

International Society for Trenchless Technology

# 21<sup>st</sup> No-Dig International Conference and Exhibition 2003

March 31 – April 2, 2003  
Las Vegas, Nevada, USA

Volume 1 of 2

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571  
[www.proceedings.com](http://www.proceedings.com)

ISBN: 978-1-60423-876-1

Some format issues inherent in the e-media version may also appear in this print version.



## TABLE OF CONTENTS

### VOLUME I

#### **SESSION A**

##### **TRACK I**

##### **EVALUATIONS & UTILITY LOCATION**

<b>Acceptance of Rehabilitation Works</b> .....	1
<i>J. Bergue</i>	
<b>TBM vs MTBM: Geotechnical Considerations</b> .....	8
<i>D. Mathy, R. Kahl</i>	
<b>Locating Lg Dia Sewers in the City of Toronto Using Electromagnetic Field Detection Technology</b> .....	20
<i>D. Crowder</i>	
<b>Current Inversion in Pipe</b> .....	27
<i>T. Oshita, S. Onodera</i>	

##### **TRACK II**

##### **MICROTUNNELING – CASE STUDIES I**

<b>Impact of Constructing a Large Diameter Tunnel Near a Large Diameter Bricks Sewer in Denver</b> .....	37
<i>R. McKim, J. Barsoom</i>	
<b>A Case Study of Tunneling Through Tulare Hill in San Jose, California</b> .....	47
<i>M. Ho, A. Kam, T. Nguyen</i>	
<b>City of Seattle-Tolt Pipeline No. 2 Bear Creek and Snoqualmie River Microtunnels</b> .....	57
<i>R. Beiler, D. Gonzales, D. Molvik</i>	
<b>Development Of Long Distance Directional Pipe Jacking Method (Lubricant Injection System)</b> .....	64
<i>S. Ishizuka</i>	
<b>Microtunneling in Downtown Portland-Tanner Creek Stream Diversion Project, Phases 2 and 5</b> .....	78
<i>S. Klein, M. Havekost, M. Hutchinson, B. Jossis</i>	

##### **TRACK III**

##### **LINING ASSESSMENT I**

<b>Cement Mortar vs. Epoxy Lining of Watermains for Improved Water Quality</b> .....	79
<i>T. Tridd, M. Knight, K. Sarami</i>	

<b>Potential for Pre-Manufactured Pipeliners in Emerging Markets</b> .....	87
<i>L. Whittle</i>	
<b>Energy Loses In Waste Pipe Lines</b> .....	95
<i>E. Hart, A. Saber, R. Sterling</i>	
<b>Structural Design of linings</b> .....	103
<i>O. Thepot</i>	
<b>Hydraulic Modeling of North Outfall Sewer</b> .....	115
<i>K. Welling, F. Fhing</i>	

**TRACKING IV**  
**PROJECT MANAGEMENT ASSESSMENT I**

<b>Funding Evaluation of Trenchless Rehabilitation needs For Sewer Infrastructure Management</b> .....	116
<i>K. Chua, A. Kwan</i>	
<b>Management of Heave and Subsidence Risk For Horizontal Directional Drilling</b> .....	130
<i>M. Francis, J. Kwong, K. Kawamura</i>	
<b>A Global Approach for Urban Buried Sewers Management By Considering Risk Assessment</b> .....	143
<i>Y. Diab</i>	
<b>Condition Assessment of Sewers For Replacement/Rehabilitation and the Accompanying Development of a Management System</b> .....	152
<i>J. Wessels</i>	

**SESSION B**

**TRACK I**  
**HDD CASE STUDIES**

<b>Directional Drilling Under Levees</b> .....	169
<i>P. Conroy</i>	
<b>The Victoria &amp; Tasmania Shore Approaches: HDD Installations Under Landfalls</b> .....	187
<i>A. McPhee, W. Oey</i>	
<b>Installation of a Large Diameter Pipe By Horizontal Directional Drilling in Mixed Ground Conditions</b> .....	198
<i>N. Koirala, B. Shoji</i>	
<b>Horizontal Directional Drilling a 16-Inch Force Main Under Clearwater Harbor</b> .....	208
<i>L. Murrin, K. O'Brien, D. Modjeski, D. McCullers, D. O'Connor</i>	

**TRACK II**  
**NEW TECHNOLOGIES & MULTI-TRENCHLESS APPLICATIONS**

<b>Replacement and Rehabilitation of the Hollywood Main Sewer Using Trenchless Technologies</b> .....	218
<i>B. Jensen, W. Elias, R. Galassi</i>	
<b>Trenchless Buffett Solves 40-Year Old Woodside Trunk Sewer Problems While Protecting Residents' Concerns</b> .....	231
<i>D. Bennett, R. Stein, J. Loscalzo</i>	

<b>Development of Tension Guide Method &amp; Step TG Method</b> .....	249
<i>I. Seto, I. Yagi, K. Aso, F. Tsuchiya</i>	
<b>Installation Exampls for Paltem Flow-Ring</b> .....	262
<i>H. Maruyama, M. Ishikawa, F. Makimot</i>	

**TRACK III**  
**LINING - CIPP**

<b>Comparing Design Considerations for CIPP with Fold and Form PVC</b> .....	281
<i>A. Kwan, K. Chua</i>	
<b>Comparison of Three Cipp Liners Buckling Strength Using a Flexible Bladder: Circular Samples vs Liner sample With a Wavy Imperfections Due to a Fiber Optic Cable</b> .....	296
<i>M. Knight, K. Sarami, T. Tridd</i>	
<b>Incorporating Reliability Into the Design of Pipeline Rehabilitation Liners</b> .....	307
<i>W. Zhao, R. Nassar, D. Hall</i>	
<b>Performance of Point Repairs in Los Angeles</b> .....	321
<i>J. Chang, J. Andraska, C. Jin, J. Redner</i>	

**TRACK IV**  
**PROJECT MANAGEMENT ASSESSMENT II**

<b>Rehabilitation of the North Outfall Sewer by Sliplining</b> .....	322
<i>Y. Cho, A. Armstrong, J. Hawkins, B. Jenson</i>	
<b>Crescent Beach Forcemain Twinning-Nicomekl River Crossing Near Vancouver, British Columbia</b> .....	332
<i>S. Lewis, T. Fitzell, J. Scholte</i>	
<b>Snohomish River Crossing: Bring on the Boulders Success on the Second Attempt</b> .....	341
<i>K. Staheli, G. Duyvestyn</i>	
<b>Evaluation of Rehabilitation or Replacement Alternatives for the Lake Valley Raw Water Pipeline in Placer County, California</b> .....	353
<i>M. Damerchie, B. Corwin, A. Habibian</i>	

**SESSION C**

**TRACK I**  
**HDD ASSESSMENT I**

<b>A Total Borehole Monitoring System for Pulled In Place Trenchless Methods: Development and Testing</b> .....	364
<i>M. Baumert, E. Allouche</i>	
<b>Need and Possibilities for a Quality Push Within the Technique of Horizontal Directional Drilling</b> .....	371
<i>G. Arends</i>	
<b>Surface Heave Mechanisms in Horizontal Boring Operations</b> .....	387
<i>J. Lueke, S. Ariaratnam</i>	

<b>Applicability of Methods Used to Estimate Pipe-Slurry Fluidic Drag Force During HDD Pipe Installations</b> .....	400
<i>A. Adedapo, M. Knight</i>	

**TRACK II**  
**MICROTUNNELING – ASSESSMENT I**

<b>Comparison of Jet Grouted Soils Design, Microtunneling Performances, and Costs</b> .....	412
<i>J. Kwong, M. Francis</i>	
<b>Influence of Overcut and Lubrication During Microtunneling</b> .....	427
<i>A. Phelipot, D. Dias, R. Kastner</i>	
<b>Effect of Pipe Shapes on the Stability of Surrounding Soil in the Construction of Underground Pipelines in Using Slurry Pipe-Jacking</b> .....	439
<i>H. Shimada, T. Sasaoka, E. Sakai, K. Matsui</i>	
<b>Microtunneling From Deep Shafts in Karstic Limestone With Underwater MTBM Retrieval</b> .....	451
<i>D. Bennett, G. Duyvestyn, B. Murphy, D. Spiegel, B. Hagenburger</i>	

**TRACK III**  
**LINING LARGE – DIAMETER REHABILITATION**

<b>Behavior and Performance of Liner Pipe in Trenchless and Trench Portions of Sliplining Rehabilitation</b> .....	468
<i>J. Zhao, I. Doherty</i>	
<b>Guidance on Design of Flexible Liners to Repair Structurally Compromised Gravity Flow Sewers</b> .....	482
<i>T. Law, I. Moore</i>	
<b>Non-Circular Slip-Lining: Woodvale Storm Drain Rehabilitation</b> .....	497
<i>R. Pickering, S. Ali-Ahmad, M. Thomas, C. Pham</i>	
<b>Performance and Reliability of the SPR Method For the Rehabilitation of Aged and Deteriorated Pipes</b> .....	505
<i>S. Morioka, T. Deguchi, E. Akimoto</i>	

**TRACK IV**  
**CONDITION ASSESSMENT I**

<b>Electronic Leak Locator for Sanitary Sewer Evaluation</b> .....	520
<i>S. Gokhale, J. Graham</i>	
<b>Possible Fields of Application of Electrical Methods For Leaktightness Testing and Leak Localizing in Drains and sewers</b> .....	527
<i>D. Stein, K. Korkemeyer</i>	
<b>Horizontal Subsurface Investigation Using A Smart Innovative Geoprobe</b> .....	538
<i>E. Allouche, T. Ahn</i>	

## VOLUME II

### **SESSION D**

#### **TRACK I**

#### **HDD ASSESSMENT II**

<b>A Rational Method for Evaluating the Risk of Hydraulic Fracturing in Soil During Horizontal Directional Drilling (HDD)</b> .....	550
<i>R. Stauber, J. Bell, D. Bennett</i>	
<b>Evaluation of Rheologic Properties of Fluid Returns From Horizontal Directional Drilling</b> .....	562
<i>S. Ariaratnam, R. Stauber, J. Bell, F. Canon</i>	
<b>Bentonite Muds: A Tool for Horizontal Drilling</b> .....	572
<i>A. Pantet, P. Monnet</i>	
<b>Drilling Fluid Use And Drilling Waste Disposal On HDD Projects</b> .....	586
<i>C. Como</i>	

#### **TRACK II**

#### **MICROTUNNELING – ASSESSMENT II**

<b>Research on the Recycling of Excess Muddy Water For Slurry Pipe-Jacking Method</b> .....	598
<i>J. Yamazaki, H. Kanari</i>	
<b>American River Crossings: Then and Now</b> .....	610
<i>D. Bennett, M. Wallin</i>	
<b>Development of Frontward Sensing Radar Using Electromagnetic Waves for the Microtunneling Method</b> .....	629
<i>T. Awata, S. Tsutsumi, K. Miyazaki, S. Yamaguchi</i>	
<b>Guided Boring Method</b> .....	634
<i>T. Fisher</i>	

#### **TRACK III**

#### **LINING CASE STUDIES I**

<b>Lining Challenges Under Interstate Route 80</b> .....	642
<i>G. Ragula</i>	
<b>Lowering Rehabilitation Costs With Better Bids</b> .....	650
<i>T. Bate, P. Murray</i>	
<b>South Metro Interceptor Tunnel Rehabilitation Project</b> .....	666
<i>W. Swallow</i>	
<b>Relining Vinyl Lined AC Pipe With Rapid-Setting Polymeric Lining to Control PCE Leaching</b> .....	676
<i>D. Gove Jr., P. Oram, D. Mahoney Jr.</i>	

**TRACK IV**  
**CONDITION ASSESSMENT I**

**Technologies For The Assessment of Large Diameter Lined Concrete Sewers in the City of Phoenix**..... 690  
*R. Webb, J. Chong, S. Ariaratnam*

**A Model For Identifying Candidate Sewers For Inspection in Clark County, Nevada** ..... 699  
*R. Gabriel, W. Boger, H. Steed*

**Data and Information Management for Major CCTV Sewer Pipeline Inspection Projects**..... 716  
*M. Giandoni, T. Monroe*

**SESSION E**

**TRACK I**  
**PIPE BURSTING – ASSESSMENT**

**The Ground Movement Associated With Pipe Bursting In Rock Conditions** ..... 717  
*A. Atalah*

**Pipe Splitting: An Instrumented Field Trial** ..... 727  
*D. Chapman, C. Rogers, F. Wan, P. Ng, S. Smith*

**The Secrets To Successful Shallow-Cover Pipebursting** ..... 743  
*T. Reeves, K. Aspern*

**Engineering and Construction Advantages of Potable Water System Rehabilitation Using Prechlorinated Pipe and Pipe Bursting** ..... 759  
*W. Thomas*

**JEA-A Fast Track Sewer Rehabilitation Program Using Internal Design and Construction Management Teams** ..... 760  
*R. Kermitz, G. Perrine, T. Hayes*

**TRACK II**  
**MICROTUNNELING – CASE STUDIES II**

**Cost Effective Microtunneling: A Case Study In Enid, Oklahoma** ..... 769  
*R. Hitt, R. Tumbleson Jr., T. Garrett*

**Trenchless Technology And The Santa Rosa Geysers Recharge Project**..... 777  
*D. Smith, J. Anderson, B. Romero*

**Jack and Bore Challenge: Installation of An 84' Sewer Pipe Under The San Francisco Water Delivery System** ..... 791  
*S. Mercado, M. Ho*

**Broadway Trunk Sewer Replacement/Rehabilitation-Phase I Microtunneling** ..... 801  
*I. Pai, G. Walker*

**Monte Cristo/Cheyenne Sewer Interceptor-Microtunneling Project**..... 813  
*D. Anderson, J. Morris*



**TRACK III**  
**EDUCATION**

**Key Issues And Dilemmas For The Trenchless Industry** ..... 814  
*D. Downey, J. Heavens*

**Performance Specifications-Key To Successful Project** ..... 822  
*J. Jurgens, J. Muenchmeyer*

**UNITRACC-Web Based Training and Competence Center For Underground Infrastructure** ..... 833  
*R. Stein*

**Education in Trenchless Technology** ..... 843  
*M. Henneveld*

**Shielding Contractors from Specifications Prepared Based on Inadequate Experience** ..... 844  
*S. Baker*

**TRACK IV**  
**PROJECT MANAGEMENT ASSESSMENT III**

**City of Los Angeles Capacity, Management, Operations And Maintenance (CMOM) Program-A Step Into The Future** ..... 881  
*F. Farhang, K. Hanks, D. Cannon*

**Development Of Prototype Municipal Asset Management System** ..... 887  
*S. Sinha*

**Qualifying Program For Nodig Products, People And Management** ..... 899  
*H. Jodi*

**An Economic Strategy To Cut Accidents With Buried Utilities** ..... 907  
*L. Bernold*

**SESSION F**

**TRACK I**  
**HDD ASSESSMENT III**

**Stability Analysis Of Road Crossings For Trenchless Technology** ..... 917  
*M. Najafi*

**Directional Boring Reliably Being Utilized for Sewer Installations** ..... 929  
*T. Dimitroff*

**Deformations of Polyethylene Pipes In Horizontal Directional Drilling Field Tests** ..... 938  
*M. Polak, G. Duyvestyn, M. Knight*

**Developing The Sewer Replacement Market Using HDD** ..... 951  
*M. Dvorak*

**TRACK II**  
**GPR**

**Ground Penetrating Radar: Implications For Subsurface Infrastructure Investigations** ..... 959  
*C. Proulx, N. Zembillas*

**Multi-Sensor 3-D Mapping of Drill-Head Position And Its Vicinity**..... 968  
*L. Bernold, L. Venkatesan, S. Suvarna*

**Development Of Automotive Mounted GPR System Using Improved Antenna And Signal Processing In Frequency Domain** ..... 978  
*Y. Sudo, S. Baba, Y. Nagashima*

**Cross-Hole Radar Effectiveness For Coal Mine-Related Subsidence Investigations** ..... 990  
*E. Guy, J. Daniels*

**TRACK III**  
**LINING CASE STUDIES II**

**Rehabilitation of a Large Diameter Structurally Deteriorated Interceptor System** ..... 1005  
*M. Ho, C. Pamintuan*

**Pipe Insertion Rehabilitation Method**..... 1014  
*I. Tardif*

**Relining of a Watermain In the City of Shanghai Using A New Method For Cleaning and Lining of Pipes Via A Non Invasive Compressed Air System** ..... 1025  
*W. Ming, W. Juan, Y. Feng, Y. Jiang*

**Stopping Infiltration In Europe And The USA** ..... 1032  
*C. Pall*

**TRACK IV**  
**LATERALS**

**Trenchless Techniques Enhance Service Lateral Repairs As An Infiltration/Inflow Control Option**..... 1045  
*R. Rowe, V. Kathula, B. Garibaldi*

**Service Line Inspection Standards What Are They And Why Are They Needed?** ..... 1061  
*A. Strachan*

**City Of Santa Monica-Rehabilitation And Sealing of Lateral Connections**..... 1070  
*E. Chusid*

**Criteria For An Effective Service Lateral Renewal Project Utilizing Trenchless Technology** ..... 1080  
*L. Kiest Jr.*

**Author Index**