Plan your experience!
Monday, March 18, 2019

Monday Events

Attendee & Exhibitor Registration
7:00 AM – 5:00 PM - Lobby

Kick-Off Breakfast
7:30 AM – 9:15 AM - Room 21-24

Exhibit Hall Open
11:45 AM – 3:45 PM - Hall A

NASTT’s 18th Annual Educational Fund Auction & Reception
5:30 PM – 7:30 PM - Room 21-24

Direct Pipe Forum
3:45 PM
MA-T3-01 and MA-T3-02
Track Leader: Jon Robison
Room 1

This forum will provide a discussion of direct pipe driven by audience participation.

Technical Paper Sessions Schedule

AM Sessions

PM Sessions

Track 1: 9:30 AM - 11:35 AM - Room 14
Track 2: 9:30 AM - 11:35 AM - Room 12
Track 3: 9:30 AM - 11:35 AM - Room 1
Track 4: 9:30 AM - 11:35 AM - Room 2
Track 5: 9:30 AM - 11:35 AM - Room 3
Track 6: 9:30 AM - 11:10 AM - Room 4

Water/Wastewater Water Wastewater Electrical Gas Other

Schedule At-A-Glance: Monday AM Sessions

8:30 AM

Emerald Parkway Culvert Repair - Combining Multiple Trenchless Techniques to Repair Collapsed Culvert and Re-establish Safety

9:30 AM

A Study on the Design-Build Delivery of a 9,000 ft. Intersect Horizontal Directional Drill Under the Barneget Bay

Low 20s, Early 30s - Riveted Steel Pipe Condition Assessment - City of Toronto's Cadillac Water Main

City of Tampa’s Courtney Campbell Causeway Project - Successful Pipe Bursting Under a Heavily Traveled Scenic Highway

CIPP Longevity - Planning for Well Beyond the Standard 50 Years

3.6-Mile Sewer Force Main Repair and Rehabilitation

9:45 AM

Elimination of Two Pump Stations in Bloomington, Illinois

Condition Assessment in the City of Champions - Brockton's Twin 24-in. CI Transmission Mains

The City of Montrose Colorado Self Performs Pipe Replacement Program Proves Successful

Rehabilitation of the 1917 NATS Trunk Sewer

Calumet Interception Sewer 19F Rehabilitation

10:00 AM

Corrosion Resistance Tunnel Shaft Lining Using fiberglass Reinforced Polymer Mortar (FRPM) Pipes

Alternative HDD Construction Method for Ocean Outfall

Inspection, Condition Assessment and Rehabilitation Planning for the Primary Trunk

Pipe Bursting Challenges and Emergency Rescue Shafts in Newport Beach, California - Orange County Sanitation District

Toronto Water's Annual Sewer Rehabilitation Program


10:15 AM

Sensitivity of the Cavity Expansion Model to Variations in Input Parameters for Specific Soil Types

Condition Assessment of Twin 30-in. Steel Force Mains

What You Don't Know Can Hurt You When Pipe Bursting

UV Light Cured CIPP Lining for Pipeline Rehabilitation

Failed Sewer Part 2: Lessons Learned During Construction

10:45 AM

Comparing Two Horizontal Directional Drilled Crossings With and Without a Surface Casing in Cache Creek, British Columbia

Benefits of a Phased Approach to Force Main Assessment

Redding, California, Successfully Uses Static Pipe Bursting for Over Three Miles of Gravity Sewer Mains and Laterals

CIPP Pipe Renovation Under the Rideau Canal Using a Styren-Free Resin

Engineered and Innovative - Taking the Trenchless Approach in Springfield, Massachusetts
This paper will explain the benefits of a phased approach in determining force main conditions and different inspection technologies available. By using specific case studies we will show how trenchless and traditional open cut techniques can be used together to save time, effort and money.

**Track 4: Pipe Bursting**

**Track Leader:** Bab Marquis

**10:20 AM**

**MM-T4-03**

Pipe Bursting Challenges and Emergency Rescue Shafts in Newport Beach, California - Orange County Sanitation District

Raul Cuellar, Orange County Sanitation District; Brad Moore, Orange County Sanitation District; Mark Hutchinson, Staheli Trenchless Consultants

This paper discusses the major challenges encountered during pipe bursting operations, the project installed 920 ft with three different pipe sizes within a busy traffic corridor in the City of Newport Beach. Two emergency rescue shafts were required to be constructed due to 2-in. thick redwood boards surrounding the existing sewer pipe.

**10:45 AM**

**MM-T4-04**

What You Don’t Know Can Hurt You When Pipe Bursting

Mark Hutchinson, Staheli Trenchless Consultants; Daniel Tan, City of Portland; Raul Cuellar, Orange County Sanitation District

This paper provides examples from past projects of factors outside the pipe that affect pipe bursting and their result. The paper provides a list of questions to ask during the predesign and design to better tailor the project to the site conditions you can’t see.

**11:10 AM**

**MM-T4-05**

Redding, California, Successfully Uses Static Pipe Bursting for Over Three Miles of Gravity Sewer Mains and Laterals

Edward Alan Ambler, AM Trenchless; Josh Vandiver, City of Redding; Carri Vandiver, City of Redding; George Mallakis, TT Technologies

The City of Redding in Northern California has constructed a static pipe bursting project replacing more than three miles of gravity sewer mainline and laterals. Redding design staff teamed with AM Trenchless and Cox and Cox Construction to perform the project to replace both existing PVC and AC pipelines.

**Track 5: CIPP**

**Track Leader:** Jason Schiro

**9:30 AM**

**MM-T5-01**

CIPP Longevity - Planning for Well Beyond the Standard 50 Years

Robert Lee, Murraysmith; Colleen Harold, City of Portland

Many municipalities utilize an asset management approach when deciding rehabilitation versus replacement. CIPP is traditionally thought to have a design life of 50 years. This paper presents the design rationale and case studies that present a case for a significantly longer and customized design life of CIPP.

**9:55 AM**

**MM-T5-02**

Rehabilitation of the 1917 NATS Trunk Sewer

Kevin Bainbridge, Robinson Consultants; Patrick Minowka, Robinson Consultants; Roger Levesque, Halifax Water; David Ellis, Halifax Water

The NATS Trunk Sewer was constructed in 1917 via tunneling and trench excavations along the Northwest Arm inlet. Inspections of the NATS identified the need for rehabilitation to remove debris, restore structural integrity, eliminate exfiltration and infiltration, establish a corrosion barrier and extend the life of the sewer.

**10:20 AM**

**MM-T5-03**

Toronto Water’s Annual Sewer Rehabilitation Program

Christopher Macey, AECOM; Bo Pajic, Toronto Water; Kevin Bainbridge, Robinson Consultants; Kristy Gibson, Toronto Water; Richard Sukut, AECOM

Toronto Water manages an inventory of over 5,540 km of sewers that directly service a population of 2.8 million. Its annual rehab program is among the largest and most mature programs in North America with a focus on sustainability and minimizing the impact of delivering the program to the public.
Kick-Off Breakfast
Monday, March 18, 2019 - 7:30 AM - 9:15 AM - Room 21-24
Full conference attendees are invited to rise and shine at NASTT's No-Dig Show Kick-Off Breakfast! The morning will provide a fun mix of networking, good food, the much-anticipated NASTT and Trenchless Technology awards, as well as unforgettable entertainment.

This year's esteemed awards will include NASTT's 2018 Outstanding Papers in Rehabilitation and New Installation, as well as Trenchless Technology's 2019 Person of the Year and 2018 Projects of the Year.

Anthony Vitale, Northeast Ohio Regional Sewer District; Ryan Butler, NTH Consultants Ltd; James Jones, Northeast Ohio Regional Sewer District; Brian Froehlich, Turn-Key Tunneling Inc; Kirthik Kirupakaran, NTH Consultants Ltd
The Emerald Parkway Culvert Repair Project is a Design-Build Contract issued by the Northeast Ohio Regional Sewer District to address a 250-ft section of collapsed 11-ft diameter corrugated metal pipe culvert. The collapse caused runoff from 625 acres of drainage area to submerge the inlet and upstream areas.

9:55 AM ........................................ MM-T1-02
Design and Construction of the Magnolia Stormwater Project in El Paso, Texas
Andrew Finney, Jacobs; Michael Ancell, Jacobs; Thomas Crislik, El Paso Water
This paper discusses the evaluation of appropriate tunneling technologies and presents construction observations related to tunneling through clean sand to construct a stormwater discharge to the Rio Grande for the Magnolia Stormwater Project.

Track 4: Pipe Bursting
Track Leader: Babis Marquis

10:45 AM ........................................ MM-T4-02
The City of Montrose Colorado Self Performs Pipe Replacement Program Proves Successful
Dave Holcomb, TT Technologies Inc; John Zarka, City of Montrose
Rising costs associated with traditional open cut replacement pushed Montrose utilities division to look at trenchless pipe bursting. This paper will focus on the complete pipe replacement program, from aging pipe selection criteria through replacement pipe install. Including program challenges, lessons learned and overall cost savings.

Track 5: CIPP
Track Leader: Jason Schiro

Monday, March 18, 2019 - AM Sessions

11:10 AM ........................................ MM-T2-05
A Study on the Design-Build Delivery of a 9,000-ft Intersect Horizontal Directional Drill Under the Barnegat Bay
Kerby Primm, Laney Directional Drilling; Mike Healy, Stantec; Marc Pannaccione, New Jersey Natural Gas; Maureen Carlin, Laney Directional Drilling
This case study discusses the recently constructed South Seaside Reinforcement Project for New Jersey Natural Gas. It included the 9,000-ft HDD installation of a 12-in. diameter pipeline under the Barnegat Bay. The drill geometry included multiple horizontal and vertical curves and the construction was executed using the intersect method.

Track 2: HDD
Track Leader: Maureen Carlin

11:10 AM ........................................ MM-T5-04
UV-Light Cured CIPP Lining for Pipeline Rehabilitation
Jeff Maier, C&L Water Solutions Inc.; Mark Hallett, Saertex Multicom LP; Steve Lamb, North Davis Sewer District
A technical overview of the ultra-violet light cured, glass reinforced CIPP lining process (UV-CIPP) for trenchless rehabilitation of sewer, storm water and pressure pipelines is presented. Design and specification considerations, product selection, installation procedures, quality assurance/quality control measures and inspection will be covered. Case study examples will be provided.

Track 3: Condition Assessment
Track Leader: Paul Savard

Monday, March 18, 2019 - AM Sessions

11:10 AM ........................................ MM-T1-05
Mechanized Cross Passage Construction: Ideal for Soft Soils with High Groundwater Table
Gerhard Lang, Herrenknecht AG; Peter Schmaeh, Herrenknecht AG
Cross passages are gaining importance in the construction of safe underground infrastructures such as traffic tunneling projects. This paper presents mechanized cross passage concepts to be used to link two traffic tunnels or tunnels with escape shafts in weak ground conditions with a high groundwater table.

Track 2: HDD
Track Leader: Maureen Carlin

10:45 AM ........................................ MM-T2-04
Late 20s, Early 30s - Riveted Steel Pipe Condition Assessment - City of Toronto's Cadillac Water Main
Peter Peng, City of Toronto; Piero Salvo, GAM Trenchless Consultants
The City of Toronto has 500 km (300 mile) of trunk water mains, of which 16 km (10 miles) are 1920/1930s vintage Riveted Steel ‘Metrolinks’ pipe. These pipes are considered to be the Cadillac of water mains because of the way they were built. The city’s proactive Condition Assessment program will be presented.

Track 2: HDD
Track Leader: Maureen Carlin
Track 1: Microtunneling
Track Leader: Brenden Tippets
3:45 PM
Kingsbury Run Culvert Repair: First Horizontal S-Curve & Double Vertical Curve in the United States
Brian Daugherty, Northeast Ohio Regional Sewer District; Colin Irvin, Ward and Burke Tunneling Inc; James Jones, Northeast Ohio Regional Sewer District; Sven Wilberg, AECOM; Devon Hopson, Northeast Ohio Regional Sewer District

The Kingsbury Run Culvert Repair Project is an $9.8 million project constructed to address a failed/collapsed brick culvert section located in Cleveland, Ohio. The contractor performed a 2,700-ft horizontal S-Curve microtunnel run and a 900-ft microtunnel run with two vertical curves, in a first in the United States.

4:10 PM
Proper Fluid Management for Successful Installations
Brian Chemsak, Beaufort Jasper Water and Sewer Authority; Colin Irvin, Ward and Burke Tunneling Inc; James Jones, Northeast Ohio Regional Sewer District; Sven Wilberg, AECOM; Devon Hopson, Northeast Ohio Regional Sewer District

4:35 PM
Globeville Ph. 3 Outfall Tunnel Project - Challenges and Solutions for Twin 8.5-Ft Diameter Tunnels
Beaufort Jasper Water & Sewer Authority; John Tucker, Insituform; Ethan Heijn, Hazen and Sawyer

5:00 PM
Randall’s Island Microtunnel Crossing: Managing Risk while Microtunneling in a Dense Urban Environment
Dennis Doherty, Microtunneling; Pedro Montehano, Use of the Pipe Ramming Method to Finish Ramming Obstructions in Unanticipated Pipe-ramming Cavities

Track 2: HDD
Track Leader: Dennis Doherty
3:45 PM
Design-Build Solution for Trenchless Installation of 9,500-ft Long HDD Crossing
Dennis Doherty, Microtunneling; Pedro Montehano, Use of the Pipe Ramming Method to Finish Ramming Obstructions in Unanticipated Pipe-ramming Cavities

4:10 PM
Engineering Judgement in Maximum Bore Pressure Design
Joe Irwin, Ward and Burke Tunneling Inc; James Jones, Northeast Ohio Regional Sewer District; Sven Wilberg, AECOM; Devon Hopson, Northeast Ohio Regional Sewer District

4:35 PM
Beaufort Jasper Water & Sewer Authority Installs Multiple High-Risk HDDs with Proven Procurement Method
Bradley Marin, GHD Ltd; John Tucker, Insituform; Ethan Heijn, Hazen and Sawyer

5:00 PM
Use of the Pipe Ramming Method to Finish Installations Begun by other Trenchless Methods
Bevin Beaudet, Bevin A.Beaudet, P.E., LLC; Bruce Tobey, PLDO

Track 3: Direct Pipe
Track Leader: Jon Robison
3:45 PM
Guided Pipe Ramming at O’Hare Airport Minimizes Disruption
Jon Robison, Direct Pipe; C. Alan Goodman, HammerHead Trenchless; Pedro Montehano, Use of the Pipe Ramming Method to Finish Ramming Obstructions in Unanticipated Pipe-ramming Cavities

4:10 PM
Overcoming Unanticipated Pipe-Ramming Obstructions in Sensitive Ground Conditions
C. Alan Goodman, HammerHead Trenchless; Pedro Montehano, Use of the Pipe Ramming Method to Finish Ramming Obstructions in Unanticipated Pipe-ramming Cavities

4:35 PM
A Case Study on the World-Record Direct Pipe® Method Installation Beneath the Gulf of Mexico
Bevin Beaudet, Bevin A Beaudet, P.E., LLC; Joseph Robison, Direct Pipe

5:00 PM
Use of the Pipe Ramming Method to Finish Installations Begun by other Trenchless Methods
Bevin Beaudet, Bevin A Beaudet, P.E., LLC; Bruce Tobey, PLDO

Track 4: Pipe Bursting
Track Leader: Sam Branchue
3:45 PM
Guided Pipe Ramming at O’Hare Airport Minimizes Disruption
Jon Robison, Direct Pipe; C. Alan Goodman, HammerHead Trenchless; Pedro Montehano, Use of the Pipe Ramming Method to Finish Ramming Obstructions in Unanticipated Pipe-ramming Cavities

4:10 PM
Not on My Watch - Using CIPP to Ensure Disaster Doesn’t Strike
Justin deMello, Woodard & Curran; Paul Costello, City of Quincy

4:35 PM
Use of the Pipe Ramming Method to Finish Installations Begun by other Trenchless Methods
Bevin Beaudet, Bevin A Beaudet, P.E., LLC; Bruce Tobey, PLDO

5:00 PM
Use of the Pipe Ramming Method to Finish Installations Begun by other Trenchless Methods
Bevin Beaudet, Bevin A Beaudet, P.E., LLC; Bruce Tobey, PLDO

Track 5: CIPP
Track Leader: Bill Moore
3:45 PM
Success for Stamford in CIPP
Bill Moore, CIPP; Stan Brancheau, Track Leader: Brent Tippets

4:10 PM
Bill Moore, CIPP; Stan Brancheau, Track Leader: Brent Tippets

4:35 PM
Success for Stamford in CIPP
Bill Moore, CIPP; Stan Brancheau, Track Leader: Brent Tippets

5:00 PM
Large Diameter Sewer Rehabilitation in the City of Portland
Bill Moore, CIPP; Stan Brancheau, Track Leader: Brent Tippets

Track 6: Wastewater Pipeline Rehabilitation
Track Leader: David Rosenberg
3:45 PM
Emergency Force Main Trenchless Rehabilitation
David Rosenberg, Direct Pipe; C. Alan Goodman, HammerHead Trenchless; Pedro Montehano, Use of the Pipe Ramming Method to Finish Ramming Obstructions in Unanticipated Pipe-ramming Cavities

4:10 PM
Emergency Force Main Trenchless Rehabilitation
David Rosenberg, Direct Pipe; C. Alan Goodman, HammerHead Trenchless; Pedro Montehano, Use of the Pipe Ramming Method to Finish Ramming Obstructions in Unanticipated Pipe-ramming Cavities

4:35 PM
Emergency Force Main Trenchless Rehabilitation
David Rosenberg, Direct Pipe; C. Alan Goodman, HammerHead Trenchless; Pedro Montehano, Use of the Pipe Ramming Method to Finish Ramming Obstructions in Unanticipated Pipe-ramming Cavities

5:00 PM
Large Diameter Sewer Rehabilitation in the City of Portland
David Rosenberg, Direct Pipe; C. Alan Goodman, HammerHead Trenchless; Pedro Montehano, Use of the Pipe Ramming Method to Finish Ramming Obstructions in Unanticipated Pipe-ramming Cavities

This case study describes a 24-in. casing installation job in Wisconsin begun with the auger boring technique. Auger boring operations stopped in saturated soil conditions of heavy, wet sand after progressing only 20 ft. The contractor used a 16-in. pneumatic ramming tool to install 90 ft of 36-in. steel-wall casing.

This paper discusses an emergency design/build construction services for the City of Riverside’s Tuartwein and Alessandro Sewer Force Main Emergency Rehabilitation project. This fast-track emergency project was required after two sanitary sewer overflows (SSOs) occurred due to failures of the 16-in. diameter force main.
Join in the fun and excitement at NASTT’s fundraising social event of the year! Since 2002, NASTT has raised more than $1,000,000 to support educational initiatives, including being able to sponsor students’ attendance at the No-Dig Show, award scholarships and provide targeted training courses to the membership at large.

This year’s Educational Fund Auction will feature a costume contest, Hawaiian vacation raffle and 50/50 raffle, and, of course, plenty of great items to bid on during the auction.

Staheli’s 18th Annual Educational Fund Auction & Reception

Monday, March 18, 2019 - 5:30 PM – 7:30 PM - Room 21-24

Monday, March 18, 2019 - PM Sessions

**Track 1: Microtunneling**
Track Leader: Brenden Tippets

**Track 2: HDD**
Track Leader: Dennis Doherty

**Track 3: Direct Pipe**
Track Leader: Jon Robison

**Track 4: Pipe Ramming**
Track Leader: Sam Brancheau

**Track 5: CIPP**
Track Leader: Bill Moore

**Water**

**Track Leader:** Bill Moore

**Track 5: CIPP**

5:00 PM ........................................................ MA-T5-04

The Mechanical Property Testing and Evaluation for Reinforced CIPP Composite Materials using Glass, Carbon Fibers and Polyester Felt

Dan Koo, Indiana University - Purdue University; Hyun Wook Joo, Korea Institute of Civil Engineering and Building Technology; Sungsoo Yoo, Korea Institute of Civil Engineering and Building Technology; Jonghoon Kim, Oklahoma State University

This paper presents a summary of mechanical test results and a comparison study of the various composite materials for CIPP rehabilitation.

**Gas**

**Track Leader:** Jon Robison

**Track 3: Direct Pipe**

4:35 PM ........................................................ MA-T3-03

A Case Study on the World-Record Direct Pipe® Method Installation Beneath the Gulf of Mexico

Nico Michels, Laney Directional Drilling; Julien O’Connel, Herrenknecht AG; Maureen Carlin, Laney Directional Drilling

In December 2017, Laney Directional Drilling set a new world record in length at 5,000 ft for the Direct Pipe® Method. The Direct Pipe® method combines the advantages of microtunneling and HDD technology creating a single pass process that uses a steerable tunnel boring machine cutting head.

5:00 PM ........................................................ MA-T3-04

42-in. Direct Pipe Through 227MPa Rock

Kendall Matlasher, Innovative Pipeline Crossings Inc; Peter Henning, Innovative Pipeline Crossings Inc

42-in. Direct Pipe through hard rock, with numerous technical challenges due to significantly harder rock strength than what was anticipated in the geotechnical reports.

**Electrical**

**Track Leader:** Dennis Doherty

**Track 2: HDD**

3:45 PM ........................................................ MA-T2-01

Design-Build Solution for Trenchless Installation of 9,500-ft Long HDD Crossing

Jiwala Sharma, Mears Group Inc; JB Brown, Mears Group Inc; Edward Weirsky, STV

This project describes the challenges during the design phase of a 9,500-ft long Hudson River crossing in New York, New York. The owner of the project has adopted design build approach to construct a bundle of HDPE pipes inside a 24-in. casing.

4:10 PM ........................................................ MA-T2-02

Engineering Judgement in Maximum Bore Pressure Design

Jake Andersen, Staehli Trenchless Consultants; Kimberlie Staehli, Staehli Trenchless Consultants

The intent of the paper is to serve as a guide for engineering judgment, which is based upon a thorough understanding of the hydrofracture mechanism and sound technical knowledge of hydrofracture prediction methods and their inherent limitations while referencing relevant case studies to that effect.

**Water/Wastewater**

**Track Leader:** Brenden Tippets

**Track 1: Microtunneling**

4:10 PM ........................................................ MA-T1-02

Proper Fluid Management for Successful Installations

Zachary Watson, BOS Solutions

Proper drilling and tunneling fluid management is crucial to the success of new pipe and shaft installations. With the proper solids control and mud programs in place, new installations can be achieved faster, more efficiently and cheaper than before. Case studies will be presented demonstrating these claims.

5:00 PM ........................................................ MA-T1-03

40-in. Direct Pipe Through 227 MPa Rock

Kendall Matlasher, Innovative Pipeline Crossings Inc; Peter Henning, Innovative Pipeline Crossings Inc

40-in. Direct Pipe through hard rock, with numerous technical challenges due to significantly harder rock strength than what was anticipated in the geotechnical reports.

5:00 PM ........................................................ MA-T1-04

42-in. Direct Pipe Through 227MPa Rock

Kendall Matlasher, Innovative Pipeline Crossings Inc; Peter Henning, Innovative Pipeline Crossings Inc

42-in. Direct Pipe through hard rock, with numerous technical challenges due to significantly harder rock strength than what was anticipated in the geotechnical reports.

**Other**

**Track Leader:** Bill Moore

4:35 PM ........................................................ MA-T4-03

Globeville Ph. 3 Outfall Tunnel Project - Challenges and Solutions for Twin 8.5-ft Diameter Tunnels

Todd Kidstuf, Kidstuf Underground Engineering; Lester Bradsha, Bradshaw Construction; Matthew Roberts, Kiewit Construction

This paper is case history of a microtunneling project, twin 8.5-ft diameter tunnels, each 550 ft, under a very busy railyard and light transit rail operated by RTD in Denver, Colorado. The job had some unexpected challenges that required on-the-fly solutions.

4:35 PM ........................................................ MA-T4-04

Overcoming Unanticipated Pipe-Ramming Obstructions in Sensitive Ground Conditions

Alan Goodman, HammerHead Trenchless; Don Carter, Kinnan Engineering

The presentation includes the case study of a 12-in. casing installation project to serve as a utilities conduit beneath a railway using pipe ramming. The operation stopped three times for undisclosed, impermeable, buried objects. Several solutions were discussed with the project owner.

5:00 PM ........................................................ MA-T4-05

The Randall’s Island Microtunnel Crossing: Managing Risk while Microtunneling in a Dense Urban Environment

Maddie Erickson, McMillen Jacobs Associates; Ed Sturm, McMillen Jacobs Associates; Daniel Elkin, McMillen Jacobs Associates; Asf Dunga, McMillen Jacobs Associates

The Randall’s Island Microtunnel Crossing consists of two 60-in. diameter, 920 ft long tunnels. Unresolved easement issues, utility conflicts and difficult ground conditions presented challenges during excavation of launch and receiving shafts. This paper discusses lessons learned and focuses on risk mitigation during planning and construction to better alleviate these challenges.

5:00 PM ........................................................ MA-T4-06

42-in. Direct Pipe Through 227MPa Rock

Kendall Matlasher, Innovative Pipeline Crossings Inc; Peter Henning, Innovative Pipeline Crossings Inc

42-in. Direct Pipe through hard rock, with numerous technical challenges due to significantly harder rock strength than what was anticipated in the geotechnical reports.

4:35 PM ........................................................ MA-T4-07

Use of the Pipe Crushing Technique Expedites Removal of ‘Swallowed’ Corrugated Metal Pipe (CMP)

Alan Goodmank, HammerHead Trenchless; Jeff Rumer, UiT

This presentation details the principles, tooling and technique of the pipe crushing method. It includes a case study in which a contractor uses the system while driving 60-in. steel-wall casings over 408-in. CMP culverts in wet sand.
## Technical Paper Sessions Schedule

### AM Sessions - 1st Session

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<th>Track</th>
<th>Time</th>
<th>Location</th>
<th>Title</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>1</td>
<td>8:00 AM – 10:05 AM</td>
<td>Room 14</td>
<td>Contact Grouting for Microtunneling Pipe: Is it Contact Grouting or Consolidation Grouting?</td>
<td>Rory Ball</td>
</tr>
<tr>
<td>2</td>
<td>8:00 AM – 10:05 AM</td>
<td>Room 12</td>
<td>A New Perspective in Hydro Fracture Evaluation</td>
<td>Jim Murphy</td>
</tr>
<tr>
<td>3</td>
<td>8:00 AM – 10:05 AM</td>
<td>Room 1</td>
<td>Advanced Pressure Pipeline Condition Assessment Forum</td>
<td>Kalyan Piratla</td>
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<tr>
<td>4</td>
<td>8:00 AM – 10:05 AM</td>
<td>Room 2</td>
<td>Removal of Large Concrete Obstruction on 96-in. Pipe Ram Crossing of Highway 61 in Neebing, Ontario</td>
<td>Alain Atalah</td>
</tr>
<tr>
<td>5</td>
<td>8:00 AM – 10:05 AM</td>
<td>Room 3</td>
<td>The City of Bend Plant Interceptor - Extending the Life of the City’s Primary Means of Wastewater Conveyance</td>
<td>Cathy Morley</td>
</tr>
<tr>
<td>6</td>
<td>8:00 AM – 10:05 AM</td>
<td>Room 4</td>
<td>Minimizing Water Main Digs with Inspection and Corrosion Control</td>
<td>Lori Kline</td>
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### AM Sessions - 2nd Session

<table>
<thead>
<tr>
<th>Track</th>
<th>Time</th>
<th>Location</th>
<th>Title</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>1</td>
<td>10:20 AM – 12:00 PM</td>
<td>Room 14</td>
<td>The Expanding Capabilities of Microtunneling Demonstrated in Washington, D.C.</td>
<td>Jim Murphy</td>
</tr>
<tr>
<td>2</td>
<td>10:20 AM – 12:00 PM</td>
<td>Room 12</td>
<td>Comparison of Different Inadvertent Return Prediction Methods in Sand Profiles and Testing their Validity with Real World Examples</td>
<td>Alan Atalah</td>
</tr>
<tr>
<td>3</td>
<td>10:20 AM – 12:00 PM</td>
<td>Room 1</td>
<td>A Novel Statistical Approach to Detect Leaksages in Water Pipeline Systems</td>
<td>Cathy Morley</td>
</tr>
<tr>
<td>4</td>
<td>10:20 AM – 12:00 PM</td>
<td>Room 2</td>
<td>Addressing the Shortcomings of a Sampling Strategy in CIPP Quality Assurance Programs</td>
<td>Lori Kline</td>
</tr>
<tr>
<td>5</td>
<td>10:20 AM – 12:00 PM</td>
<td>Room 3</td>
<td>Successful I/I Program Saves $20 Million in Treatment Expansion</td>
<td>Nick Bevins</td>
</tr>
<tr>
<td>6</td>
<td>10:20 AM – 12:00 PM</td>
<td>Room 4</td>
<td>Join us for a showcase of innovative product releases in the trenchless industry. Companies presenting products are this year’s innovative product award finalists.</td>
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### PM Sessions

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<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>3:30 PM – 5:35 PM</td>
<td>Room 14</td>
<td>Mitigating Geologic Risk: Four Large Diameter H2S Successfully Completed in Karst Terrain</td>
<td>Jim Murphy</td>
</tr>
<tr>
<td>2</td>
<td>3:30 PM – 5:35 PM</td>
<td>Room 12</td>
<td>City of Largo, Florida 20-in. Ductile Iron Redlined Pipe Inspection Using the LDS1000TM Tool Under a Hard to Reach Canal Crossing</td>
<td>Cathy Morley</td>
</tr>
<tr>
<td>3</td>
<td>3:30 PM – 5:35 PM</td>
<td>Room 1</td>
<td>Sioux Falls, South Dakota, 129 Trenchless Crossing Obstacles Overcome through Teamwork and Perseverance: Or How Did We Miss That?</td>
<td>Alain Atalah</td>
</tr>
<tr>
<td>4</td>
<td>3:30 PM – 5:35 PM</td>
<td>Room 2</td>
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<td>Lori Kline</td>
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<tr>
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<td>3:30 PM – 5:35 PM</td>
<td>Room 3</td>
<td>Binbrook Force Main Cleaning in City of Hamilton, Ontario</td>
<td>Cathy Morley</td>
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<tr>
<td>6</td>
<td>3:30 PM – 5:35 PM</td>
<td>Room 4</td>
<td>的成功的案例展示了在硬岩区域进行管道更换的挑战与机遇。</td>
<td>Lori Kline</td>
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</table>

## Tuesday Events

**Attendee & Exhibitor Registration**
7:00 AM – 5:00 PM - Lobby

**Exhibit Hall Open**
12:00 AM – 3:30 PM - Hall A

**Advanced Pressure Pipeline Condition Assessment Forum**
8:00 AM
TM1-T3-01 and TM1-T3-02
Track Leader: Joe Lane
Room 5

This forum will provide a discussion of advanced pressure pipeline condition assessment driven by audience participation.

**Innovative Products**

10:20 AM
TM2-T3-01 and TM2-T3-02
Track Leader: Cindy Preuss
Room 1

Join us for a showcase of innovative product releases in the trenchless industry. Companies presenting products are this year’s innovative product award finalists.

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**Schedule At-A-Glance: Tuesday AM, 1st Session**

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<tr>
<th>Track #</th>
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<th>Location</th>
<th>Title</th>
<th>Presenter</th>
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<tr>
<td>1</td>
<td>8:00 AM – 10:05 AM</td>
<td>Room 14</td>
<td>Contact Grouting for Microtunneling Pipe: Is it Contact Grouting or Consolidation Grouting?</td>
<td>Rory Ball</td>
</tr>
<tr>
<td>2</td>
<td>8:00 AM – 10:05 AM</td>
<td>Room 12</td>
<td>A New Perspective in Hydro Fracture Evaluation</td>
<td>Jim Murphy</td>
</tr>
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<td>Kalyan Piratla</td>
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<td>Minimizing Water Main Digs with Inspection and Corrosion Control</td>
<td>Lori Kline</td>
</tr>
<tr>
<td>7</td>
<td>8:25 AM – 10:20 AM</td>
<td>Room 14</td>
<td>The Expanding Capabilities of Microtunneling Demonstrated in Washington, D.C.</td>
<td>Jim Murphy</td>
</tr>
<tr>
<td>8</td>
<td>8:25 AM – 10:20 AM</td>
<td>Room 12</td>
<td>Comparison of Different Inadvertent Return Prediction Methods in Sand Profiles and Testing their Validity with Real World Examples</td>
<td>Alan Atalah</td>
</tr>
<tr>
<td>9</td>
<td>8:25 AM – 10:20 AM</td>
<td>Room 1</td>
<td>A Novel Statistical Approach to Detect Leaksages in Water Pipeline Systems</td>
<td>Cathy Morley</td>
</tr>
<tr>
<td>10</td>
<td>8:25 AM – 10:20 AM</td>
<td>Room 2</td>
<td>Addressing the Shortcomings of a Sampling Strategy in CIPP Quality Assurance Programs</td>
<td>Lori Kline</td>
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<td>11</td>
<td>8:25 AM – 10:20 AM</td>
<td>Room 3</td>
<td>Successful I/I Program Saves $20 Million in Treatment Expansion</td>
<td>Nick Bevins</td>
</tr>
<tr>
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<td>Five Drives with 26 Curves Built in Zug, Switzerland; Lessons Learned</td>
<td>Jim Murphy</td>
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<td>15</td>
<td>8:50 AM – 10:45 AM</td>
<td>Room 1</td>
<td>Sioux Falls, South Dakota, 129 Trenchless Crossing Obstacles Overcome through Teamwork and Perseverance: Or How Did We Miss That?</td>
<td>Alain Atalah</td>
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<td>18</td>
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<td>Room 4</td>
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</table>
## Schedule At-A-Glance: Tuesday AM, 2nd Session

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<th>Track 2 (TM2-T2-01-04)</th>
<th>Track 3 (TM2-T3-01-04)</th>
<th>Track 4 (TM2-T4-01-04)</th>
<th>Track 5 (TM2-T5-01-04)</th>
<th>Track 6 (TM2-T6-01-04)</th>
</tr>
</thead>
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<tr>
<td>Track Leader</td>
<td>Project Planning &amp; Delivery</td>
<td>HDD &amp; Geotechnical Issues</td>
<td>Innovative Products</td>
<td>Project Planning &amp; Delivery &amp; Condition Assessment</td>
<td>Slippinng</td>
<td>Watermain Rehabilitation</td>
</tr>
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<td>10:20 AM</td>
<td>Horizontal Bends in Horizontal Directional Drilling</td>
<td>Predicting the Saturated Hydraulic Conductivity of Natural Soil</td>
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<td>Joanne Carroll</td>
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<td>10:45 AM</td>
<td>Curved Microtunneling Alignments in the Design Toolbox</td>
<td>Assessment of Soil and Bedrock Abrasivity for Horizontal Directional Drilling Projects</td>
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<td>Tunneling in the Shadow of Camden Yards</td>
<td>Horizontal Directional Drilling - Guidance Types, Accuracy and Safety</td>
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<td>Westport’s Pump Station No. 2 Force Main Replacement Project Using HDD</td>
<td>Assessment and Remediation of Gas Utility Tunnels in Chicago</td>
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### Wastewater

**Tuesday, March 19, 2019 - AM, 1st Session**

**Track 1: Microtunneling**

**Track Leader:** Rory Ball

**8:25 AM…****TM1-T1-02**

**The Expanding Capabilities of Microtunneling Demonstrated in Washington, D.C.**

Todd Brown, Brabshaw Construction Corporation

The Oregon Avenue NW Sewer Rehabilitation project in Washington, D.C., consisted of 4,300 ft of 24-in sewer to eliminate pipelines through Rock Creek Park. 2,700 ft of the new sewers were installed by microtunneling, including a single 1,860-ft long drive and a 430-ft long drive with a 625-ft radius 5-Curve.

**8:50 AM…****TM1-T1-03**

**Five Drives with 26 Curves Built in Zug, Switzerland; Lessons Learned**

Marc Reinhard, Go Bau AG

Five drives were built in the city of Zug, Switzerland, with eight vertical and 18 horizontal curves. This paper discusses the lessons learned through designing and executing. Risk management, rolling planning, ensuring the required quality, cost monitoring and cost forecast, time schedule and technical challenges are the main points.

**9:15 AM…****TM1-T1-04**

**Microtunnel Planning for the Browns Valley Trunk in Napa, California**

Dru Nielsen, McMillen Jacobs Associates; Justin Reeves, McMillen Jacobs Associates; Robin Gamble Holley, Napa Sanitation District

Findings from geotechnical research and exploration documents faults, high groundwater, variable ground conditions, potential obstructions (battered piles), and historically-filled and rerouted drainageways along a planned 15,600-ft trunk sewer to be designed and constructed in part by microtunneling under Caltrans State Route 29 and congested traffic corridors in Napa, California.

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### Water/Wastewater

**9:40 AM…****TM1-T1-05**

**Construction of 5,550 lf of 30 and 40-in. Relief Sewer Using Trenchless and Conventional Technologies in Connecticut**

John Gakowski, Jacobs Engineering Group; Jason Waterbury, Metropolitan District Commission; Eric Murr, Jacobs Engineering Group

MDC and Jacobs prepared this paper to describe challenges overcome during sewer construction and the tunneling technologies implemented to achieve project success. The project includes various tunneling and open-cut excavation techniques, river crossings, permitting and traffic control considerations. Tunneling equipment selection significantly reduced construction risks throughout the project.

**8:50 AM…****TM1-T4-03**

**Sioux Falls, South Dakota, I-229 Trenchless Crossing Obstacles Overcome through Teamwork and Perseverance: Or How Did We Miss That?**

Michelle Carter, HDD; Dustin Posten, City of Sioux Falls; Dave Bennett, Bennett Trenchless Engineers

Despite a thorough geotechnical investigation, unpleasant surprises were encountered. The City, South Dakota DOT, the design team and the contractor worked together to overcome difficulties and complete the project without litigation.

**9:15 AM…****TM1-T4-04**

**Pipe Jacking in Hard Rock below a Highway Overpass in Montreal, Quebec**

Tom Fueter, The Robbins Company; Gill Tardif, Nella Drilling Inc

Contractor Nella Drilling is utilizing a small diameter (66-in.) hard rock boring machine known as a Rockhead Gripper Shield to excavate the first-ever pipe jacking tunnel in rock below Montreal for the Contract A-335-4 Project, a wastewater pipeline.

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### Electrical

**10:15 AM…****TM1-T5-02**

**The City of Bend PlantInterceptor - Extending the Life of the City’s Primary Means of Wastewater Conveyance**

Robert Lee, Murraysmith; Jason Sube, City of Bend

This paper will focus on the condition assessment and rehabilitation of the City of Bend’s Plant Interceptor. Condition assessment of the 20,000 lf 36-in. and 42-in. pipe utilized digital scanning, sonar and laser. Rehabilitation utilized cured-in-place pipe, allowing both thermal and UV-curing methods.

**8:50 AM…****TM1-T5-03**

**Carry Drive SE Sanitary Rehabilitation Phase 1 & 2 - CIPP Lining of H2S Damaged Sanitary Main**

Jordan Quick, ISL Engineering and Land Services Ltd; Kimberley Kimball, ISL Engineering and Land Services Ltd

From design to implementation, our presentation will focus on the challenges we faced and solutions we implemented throughout the project.

**9:15 AM…****TM1-T5-04**

**Addressing the Shortcomings of a Sampling Strategy in CIPP Quality Assurance Programs**

Tony Araujo, Paragon Systems Testing

Many QA programs specify random sampling of field-installed CIPP samples to ensure that sewer rehabilitation installations comply with the owner’s specifications. This paper identifies the shortcomings of this approach and describes the experience of the City of Toronto in implementing a comprehensive quality control approach to CIPP installations.
9:40 AM..................................................TM1-T5-05
Normandie Sewer - The UV Cured-in-Place Sewer Rehabilitation in the City of Los Angeles
Sylvester Kueh, City of Los Angeles; Kent Wel lens, City of Los Angeles
Rehabilitation of a major sewer using an UV cured-in-place liner technology. The 30-in. to 39-in. brick and concrete sewer was put in service in 1915 and had deteriorated, resulting in two sinkholes. Replacement and other methods of rehabilitation were considered but proved to be more expensive.

Track 6: Asset Management & Condition Assessment
Track Leader: Cathy Morley

8:50 AM......................................................................TM1-T6-03
Binbrook Force Main Cleaning in City of Hamilton, Ontario
Erika McCarthy, Stantec Consulting Ltd; Gerald Bauer, Stantec Consulting Ltd; Dave Albertson, Hamilton Water; Donald Young, Hamilton Water
Hamilton Water retained Stantec to develop a plan to clean the Binbrook Wastewater Pumping Station force main to meet development agreements. The mandate was to restore pumping capacity. Stantec created a flexible cleaning program utilizing available trenchless technology. This paper focuses on the lessons learned when instituting a force main maintenance program.

9:15 AM......................................................................TM1-T6-04
Successful I/I Program Saves $20 Million in Treatment Expansion
Robert Lee, Murraysmith; Greg Springman, City of Sweet Home; Preston Van Meter, Murraysmith
The City of Sweet Home, Oregon, has embarked on a successful I/I abatement program that has reduced peak flows to its WWTP by more than 50 percent. This program has resulted in significant savings in conveyance upgrades and WWTP expansion, proving that I/I reduction can be the most cost-effective approach.

9:40 AM......................................................................TM1-T6-05
Simple Tool for Operators to Quantify I/I, Detect Leaks & Measure Rehab Progress
George Kurz, Sewer Capacity Management
This paper describes a simple, non-proprietar y spreadsheet tool for measuring annual I/I and peak RDI/I using data already collected by wastewater treatment facility operators for EPA compliance. This system is more effective and has a broader application than the most recent method recommended by the US-EPA.

Wastewater
Tuesday, March 19, 2019 - AM, 2nd Session
Track 1: Project Planning & Delivery
Track Leader: Dave Haug

11:10 AM......................................................................TM2-T1-03
Tunneling in the Shadow of Camden Yards
Joe Schrank, McMillen Jacobs Associates; Justin Kirk, AECOM; Todd Brown, Bradshaw Construction Company; Brandon Knapp, CSX Transportation; Matt Over, McMillen Jacobs Associates
The design-build team perspective from the initial feasibility to project completion for the CSX Camden Street Storm Drain Replacement Project will be presented with a focus on the major project challenges and the development of a buildable solution that successfully managed the major risks for construction of three short tunnels.

11:35 AM......................................................................TM2-T1-04
Rationalization and Implementation of an Upgrading Approach for the Northeast Interceptor in Winnipeg, Manitoba
Adam Braun, AECOM; Christopher Macey, AECOM; Kas Zurek, City of Winnipeg; Stacy Coumoyer, City of Winnipeg; Mike Gaudreau, AECOM
The North End Water Pollution Control Centre (NEWPCC) handles more than 65 percent of the daily wastewater load for a city of 780,000. The Northeast Interceptor is one of three key Interceptors that service the NEWPCC and has a critical river crossing immediately upstream of the plant that needed to be upgraded.

Track 2: HHD & Geotechnical Issues
Track Leader: Carrie Layhee

11:35 AM......................................................................TM2-T2-04
Westport’s Pump Station No. 2 Force Main Replacement Project Using HDD
Bryan Thompson, Town of Westport; Albyn Hull, Haley & Aldrich Inc; Lori Carriero, Tighe & Bond
This presentation will discuss the challenges encountered when directional drilling a new force main underneath a tidal river in Westport, Connecticut. Technical challenges included accessing/evaluating subsurface conditions in a tidal river and designing a drill entirely in hard and abrasive material. Numerous permits were also required.

10:45 AM......................................................................TM2-T4-02
Selection Process Challenges: Force Main Study Considers Variety of Trenchless Technologies and Corresponding Stakeholder Impacts
William Gibson, AECOM; Katherine Linears, Hampton Roads Sanitation District; Christopher Macey, AECOM
This paper will detail a case study in which the conditions were unusually opportunistic to evaluate a variety of trenchless technologies available to rehabilitate a critical 48-in., 1970s-era PCCP force main, or conversely, construct a parallel 42-in. HDD. The paper will detail the evaluation approach, findings, recommendations and selected alternative.

Track 5: Skiplining
Track Leader: David Crowder

11:35 AM......................................................................TM2-T5-04
Rehabilitation of Various Trunk Sewers in City of Toronto
Prapan Dave, City of Toronto; Laurel Murphy-Jacobs, Joe Vera Southland; Renda Brian Ratcli tch, Capital Sewer Services
The City of Toronto is rehabilitation approximately 50 km of various trunk sewers in next 10 years. The City has successfully completed a few projects using skiplining and CIPP technologies. The paper will showcase successful projects, rehabilitation technique selection, challenges faced, successes and lessons learned.

10:20 AM......................................................................TM2-T2-01
Predicting the Saturated Hydraulic Conductivity of Natural Soil
Chi Hyun Park, McMillen Jacobs Associates; Charles Huse, Northeast Ohio Regional Sewer District
The main goal of this paper is to present available methods in estimating hydraulic conductivity of saturated soils using geotechnical parameters in tunnel design and demonstrate their applicability to recent tunnel projects. This paper will examine the procedure and reliability of predicting the saturated hydraulic conductivity of natural soils.

Track 4: Project Planning & Delivery & Condition Assessment
Track Leader: Will Craven

8:50 AM......................................................................TM1-T3-03
City of Largo, Florida 20-in. Ductile Iron Reclaimed Pipe Inspection Using the LDS1000TM Tool Under a Hard to Reach Canal Crossing
Edward Allen Aminoff, AM Trenchless; Pietro Salvo, GAME Consultants; Weston Hagen, Relaes Engineers; David Block, City of Largo
Florida worked with Reiss Engineering, AM Trenchless and GAME Consultants to successfully inspect a 20-in. ductile iron reclaimed water main through five 45-degree bends under a hard to reach canal crossing. No evidence of leaks was observed and the City developed detailed protocol for future successful inspections.

Track 4: Pipe Jacking
Track Leader: Alan Atalash

9:25 AM......................................................................TM1-T4-02
Removal of Large Concrete Obstruction on 96-in. Pipe Ram Crossing of Highway 61 in Neebing, Ontario
James Carroll, MarshWagner; Travis Krag, LTL Drilling; Connor Beck, LTL Directional Drilling; Spencer Shank, Cooper Sales and Services
This paper will discuss the use of a non-detonating explosive to remove an abandoned bridge abutment encountered during a 36-in. pipe ramming under an active highway. Team work with the owner, contractor and engineer ensured safety of the traveling public and ability to complete ramming operations after weeks of delay.
Fifteen to 25 percent of water mains are asbestos cement (ACP). Asbestos was used until 1980s when it was eliminated due to health concerns. Utilities are faced with managing this aging infrastructure. Until now, there has not been reliable technologies for non-destructive testing for condition assessment. This presentation will present the non-destructive testing technology, Backscatter Computed Tomography (BCT).

| Track 5: Slipping  
Track Leader: David Crowder |
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<td>10:45 AM ...........................................TM2-T5-02</td>
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<td>11:35 AM ...........................................TM2-T6-04</td>
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<td>8:00 AM ...........................................TM1-T4-01</td>
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<td>8:25 AM ...........................................TM1-T6-02</td>
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</table>
**Networking Event**

**Gala Awards Dinner**

**Tuesday, March 19, 2019 - 7:00 PM - 10:00 PM - Room 21-24**

You are cordially invited to attend the trenchless industry’s premiere awards dinner! Join leaders and colleagues from across the industry while we honor those who have accomplished outstanding achievements in their respective fields. NASTT will present and recognize its Hall of Fame Class of 2019, as well as the Chair’s Award for Outstanding Lifetime Service, the Ralston Award for Young Trenchless Achievement and the Abbott Awards for Innovative Products & Services.

*NASTT’s 2019 No-Dig Show Gala Awards Dinner is a ticketed event.

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**Gas**

**Tuesday, March 19, 2019 - AM, 1st Session**

**Track 2: HDD**

**Track Leader:** Jim Murphy

**8:50 AM-----------------------------------TM1-T2-03**

**Mitigating Geologic Risk: Four Large Diameter HDDs Successfully Completed in Karst Terrain**

Gary Castleberry, GeoEngineers Inc; Paul Mitchell, Enbridge Inc

This paper describes how four HDDs along a 36-in. pipeline route were completed in highly developed karst terrain. The paper will cover front-end engineering requirements, geotechnical and geophysical investigations and design recommendations, pipeline integrity studies and construction methodologies critical to the pipeline’s success and applicable to future projects.

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**Entrance**

**Other**

**Tuesday, March 19, 2019 - AM, 1st Session**

**Track 2: HDD**

**Track Leader:** Jim Murphy

**8:00 AM-----------------------------------TM1-T2-01**

**A New Perspective in Hydro Fracture Evaluation**

Stefan Goege, CCI Inc; Nicolas Boelhower, CCI Inc; Justin Taylor, CCI Inc

In this paper, realized annular pressure data during construction has been accumulated and reviewed to determine the accuracy of the fluid pressure prediction model in various case studies. Additionally, using the same data, pressure magnitude of actual hydraulic fracture occurrences have been recorded and compared with the prediction.

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**10:45 AM-----------------------------------TM2-T2-02**

**Assessment of Soil and Bedrock Abrasivity for Horizontal Directional Drilling Projects**

Nicholas Strater, Brierley Associates; Danny Crumpton, Inrock; Brian Dorwart, Brierley Associates; Jim Williams, Brierley Associates

The paper will summarize the impacts of abrasive ground conditions and typical soil and bedrock formations that may prove abrasive. An abrasivity scale will be presented for use in project planning, design and construction assessments.

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**10:20 AM-----------------------------------TM2-T1-01**

**Horizontal Bends in Horizontal Directional Drilling**

Diana Worthen, Jacobs

This paper presents a discussion on horizontal bends in horizontal directional drilling installations. It addresses best practices in borepath design and the effect on pullback forces when a horizontal bend is added to a crossing, particularly for larger diameter HDDs.

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**Water/Wastewater**

**Tuesday, March 19, 2019 - AM, 2nd Session**

**Track 4: Project Planning & Delivery & Condition Assessment**

**Track Leader:** Wil Layhee

**11:35 AM-----------------------------------TM2-T4-04**

**Assessment and Remediation of Gas Utility Tunnels in Chicago**

Aswathy Sivaram, Black & Veatch; Cary Hirner, Black & Veatch; Gary Hinrich, Black & Veatch

Tunnel and Pipeline Remediation Program - includes assessment, inspection and potential remediation of these tunnels and associated pipelines.

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**10:20 AM-----------------------------------TM2-T4-01**

**What Happens After the Installation Is a Success?**

Brian Avon, Carollo Engineers; Josh Hampton, PG&E

In many cases, owners do not have a full understanding of trenchless technology and its application, whereas consultants may not understand the owner’s long term maintenance issues. This paper focuses on the aspects of a project and the installed assets owners and consultants must consider.
## Schedule At-A-Glance: Tuesday PM Sessions

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<td>Pilot Tube</td>
<td>HDD</td>
<td>Condition Assessment &amp; Asset Management</td>
<td>Research &amp; Emerging Technologies</td>
<td>Slippinig</td>
<td>Wastewater Pipeline Rehabilitation</td>
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<tr>
<td>3:30 PM</td>
<td>Mohammad Najafi</td>
<td>Rachel Maupin</td>
<td>Jonathan Kunay</td>
<td>Brenda Kinggmill</td>
<td>George Regula</td>
<td>Marc Lehmann</td>
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<td>3:55 PM</td>
<td>Unique Horizontal Drain Installation Under a Building Using Pilot Tube Guidance Auger Bore Methods</td>
<td>The Environmentally Sensitive Boca Ciega Bay 4200-ft Force Main Replacement: Taming HDD Technology</td>
<td>Frontera Lift Station Force Main Condition Assessment</td>
<td>Conducting the ASTM D2992 – Challenges and Concerns</td>
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<td>Fixing a 19th Century Sewer with a 21st Century Solution: A Case Study for Geopolymer Sanitary Sewer Rehabilitation</td>
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<tr>
<td>4:20 PM</td>
<td>Guided Auger Boring Resolves Everyday Utility Installation Challenges at the Doha International Airport</td>
<td>Improved Magnetic Navigation for Horizontal Directional Drilling Using a Down-Hole Rotating Rare Earth Magnet Implementation</td>
<td>Cast Iron Pipe Condition Assessment Service Measured by Centuries</td>
<td>Living Labs Validation of Trenchless Technical Solution in Real World Applications</td>
<td>Rehabilitation of the Frontier Street Horseshoe-Shaped Combined Sewer in Hamilton, Ontario</td>
<td>Challenges Encountered During Rehabilitation of a Trunk Sewer Using Sprayed Geopolymer</td>
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<tr>
<td>4:45 PM</td>
<td>Trenchless Technologies Used in Flood Prevention Schemes Project in Doha, Qatar</td>
<td>Soil Mechanics and Calculating Hydraulic Fracture Risk</td>
<td>The Use of Innovative Inspection Technologies to Assess and Prioritize Rehabilitation for Water Pipeline Infrastructure</td>
<td>Demonstration of a Prototype System for the Automated Interpretation of Sewer CCTV Inspection Videos</td>
<td>Slipping 120-In. RCP Wastewater in Dallas, Texas</td>
<td>Narragansett Bay Commission Rehabilitation of Large Diameter Brick Sewer with GeopSpy Geopolymer Mortar</td>
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<td>Installation of New Culverts for Vermont Transportation Agency Using Two Pipe Ramming Methods</td>
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### Water/Wastewater: Wastewater

**Tuesday, March 19, 2019 - PM**

**Track 1: Pilot Tube**

**Track Leader:** Mohammad Najafi

**4:45 PM — ** TA-T1-04 Tunnel Design and Construction in Soft, Wet Ground

*Ryan Marsters, Lithos Engineering; John Beckos, B'InTrenchless Inc*

This paper will discuss a 375-ft tunnel that was built under four railroad tracks and highway I-15 consisting of 36-in. carrier pipe within 48-in. steel casing in Kaysville, Utah. Ground conditions were soft, wet clay, silt and sand deposited in a lake environment. Pilot tube auger boring with a hammer backup was the final installation method.

**5:10 PM — ** TA-T1-05 Installation of New Culverts for Vermont Transportation Agency Using Two Pipe Ramming Methods

*Alan Goodman, Hammerhead Trenchless; Tom Loyer, Engineers Construction Inc*

A contractor completed a design-build culvert project for Vermont Transportation Agency (VTrans), requiring three new 72-in. culverts to relieve ponding after large precipitation events along a section of railway bed. The contractor conducted a variety of ground stabilization and pipe installation techniques, including the pilot tube method.
This paper will provide an overview of the inspection, design and rehabilitation for this 275-m long, 1,200-mm by 1,350-mm diameter horseshoe shaped combine overflow sewer, located 7.5 m below Barton Street in the City of Hamilton.

**Water/Wastewater**

**4:45 PM** ................................. TA-T5-04

Sliplining 120-in. RCP Wastewater in Dallas, Texas

Marty Paris, Kimley-Horn and Associates Inc; Kevin Cannon, Dallas Water Utilities; Ashtyn Morgan, Kimley-Horn and Associates Inc

This paper will review a case study of the 120-in. Southside Interceptor Rehabilitation project in Dallas, Texas. The project involved evaluating rehabilitation alternatives for 15,000 ft of 120-in. RCP wastewater and 12,600 ft of parallel 72-in. RCP wastewater. The design included sliplining the 120-in. and point repairs on the 72-in.

**Track 6: Wastewater Pipeline Rehabilitation: Geopolymer**

**Track Leader:** Marc Lehmann

**3:30 PM** ................................. TA-T5-02

Fixing a 19th Century Sewer with a 21st Century Solution: A Case Study for Geopolymer Sanitary Sewer Rehabilitation

Allison Swather, City of Joliet; Joseph Sullivan, RJN Group Inc

In 2016, sewer crews discovered the structural integrity of Joliet’s limestone arch sewer was compromised. The sewer, which was constructed in the 1860s, was rehabilitated with a 1-in. thick geopolymer coating application. Overall, 2,200 ft of sewer were repaired in this high priority downtown business district.

**3:55 PM** ................................. TA-T5-03

DC Water New Jersey B Street 10- to 18-Ft Diameter Trunk Wastewater Rehabilitation During Live Dry Weather Flow

Scott Naiva, Miliken Infrastructure; Steve Bian, DC WATER; Tim Bako, HDR Northeast

In 2018, DC Water started rehabilitation of its New Jersey B Street trunk line under live flow conditions. The project is 4,340 ft of 10- to 18-ft span pipe. This covers why geopolymer mortar was chosen, rehabilitation options considered, liner design/ construction challenges and lessons learned.

**4:20 PM** ................................. TA-T6-02

Challenges Encountered During Rehabilitation of a Trunk Sewer Using Sprayed Geopolymer

Paul Headland, Atillo Services LLC

The 16th Avenue Sanitary Trunk Sewer Rehabilitation project comprises sprayed geopolymer relining of approximately 3-km of 2,642-mm diameter sewer tunnel at depths of up to 47-m below ground. This paper presents the results of the rehabilitation, as well as challenges encountered and lessons learned during the project.

**4:45 PM** ................................. TA-T6-04

Narragansett Bay Commission Rehabilitation of Large Diameter Brick Sewer with GeoSpray Geopolymer Mortar

Scott Naiva, Miliken Infrastructure Solutions; Meg Goulet, Narragansett Bay Commission; James Fleming, National Water Main Cleaning

The summer 2018 Narragansett Bay Commission (NBC) in Providence, Rhode Island, had National Water Main Cleaning (NWMC) rehabilitate 2,200 ft of up to 60-in. brick pipe using Milliken’s GeoSpray geopolymer spray on mortar. This presentation is on trenchless options considered, construction challenges in the middle of a highway and lessons learned.

**5:10 PM** ................................. TA-T6-05

Urgent Storm Pipe Rehabilitation as a Result of Lingering Effects and Damage Caused By Hurricane Harvey

Steve Henning, Vortex Companies

Several large diameter CMP stormwater pipes (84-in. to 96-in.) running beneath a multi-lane roadway in Houston, Texas, were failing as a result of damage and extreme flooding created by Hurricane Harvey. Full structural rehabilitation was achieved using a geopolymer lining system, thus avoiding total replacement.
Many technologies maintain pipelines in a way that provides service beyond design life. Without diagnostic and maintenance tools, it is a guessing game when to replace. There was a concern replacement would be necessary for the DeSoto, Kansas, transmission main. With tools to inspect (cctv/leak detection) and cleaning, replacement was canceled.

**5:10 PM - TA-T5-05**
**Track 5: Slipping**
**Track Leader: George Ragula**

**Denver Water Turns to Slipping to Renew Century-Old Transmission Main**

Martin Garcia, Denver Water; Stephen Austin, Underground Solutions Inc

Denver STRiL used slipping to rehabilitate a century-old 36-in. cast iron transmission main when its standard methods of cement mortar lining were no longer an option. This renewed pipeline is now the largest diameter PVC pressure pipe installed in Denver Water’s system.

**4:20 PM - TA-T2-03**

**Soil Mechanics and Calculating Hydraulic Fracture Risk**

Tuesday, March 19, 2019 - PM

Track 2: HDD
Track Leader: Rachel Maupin

**3:30 PM - TA-T1-01**

**Unique Horizontal Drain Installation Under a Building Using Pilot Tube Guided Auger Bore Methods**

Michelle Macauley, Macauley Trenchless; Steve Torgerson, Trenchless Construction Services

Design considerations and construction recap for installation of four 8-in. diameter horizontal drains under a critical building with no interior access. Key considerations included high water table in granular soils, limited work area around the building, and coordination around and under a critical facility that never shuts down.

**Gas**

Tuesday, March 19, 2019 - PM

**5:10 PM - TA-T5-05**

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**Wednesday, March 20, 2019 & Thursday, March 21, 2019**

**Plan to Attend a Post-Conference Course**

**Cost to Attend:** $400 Regular/$250 Government unless otherwise noted. Includes attendance to the course, handouts and a Continuing Education Unit certificate issued by Louisiana Tech University.

**NASTT’s Horizontal Directional Drilling (HDD) Good Practices Course**

Wednesday, March 20, 2019 - 2:30 PM – 6:30 PM
Thursday, March 21, 2019 - 7:30 AM – 12:00 PM
Room 13/14

The HDD Good Practices Guidelines course provides an in-depth overview of Horizontal Directional Drilling (HDD) and covers six topics: (1) operation and application; (2) equipment and materials; (3) planning, including surface and geological investigations, utility surveys, bore planning, and regulations and permitting; (4) jobsite safety; (5) risk reduction, trouble shooting and mitigation; and (6) design.

**NASTT’s Pipe Bursting Good Practices Course**

Wednesday, March 20, 2019 - 2:30 PM – 5:30 PM
Thursday, March 21, 2019 - 8:30 AM – 12:00 PM
Room 1

The NASTT Pipe Bursting Good Practices Course provides an in-depth overview of pipe bursting and covers four topic areas: (1) the types, methods and application of pipe bursting; (2) planning and preliminary design of a pipe bursting job; (3) design and construction considerations; and (4) troubleshooting and plant operational factors.

**NASTT’s Cured-In-Place Pipe (CIPP) Good Practices Course**

Wednesday, March 20, 2019 - 2:30 PM – 6:00 PM
Thursday, March 21, 2019 - 8:00 AM – 12:00 PM
Room 3

The CIPP course provides an in-depth overview of water, wastewater mainline and sewer lateral pipe rehabilitation using CIPP from planning and design to job completion.

**NASTT’s Sewer Laterals Good Practices Course**

Wednesday, March 20, 2019 - 2:30 PM – 5:30 PM
Thursday, March 21, 2019 - 8:30 AM – 12:00 PM
Room 2

This course offers a clear understanding of the problems and relevant issues unique to the private lateral portion of the collection system network, explains available options for inspection, evaluation and repair of sewer laterals and address the financial and legal issues that affect the means by which necessary work can be accomplished.

**Continuing Education Units (CEUs) and Professional Development Hours (PDHs) - See page 20**

**NASTT’s New Installation Methods Good Practices Course**

Wednesday, March 20, 2019 - 2:30 PM – 6:00 PM
Thursday, March 21, 2019 - 8:00 AM – 12:00 PM
Room 4

The New Installation Good Practices Guidelines course provides an in-depth overview along with case studies covering many topics: (1) Trenchless methods used for grade and alignment control and guidance; (2) The limitations and advantages of each method discussed; (3) The steps you need to follow to know the underground; (4) How to establish the invert for a proper launch; (5) The history, sizes, equipment options and process of excavating through different ground types, pipe materials; (6) Ways to track where the pipe is located underground; and (7) Installation and jacking forces and ways to reduce these forces.

**NASTT’s Gas Good Practices Course**

Cost to Attend: $200 Regular/$150 Government
Thursday, March 21, 2019 - 8:00 am – 12:00 pm
Room 11/12

This Gas Good Practices course will deliver a comprehensive, consensus-based course outline that is non-commercial and academically oriented. Our instructors are experts and respected leaders in the gas industry.
**Wastewater**

**Wednesday, March 20, 2019 - AM**

**Track 4: Pipe Bursting & HDD Construction Safety**  
**Track Leader: Alan Ambler**

### Schedule At-A-Glance: Wednesday AM Sessions

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<td>HDD Chris Schuler</td>
<td>Gas: Rehabilitation &amp; HDD Dennis Walsh</td>
<td>Pipe Bursting &amp; HDD Construction Safety Alan Ambler</td>
<td>Wastewater &amp; Stormwater Pipeline Rehabilitation Andrew Costa</td>
<td>Emerging Technologies Peter Cram</td>
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**8:00 AM**
- Microtunneling Installation of 24-in. (600-mm) Diameter Sanitary Sewer

**8:25 AM**
- Engineering Judgment Required to Use Empirical Tunneling Estimating Methods

**8:50 AM**
- Azimuth-based Navigation System for Extended Length and Cursed Microtunneling

**9:15 AM**
- Reducing Risks of Microtunneling from the Pipe's Perspective

**9:40 AM**
- Design Challenges of the Parking Lot 6 Project in Cambridge, Massachusetts, Trenchless Connections and Shafts

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**Student Research Poster Competition**  
**10:30 AM – 12:30 PM**  
**Hall A**

**Closing Luncheon**  
**12:30 PM – 2:00 PM**  
**Room 21-24**

**Post-Event Course Registration Check-in**  
**1:30 PM – 5:00 PM**  
**Hall/Room 14**

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**Technical Paper Session Schedule**

**AM Sessions**

- **Track 1:** 8:00 AM – 10:05 AM - Room 14
- **Track 2:** 8:00 AM – 10:05 AM - Room 12
- **Track 3:** 8:00 AM – 10:05 AM - Room 1
- **Track 4:** 8:00 AM – 10:05 AM - Room 2
- **Track 5:** 8:00 AM – 10:05 AM - Room 3
- **Track 6:** 8:00 AM – 10:05 AM - Room 4

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**Plan your experience!**  
**Wednesday, March 20, 2019**

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**Penn Township Sewage Authority**  
**Wastewater Authority:** a Model of Consistency

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**Mike Schultz, TT Technologies Inc; Stan Caroline, Penn Township Sewage Authority**

Penn Township Sewage Authority will discuss the early days of its replacement program. What drove it to bring the work in-house? The lessons learned and how it ended up developing a 20-year replacement program focusing on pipe bursting and the cost saving to date.

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**Sliplining Major Interceptor Sewers at the Littleton Englewood Wastewater Treatment Facility Saves Time and Money**  
**Michael Middleton, Ingenium Engineers; Gunter Ritter, City of Englewood; Micheal Racca, AUI Inc**

Sliplined 2,000 lf of RCP interceptors (66-in., 54-in. and 24-in.) with HOBAS pipe, spray applied epoxy.
past decade. Furthermore, discussion of unique
on several significant projects conducted over the
in the Chinese HDD industry, including discussion
Samuel Ariaratnam, Arizona State University
Horizontal Directional Drilling Market in China
presentation highlights the AZ100 TGS capabilities on six
lf on extended length and value engineered alignments
system has been used to successfully install thousands of
Azimuth-Based Navigation System for Extended
that significant engineering judgement is required
from a recently completed microtunnel project. They
Empirical Tunneling Estimating Methods
8:25 AM ........................................ WM-T5-01
Case Study of Large Diameter Sewer Rehabilitation using Centrifugally Cast Cementitious Pipe Liner
Marc Lehmann, CDM Smith; Jeff Bowra, Capital Region Water
What do you do when your oddly shaped sewer is in worse condition than anticipated? We will present a case study of the construction phase of rehabilitating 13,000 lf of large diameter cast in place concrete sewer using a specialized centrifugally cast cementitious pipe lining.
Track 6: Emerging Technologies
Track Leader: Peter Oram

Wednesday, March 20, 2019 - AM

8:00 AM ........................................ WM-T6-01
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Wednesday, March 20, 2019 - AM

8:25 AM ........................................ WM-T6-02
Engineering Judgement Required to Use Empirical Tunneling Estimating Methods
Bill Zietlow, Brielry Associates; Becky Brock, Brielry Associates; Ryan Drum, Denver Public Works
The authors evaluate competing methods for estimating both tunneling-induced settlement and pipe jacking forces and compare to measured results from a recently completed microtunnel project. They find wide variation in predicted results and conclude that significant engineering judgement is required when selecting empirical methods and applying the estimated results.
Track 2: HDD
Track Leader: Chris Schuler

9:15 AM ........................................ WM-T6-04
The Evolution of Carbon Fiber CIPP (FCFIPP) for Small Diameter Potable Water & Fire Suppression Systems
Ian Lancaster, Aegion; Medhi Zarghami, Simpson Gumpertz & Hager
In 2013, engineers and material scientists from SGH and Aegion embarked on a development program for the Arizona Public Service Company. This development surrounded the use of carbon-fiber reinforced CIPP to rehabilitate and renew aging high pressure potable water/fire suppression system at a major facility in the southwestern United States.
Track 2: HDD
Track Leader: Chris Schuler

8:50 AM ........................................ WM-T2-03
Water Agency in North Suburban Chicago Adds Six Communities to System Using Mix of Open Trench and Trenchless Construction
William Source, Central Lake County Joint Action Water Agency; Amrou Atassi, CDM Smith; Jared Wendoff, CDM Smith; Marvin Lee, Underground Solutions
Trenchless construction using HDD was a key component of a larger overall project to expand the service area for Central Lake County Joint Action Water Agency in Lake County, Illinois. In total, the project included over 9,000 ft of transmission main piping installed via HDD with pipe sizes ranging from 10-in. to 24-in. in diameter.
Track 4: Pipe Bursting & HDD Construction Safety
Track Leader: Alan Ambler

Wednesday, March 20, 2019 - AM

8:50 AM ........................................ WM-T2-03
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Track 4: Pipe Bursting & HDD Construction Safety
Track Leader: Alan Ambler

8:50 AM ........................................ WM-T4-02
Do It Yourself Water Main Pipe Bursting
Russel Cobath, City of Monroe
A case study of how the City of Monroe, North Carolina, developed an internal water main pipe bursting program. As the only municipality in North Carolina to self-perform water main pipe bursting, the program has allowed Monroe to reach its replacement goals in an efficient, flexible and cost-effective way.
Track 5: Water/Wastewater Pipeline Rehabilitation
Track Leader: Andrew Costa

8:50 AM ........................................ WM-T4-02
Do It Yourself Water Main Pipe Bursting
Russel Cobath, City of Monroe
A case study of how the City of Monroe, North Carolina, developed an internal water main pipe bursting program. As the only municipality in North Carolina to self-perform water main pipe bursting, the program has allowed Monroe to reach its replacement goals in an efficient, flexible and cost-effective way.
Track 5: Water/Wastewater Pipeline Rehabilitation
Track Leader: Andrew Costa

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Track 2: HDD
Track Leader: Chris Schuler

Wednesday, March 20, 2019 - AM

8:00 AM ........................................ WM-T5-01
Water Flows Uphill in Colorado: Rehabilitation of 54-in. Irrigation Siphon
Adam Sedgewick, FRP Construction LLC; Max Schmidt, Orchard Mesa Irrigation District; Mo Elsany, FRP Construction LLC; Marvin Murphy, FRP Construction LLC
This project consisted of the rehabilitation of a 54-in. steel irrigation line in a remote location with steep terrain. In addition, the pipe had to be rehabilitated through the winter months in Colorado. The owner was very pleased with the fiber-reinforced polymer technology utilized on this project.
Track 6: Emerging Technologies
Track Leader: Peter Oram

9:40 AM ........................................ WM-T2-05
Trenchless Technology Triumph in Tempe
Levi Hawkins, PSC; Steve Mortensen, PEC
A combined 10,000 lf of new HDD waterline split into two concurrent projects. The design phase considered sliplining, CIPP, HDD and even open-cut installation. Ultimately HDD was chosen and the paper will cover the decision-making process, considerations for each method and the factors that led to our decision.
Track 4: Pipe Bursting & HDD Construction Safety
Track Leader: Alan Ambler

Gas/Wastewater

Wednesday, March 20, 2019 - AM

8:25 AM ........................................ WM-T2-01
Small Diameter HDD Downhole Pressure Control
Jake Andersen, Staheli Trenchless Consultants; Matthew Izzard, Tracto-Technik UK LTD; Mark Hutchinson, Staheli Trenchless Consultants
Discussion of the design of small diameter HDD installations and recommended design criteria from the owner’s perspective. Special consideration is given to the extent of the contract documents and design when compared to large diameter HDD installations and the key contract elements that promote a successful project for an owner.
A CO2 pipeline project in southern Mexico was in need of a corrosion protection solution. A thermoplastic lining system was selected to rehabilitate the system. The project focuses on the safety advantages of deploying new technology during horizontal directional drilling (HDD) exit-side operations with a particular focus on removing workers from danger zones. Additional focus is on improving risk mitigation through precise torqueing of tool joints as tooling is added or removed from the tail string.

**CO2 Pipeline in Mexico Uses New Connection Method with HDPE System**

Sean Bortis, Aegion; Alex Gutierrez, Miller Pipeline

This paper presents a value-engineered alternative design utilizing the same CFRP system to act as the pipeline's required CO2 crack arrestors.

**Pipe Bursting & HDD Construction Safety**

Track Leader: Alan Ambler

9:40 AM .................................................... WM-T4-05

**Removing Workers From Danger Zones During Exit-Side Horizontal Drilling (HDD) Operations**

Jason LaValley, LaValley Industries; Jorge Prince, LaValley Industries

This paper focuses on deploying new technology during horizontal directional drilling (HDD) exit-side operations with a particular focus on removing workers from danger zones. Additional focus is on improving risk mitigation through precise torqueing of tool joints as tooling is added or removed from the tail string.

**Use of Spray-Applied Pipe Linings as a Structural Conduit**

Mohammad Najafi, Center for Underground Infrastructure Research and Education; Jeffrey Syar, DOT Office of Hydraulic Engineering; Seyed Korky, Center for Underground Infrastructure Research & Education; Zahra Kohankar, Kouchesfehani Center for Underground Infrastructure Research and Education

This paper outlines ongoing research and evaluation program conducted through NCHRP for seven U.S. DOTs (DeDOT, FDOT, MnDOT, NCDOT, NYSDOT, Ohio DOT, and PennDOT) to consider spray applied pipe linings (SAPLS) as a structural renewal for culverts and storm drains.

**Use of Spray-Applied Pipe Linings as a Structural Renewal for Gravity Storm Water Conveyance Conduits**

Mohammad Najafi, Center for Underground Infrastructure Research and Education; Jeffrey Syar, DOT Office of Hydraulic Engineering; Seyed Korky, Center for Underground Infrastructure Research & Education; Zahra Kohankar, Kouchesfehani Center for Underground Infrastructure Research and Education

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**Continuing Education Units (CEUs) and Professional Development Hours (PDHs)**

NASTT, in conjunction with Louisiana Tech University, will award one CEU/10 PDHs for every 10 hours of six-track technical paper participation. CEUs/PDHs will also be awarded for the Introduction to Trenchless Technology – New Installation, Introduction to Trenchless Technology – Rehabilitation, Cured-In-Place Pipe (CIPP) Good Practices, Sewer Laterals Good Practices, Horizontal Directional Drilling Good Practices, Pipe Bursting Good Practices, New Installation Methods Good Practices and Gas Good Practices. To be eligible to receive CEUs you must:

1. register to attend the No-Dig Conference sessions and/or register as a full conference exhibitor.
2. make sure your name badge is scanned upon entering and leaving each conference session.
3. complete an evaluation form for each session attended.