Outline

- SONIC Technology
  - Sonic Basics
  - Capabilities of the SONIC Method
  - Equipment configurations available
- Potential Advantages
- Potential Geotechnical Applications
- Cost
Drilling Technology for **High-Quality** Continuous Soil Sampling and **Efficient Borehole Drilling** Utilizing High Frequency Resonant Energy
Double-cased system using an inner core barrel and a larger override casing

Core sizes: 3” – 10”

Boreholes: 3” – 12”

Depths: 600’+/-
SONIC Drilling Process

1st Step: Advance Core Barrel
SONIC Drilling Process

Core formation is typically 10 foot (3.3 meters) core runs
2nd Step: Override Core Barrel With Sonic Casing
SONIC Drilling Process

Borehole is continuously cased.
This ensures no downhole sample contamination (mixing in hole)
SONIC Drilling Process

Step 3: Pull core barrel from ground and extrude sample
Add a drill rod to drill string to advance core barrel beyond casing.
SONIC Drilling Process

Advance core barrel as in Step 1 to obtain next formation sample.
SONIC Drilling Process

Advance override casing to same depth as core barrel to case the borehole.
SONIC Drilling Process

Remove core barrel with sample
SONIC Drilling Process

Remove core barrel with sample
SONIC Drilling Process

Extrude formation sample into sample bag
Continuous Core Sample Production

Core extrusion into plastic sleeve

Core samples opened for inspection
Core Sample Production - Alternate

Removal of solid liner after core run

Continuous core in solid liner

Cased borehole also allows for:
✓ Split Spoons
✓ Shelby Tubes
✓ Conventional diamond coring
Geologic Applications

- All unconsolidated formations, including: sand (including heaving); gravel; clay; hard till; cobbles and boulders.
- Fill and construction debris.
- Any formation known as “difficult” for conventional methods.
- Some bedrock formations, typically softer, porous and weathered: shale; sandstone; limestone; basalt; etc.

★ SONIC is not typically cost-effective drilling large amounts of very dense/hard bedrock.
Rig Platforms Available

Standard truck-mount 600 series
Track-mounted drills – 600 Series
300 Series Rigs
Potential SONIC Advantages

Information

🛠️ Continuous core samples

100% recovery obtained in any type of geologic formation with minimal or no fluid usage.

No refusal; accurate information obtained where other methods fail; able to handle heaving/flowing soils.
Overburden/Bedrock Interface (single core run – 100% recovery)
Advantage - unforeseen obstructions overcome with single drilling system
Potential SONIC Advantages (cont.)

**Speed and Efficiency:**
Sonic is typically at least 2x – 3x faster than conventional methods
(sometimes 5x – 6x faster depending on conditions)

- Maintain projects schedules
- Minimize delays associated with unforeseen subsurface conditions
- No re-mobilizations – obtain the information the first time
- Lower oversight costs
Potential Sonic Applications
Acceptance and Use by Geotechnical Community

Environmental \(\rightarrow\) Geotechnical/Geo-construction

- Exposure/Success on high-profile, difficult projects
- Continuous core importance – enhancement of information
- Risk Minimization
- Accuracy (of info; tolerances)
- Efficiency (geo-construction)

*Incorporation - Enhancement*
Potential SONIC Applications

Embankment Drilling for Investigation & Remediation

Recent Examples

- Tuttle Creek
- Clearwater
- Mississinewa Lake
- Success
- Martis Creek
- Swinging Bridge
- Ball Mountain
- Wolf Creek
- Waterbury
- Shiawasee
- Lake Isabella
- Center Hill

★ Minimal or no fluid usage
★ Minimal risk to the structure
★ Fast and efficient
★ Accurately identify subsurface conditions
Potential SONIC Applications

Tunnel Projects

- Baseline investigation
- Confirmation
- Construction Support; Instrumentation

Recent Examples
- Eastside CSO - Portland
- Westside CSO - Portland
- Brightwater – Seattle
- Dulles Extension – DC
- Sky Harbor – Phoenix
- Big Walnut – Columbus
- Biscayne Bay – Miami
- Blue Plains – DC WASA
Potential SONIC Applications
Earth Retention/Anchor Installation
Potential SONIC Applications

Mini/Micropile Installation
Potential SONIC Applications

Pier Installation

- Faster/more cost effective
- Handles difficult soils
- Casings eliminated – grout through sonic casing
Potential SONIC Applications

Grouting
Foundation Exploration

Sonic & Diamond Coring in Karst Limestone
Cost

Typically: footage; daily; split-rate
- % more than auger; slightly more than mud rotary; comparable to conventional coring, ARCH, ODEX or Becker

Very cost-effective in “difficult” or challenging conditions

Value: Total Delivered Cost
- More and better information allows better designs and decisions
- Schedules maintained/shortened, minimizing oversight costs
- Obtain both environmental, hydrogeologic and geotechnical information single mobilization effort/contract
- Minimize risk – to project costs and existing infrastructure

Approximately 1⁄2 Sonic projects awarded where Sonic proposed as alternate vs. conventional
Summary – SONIC Potential:

- Need for high-quality information
  - During investigation
  - During construction & ground modification

- Difficult or challenging subsurface conditions
  - Natural
  - Man-placed (fill)

- Need for accuracy and precision

- Protection of sensitive structures and site conditions
  - Existing infrastructure (roads, bridges, buildings, tunnels, etc)
  - Environmental

- Tight schedules, need to minimize time in field
Questions?