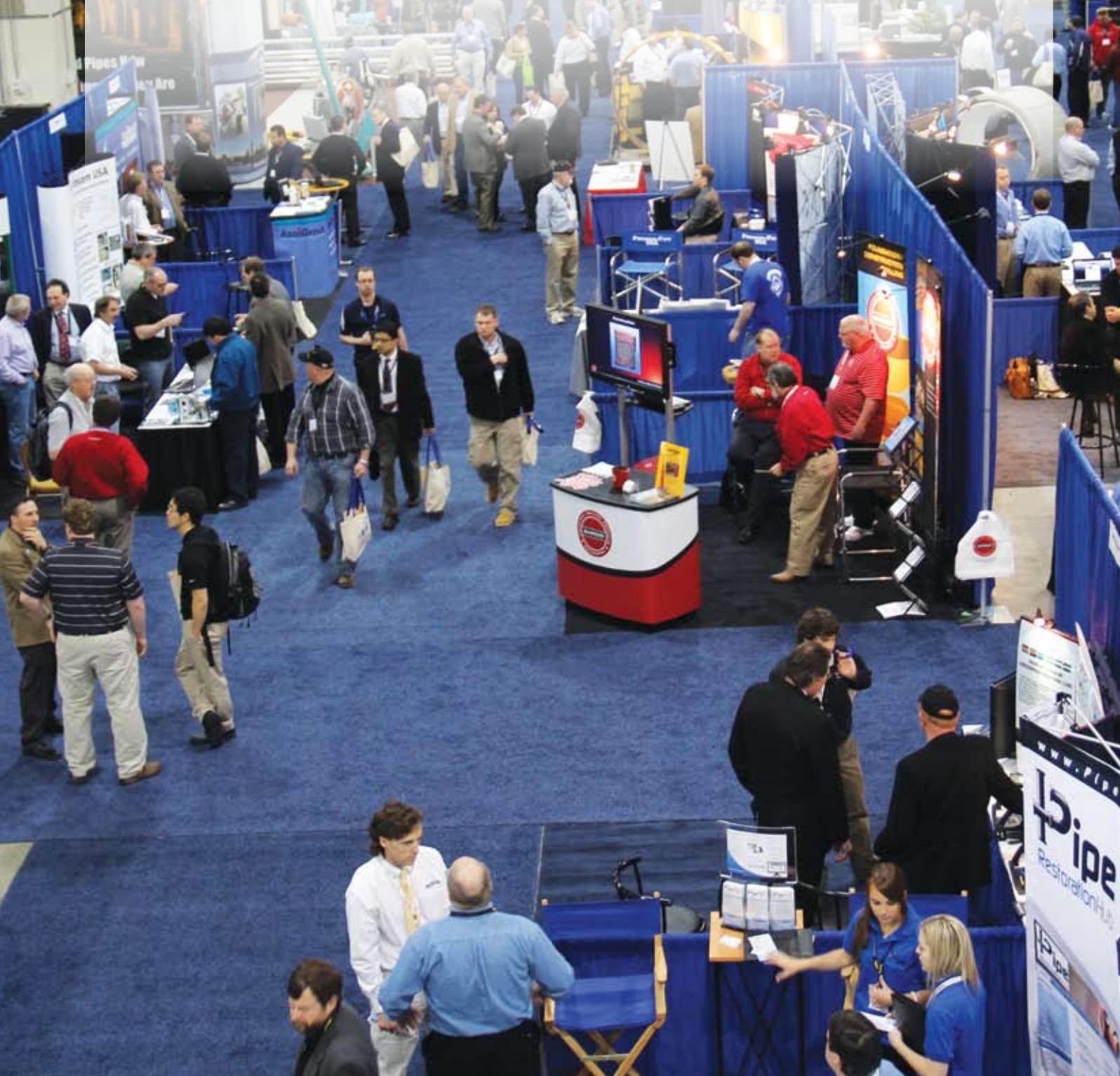
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No-Dig Takes on Washington

The Annual Show Celebrates its 20th Anniversary
With a Record Crowd in the Nation's Capital

Compiled by NTT Staff



The No-Dig Show this year in Washington, D.C., drew a record crowd to the Gaylord National Resort & Convention Center. The 20th annual show attracted 1,814 people, the second-highest attendance for a No-Dig in North America (the International No-Dig in 2009 saw 1,903 members come to Toronto).

Nearly 140 exhibiting companies featured products and industry advancements in the 73,000-sq ft exhibition hall. There were also 140 peer-reviewed technical papers presented, covering condition assessment and inspection, horizontal directional drilling, microtunneling, large diameter tunneling, pipe bursting, auger boring, slip lining, cured-in-place pipe relining and more.

Of course, respected awards honoring the people and projects that shape the industry were given to recipients throughout the three-day event. These awards were presented at various social engagements.

Monday, March 28, saw the Kick-off Breakfast where the 2011 *Trenchless Technology* Person of the Year Award and the 2010 Outstanding Papers in Rehabilitation and New Installation awards were given out. Attendees also experienced the comedy routine of Greg Schwem, labeled by *Chicago Magazine* as "America's favorite corporate funny man." Schwem tailored his routine, "Comedy With a Byte," to the trenchless industry. He has previously performed to corporate crowds from McDonald's, Microsoft, Motorola and United Airlines, among others.

The annual Educational Fund Auction and Reception was later Monday night with raised funds supporting NASTT's 11 student chapters. Since 2002, the auction has raised more than \$430,000 and directed those funds toward educational activities. This year, \$75,500 was raised through silent auction and — new this year — an eBay online auction. Machine rentals, laptops, jewelry, golf clubs, various trips and even maple syrup were some of the featured items.

On Tuesday, the Gala Awards Dinner saw the presentation of the Trent Ralston Award for Young Trenchless Achievement, the Joseph L. Abbot, Jr. Innovative Product Awards, the NASTT Chairman's Award for Outstanding Lifetime Service and the various winners of the 2010 *Trenchless Technology* Projects of the Year in Rehabilitation and New Installation. After dinner, the band Black Tie performed a wide genre of music spanning from early classics to the latest hits.

Wednesday's closing luncheon celebrated the success of the 2011 show. The 2011 Municipal & Utility Achievement Awards were announced during this event. These awards recognized the exceptional achievement among American and Canadian municipalities and public utilities.

The 2012 No-Dig Show will be in Nashville, Tenn., at the Gaylord Opryland Resort & Convention Center, March 11-15. The deadline to submit a 300-word abstract on NASTT's online form is June 30. No e-mail, mail or fax abstracts will be accepted.

George Ragula is the 2012 program chair and says there will be an increased emphasis on sustainability and cost



NASTT members join George Washington to open the 2011 No-Dig Show. More than 1,800 attended the 20th anniversary of the event in Washington, D.C.

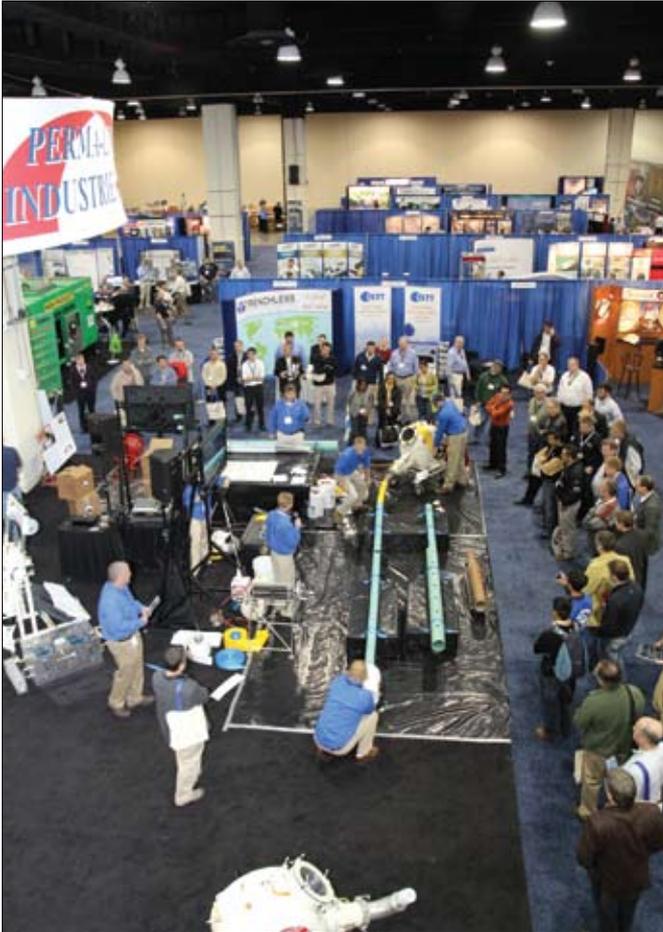
efficiency for the trenchless market. This will be the third No-Dig event in Tennessee, surely bringing back memories of past successful shows.

Visit www.nodigshow.com for more information on the upcoming convention.

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Clockwise from left: This year's No-Dig Show featured many exhibits and demonstrations; Kathryn Wallin of Bennett Trenchless Engineers is awarded the Trent Ralston Award for Young Trenchless Achievement at Tuesday's Gala Awards Dinner; Maynard Akkerman of Akkerman Inc. and Jennifer Glynn of RMC Water & Environment look over various items at the Educational Fund Auction Monday night; Indiana University - Purdue University Indianapolis students celebrate the presence of Mortimer, the sewer rat; NASTT Vice Chair Bob Westphal (left), Mike Vargo of Prime Resins and NASTT Past Chair Joanne Hughes assist a Louisiana Tech University student with the raffle at the auction; Kate Pemberton (left), official No-Dig Show photographer, Great Southern Press, poses with Lindsey Bowman and Michelle Hill of Benjamin Media.





Clockwise from top left: Virginia Tech students and their advisor Sunil Sinha (far right) at Monday's auction that raised \$74,000 to support student chapters; Alan Rorrer and NASTT Treasurer Kaleel Rahaim both helped with the exhibit for their company Interplastic Corp.; Mike Vellano (left), James Tighe and Reed Rohrbaugh attended this year's No-Dig on behalf of Inland Pipe Rehabilitation; The large group of 2011 Municipal and Utility Achievement Award winners pose with their plaques; NASTT Executive Director Mike Willmets (left), NASTT Assistant Executive Director Angela Ghosh, NASTT Chairman George Ragula and Michelle Hill, Mary Beth Butkovic and Kevin Duresky of Benjamin Media make up the 2012 No-Dig Show Management Group; Past ISTT and NASTT Chair Ray Sterling (left) and current ISTT Chair Sam Ariaratnam (second from right) socialize with Kim Lyon, Chris Schuler and Casey Clark of Miller Pipeline Corp. at Tuesday's Gala Awards Dinner; Louisiana Tech students have fun at the auction with Jeanette Rankin (an important member of the Auction Committee) and Tom Tibor of Baroid.



2011 No-Dig Award Winners

Trenchless Technology Person of the Year Award

Bob Westphal, senior vice president of Michels Corp.



Bob Westphal accepts *Trenchless Technology's* Person of the Year award alongside his wife Jone.

2010 Outstanding Papers in Rehabilitation and New Installation

Paper C-4-04: Construction of Non-Circular Sewer Rehabilitation Projects in Los Angeles

Brad Jenson, Yasmin Hafeez, Yoon Cho and Ed Gobaton from the Bureau of Engineering, Department of Public Works, City of Los Angeles

Paper E-1-05: Virginia Natural Gas Hampton Roads Crossing Pipeline HDD Installation

Craig Prout from Mears Group

Trent Ralston Award for Young Trenchless Achievement

Kathryn Wallin, Bennett Trenchless Engineers

Joseph L. Abbot, Jr. Innovative Product Awards

New Installation Award: Vermeer for its D20x22 FX Series II Flex-Angle Drill for geothermal drilling

Rehabilitation Award: Zia System for its Cured-in-Place Pipe Intelligence (CIPPI) system

NASTT Chairman's Award for Outstanding Lifetime Service

Jim Hoggatt, Engineering Department Manager for South Tahoe Public Utility District in South Lake Tahoe, Calif.



NASTT Chairman George Ragula presents the Chairman's Award to Jim Hoggatt for his outstanding lifetime service.

2010 Trenchless Technology Projects of the Year

New Installation

Winner: Perth Amboy/Sayreville (N.J.) Record-Setting HDD Crossing of 24-in. Fusible PVC

Rehabilitation Winner: San Diego Regional Airport Authority Fiber-Reinforced CIPP Project

2011 Municipal & Utility Achievement Awards

Santa Cruz County Sanitation District; City of Edmonton Drainage Services; Regional Municipality of York Environmental Services; City of Hamilton Asset Management Group; Regional Municipality of Halton Wastewater Services Division; Clean Water Services Conveyance Systems Department; Town of Markham Waterworks Department; South Tahoe Public Utility District Engineering Department; Halifax Water Engineering & Information Services; PECO Energy Co.; Public Service Electric & Gas Distribution Technology; City of Los Angeles Bureau of Engineering; Con Edison of New York; City of Oxnard Public Works Department; City of Portland Environmental Services; and Washington Suburban Sanitary Commission.

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Taking Stock!

Considering the great attendance numbers and the amount of funds raised, NASTT's 20th annual No-Dig Show was a huge success. With 1,800 attendees, this show was second in attendance to the 2009 Toronto International No-Dig Show by a mere 100 people.

These are challenging times for our industry. Municipal and utility budgets are cut to the bone, work is hard to come by and all aspects of our industry are feeling the pinch. To have such a successful conference under the current economic conditions says volumes about the people involved, the applicability of our products and the need for the services our members provide. The best part: We are still growing, still developing innovative products and still reaching out to educate municipalities and utilities. The conference was a resounding success, but we can't lose sight of why it was so. While it was my honor to be the Chair of the Program Committee, it is the people who volunteer their hard work that make the conference what it is. The Program Committee and Sub-Committee members (Auction Committee, Entertainment Committee, etc.), Benjamin Media and NASTT staff focused their efforts on making the 20th annual No-Dig Show the best, and they set the bar for future conferences. The generosity and dedication of our Corporate and Event sponsors at all levels demonstrates their dedication to our industry. My thanks goes out to all of you.



Program Committee Membership

The show-planning process is starting again, this time with George Ragula in the Program Chair position and Kim Staheli as Vice Program Chair. I strongly believe that working on the Program Committee is rewarding and allows one to "give back" to the trenchless industry. Plus, it's a great group of dedicated people to work with. If you have the time and the interest, I would encourage and challenge you to join these people in developing a program to surpass the 2011 event.

The criteria for service on the No-Dig Show Program Committee generally follows the guidelines listed below:

- Membership in NASTT.
- Meet at least one of the following criteria:
 - Attend the July 16, 2011, meeting in Nashville, Tenn., to review and select abstracts for the Technical Program, and
 - Attend one additional meeting when possible, or serve as a session moderator or judge for one of the contests at the conference.
 - Volunteer and serve on a committee or sub-committee developed by the Program Chair (i.e. Entertainment Committee, Auction Committee, Student Activities Committee, etc.).
 - Become a session leader for one of the conference technical sessions.

The Program Chair can appoint people to the Program Committee based on work they are doing to enhance the program or conference. For example, the Chair can appoint municipal or utility people in the area of the conference to

help the committee. Again, to the members of the 2011 Program Committee, vendors, exhibitors and sponsors, thank you all for your dedication, hard work and support. It truly paid off! Please consider being on the committee for 2012. I know George and Kim are going to lead us to the best conference ever. I look forward to continuing the tradition of having each subsequent No-Dig Show surpass its predecessor. With this leadership and your help we can do it!

Sincerely,
Jack Burnam, 2011 Program Chair

Special Thanks to the 2011 No-Dig Program Committee Members

Jack Burnam	CH2M Hill, 2011 Program Chair
Erez Allouche	Trenchless Technology Center
Samuel Ariaratnam	Arizona State University
Alan Atalah	Bowling Green State University
Frank Badinski	York Region
Joe Barsoom	PB Americas Inc.
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Piero Salvo	GENIVAR
John Schroeder	CDM
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Sunil Sinha	Virginia Tech University
Kim Staheli	Staheli Trenchless Consultants
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Richard Thomasson	Malcom Pirnie Inc.
Ernie Ting	Town of Markham
Matthew Wallin	Bennett Trenchless Engineers
Dennis Walsh	Woodard & Curran

NASTT's 2012 No-Dig Show Call for Abstracts

Trenchless Takes Center Stage!

Submission Deadline: June 30, 2011

The North American Society for Trenchless Technology (NASTT) is now accepting abstracts for its 2012 No-Dig Show in Nashville, Tenn., located at the Gaylord Opryland Hotel and Convention Center, March 11-15, 2012.

Prospective authors are invited to submit a 300-word abstract outlining the scope of their paper and the principal points of benefit to the trenchless industry. The abstracts must be submitted electronically via the No-Dig Show website at: www.nodigshow.com by June 30, 2011. The 2012 No-Dig Show Program Committee will review abstracts in mid-July and notify the primary authors of acceptance immediately afterward. To ensure meaningful technical content, all papers will be peer-reviewed. Final papers will be published in the conference proceedings.

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

HDD

- Pipeline Inspection and Locating
- Condition Assessment
- Subsurface Utility Engineering
- I&I and Leak Detection

Cutting-Edge Advances in Pipeline and Manhole Rehabilitation

- Cured-in-Place Pipe Lining
- Sliplining
- Pipe Bursting
- Laterals Rehabilitation
- Grouting
- Lining Materials and Application Methods

New Installations

- New Concepts for Trenchless Equipment, Materials and Methods
- Horizontal Directional Drilling (HDD)
- Microtunneling
- New Applications for Boring Techniques (Auger Boring and Pipe Ramming)
- Pilot Tube Boring (Tunneling)

Trenchless Research and Development

- University and Industry Initiatives
- Education and Training

Environmental Incentives, Challenges and Sustainability

- Carbon Reduction
- Sustainable Construction Practices

Municipal Issues

- Selection Criteria for Contractors
- Development of Submittal Requirements
- Measuring Quality Assurance/Quality Control
- Project Budgeting and Prioritization
- Selection Criteria for Materials
- Funding for "Green" Technologies
- Lessons Learned

Industry Issues

- Social Costs and Impacts
- Industry Trends, Issues and Concerns

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Q&A

Dan Willems, Saskatchewan Engineer and an NASTT Chapter Officer, Explains What It's Like to be Trenchless in Canada



NASTT's Trenchless Today (NTT): Please give us a little information about your professional background.

Willems: I was born and raised in Saskatoon, Saskatchewan, and attended the University of Saskatchewan, graduating with a Bachelor's of Science in Civil Engineering in 2001. I worked for Associated Engineering in Saskatoon from 2001 through 2002. At the beginning of 2003, I moved to Edmonton, Alberta, where I worked for Stantec through February 2005. During the first years of my career, I acted as a junior project engineer and resident engineer for various municipal infrastructure projects, including several water/sewer projects and water treatment facilities.

In February 2005, I began working for the City of St. Albert. My time there was incredibly satisfying, being involved in almost every utility project that was under way there at the time including the St. Albert Sanitary Trunk Sewer Phase 1 project, which was a significant microtunneling project. In March 2007, I returned to Stantec and moved back to Saskatoon in January 2011.

NTT: How did you choose the field of engineering?

Willems: I was inspired to enter engineering by a longtime family friend and neighbor, Dr. Jerry Huff. He was an electrical engineering professor at the University of Saskatchewan, and from a young age he impressed upon me a desire to enter the engineering field. It's funny — at the time I didn't really realize what the intent of some of the interaction was about, but with several years of hindsight now, it's fully obvious how I was being "gently" directed into a career in engineering. Though I ended up pursuing civil engineering instead of electrical engineering, Jerry was a great friend and mentor who played a strong role in my early career.

NTT: What are your areas of expertise within Stantec?

Willems: At this point in my career, I am a project manager and engineer specializing in rehabilitation and replacement of buried linear infrastructure. I also regularly assist with water and sewer utility designs for several land development projects locally. My background in trenchless technology has provided me with various opportunities to offer advisory services to our other offices on projects located throughout North America.

NTT: What specific projects are you currently working on?

Willems: Currently, I'm involved in several exciting projects, including the Mill Woods Double Barrel Replacement/SESS SA1 Trunk project, which is a tunneling project for two new trunk sewers in Edmonton. The project is very interesting and will include several complicated tie-ins which have been very challenging to design. The scale and level of complexity of the project is fascinating, and we are fortunate to be contributing to this important utility servicing project. I'm also coordinating the City of St. Albert's CCTV inspection and CIPP lining programs. My work includes analysis of the field inspection data, identifying/prioritizing sewers for rehabilitation and assembling the annual rehabilitation program, tender period services and coordination of construction activities on behalf of the client. I've played a role in these annual programs since 2003 and really enjoy them.

NTT: How is the current market in Canada? What are the market drivers?

Willems: Alberta and Saskatchewan are seeing strong growth of the trenchless industry throughout. Edmonton has been a hub of trenchless technology in Canada for decades, with a long history of tunneling for its water, sewer and light rail transit infrastructure. Calgary has also been a strong market with several recently com-

pleted tunneling and pipe bursting projects. Alberta as a whole has seen numerous significant HDD projects to support growth and development of the tar sands in the north part of the province.

Saskatchewan is a developing market for trenchless technology. HDD is broadly utilized for long rural pipeline construction and CIPP lining is well established for sewer rehabilitation in the urban centers. There is significant development underway throughout the province, particularly in the potash, oil and uranium industries. These developments are resulting in major infrastructure construction, including significant growth in major urban centers, which imposes "trickle-down" projects to repair aging infrastructure and increase capacity to support rapid population growth. The main challenge to the growth of the trenchless market in Saskatchewan will be properly informing designers of the types of technology available and the availability of qualified contractors.

NTT: What is the outlook for the future — near and long term?

Willems: In the near term, there are some large diameter pipeline projects coming up that I believe should provide a strong foothold in Saskatchewan for tunneling and microtunneling. Throughout Canada, the pilot tube method should grow in popularity as more contractors adopt the technology and designers learn of its capabilities, particularly when used with other more established methods such as auger boring and pipe ramming.

Over the long term, an increased focus will be placed on water pipeline assessment and rehabilitation. We anticipate a great deal of evolution in existing assessment and rehabilitation methods, including the development of several new technologies to meet the unique challenges of this sector.

NTT: How did you become involved with NASTT?

Willems: Following the encouragement of my good friend and mentor Dave Krywiak, I got involved in NASTT in 2005. I started out helping with planning monthly technical lunches for the Northwest Chapter in Edmonton. The people who are involved in the chapter are so committed, and participating is so enjoyable that I quickly became more and more involved, assisting with the planning committee for the Alberta Trenchless Conference and assuming the role of the chapter's website administrator in 2006.

Since then, among other contributions, I've chaired the chapter's annual Northwest Trenchless Conference twice (2008 and 2010), sat on the annual Northwest Trenchless Project of the Year award committee since 2006, have coordinated Northwest Chapter sponsored trenchless tracks at several regional water/wastewater conferences, and have served as both the secretary (2010-11) and vice chair (2011-current) on the chapter's Board of Directors. I'm very passionate in my support of NASTT and the Northwest Chapter and find my involvement in the organizing very fulfilling on both a personal and professional level.

NTT: What are your most memorable professional experiences?

Willems: I enjoy the opportunity to write and present on the projects I've been involved in. The first time I attended and presented at a No-Dig conference (Nashville in 2006) was such a wonderful experience to contribute in a small part to such a great event.

Most recently, I was very proud of being involved in the planning of the 2010 Northwest Trenchless Conference in Edmonton. I'm consistently surprised of the incredible support we are able to get from contractors, suppliers, manufacturers, consultants, municipalities and private utilities locally, regionally and internationally to make the event such a wonderful success. Every year we manage to outdo ourselves and the event continues to grow.

Pipe Bursting Guidelines Updated in New Edition

By David Bennett, Samuel Ariaratnam and Kate Wallin

With a worldwide increase in urban growth, more and more municipal governments are facing enormous challenges with aging water and wastewater systems. Potable water distribution piping is often below operational requirements, and sanitary and storm collection piping is often at or beyond peak capacity. Utility owners face the onerous task of replacing or rehabilitating their infrastructure while under ever increasing financial and environmental restrictions.

Pipe bursting is defined as the replacement of the original pipe by fragmenting the existing conduit and installing the product or new pipe in its place. This construction technique is recognized as the only method of trenchless rehabilitation that can replace an existing line with a completely new pipe. Additionally, pipe bursting allows for the replacement of existing pipe with a new line of equal or larger diameter to maintain or increase flow capabilities.

The First Edition of the *Pipe Bursting Good Practices Guidelines* was published in 2005 as a supplement to the Pipe Bursting Training Course developed by the North American Society for Trenchless Technology (NASTT). The first edition benefited from valuable industry technical support, including TT Technologies Inc., EarthTool Co., Albuquerque Underground Inc. and Insituform Technologies. NASTT has since provided more than two dozen pipe bursting training courses throughout the United States and Canada to a wide range of industry practitioners. Pipe bursting rapidly evolved in the ensuing years, and the first edition quickly became outdated. In 2009, under the guidance and support of NASTT, Bennett Trenchless Engineers and Dr. Samuel Ariaratnam, with key assistance from Collins Orton and Chris Braehler, TT Technologies, Mike Rocco, AUI, and others, the process to update the First Edition and companion training course began. The *Pipe Bursting Good Practices Guidelines*, Second Edition, published in early 2011, is an industry-driven resource that provides guidance to project owners, agencies, engineers, contractors, students and other interested parties who want to gain a better understanding of pipe bursting. The intent is to present sound, practical advice that will serve as the backbone reference for training both design and field-responsible project personnel to improve success on pipe bursting projects. Significant updates were made from the 2005 first edition to capture the current state-of-practice presented in four chapters.

Chapter 1 provides an introduction and background on the process and informs the reader that pipe bursting is the only trenchless method capable of installing a new

pipe of equal or larger diameter along the same alignment as the existing pipe. Pipe bursting has become a common technique for replacement of existing pipelines due to either structural deterioration or the need for added hydraulic capacity. The majority of applications are for installing pipes in the 8- to 12-in. range, although pipes as large as 36 in. can be burst. Gravity sewer replacement is the primary application in North America, but replacement of potable water lines is more common in Europe and a growing market in the United States. The replacement of natural gas pipelines using pipe bursting is a relatively small market compared to sewer and water applications.

Chapter 2, "Planning and Design," describes the steps in planning and designing pipe bursting projects, including geotechnical and surface investigations and utility surveys. A new section on design calculations was added to the second edition and provides guidance on evaluating settlement and heave risks, vibrations, bypass pumping and installation loads. The process for evaluating heave risks is new and is based on an empirical approach first developed for estimating settlements

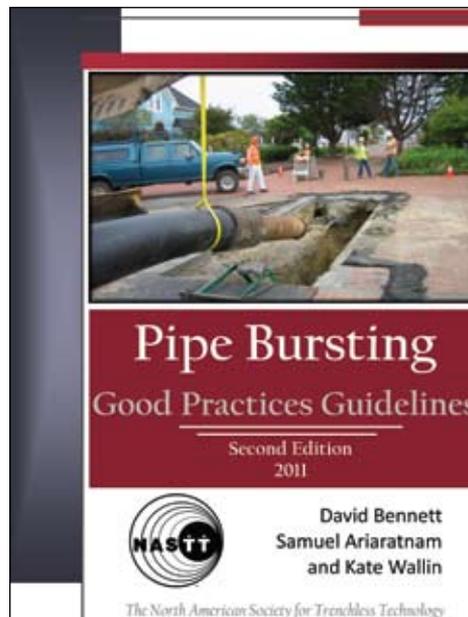
associated with tunneling. Chapter 2 also addresses good practices for drawings and technical specifications.

Chapter 3, "Construction," summarizes good construction practices, including construction sequence, shop drawings/submittals and QA/QC. Numerous illustrations were included to assist the reader in understanding each step of the pipe bursting construction process.

Chapter 4, "Troubleshooting, Avoidance, and Mitigation Measures," was completely revised for the second edition, and focuses on types of problems that can occur, how to diagnose and remedy problems and how to avoid problems. Summary tables in Chapter 4 help the reader quickly identify the problem and the potential solution, as well as how to avoid its recurrence. Categories include host pipe problems, advance rate/productivity issues, equipment problems and surface deformations/utility damage problems. The second edition includes references and a helpful subject index.

The intent of this NASTT publication is to educate owners and their agents of the benefits of a proven alternative technology known as "pipe bursting." For more information or to purchase copies, please visit the bookstore on NASTT's website at www.nastt.org.

All three authors contributed to the second edition of the book. David Bennett and Kate Wallin are employed at Bennett Trenchless Engineers and Dr. Samuel Ariaratnam is a professor at Arizona State University.



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In the Trenches



NASTT Highlights Three Dedicated Members

By Kelly Pickerel

NASTT has been around for more than 20 years and membership numbers continue to grow. Three outstanding members — Sandra Gelly, Kevin Nagel and Don Del Nero — are highlighted on the coming pages. They've all been involved with NASTT for many years and uniquely benefit from the society. *NASTT's Trenchless Today* explores just how they've benefited from NASTT and how their careers have led them to where they are today.

Sandra Gelly

Sandra Gelly got into the trenchless business by accident. She was working toward a degree in civil engineering at McGill University in Montreal, when she sat in on a "Trenchless 101" session.

"I can't tell you how many forks in the road led to this," Gelly says. "At that time, McGill University didn't have a NASTT student chapter and trenchless technology was only taught as part of an optional course."

At the end of the semester, Gelly applied for a job and was hired to work in the underground infrastructure department at the Center for Expertise and Research on Infrastructures in Urban Areas (CERIU), where she stayed for more than a year. CERIU, a nonprofit organization, helps municipalities, consultants, contractors and educational institutions find information and tools for trenchless reha-

bilitation of water and sewer mains. Gelly's experience with underground infrastructures eventually landed her a job at WSA Trenchless Consultants.

"I consider myself very fortunate to have reached this point in my career," she says, "while having so many great mentors and colleagues."

Today, Gelly is a project engineer in GENIVAR's trenchless technologies department, which acquired WSA in 2009.

"I started off as a junior engineer working as a site supervisor for sewer and water main CIPP projects in Quebec and Ontario," she says. "It gave me hands-on experience with trenchless work and design, which was exactly what I was hoping for."

Gelly says she has been fortunate to work on major projects, including the City of Montreal's water and sewer intervention plan.

"That allowed me to focus more on sewer and water inspection, condition assessment and recommendations," she says. "Within the scope of that project I was also able to do the site supervision on a 10-km watermain CIPP job in Montreal."

Recently, Gelly says she's been acting more as a project engineer, coordinating site supervisors and managing



Gelly

projects. She also provides technical assistance and prepares condition assessments and recommendation reports throughout Canada.

"Everything about my job involves trenchless," she says. "Throughout the years I've been able to participate in almost every aspect of our projects, which has allowed me to gain both a global and detailed appreciation of trenchless work."

Gelly's involvement with NASTT has proven to be beneficial in gaining appreciation of the industry.

"Trenchless experts from all over make it easy to learn," she says. "The contacts and friends made at the conferences and events provide great opportunities to share information, stay involved and have fun in my work."

A member of NASTT since 2005, Gelly says she enjoys helping with student chapters most.

"It's great to see the student involvement and energy they bring into the mix," she says. "I hope that my involvement may one day allow for more young people to join the trenchless family."

Don Del Nero

Don Del Nero says his most memorable NASTT experience was arriving at the 2005 No-Dig in Orlando, Fla., late at night with tired eyes. He says there was a heavy mist in the air from the humidity and the watered plants in the atrium of the hotel.

"After I got off the elevator, I walked through this mist and here comes a sign directly in front of me, 'Watch for the alligators!'" he says. "Being road weary and [having] an inability to see clearly, I actually was

a little startled to see the sign. Suffice to say, I didn't become alligator bait!"

Luckily, Del Nero survived the threat of what was hidden in the mist and lived to see another No-Dig. The vice president and assistant lead at CH2M Hill's global tunnel practice has been involved with NASTT for more than 10 years and says the people and supportive relationships are the best part about being in the society.



Del Nero

"Relationships [are] what life is all about and it is no different in the engineering field," he says. "The adage is not what you know but who you know does pay a very positive role in our industry."

Del Nero's background was in traditional geotechnical engineering, but he has gradually morphed into a career focusing on trenchless work. At CH2M Hill, he's involved with every-

thing from planning through construction of horizontal directional drilling installations to tunnels in the 30-plus ft range.

"[It's] very exciting work and something I love to do," he says. "I'm blessed that I can wake up every day loving what I do and the company I work for."

When Del Nero lived in upstate New York, he wasn't involved with NASTT as it was not very well publicized in that area, he says. Once he moved to Atlanta in the late '90s, he became involved with the society by attending No-Dig events.

"Fostering growth in the underground industry is a primary goal of NASTT so I met many very gracious peo-



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ple who were willing to invest in me and encouraged me to get involved," he says. "Providing opportunity to the younger generation to grow professionally has been a hallmark of NASTT and the big reason why I'm involved today."

Del Nero says he takes every opportunity to mold young engineers.

"I take pride in mentoring younger staff in the 'ways of the trenchless force,'" he says, adding that the society also mentors him in ways to become a better engineer. "Underground technologies are changing daily and there would be no chance to stay abreast of these changes without NASTT and their dedicated staff. The organization is led by some pretty neat individuals and that makes all the difference."

Kevin Nagle

Kevin Nagle's first No-Dig Show was in 2006 in Nashville. He says he's excited to head back to Tennessee for next year's show.

"From seeing the great exhibits in the exhibit hall to listening to the great seminars on the different trenchless methods to the entertainment and night life that Nashville had to offer — it was the perfect destination," he says.

It was suggested that Nagle get involved with NASTT to broaden his knowledge of the trenchless industry. He says it has been a great learning experience in the five short years he's been a member.

"I have met some really great people and learned some invaluable lessons through NASTT," he says. "Building relationships through NASTT has greatly broadened my information resources. Knowing the right person to call and ask the question is half the battle."

Nagle graduated from the University of Illinois with a B.S. in civil engineering, primarily focusing on struc-

tures. After six years as a structural engineer at an engineering firm, Nagle decided to look for a profession more construction-based, so he could get out from behind a desk.

"TT Technologies allowed me the opportunity to put my practical engineering knowledge to use in the trenchless industry, and I jumped at the opportunity," he says. "I enjoy talking to engineers, contractors and our own field technicians about how to approach trenchless challenges each and every day. I find it very beneficial to pull knowledge from each of these three avenues to try and come up with the best answer to a challenge."



Nagle

Nagle has been with TT Technologies in Aurora, Ill., since 2005 and can't be "pigeon holed" into a specific job title. The equipment manufacturing company offers a complete line of trenchless equipment, including boring tools, pipe bursting systems and directional drills.

"Every day is different, and each day is filled with new challenges," he says.

"On any given day, I can be dealing with some portion of equipment safety, R&D, specifications, equipment sales, contracts, trenchless education and customer service."

Nagle says his involvement with the No-Dig Show program committee has helped him build great relationships and become a better engineer, too.

"Every day is different, and each day is filled with new challenges," he says. "There are so many extremely bright people involved with NASTT, and this has allowed me the opportunity to pull from that knowledge base when a new challenge arises."

Kelly Pickerel is assistant editor of NASTT's *Trenchless Today*.

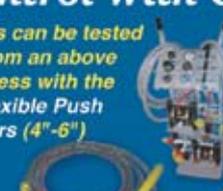
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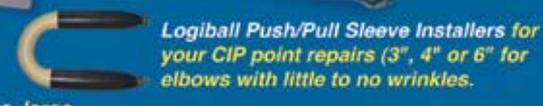
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NEW RELEASE ANNOUNCEMENT

Pipe Bursting Guidelines

With a worldwide increase in urban growth, more and more municipal governments are facing enormous challenges with aging water and wastewater systems. Potable water distribution piping is often below operational requirements plus, sanitary and storm collection piping is often at peak capacity or even beyond. These utility owners are faced with the onerous task of replacing or rehabilitation their infrastructure while under ever increasing financial and environmental restrictions.

Pipe bursting is defined as the replacement of the host, or original, pipe by fragmenting the existing conduit and installing the product or new pipe in its place. This construction technique is recognized as the only method of trenchless rehabilitation that can replace an existing line with a completely new pipe, providing a total pipe replacement. Additionally, pipe bursting allows for the replacement of existing pipe with a new line of equal or larger diameter, to maintain or increase flow capabilities.

The First Edition of the *Pipe Bursting Good Practices Guidelines* was published in 2005 as a supplement to the Pipe Bursting Training Course developed by the North American Society for Trenchless Technology (NASTT). The Second Edition of the *Pipe Bursting Good Practices* has expanded to reflect the current state of the industry. The Second Edition also has a new section on design calculations and a newly revamped Trouble Shooting section including remediation and preventative measures. The Second Edition *Guidelines* were authored by Dr. David Bennett, Dr. Samuel Ariaratnam, and Kate Wallin in conjunction with TT Technologies, Inc., Earth Tool Company and Albuquerque Underground, Inc.

Topics covered in the book include:

- Pipe Bursting Techniques
- Design Considerations
- Elements of Construction
- Trouble Shooting and Remedial Actions

The intent of this North American Society for Trenchless Technology (NASTT) publication is to educate owners and their agents of the benefits of a proven alternative technology known as "Pipebursting". For more information and pricing, visit the NASTT web site at www.nastt.org.



Pipe Bursting Good Practices Guidelines

Second Edition
2011



David Bennett
Samuel Ariaratnam
and Kate Wallin

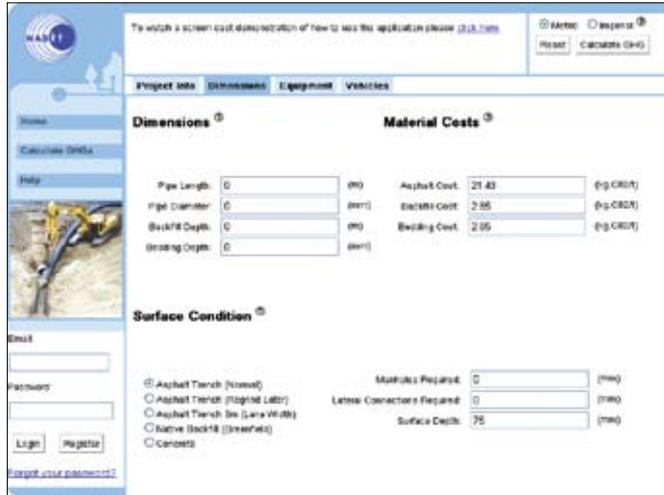
The North American Society for Trenchless Technology

NASTT Chapter News

Regional Chapter News

British Columbia

In the last year, NASTT-BC had three exciting half-day presentations and will host two NASTT courses in HDD and pipe bursting in June. The Chapter's magazine *Y-dig* should be out in June. Chair Karl Mueller says there have been advances locally in legislated carbon emission reductions for municipalities and it promises to be a boon for the trenchless industry.



Outside interest has taken the British Columbia Chapter's carbon calculator to a new level. It will be developed further through a joint venture of NASTT and American gas companies.

The concept of the carbon calculator was developed in 2009 and has now been taken up by a joint venture of NASTT and a number of gas companies from the Eastern United States, who have commissioned a major consultant to develop it further. The Pipe Jacking association of the UK is developing the chapter's concept to a higher level. Both of these tools are to assist designers in making informed design decisions. NASTT-BC is now waiting for final rules from the British Columbia government before it develops a protocol that will allow municipalities to use the carbon credit to offset against other carbon emissions from other parts of their operations. This will measure the actual carbon saved through the use of trenchless and sell those benefits.

Great Lakes St. Lawrence & Atlantic

The latest edition of the GLSLA Chapter magazine was distributed at the 2011 No-Dig Show in Washington, D.C.



The ACWWA conference will be in St. John's this year.

GLSLA also generously donated \$1,000 toward the purchase of items for NASTT's 10th annual Educational Fund Auction

The GLSLA Chapter will participate in the Atlantic Canada Water & Wastewater Association (ACWWA) Conference in St. John's, Newfoundland and Labrador, on Oct. 2-4. This year's ACWWA conference, titled "Got Water?," will concentrate on the necessity of water and the devastating affects of natural events. Members will also attend the INFRA 2011 conference in Quebec City, Nov. 7-9, focusing on the innovation and expertise in municipal infrastructure.

Nearly 1,000 participants will discuss infrastructure and its essential support to civic vitality.

Mid Atlantic

The Mid Atlantic Chapter has two upcoming two-day seminars: a July seminar in Charleston, W.V., and a November seminar in Norfolk, Va. The group just had a seminar in Philadelphia on May 25 and 26.

Midwest

The Midwest Chapter has two upcoming two-day seminars: June 22-23 in Cincinnati and Sept. 26-27 in St. Paul, Minn.

Pacific Northwest

The Pacific Northwest Chapter hosted the 2011 Trenchless Symposium on Feb. 24 and 25 at the Cedarbrook Lodge in SeaTac, Wash. As part of the conference, PNW offered the NASTT Good Practices Short Course on Cured-in-Place-Pipe (CIPP). Both the Symposium and Short Course were very successful events for the Chapter, with more than 25 Short Course attendees, more than 60 Symposium attendees and



The Pacific Northwest Chapter had its 2011 Trenchless Symposium at the Cedarbrook Lodge in SeaTac.

10 exhibitors. The PNW Chapter is currently planning a board meeting for June, in which members will discuss the second edition of the *PNW Trenchless Review*, the Chapter publication. Members at the meeting will also discuss the possibility of hosting trenchless seminars for local municipalities to fulfill PNW's goal of increasing trenchless education in the public sector.

Northwest

The Northwest Chapter had its annual general meeting at the Washington, D.C., No-Dig in March. Twelve members participated. The Chapter elections produced representation in two of the three provinces the Northwest Chapter represents — Saskatchewan and Alberta. It is still looking for people in the trenchless industry in Manitoba who might be interested in becoming active with the chapter. Chapter chair Duane Strayer requests anyone contact him at dstrayer@nastt-nw.com if interested.

Planning is underway for the 2011 Northwest Trenchless conference to be held in Calgary on Nov. 16-17. The chair of the conference organizing committee is Nadeer Lalji, who can be contacted at nlalji@nastt-nw.com for more information.

Rocky Mountain

The Rocky Mountain Chapter (RMNASTT) is busy planning its second annual conference after hosting its highly successful first conference in October 2010 in Denver. The 2011 conference will be Oct. 7, at the Doubletree Hotel in Westminster, Colo. A half-day "Best Practices Course" will be offered on Thursday afternoon Oct. 6. Presentations by both local and national trenchless experts will be given in the areas of Utility Management, New Construction, Rehabilitation and Repair and Trenchless Con-



The Rocky Mountain Chapter will have its second annual conference this October.

struction. Twenty sponsor/exhibitor spots are available for interested companies.

The Rocky Mountain Chapter is also beginning an active outreach to its members and future members in Utah and Wyoming. Several members in the Salt Lake-area have indicated an interest in starting a luncheon meeting series to highlight trenchless topics and projects of interest. The chapter is still looking for interest in Wyoming. If you are interested in helping to start some RMNASTT activities in either Utah or Wyoming please contact Tracy Lyman, chairman, c/o Brierley Associates, (303) 534-5789 x3206 or tlyman@brierleyassociates.com.

Southeast

The Southeast Chapter has two upcoming two-day seminars: an August seminar in Fort Lauderdale, Fla., and a December seminar in Atlanta.

Western

The 7th annual Western Regional No-Dig Conference & Exhibition will be Oct. 3-4 at the Wyndham Hotel in San Jose, Calif. The event will have many vendors and technical paper presentations. If registered by Sept. 3, the fee is \$275 for NASTT members and \$325 for non-NASTT members. If registered after Sept. 3, the fee is \$325 for NASTT members and \$375 for non-NASTT members. There is a special rate for those wishing to stay in the Wyndham Hotel. The special rate reservation deadline is Sept. 3. For additional information, contact chair Jennifer Glynn at (925) 627-4151.

Special Congratulations to LA

The City of Los Angeles recently completed one million feet of sewer that has been constructed or rehabilitated using trenchless technologies. The city has an aggressive sewer rehabilitation program to manage effectively and renew its

6,700-mile wastewater sewer system. Always pursuing new, better technologies to protect the city's aging infrastructure as a valuable resource, Los Angeles has embraced trenchless sewer construction methods.

"Angelenos spend a lot of time driving, and traffic in this city is legendary," said City Engineer Gary Lee Moore. "Our engineers recognized this challenge and found a way to keep people moving while also accomplishing the important work of renewing the sewer system. I applaud staff for this innovative thinking and am excited that Los Angeles is first in reaching this million-foot milestone."

Since the launch of trenchless methods more than 15 years ago, the city has saved more than \$80 million in construction costs. Traditional open-cut sewer rehabilitation costs approximately \$125 per linear foot, and trenchless methods average about \$30 per linear foot.

Congratulations to Los Angeles and our NASTT members who helped reach the one million mark!

Student News

At this year's No-Dig event, many students were recognized for their leadership and excellence. The competition and scholarship winners are listed below:

NASTT Student Chapters Activities

Presentation Competition

First place: Virginia Tech University

Second place: Bowling Green State University

Third place: Louisiana Tech University

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NASTT Student Research Poster Competition

First place: Shaurav Alam and Rajesh Dulam, Louisiana Tech University
Second place: Jai Jung, Virginia Tech University

John P. Lake Rain for Rent Academic Scholarships

Sridevi Bajgur, University of Texas at Arlington
Brock Baker, Bowling Green State University
John Michael, Arizona State University
Olalekan Sodeinde, Vanderbilt University
Nisha Thuruthy, Virginia Tech University
Christopher Warshaw, Louisiana Tech University



The Michael E. Argent Scholarships were awarded to (L-R) Kristi Steiner, Alison St. Clair and Sandria Brown at this year's No-Dig event (Not Pictured: Trupti Kulkarni and Kazi Rahman).

Michael E. Argent Scholarships

Sandria Brown, Bowling Green State University
Trupti Kulkarni, University of Texas at Arlington
Kazi Rahman, Queen's University
Alison St. Clair, Virginia Tech University
Kristi Steiner, Virginia Tech University

Sandria Brown is a second year graduate student studying construction management at Bowling Green State University (BGSU) in Bowling Green, Ohio. Brown is the current president of the NASTT student chapter and the student representative for the Ohio Horizontal Directional Drilling Association (OHDDA). Her research interests are within the horizontal directional drilling (HDD) industry. During Brown's leadership as student chapter president she has designed a new chapter logo and played an instrumental role in



Brown

the development of the chapter's social media campaign. Currently she has been working with OHDDA members in the creation of an internship/co-op program for an active chapter member so that the student may gain valuable work experience and mentoring within the trenchless technology industry.

Trupti Anil Kulkarni is a Ph.D. student at The University of Texas at Arlington and is working as a research assistant for



Kulkarni

the Center for Underground Infrastructure Research and Education (CUIRE). Kulkarni received her bachelor's of civil engineering from Ramaiah Institute of Technology in India in 2006 and her Master's of Science from The University of Texas at Arlington in 2009. Her area of specialization is construction management and trenchless technology. She is currently the treasurer for the NASTT student chapter and a member of ASCE at The University of Texas at Arlington. She is also working on ASTM and AWWA for renewal of potable pipes and ASCE manual of practice.

Kazi Rahman is a Ph.D. student at Queen's University. He has been investigating the impact of pipe bursting on surrounding infrastructure like adjacent pipelines, overlying pavements and nearby foundations. As secretary of the NASTT-Queen's Chapter, he has contributed to organizing field trips, short courses and workshops in order to educate and motivate more students to this industry. In the future, Rahman would like to work in the trenchless industry as a consultant to utilize his analytical skills and gain more experiences. He would also like to contribute to expand the industry in developing countries like his home country of Bangladesh. He says he loves trenchless technology and would like to promote a hassle-free pipeline management system in Bangladesh by utilizing his knowledge.



Rahman

Alison St. Clair is a fourth-year Ph.D. candidate in the Vecelio Construction Engineering and Management Program in Civil and Environmental Engineering at Virginia Tech. Her research focuses on developing a model to predict the performance of water pipe infrastructure assets. While at Virginia Tech she was awarded as a Citizen Scholar for her efforts in coordination of the No-Dig Show student activities. In 2008, St. Clair created the NASTT student chapter at Virginia Tech where she served as president until 2010. Upon graduation, St. Clair would like to work for an engineering consultant helping to move the water and wastewater infrastructure industry forward.



St. Clair

Kristi Steiner is a first year graduate student at Virginia Tech in Civil and Environmental Engineering. She became president of the NASTT student chapter in the fall of 2010, and she hopes to continue her role as president until she graduates in December 2011. Her research focuses on water/wastewater pipeline renewal technologies and management practices. She has participated in industry workshops/conferences, and she looks forward to continuing to do so in the future. Upon graduation, Steiner says she is excited to give back to the trenchless industry, and she hopes to work for a large consulting firm on trenchless rehabilitation projects.



Steiner

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Central Contra Costa Sanitary
District Offices - Martinez, California

Wednesday, November 16, 2011

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Coast Plaza Hotel
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NASTT Regional Chapters

British Columbia

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

Chapter Contact

Karl Mueller, Chair
Phone: (604) 293-3293
E-mail: kmuller@kwl.ca

Website

www.nastt-bc.org

Elected Officers

Chair - Karl Mueller
Vice Chair - Rod Loewen
Secretary - vacant
Treasurer - Gurjit Sangha



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

Isabel Tardif, Chair
Phone: (514) 848-9885
E-mail: Isabel.tardif@ceriu.qc.ca

Website

www.glsla.ca

Elected Officers

Chair - Isabel Tardif
Vice Chair - Kevin Bainbridge
Treasurer - Derek Potvin
Secretary - Gerald Bauer



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@pirmie.com

Website

www.mastt.org

Elected Officers

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



Midwest

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

Chapter Contact

Jeff Boschert, Chair
Phone: (314) 229-3789
E-mail: jeffboshert@sbcglobal.net

Website

www.mstt.org

Elected Officers

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



Northwest

The Northwest Chapter (NASTT-NW) was established in 1988 by members in the Canadian provinces of Alberta and British Columbia, Canada, and in Washington state. In 2005, the members in British Columbia established the NASTT-BC Chapter. In 2009, the members in Washington state established the Pacific Northwest Chapter and the Northwest Chapter adjusted the geographic area to include the members in the provinces of Manitoba and Saskatchewan, Canada.

Chapter Contact

Duane Strayer, Chair
Phone: (403) 262-4500
E-mail: strayerd@ae.ca

Website

www.nastt-nw.com

Elected Officers

Chair - Duane Strayer
Vice Chair - Dan Willems
Secretary - vacant
Treasurer - Mark Brand



Pacific Northwest

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

Chapter Contact

Erik Waligorski, Chair
Phone: (425) 289-7320
E-mail: ewaligorski@rothhill.com

Elected Officers

Chair - Erik Waligorski
Vice Chair - Chris Price
Secretary - Chris Sivesind
Treasurer - Matt Pease

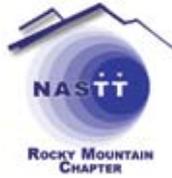


Rocky Mountain

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

Chapter Contact

Tracy Lyman, Chair
Phone: (303) 534-1100
E-mail: tlyman@lymanhenn.com



Website

www.rmnastt.org

Elected Officers

Chair - Tracy Lyman
Vice Chair - Al Paquet
Secretary - Ken Matthews
Treasurer - Aaron Burns

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

www.sestt.org

Elected Officers

Chair - Jerry Trevino
Vice Chair - Ed Paradis
Secretary - Chris Ford
Treasurer - Henry Derr

Western

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

Chapter Contact

Jennifer Glynn, Chair
Phone: (925) 627-4100
E-mail: jglynn@rmcwater.com



Website

www.westt.org

Elected Officers

Chair - Jennifer Glynn
Vice Chair - vacant
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Dr. Levent Ozdemir, PE., President, Ozdemir Engineering Inc. and Retired Professor, Colorado School of Mines

Timothy Coss, President, Microtunneling, Inc. and Senior Research Associate, Microtunneling Research Institute, Colorado School of Mines



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Monday, September 19, 2011

7:30 - 8:00 Registration

8:00 - 8:30 Opening Remarks – Levent Ozdemir

8:30 - 9:15 Site Investigations – Greg Raines, MWH

9:15 - 10:00 Geotechnical Baseline Reports – Randy Essex, Hatch Mott MacDonald

10:00 - 10:15 Coffee Break

10:15 - 10:45 Risk Assessment – Bob Goodfellow, Black and Veatch

10:45 - 11:30 Selection of Excavation Method – Gary Brierley, Brierley Assoc.

11:30 - 12:15 Tunnel and Ground Support Design – Jon Kaneshiro, Parsons

12:15 - 1:15 Lunch

1:15 - 2:00 Predicting Groundwater Inflows – Ron Heuer, Consultant

2:00 - 2:30 Design for High Water Inflow – Bill Hansmire, Parsons Brinckerhoff

2:30 - 3:00 Tunneling through Difficult Ground – Don Deere, Deere & Ault

3:00 - 3:15 Coffee Break

3:15 - 4:00 NATM Design and Construction – Michael McRae, Jacobs Associates

4:00 - 4:45 Drill and Blast Tunneling – Kip McCalla, Atlas-Copco

4:45 - 5:30 Roadheader Tunneling – Bruno Reumueller, Sandvik

Tuesday, September 20, 2011

8:00 - 8:45 Hard Rock TBMs – Dennis Ofiara, The Robbins Company

8:45 - 9:30 EPB Machines – Walter Trisi, Caterpillar Tunneling Canada

9:30 - 10:15 Slurry Shield Machines – Werner Burger, Herrenknecht

10:15 - 10:30 Coffee Break

10:30 - 11:00 EPB and Slurry TBM Interventions – Jerry East, Global Diving

11:00 - 11:30 Segmental Concrete Liners – Jon Hurt, ARUP

11:30 - 12:00 TBM Guidance and Monitoring – Nod Clarke-Hackston, VMT

12:00 - 1:00 Lunch

1:00 - 1:45 TBM Production and Cutter Life – Levent Ozdemir

1:45 - 2:30 TBM Excavation in Bouldery Ground – Steven Hunt, CH2M Hill

2:30 - 3:15 Shaft Design and Construction – Glenn Boyce, Jacobs Associates

3:15 - 3:30 Coffee Break

3:30 - 4:00 Overview of Underground Grouting – Ray Henn, Lyman Henn

4:00 - 4:30 Jet and Compaction Grouting – Tom Szynakiewicz, Hayward Baker

4:30 - 5:00 Ground Freezing for Shafts and Tunnels – Paul Schmall, Moretrench

5:00 - 5:30 Consolidation and Contact Grouting – Brad Crenshaw, Ground Engineering

5:30 - 7:30 Banquet

Wednesday, September 21, 2011

8:00 - 8:30 Pipe Umbrellas and Spiling – Franz Walcshofer, Dywidag

8:30 - 9:15 Tunnel Utilities – Shane Yanagisawa, Frontier-Kemper

9:15 - 10:00 Microtunneling – Tim Coss, Microtunneling Inc.

10:00 - 10:15 Coffee Break

10:15 - 11:00 Tunnel Costing and Scheduling – Jim Peregoy, Peregoy Construction Service

11:00 - 11:30 Construction Management – Tom Peyton, Parsons Brinckerhoff

11:30 - 12:00 Dispute Resolution – Ray Henn, Lyman Henn

12:00 - 1:00 Lunch

1:00 - 1:30 TBM Applications in Mining – Christian Frenzel, CSM

1:30 - 2:00 Case History – NY 2nd. Avenue Subway – Verva Nasri, AECOM

2:00 - 2:30 Case History-Minneapolis Airport Tunnels – Paul Zick, Obayashi

2:30 - 3:30 Case History – Portland ESCSO Project – Shawn Renken, Kiewit

3:30 - 4:00 Discussion and Closing Remarks – Levent Ozdemir

NASTT Student Chapters



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Tempe, Ariz.

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Bowling Green, Ohio

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UNIVERSITY

Concordia University

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PURDUE UNIVERSITY
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University of Alberta

Edmonton, Alberta

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Construction of Non-Circular Sewer Rehabilitation Projects in Los Angeles

Brad Jenson, Yasmin Hafeez, Yoon Cho, and Ed Gobaton
-Bureau of Engineering, Department of Public Works,
City of Los Angeles

INTRODUCTION

The City of Los Angeles owns and operates one of the largest wastewater collection and treatment systems in the world. The City operates and maintains over 6,500 miles of sewers and four wastewater treatment facilities with a combined treatment capacity of 550 million gallons per day (mgd). Sewer construction in Los Angeles began in the 1870s and had major construction periods in the 1920s and 1950s. Many of these older sewers are approaching the end of their useful service life and will need to be replaced or repaired to continue serving the citizens of Los Angeles. Previously, non-circular sewers required the sewers to be bypassed and repaired by man-entry installation of a new pipe or liner. A pilot project in 2002 experimented with a non man-entry lining of a pipe using a Fiberglass Reinforced Pipe (FRP). The City has recently begun to implement a rehabilitation program for non-circular sewers which includes rehabilitation of sections of the Central Outfall Sewer (COS) and the North Outfall Sewer (NOS). These rehabilitation projects are utilizing newly approved materials and various construction methods to repair these sewers.

BACKGROUND

In the early years of Los Angeles, like other municipalities, the goal of a sewer was to convey the sewage to the outskirts of the City for disposal. The City eventually extended the sewer system to the ocean by construction of the COS in 1904. The oval shaped COS was constructed using two or three layers of bricks and conveyed the flow from downtown Los Angeles and discharged the sewage into Santa Monica Bay. This sewer remained in operation for approximately 20 years before the effects of corrosion and capacity limitations required the replacement of this sewer by the NOS which was constructed in the mid to late 1920s. The semi-elliptical NOS was constructed of un-reinforced concrete and incorporated clay tile liners above the springline to protect the concrete from the attack of sulfuric acid. As the City continued to grow and required additional sewer capacity, the COS was subsequently repaired in the 1940s and returned to service. Of the 6,500 miles of sewers in the City, approximately 68 miles are non-circular pipes which were primarily constructed in the 1920s and 1930s.

As the sewers in Los Angeles continue to age and the pipe conditions deteriorate, the City has moved forward on rehabilitating the collection system and has recently began rehabilitating a number of non-circular sewers using methods and materials that are new to the City.

REHABILITATION METHODS

As part of the design of the recently awarded rehabilitation projects, the City has specified three methods that the

contractor can select for construction. These methods are sliplining with a Reinforced Polymer Mortar Pipe (RPMP), cast-in-place PVC liner and a coiled profiled strip liner. In general the City does not specify the actual liner or installation methods to be used by the contractor unless other project considerations dictate one method over another such as limited access or other surface constraints.

Sliplining

Sliplining has been successfully used by the City for numerous rehabilitation projects involving circular pipes. This method allows the sewer to be rehabilitated while remaining in service and does not require a bypass. For circular projects the City has specified a 3-in. annular gap between the new pipe and the existing sewer, typically resulting in a 9-in. reduction in diameter and utilizes a size of pipe that is commercially available. For the non-circular projects the pipes are manufactured using a mandrel that is custom made for the project so specifying a common size or dimension is not necessary. As such a 3-in. gap is being specified on the sides and top, resulting in a slightly modified shape for the final sewer. Figure 1 shows the typical cross sections for the oval and semi-elliptical (SE) pipes.

The installation method for sliplining may also differ for the non-circular projects. The methods of installing these slipliners can be by non man-entry sliplining or by man-entry and carrying the pipes into the sewer. The man-entry option will typically require the sewer to be bypassed or diverted. Any man-entry installations will require the contractor to comply with tunnel safety orders assuring that a safe work environment is maintained for the contractor and City inspectors. Rehabilitation by non man-entry sliplining of a non-circular pipe into an existing non-circular sewer has been very limited. The City completed a pilot project in 2002 that repaired a section of the Woodvale storm drain by sliplining a semi-elliptical pipe into the storm drain. This project was done in completely dry conditions to see what issues might arise by this type of construction. In 2008 the City installed approximately 40 ft of oval pipe into the COS by non man-entry sliplining. In 2009 the City installed 200 ft of SE pipe into the NOS by man-entry installation as part of an emergency repair project near the Los Angeles River. In the City the majority of the non-circular sewers rehabilitated to date have been by man-entry installation.

Cast-in-Place and Coiled Profile Strip Liner

The City has specified or approved two methods for installing a cast-in-place PVC liner in the existing sewer. One method is to utilize a form and a PVC liner which is combined with high strength concrete to construct a new pipe within the old sewer. The City has typically specified a 4-in. concrete thickness. The PVC lining can be specified to be less than a 360 degree lining. The second method is a coiled profile strip liner. This method winds in a PVC liner using a machine to create the specified cross section. The annular space is then filled with high strength concrete which completes the liner. In this case the PVC is a 360 degree lining. The semi-elliptical cross section has specified reinforcement at the lower corners and additional

reinforcement if the contractor installs the concrete using multiple lifts. Both options require man-entry installation and compliance with tunnel safety requirements. Bulk cleaning of the sewer and surface cleaning of the pipe walls is required.

NON-CIRCULAR SLIPLINING PROJECTS

The City has recently begun three rehabilitation projects, one as an emergency sewer repair and two as part of the Capital Improvement Program. The NOS experienced a fail-

NOS EMERGENCY REHABILITATION 23RD AT TRINITY

In November 2008 the City was notified by local residents (living near 23rd and Trinity streets) of unusually high sewer odors in and around their homes. Upon further investigation as to the source of these odors, it was discovered that a large void had developed in the crown of the existing 66-in. brick and concrete semi-elliptical NOS. This void had resulted in the collapse of the local 8-in. sewer and was allowing the sewer gases to migrate from the NOS into the local residential properties through the house connections. A contractor was immediately mobilized to stabilize the intersection and to prepare to repair the sewers.

This section of the NOS had been constructed in the mid-1920s and was constructed with an un-reinforced concrete base with a two ring brick arch. Immediately downstream of the void, the sewer joins a 57-in. SE brick and concrete sewer and becomes a 72-in. SE concrete pipe with clay tile liners. In 2005 the 72-in. sewer had been intercepted and the flows diverted to a drop structure which drops the flow 90 ft into a 132-in. pipe. Gases from this drop structure and from the junction of the 57-in. and 66-in. sewers likely added to the corrosion and eventual pipe failure. The immediate construction focused on stabilizing the street and local utilities and preventing a street collapse and subsequent sewer blockage and sewer spill. This work entailed excavation of the curved portions of the 57-in. and 66-in. sewers as well as the existing junction structure. The sewers upstream of the void were inspected by CCTV and found to have several sections with one layer of bricks missing from the crown of the sewer and the scope of this emergency project was increased to address the extent of the problem.

The scope of this emergency project was eventually increased to include repair to sections of the 72-in., 57-in. and 66-in. semi-elliptical sewers as well as the existing junction structure. A total of 112 ft of 72-in. sewer, 45 ft of 57-in. and 1,044 ft of 66-in. were included in the project to be lined. The straight sections of the sewers were to be lined by non man-entry sliplining using a non-circular reinforced polymer mortar pipe (RPMP). The curved sections of the sewer could be rehabilitated by RPMP or by removing the top of the existing sewer and replacing this with a PVC-lined concrete section. Due in part to the lead time in getting the RPMP pipe, the contractor rehabilitated the curved sections with PVC-lined concrete while the pipe was being manufactured for the remaining sections of the project.

The 72-in. was the first section to be rehabilitated. A pit was constructed near the downstream end of the 72-in. sewer that was to be lined and the excavation at the junc-

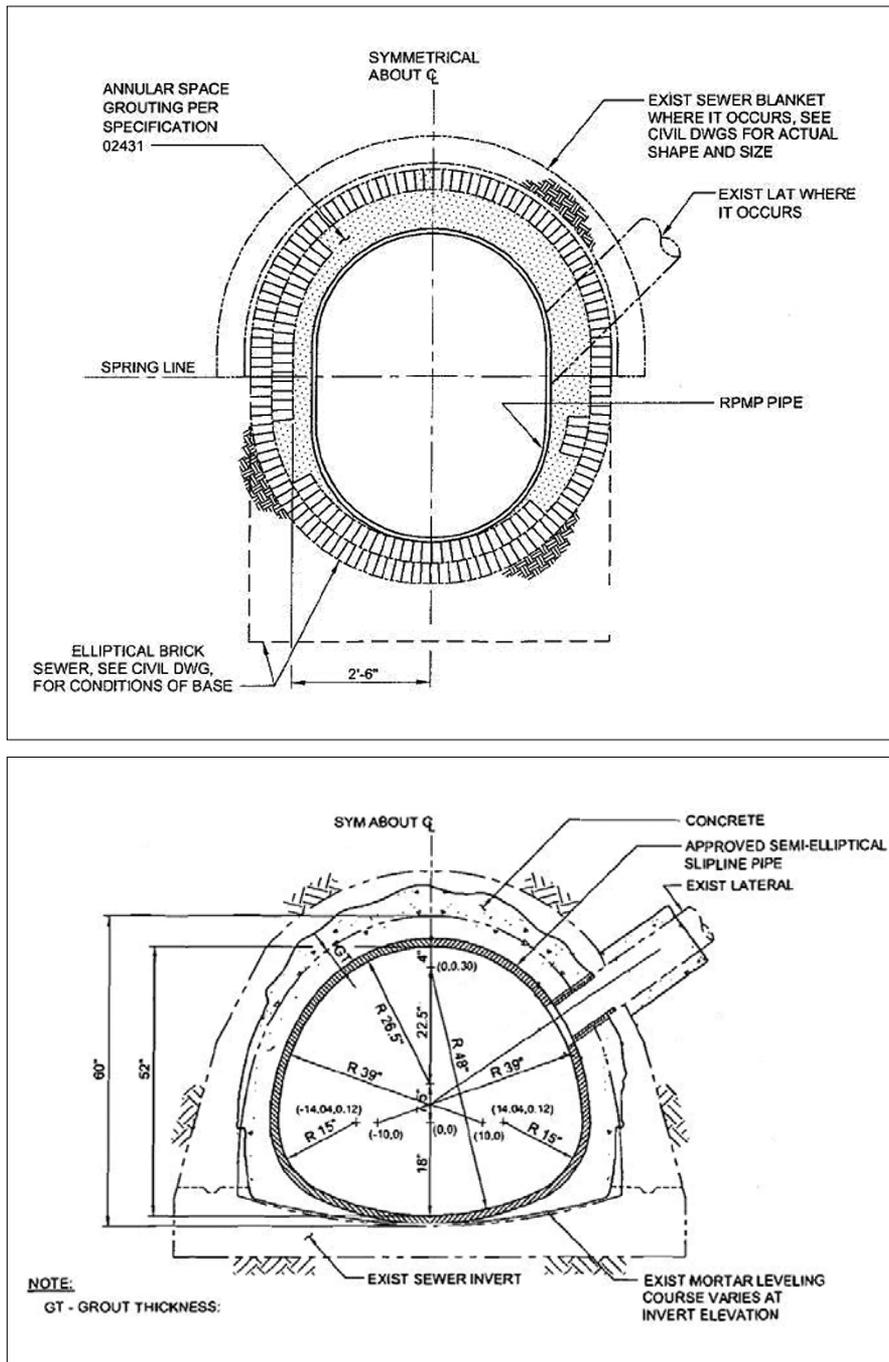


Figure 1. Slipliners for Oval and Semi-Elliptical sewers

ture in November 2008 requiring an emergency contract to make repairs to the damaged sewer. In June 2009 the City awarded two contracts, one to repair 1.5 miles of the NOS and one to repair 3 miles of the COS. Each of these projects is utilizing different materials and installation methods than previously utilized.

tion structure was used for a second access pit. The contractor cleaned and removed all debris prior to the sliplining operation. The installation of the liner was completed by installing 17-foot segments of pipe in the downstream pit and pulling these segments into the sewer toward the upstream junction structure using a cable. A pulling ring was fabricated that was attached to the cable and distributed the pulling forces evenly over the pipe joint. The short distance for this installation allowed the contractor to use a crane to pull the cable and the pipe into the sewer. Cables attached to the lead pipe were utilized to restrain the pipe while the next segment was pulled forward in order to close the joint. One section of pipe was pulled into place from the pit toward the downstream diversion structure. The final closure piece was then placed into the access pit. Once all segments had been installed, the upstream segment was restrained and the cable was used to pull the final joint together. This installation was completed in one day excluding the grouting of the annular space.

The 66-in. sewer used a slightly different installation procedure. As with the 72-in. sewer, the contractor pulled a cleaning sled through the sewer to remove the bulk debris. Just prior to sliplining this reach, the contractor used a hydroflusher to remove any remaining debris in the invert. A modified pushing rig was used that utilized a crane to pull a cable through pulleys and was attached to a beam and pushing ring which in turn pushed the slipliner into the existing sewer. As this was the first non-circular slipliner installation into a non-circular sewer, a CCTV camera was attached to the lead pipe in order to monitor the progress of the liner and to observe if there was any damage to the

existing sewer caused by the installation of the slipliner. The City and the contractor were concerned over loose bricks falling into the annular space and preventing the pipe from advancing or potentially creating a local collapse. The 1,000 ft of slipliner was installed in three days with minimal difficulties.

A number of challenges were encountered during this installation. After installing approximately 700 ft of liner, the contractor began to have problems in pushing the pipe. During the installation the CCTV camera observed numerous occasions of the slipliner hitting the side of the existing sewer causing bricks to fall into the sewer. Because the CCTV camera was installed in the lead pipe, the contractor was able to observe debris accumulating in front of the lead pipe. A hydroflusher was used to pull this debris out of the sewer and the installation of the pipe was able to proceed. The contractor also reported that there may have been slight variations in the horizontal alignment and invert of the sewer. The slipliner may have also pushed over some of the debris in the invert causing the pipe to rise. There was evidence on the lead pipe that the pipe had scraped the top of the existing sewer during the installation process. The contractor utilized 8-foot pipe lengths for this section which were able to provide enough flexibility to negotiate these changes in alignment. Figure 2 shows the installation of the liner. The pipe was successfully installed.

NOS MAZE REHABILITATION PHASE 5

The NOS Maze Phase 5 is the final project to rehabilitate a section of the NOS known as the "Maze". This project has a combination of circular and non-circular pipes to be rehabilitated. The project also includes 517 ft of an existing 42-in. semi-elliptical pipe that will be removed and replaced as it was determined to be too small for sliplining. The majority of the project is to rehabilitate 6,719 ft of 60-in. semi-elliptical concrete sewer. The project will also rehabilitate 120 ft of 75-in. and 840 ft of 63-in. circular pipes. A contract for this project was awarded in June 2009 for \$12,481,511. The construction is scheduled to be completed in August 2011.

The contractor has selected to install a semi-elliptical RPMP pipe into the sewer by man-entry installation. The basic process of this rehabilitation will be to construct access pits, clean the sewer and remove the bulk debris, install the liner in the sewer and grout the annular space. The design provided work sites at the beginning and end of the project and at both ends of each curve. The contractor will not use all of the proposed pits. Pipe cleaning will be done by hydroflushing and will utilize existing maintenance holes. The contractor will install 4-foot pipe lengths of the slipliner pipe from the pit into the sewer, including the straight and curved sections. These pipes will be blocked in place as the installation proceeds which will allow the grouting of the annular space without movement of the slipliner pipe.

The alignment of this project contains numerous curves and angle points that will require special installation methods. The project has a total of eight curves that have a 50-foot radius. The design allowed most of these curves to be rehabilitated by either lining the curves by man-entry or to open cut the curve, remove the top of the sewer and then install the new liner inside the existing pipe invert. A curve on the existing 75-in. pipe will likely require the contractor to install the liner by sliplining as existing utilities limit the surface access and bypassing the 90 cfs

of flow may not be practical to allow a man-entry installation of the liner. The contractor is proposing to line the curves on the 60-in. semi-elliptical pipe by man-entry and using 4-foot pipe lengths. These pipes are being manufactured with a curvature that has a 4.5 degree curve per pipe. This will allow the pipe to negotiate the curve and incorporates a joint with a gasket. The project also includes two 15 degree angles that have no surface access at the angle points. Access pits are located near the angle points that may be used by the contractor. Surface access at the angle points was restricted by traffic restrictions and by existing utilities above the sewer. The contractor is again proposing to use shorter pipe lengths and man-entry installation to install the pipes past these angle points. This process will minimize the surface impacts and disruption as seen on previous rehabilitation projects.

The rehabilitation portion of this project began in March 2010. The project is scheduled to be completed in 2011.

COS REHABILITATION NORS DIVERSION 4 TO MARKET STREET

The COS is the oldest outfall in the City that is still in use. After the sewer was rehabilitated in the 1940s, minimal repair work has been done on this sewer during the past six decades. The sewer is now experiencing major brick loss and in one location a hole in the pipe has been discovered immediately upstream of this project. A contract to repair three miles of this sewer was awarded in June 2009 for \$15,050,237. The construction is scheduled to be completed in 2011.

The construction of the COS in 1904 predated much of the current development in this part of Los Angeles. Because of this, the alignment does not follow the public right-of-way and instead the sewer easement traverses a number of private properties, runs underneath residential and commercial buildings, and over a major interstate highway. Due to variations in fill elevations, the profile is not at a uniform elevation below grade level, and rises above grade along some sections. At one location, the sewer runs 400 ft under an active two-story commercial building, and there is an angle point under this building. The alignment presented a challenge in identifying available work sites to be used during the construction phase.

The contractor has selected to use a man-entry cast-in-place liner to rehabilitate this sewer. This method will require the sewer to be completely dry during the construction phase. The contractor will be required to bypass local sewers as necessary. Because of the size of the sewer and the equipment to be used, an external bypass of local flows will be required as to not interfere with the lining operations. One of the factors that influenced the contractor to choose man-entry cast-in-place over sliplining was the risk during the sliplining operation to encounter bricks that were protruding and that would prevent the slipliner from being successfully installed and the risk of the pipe being slightly smaller than expected due to variations in the original construction. With the cast-in-place option, the form will have a small amount of flexibility to modify the cross section should the existing cross section be different.

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Figure 2. Installation of the 66-in. slipliner

The cast-in-place liner will require additional cleaning that is not required for the sliplining option. In addition to removing the bulk debris from the invert of the sewer, the contractor will be required to clean the walls of the sewer to remove all debris such as sewage wastes, grease, loose bricks and other solid or semi solid foreign material.

This cleaning will involve the use of low water pressure washing equipment using a water pressure ranging from 1,000 to 3,000 psi. Following the cleaning, a neutralizing agent of magnesium hydroxide will be applied to the surface.

The basic work approach for the rehabilitation will involve providing ventilation and odor control of the sewer for man-entry work, construction of access pits, debris removal and cleaning of the sewer, installation of the form, and installation of the concrete. The contractor will install an odor control scrubber near the downstream end of the project. Air will be drawn into the sewer from an opening at the upstream and downstream terminus of the project. A major access pit will be located 2,200 ft from the upstream end of the project at a major angle point in the alignment. This location will be used to insert the form into the COS. This form will be moved to the upstream end of the project where the lining will begin. A crew will install the form, including the PVC liner and set the form to grade. A crew will then install the 4,000 psi concrete into the 100-foot long form. The following day, a crew will move the form downstream, install the PVC liner over the form and again set the form to grade. This operation will then be repeated. The contractor will have a cleaning crew working ahead of the rehabilitation crew to prepare the sewer for lining.

This project is currently in the initial stages of construction. Ventilation and odor control equipment have been installed and the contractor has constructed the main access pit. Cleaning of the sewer is progressing including bulk debris removal and surface cleaning. The traveling slipform is being manufactured and once delivered to the project site, the installation of the liner will commence.

FUTURE PROJECTS

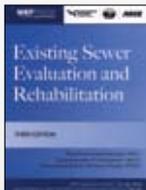
The City has many miles of non-circular sewers that are between 80 and 100 years old that will need to be rehabilitated in the coming years. The City is preparing design packages to address these non-circular sewers that will be constructed in the future. A number of these projects are scheduled to begin construction in 2013.

CONCLUSION

The rehabilitation projects that are currently being constructed will provide valuable experience as future projects are designed. These projects have and will demonstrate the capabilities of sliplining non-circular pipes into non-circular sewers by both man-entry and non man-entry methods. The man-entry projects will also help identify key issues such as safety that will be addressed in future designs.

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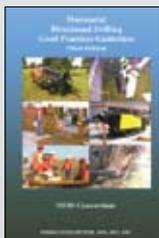
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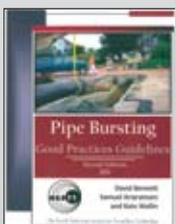
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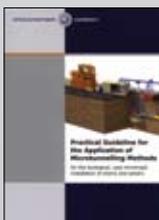
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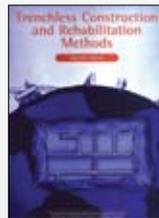
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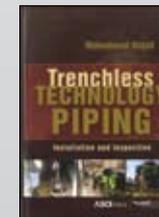
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Virginia Natural Gas Hampton Roads Crossing Project – 24-inch Pipeline Installation – HDD

Craig Prout
-Mears Group, Inc.

INTRODUCTION

Virginia Natural Gas (VNG), a wholly owned subsidiary of Atlanta Gas and Light (AGL), delivers natural gas to customers in the Norfolk, Newport News and Hampton Roads areas of Virginia. The VNG distribution system was physically separated into two divisions by Hampton Roads Harbor. Each of the system's divisions was fed by a single gas pipeline, making it vulnerable to gas disruptions. Furthermore, without any connection between the two divisions, VNG was very limited in being able to move the most cost effective gas supplies throughout its system. Therefore to improve the efficiencies of the overall pipeline network and mitigate the possibility of disruptions VNG elected to construct the Hampton Roads Crossing (HRX) project.

The HRX Pipeline is a 24-in. diameter gas transmission pipeline connecting Dominion Gas in Newport News to Norfolk over a distance of approximately 21 miles. A section of the pipeline is onshore (approximately 15 miles), whereas the remaining length (some 5.6 miles) was categorized as the offshore section. The offshore section originated as the route entered the harbor waters at Anderson Park in Newport News. From Anderson Park the pipeline ran approximately 22,000 ft across Hampton Roads to make landfall again at Craney Island. This section was designed to be installed with a combination of horizontal directionally drilled (HDD) shore approaches at each landfall site, marine pipelay with jetted burial and water-to-water HDD crossings. An onshore landlay takes the pipeline from the Hampton Roads landfall on Craney Island past the Navy Fuel Depot to the site of the project's longest HDD crossing that traverses the Elizabeth River to bring the pipeline into the parking lot of one of the Old Dominion University's student dorms in Norfolk.

VNG solicited contractors with an Invitation to Bid for the marine section of the HRX Pipeline in the summer of 2007. Proposals were received in the fall of 2007 with construction planned to begin in the summer of 2008. After an extensive bidding process, VNG selected Weeks Marine as the general contractor, with Mears Group as its HDD subcontractor.

The design of the pipeline across Hampton Roads was presented by VNG's consultant (Michael Baker Jr. Inc.). The final agreed and contracted solution was to maximize the use of water-to-water HDD crossings that would be "stitched" together using short, flanged, tie-in sections. This brought the number of HDD crossings included in the HRX marine crossing project to total seven. Included in these seven HDD crossings were two shore approaches, three water-to-water crossings and two land-to-land crossings. In total the combined length of the HDD's was in excess of 23,500 ft, with the longest being the Elizabeth River crossing at 7,350 ft.

LAMBERTS POINT GOLF COURSE CROSSING

HDD construction activities began with the Lamberts Point Golf Course crossing in late May 2008. To complete

the crossing, Mears set up a 660,000 lb capacity rig in the Sailing Center parking lot on the campus of Old Dominion University (ODU). In addition to the golf course, the surface conditions involved with the crossing included a drainage channel and entry/exit routes to a Hampton Roads Sanitation District waste water treatment facility. Subsurface conditions included several local utilities most notably a series of large storm drains and the main line infrastructure associated with the waste water plant.

To guide the drill during pilot activities, Mears utilized a standard ParaTrack magnetic steering system. The pilot hole began with an entry angle of 11 degrees and continued a horizontal distance of 920 lf before exiting at 10 degrees. During the initial pilot hole, approximately 120 lf in front of the rig setup location, a fluid release occurred in the drain that needed to be addressed before further drilling activities could continue. Since the release occurred in an area of standing water, aqua barriers were used to dam the channel and contain the drilling mud. Once the release was suitably dealt with, drilling continued and the pilot hole was completed without any further significant occurrences.

After completing the pilot hole, a series of ream and swab passes were conducted to expand and condition the hole. The first ream pass enlarged the hole to a diameter of 24 in. and a second ream pass opened the hole to 36 in. A 32-in. swab pass was then completed to further prepare the hole and ensure its suitability for pullback activities to begin.

Due to lack of open right-of-way (ROW), it was not possible to construct the length of pipe required for pullback in one section; instead the pipeline had to be constructed in three separate lengths of approximately 320 lf each. After the first length of pipe was pulled into the hole, the second length was then added to the tail of the first, a process that was again repeated for the third and final length. Pullback of the Lamberts Point Golf Course crossing was completed on June 5, 2008.

THE ELIZABETH RIVER CROSSING

The 7,350 ft crossing of the Elizabeth River commenced in early June 2008. In addition to the 660,000 lb spread that was previously utilized to complete the golf course crossing, Mears also employed a 160,000 lb capacity drilling spread

to provide exit side assistance. The primary rig (660,000 lb) was set up on the east bank entry side of the crossing which was again in the Sailing Center parking lot on the ODU campus. The tension rig (160,000 lb) was set up on the west bank



Figure No. 1 – Cranes support the product pipe as it transitions into the hole on the Elizabeth River HDD.

exit side of the crossing on the grounds of the Naval Fuel Depot. Both drill spreads were equipped with full drilling fluid mixing and pumping systems, which allowed flexibility for completing the pilot hole with an intersect approach if necessary.

The pilot hole was drilled with a 9 7/8-in. jet bit and using a ParaTrack magnetic guidance system. The initial pilot hole drilling commenced from the east bank with the 660,000 lb drilling rig spread. In order to assist in stabilizing the top section of the drilled hole and to allow the drill pipe to be pushed without buckling, 450 ft of 12-in. diameter steel casing was installed in the top section of the hole (this casing was removed after the pilot hole was completed).

The vast majority of this crossing lay under the river bed. The river currents and constant river traffic meant that laying tracking wire(s) on the river bed to aid with the down-hole surveying of the pilot hole's progress would be very difficult and time consuming. The alternatives to laying tracking wires on the river bed were to use a different steering system that would not rely on magnetics (i.e. a gyroscopic system) or to hold the tracking wires at or above the water surface. A system was devised whereby a tracking coil was set on "outriggers" that were attached to a deck barge. When the drilling crew requested a tracking coil shot, the deck barge was towed onto location, the coil was energized, survey readings recorded and then the barge released until next requested.

The pilot hole drilling commenced on June 9, 2008. Twelve working days later, on June 21, the 660,000 lb rig drilled the final joint of the pilot hole to provide an on-target exit, on the west bank of the river, just in front of the 160,000 lb drilling rig. The 160,000 lb rig had not been required during this stage of the crossing since a pilot hole intersect was not necessary.

With the pilot hole complete, the 160,000 lb drilling rig was connected to the drill pipe and a 26-in. diameter reamer was connected on the east bank. A 26-in. diameter forward ream pass was accomplished using the tandem rig spreads with no remarkable events and was completed on July 3. The 26-in. pre-ream was followed with a 36-in. pass. A downhole drill pipe failure occurred during the 36-in. pre-ream some 1,900 ft ahead of the 660,000 lb drilling rig; however, a connection to the broken drill pipe was made three days later and, after recovering and replacing the failed section, the pre-ream continued after losing just one week's production time. The 36-in. pre-ream was completed on July 22, a swab pass was run and then the pullback began on July 26.

The product pipeline (24 in. x 0.500 in. w.t. grade X60 with FBE coating and ARC) was pre-fabricated and pre-hydrotested on the grounds of the Navy Fuel Depot and Craney Island. ROW limitations required that the product pipe was constructed in two separate and offset lengths. Other surface conditions that needed to be considered along the pipe fabrication path included an existing above ground pipeline and a creek. To deal with the existing pipeline, a bridge was placed over the structure and rollers of increasing height were positioned under the product pipe as it approached and left the point of crossing. To manage the creek and offset pipe lengths, a series of cranes and cradles were utilized to suspend the pipeline and simultaneously position it so that just prior to pullback a final weld could be completed joining the two segments. At the drill exit point the pipeline was also raised to provide



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minimal stress at the break-over as it was pulled back into the drilled crossing (See Figure No. 1). The pullback operation started on July 26 and was completed approximately 26 hours later.

CRANEY ISLAND SHORE APPROACH

At the beginning of August 2008, Mears' 500,000 lb drilling rig spread was mobilized to the project where it was set up at the entry location of the first shore approach on the northwestern corner of Craney Island. In addition to the 500,000 lb rig, a 140,000 lb drill rig was mobilized to the project and it was placed on a construction barge by Weeks Marine.

The same steering technologies that were utilized on the Elizabeth River crossing were once again employed to construct the Craney Island shore approach. The first section of the pilot hole was completed using a ParaTrack magnetic guidance system. To establish the coil in the shallow waters close to shore, divers placed anchors on the floor of Hampton Roads and then secured the coil wires to the anchors. Once the drill had reached deeper waters, a coil barge was utilized to gather steering data and guide the drill. The pilot hole commenced with an entry angle of 10.4 degrees, and after traveling a horizontal distance of 2804 lf, the drill exited in a previously dredged pit at an angle of 3.4 degrees. The approximate water depth at the point of exit was 45 ft (in the dredged excavation).

To accomplish the pre-reaming of the pilot hole, the Mears' 140,000 lb drilling rig that was loaded onto the Weeks Marine construction barge was set up to accept the drill pipe seaward of the exit point. Using cranes on the marine vessels, the drilling bottom hole assembly (the "bha" – i.e. the drill bit and non-magnetic collar with steering probe) was raised to the barge deck as the drill pipe was progressively fed into the pilot hole by the onshore 500,000 lb drilling rig. The bha was then removed and the drill pipe behind it attached to the barge mounted drilling rig. In this way, the shore approach had a continuous string of drill pipe extending from the onshore drilling rig, through the drilled crossing, exiting the seabed in the dredged trench, being suspended through the water from exit to the deck of the barge where it was connected to the barge mounted drilling rig (See Figure No. 2).



Figure No. 2 – Pilot Hole and path of drill string for reaming operations.

Pre-reaming was accomplished by forward reaming from the onshore drilling rig toward the barge mounted rig. The onshore rig provided the rotation to the drill string and tooling while the barge mounted drilling rig provided the tension. The crossing was pre-reamed in two stages. The first pass was made with a 26-in. diameter reamer; this was followed by a second pass with a 36-in. diameter tool. To reduce the amount of work and marine support required offshore, each reamer was moved back through the hole to the landside rig before being removed from the drill string.

After completing the 36-in. hole, opening pass operations were temporarily interrupted due to the pending arrival of Hurricane Hanna. Offshore based equipment was moved inland to protected locations and to the extent possible, onshore equipment working in low lying areas was moved to higher ground.

Once the storm had passed and the barge was back in place, the drill string was reconnected to the 140,000 lb tension rig and a 32-in. reamer was inserted in the drill string at the land side rig. The reamer was then moved through the length of the hole from entry to exit and back



Figure No. 3 – Tug boats managing the product pipe as it is moved into position for pullback.

again providing a swab pass. This completed the planned HDD activities in preparing the hole for pullback; however, unfavorable sea conditions caused delays in launching the product pipe from Craney Island. Therefore, additional swab passes were completed to maintain hole condition during the period of delay.

Using a series of tug boats and the landside support of Bradford Bros. (the pipe fabrication contractor), Weeks Marine launched the product pipe from Craney Island and placed it in position for pullback behind the seaward side tension rig (See Figure No. 3). Weeks then moved the tension support barge back while drill pipe was added to the string at the land side site, a process that continued until the drill string had extended far enough to reach the pull head of the product pipe. A crane was then used to lower the pullback assembly to bottom and divers connected the drill string to the product pipe.

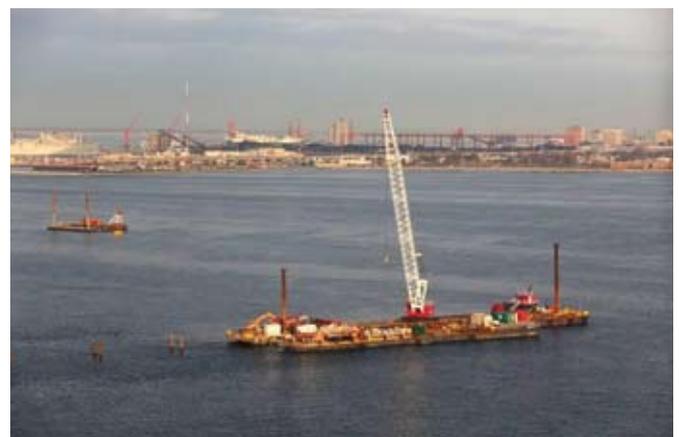


Figure No. 4 – The primary rig (500,000 lb) set up on the 271 barge, water support barge and goal post structures.

Because the planned process for connecting the installed segments of pipeline on the river bottom called for flanged stitch points it was necessary for each segment of product pipe to be pre-fabricated with a flange on the end. Therefore prior to pullback, divers installed buoyancy controls at the location of the flange. This provided flotation and helped to mitigate additional drag during pullback.

ANCHORAGE CROSSING

After completing the Craney Island shore approach, the 500,000 lb drill spread was transported to a load out facility in Portsmouth, Va., where the drill rig, control cab and excavator were positioned on the 271 barge of Weeks Marine. A collection pit for gathering drilling fluids, both returns and those lost on deck during drill joint disconnection, was secured over the edge of the barge in front of the drill rig.

A water barge with the capacity of providing approximately 700,000 gals was also set up to support the water-to-water drilling operation. In addition to its capability of providing a fresh water source to the project, the deck of the barge was used to support the mud recycling unit, office trailer, storage container, bentonite inventory and other HDD resources (See Figure No. 4).

Using GPS technology, the barges were then moved into the appropriate position for beginning the Anchorage Crossing pilot hole. Once the barges had been established in place, the marine contractor drove four sets of goal posts that had been fabricated from I-beams. Chains were strung by divers between each set of posts at increasingly greater depths moving away from the barge to support the entry angle of the casing pipe. Once the posts were completed the 400-ft section of casing, which had been constructed on Craney Island, was pulled out into the water by tugs and positioned in between the goal posts with the assistance of a support crane. HDD personnel then installed the casing and made preparations to begin the pilot hole.

The pilot hole of the Anchorage Crossing began on Oct. 25, 2008. The previously described steering barge concept was again utilized as the guidance method for directing the drill during pilot hole activities. After successfully resolving some issues related to the capacity of support that the casing could provide, the pilot hole for the Anchorage Crossing was completed on Nov. 24, with a final measured distance of 3550 lf, exiting in a trench previously dredged by the marine contractor.

After completing the Anchorage Crossing pilot hole, the drill string was lifted to the tension support barge, the bha was removed and the string was connected to the 140,000 lb rig. The casing that had been installed previously to support the drill pipe during pilot hole operations was removed and a 26-in. reamer was inserted in the string on the primary rig side. Using the assistance of a crane, the 26-in. reamer was lifted over the support chains, lowered to bottom and moved through the hole. Once the reamer had reached the exit-side trench, it was raised to the deck of the tension support barge where it was removed from the drill string and the 36-in. reamer was installed. With the assistance of a crane the reamer was lowered to bottom and moved from exit to entry. Approximately 2,000 ft into the 36-in. pass, the rotational forces required to turn the drill string increased considerably; therefore, a weeper sub was inserted in the string on the primary rig side and the 36-in. reamer was tripped back approximately 1,600 ft allowing the weeper sub to lubricate the hole. As expected the weeper pass significantly reduced the amount of torque required to rotate the drill string and the remainder of the 36-in hole opening pass was completed without issue.

As with the shore approach drill, the full length of the product pipe was constructed on Craney Island, therefore it was necessary for the marine contractor to launch and sink the pipe in a position on the sea bottom behind the tension barge. Upon completing reaming activities the ten-

sion barge was moved back while drill pipe was added to the string until there was adequate length to reach the pull head for connection. The pull back assembly was then lowered to the sea bottom through the use of a support crane and connected by divers. The intended stitch point tie-in process that would be used to connect the series of drills required that the pipe was within a 10-ft window near the top of the entry/exit trench at the completion of the pull-back. Therefore, it was also necessary to move the 500,000 lb primary set-up away from the entry pit and re-establish anchors prior to commencing with the pull.

In order to hold the pull force that the 500,000 lb rig was capable of producing during pullback, the marine contractor utilized a significant barge anchoring system. However, it was soon realized that the slack associated with the anchoring system presented an issue that needed to be addressed.



Figure No. 5 – Mears drilling resources being unloaded at Davis Boat Works.

While the bow anchors of the barge pulled against the major stern anchors with enough force to provide a stable working platform during pilot hole and reaming phases, the dynamics of the anchoring system

changed during pullback activities due to the forces that the drill rig exerted on the barge deck. Once the pull of the drill rig on the product pipe exceeded the forward force being applied by the bow anchors, the barge would move forward as additional slack was taken out of the stern anchors. In turn, when the pull of the rig was relieved, the stern anchors would recover their slack until the forces being applied on the barge by the bow and stern anchors had once again equalized. Since the bow anchors were already at capacity and the vices of the rig were not capable of holding the drill pipe under significant load it was necessary to construct a support structure in front of the rig that could handle the stored tension during the period that each joint was removed from the string. Once this issue had been suitably addressed, the pullback took place without any further notable occurrences and the installation was completed on Jan. 9, 2009.

MIDDLE GROUND CROSSING

Having completed both the Anchorage Crossing and the Craney Island Shore Approach, additional work was available to the marine contractor which required resources previously utilized as the steering barge. In order to guide the drill during pilot hole activities, divers attempted to set up the required coil wire for the ParaTrack system on the sea floor. Unfortunately due to limited visibility, tidal currents and other marine conditions that were present, setting up the coil with the necessary precision proved to be too difficult. After making initial attempts to utilize the coil, the pilot hole was ultimately completed using a gyroscope tool.

After completing the pilot hole, reaming and pullback activities followed the same basic process described on the Anchorage Crossing with one exception – this time the 36-in. ream pass which previously had been completed by moving

the reamer from the 140,000 lb rig to the 500,000 lb rig was moved in the opposite direction. Otherwise all activities remained the same and further significant events did not occur. The 2,499 ft installation of the Middle Ground Crossing which began pilot hole drilling on Jan. 19, 2009, was constructed in 31 days, with a successful pullback occurring on Feb. 19, 2009.

CHANNEL CROSSING

The final water-to-water crossing required that daily marine traffic entering the Hampton Roads harbor was taken into consideration. To keep from disrupting the activities of the highly active corridor, the length of the channel itself was drilled without gathering any secondary (tracking coil) steering data. Instead the steering barge, which was once again employed for this crossing, was used to collect guidance information just prior to the drill entering the channel zone and then again immediately after the drill had exited the channel zone. When the drill cleared the channel, it was found to be in the expected location and the 2,901 ft pilot hole was completed using the assistance of the steering barge.

Reaming and pullback activities on the Channel Crossing went as expected and were completed using the same approach, techniques and processes described in the previous water-to-water crossings. Final pullback of the product pipe took place on March 31, 2009, without any notable events or occurrences.

ANDERSON PARK

After completing the water-to-water crossings, the barges supporting the primary drill rig setup were taken to the



Figure No. 6 – An overview of the project depicting marine and HDD resources working at multiple tasks along the Hampton Roads installation route.

Davis Boat Works facility in Newport News, Va., and unloaded (See Figure No. 5). The equipment was then mobilized to Anderson Park where it was set up on the final shore approach.

To complete the pilot hole, a coil was set-up for the land portion of the shore approach and the steering barge was used to collect information offshore. The drill entered at an angle of 10 degrees and as with the four previous drills involving the Hampton Roads harbor, the pilot hole exited in a pre-dredged trench.

Reaming and pullback activities followed the same approach, techniques and processes described in the Craney Island shore approach. At this point in the project, the sequence of events and required durations for each activity were well known by the team of contractors and subcontractors; seasonal weather conditions had also improved all of which allowed the installation to be completed efficiently and without the occurrence of significant events. Final pullback was completed on April 29, 2009 – 21 days after the pilot hole initially began.

SUMMARY

When the Anderson Park shore approach was completed it marked the conclusion of the HDD portion of the Hampton Roads Crossing project. Weeks Marine went on to successfully trench in an additional 5,200 lf of concrete-coated pipe between the Anderson Park and Channel Crossing HDD installations. Once the various HDD and trenching pipe segments had been stitched together, the complete pipeline was hydrotested, passing inspection on Oct. 4, 2009. After completing final cleaning and drying activities, the pipeline was ultimately turned over to VNG on Dec. 17, 2009.

To view the complete version of Paper E-1-005, please visit www.nastt.org.

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Contact Info:

Monica Perry

Phone: (604) 594-3952

E-mail: mwperry@telus.net

10

NASTT's Pipe Bursting Good Practices Course

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Contact Info:

Monica Perry

Phone: (604) 594-3952

E-mail: mwperry@telus.net

September

13

HDD Consortium's HDD Good Practices Guidelines Course

Martinez, Calif.

Contact Info:

Angela Ghosh

Phone: (330) 491-0058

E-mail: aghosh@nastt.org

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3-4

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Contact Info:

Web: www.nastt.org/west

Jennifer Glynn/Kate Wallin

Phone: (925) 627-4151/(916) 294-0095

6-7

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Contact Info:

Web: www.rmnaastt.org

Al Paquet

Phone: (970) 215-9115

E-mail: al.paquet@ch2m.com

November

16

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Contact Info:

Web: www.nastt-nw.com

Angela Ghosh

Phone: (330) 491-0058

E-mail: aghosh@nastt.org

16-17

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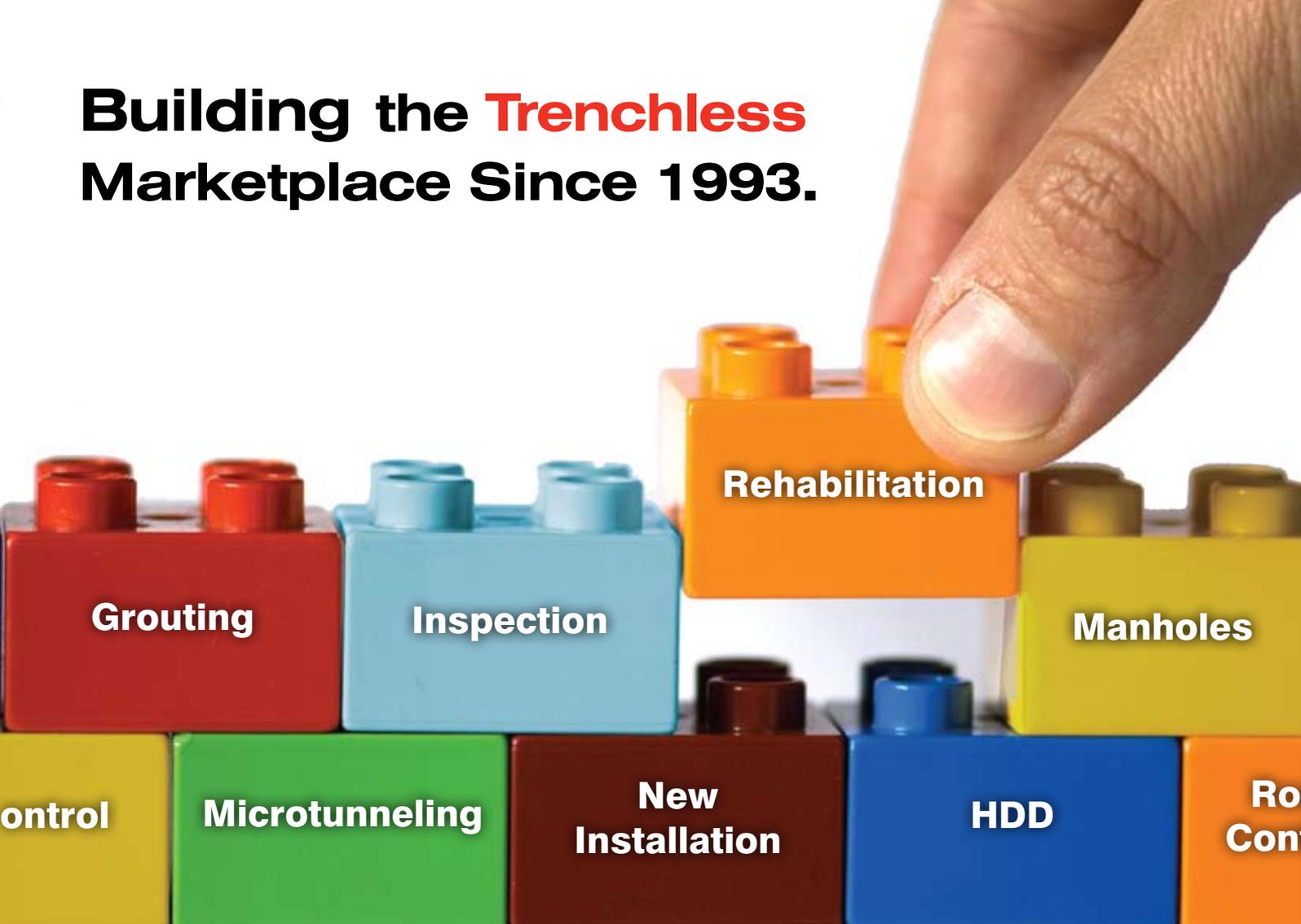
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