Managing Risk in the Trenchless World

2018-08-28 OAWWA Conference
Agenda

1. Trenchless Methods
2. Trenchless Risks
3. Risk Mitigation Strategy
4. Case Histories

Newport Beach Microtunnel ‘15
Trenchless Technology Definition

“A family of methods, materials, and equipment capable of being used for the installation of new or replacement of existing underground infrastructure with minimal reduced disruption to surface traffic, business, and other activities.”

-NASTT
Underground Installation Methods

Underground Construction Techniques

New Installation

- Geological Survey
  - Open Cut
    - Wide Trench
    - Narrow Trench
    - Mole Ploughing
    - Vacuum Excavation Potholing
  - Trenchless
    - Directional Drilling
    - Pipe Jacking & Microtunneling
    - Auger Boring
    - Pipe Ramming
    - Inpect Moling
    - Pilet Tube
- Location
  - Ground Penetrating Radar
  - Sonar
  - Potholing

Renovation

- Non-structural
  - Cement mortar Lining
  - Epoxy Lining
  - Polyurethane Lining
- Structural
  - Close-fit sliplining
  - Spiral Wound Lining
  - CIPP Lining
  - Woven Hose Lining

Replacement

- Slip Lining
- Pipe Bursting
- Pipe Splitting
- Pipe Reaming
- Pipe Extraction

Repair

- Joint Grouting
- Localized Sealing
- Potholing for Local Repair
- Flood Grouting

Condition Assessment

- CCTV
- Leak Detection

Location

- Ground Penetrating Radar
- Sonar
- Potholing
Trenchless Methods

Overview

New Installations
- Multiple Technologies
- Wide Variety of Applications
- Benefits and Risks Compared to Open-Cut

Renewal, Repair or Replacement
- Vast Options
- Many Applications – Man/Non-Man Entry
- Assessment is Critical
- Benefits Compared to New Installations
# Trenchless Methods

## Risks

<table>
<thead>
<tr>
<th>Ground and Water</th>
<th>Obstructions</th>
<th>Product</th>
<th>Environmental/Public</th>
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</thead>
<tbody>
<tr>
<td>• Claims</td>
<td>• Claims</td>
<td>• Alignment Issues</td>
<td>• Ground Loss or Heave</td>
</tr>
<tr>
<td>• Installation Failure</td>
<td>• Installation Failure</td>
<td>• Latent defects and Quality Issues</td>
<td>• Fluid Loss</td>
</tr>
<tr>
<td>• Equipment Damage</td>
<td>• Schedule Impact</td>
<td>• Long-Term Infiltration or Exfiltration</td>
<td>• Community Impacts</td>
</tr>
<tr>
<td>• Schedule Impact</td>
<td>• Utility impact</td>
<td></td>
<td>• Reputational</td>
</tr>
<tr>
<td>• Contamination</td>
<td></td>
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Trenchless Risk Mitigation Strategy

• **Employ tactics to prevent minor to major pitfalls**
  • Consider the feasibility of rehab methods
  • Detailed QA planning, design, and CM checklists
  • Collaborative risk registers with stakeholders
  • Thorough contracts: GDRs, GBRs, technical specs, EBDs….
  • Maintain a database on industry
  • Explicit experience requirements on companies and key individuals
Trenchless Risk Mitigation Strategy

• Employ tactics to prevent minor to major pitfalls
  • Creative bid strategies
  • Coordinated, comprehensive submittal requirements
  • Knowledgeable team of full-time site staff who provide proactive support for high risk installations
  • Handle issues at the lowest level, ASAP
  • Share lessons learned internally & externally
Case History #1

RWBN-SSE HDD
Construction Challenges for HDD

- Maintaining continuous 1% slope to sustain gravity sewer flow
- Tight easement constraints resulting in horizontal S-curve w/ slight compound curve
- ~100-foot elevation difference between HDD entry and exit
- Deep soil overburden
- Drill drop and tap-in to existing 7.5 foot I.D. interceptor
Inadvertent Return

• Pilot drilling successful
• Single-Pass Reaming
  • Mud composition problems
• Loss of flow return
Inadvertent Return

HDD Alignment

Inadvertent Return Location
Case History #2

PAW WETL
West End Trunk Line Microtunnel (WETL)
WETL - Overview

- Single Drive – 1022 feet
- Herrenknecht MTBM
- Steel Casings - (59” O.D)
- 30” PVC Sewer line
- Karstic Limestone
Anticipated Risks & Challenges Encountered

**Anticipated Risks**
- Potential Voids or Soil Seams
- Fractured Rock Zones

**Challenges Encountered**
- MTBM Wedging
- Advance Rates
- High Thrust Loads
MTBM Rescue & Re-Launch

Anticipated Risks Encountered:
- Potential Voids or Soil Seams
- Fractured Rock Zones
4a. MTBM Rescue & Re-Launch

Modifications
- Replacement of Cutterhead.
- Removal of 1 storage can.
- Removal of ½ inch skin on powerpack (3rd Can).
- Supercharge the annulus prior to re-launch.

Anticipated Risks Encountered:
- Equipment, Means & Methods
4a. MTBM Rescue & Re-Launch

**Modifications**
- Replacement of Cutterhead.
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- Removal of ½ inch skin on powerpack (3rd Can).
- Supercharge the annulus prior to re-launch.

**Anticipated Risks Encountered:**
- Equipment, Means & Methods
Case History #3
Newport Beach Force Main
## Tunnel Timeline

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>2/16/15</td>
<td>Started tunneling</td>
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## Tunnel Timeline

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Notes</th>
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<tbody>
<tr>
<td>2/16/15</td>
<td>Started tunneling</td>
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<tr>
<td>2/27/15</td>
<td>Hit strange debris and Imhoff Tank</td>
<td>Borings to ID debris Excavated to clear debris</td>
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<tr>
<td>3/7/15</td>
<td>Additional potholing</td>
<td>Timber found near bridge</td>
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<tr>
<td>3/9/15</td>
<td>Resumed tunneling</td>
<td>Re-examined ALL tunneling risks</td>
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<tr>
<td>3/10/15</td>
<td>MTBM Broke</td>
<td>Repair MTBM</td>
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<tr>
<td></td>
<td>Geophysical survey</td>
<td>Pothole under bridge</td>
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<tr>
<td>3/12/15</td>
<td>Identification of piles</td>
<td>Began work to remove piles</td>
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<tr>
<td>3/17/15</td>
<td>Resumed tunneling</td>
<td>200’ away from piles</td>
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<tr>
<td>3/19/15</td>
<td>Additional piles found</td>
<td>4 rows of 4 piles uncovered</td>
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<td>3/21/15</td>
<td>Halted tunneling</td>
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<td>4/2/15</td>
<td>Resumed tunneling</td>
<td>All piles cleared, pits backfilled</td>
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<td>4/14/15</td>
<td>MTBM collided with obstruction</td>
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<td>05/23</td>
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Magnitude of Risk Impacts

What everyone involved should understand.

- BMW Dealer
- McLaren Dealer
- Newport Yacht Club
- Balboa Island
Thank you