



October 22, 2009

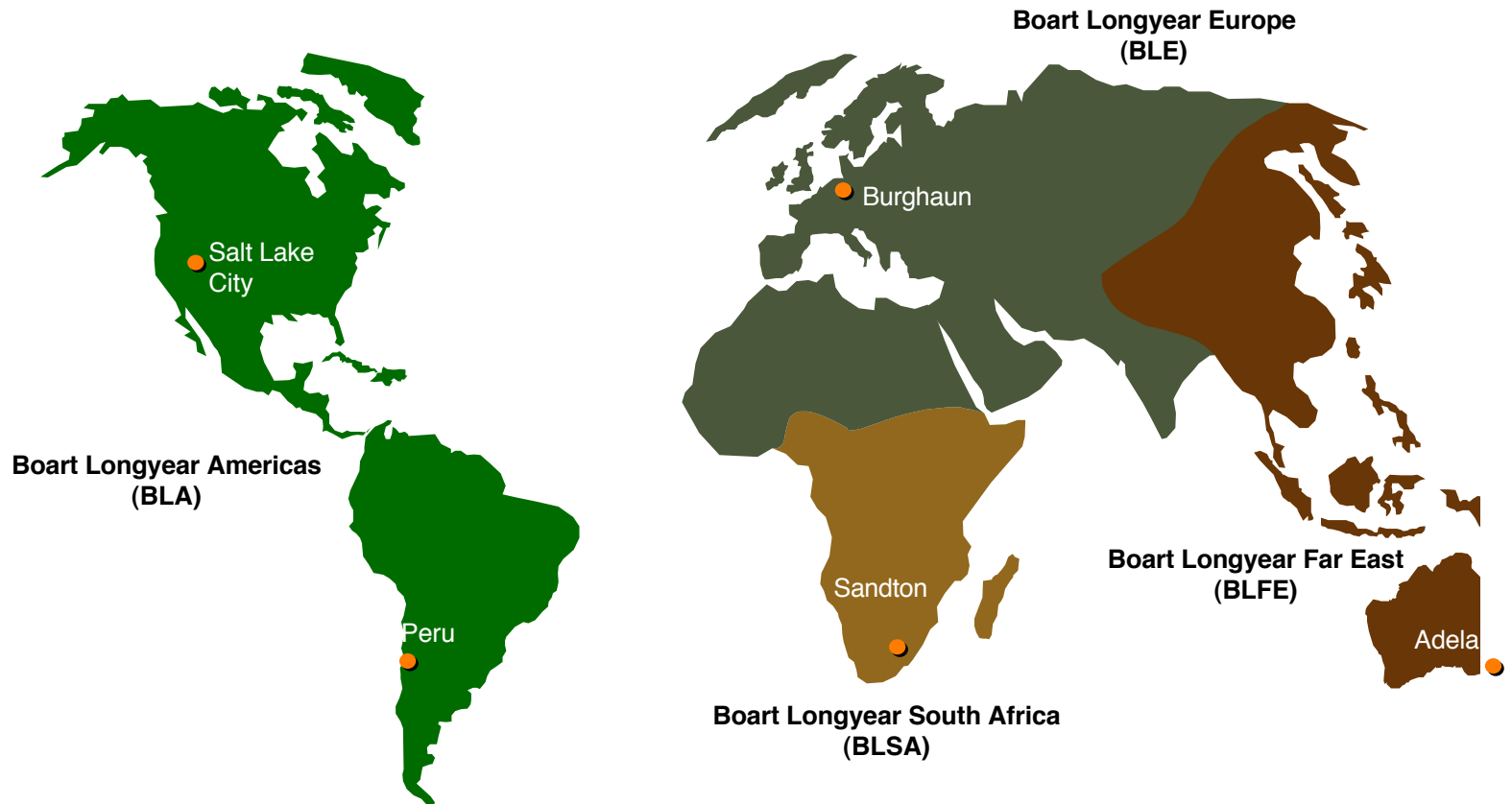


 **BOART LONGYEAR**





Regional Structure - Global Centers





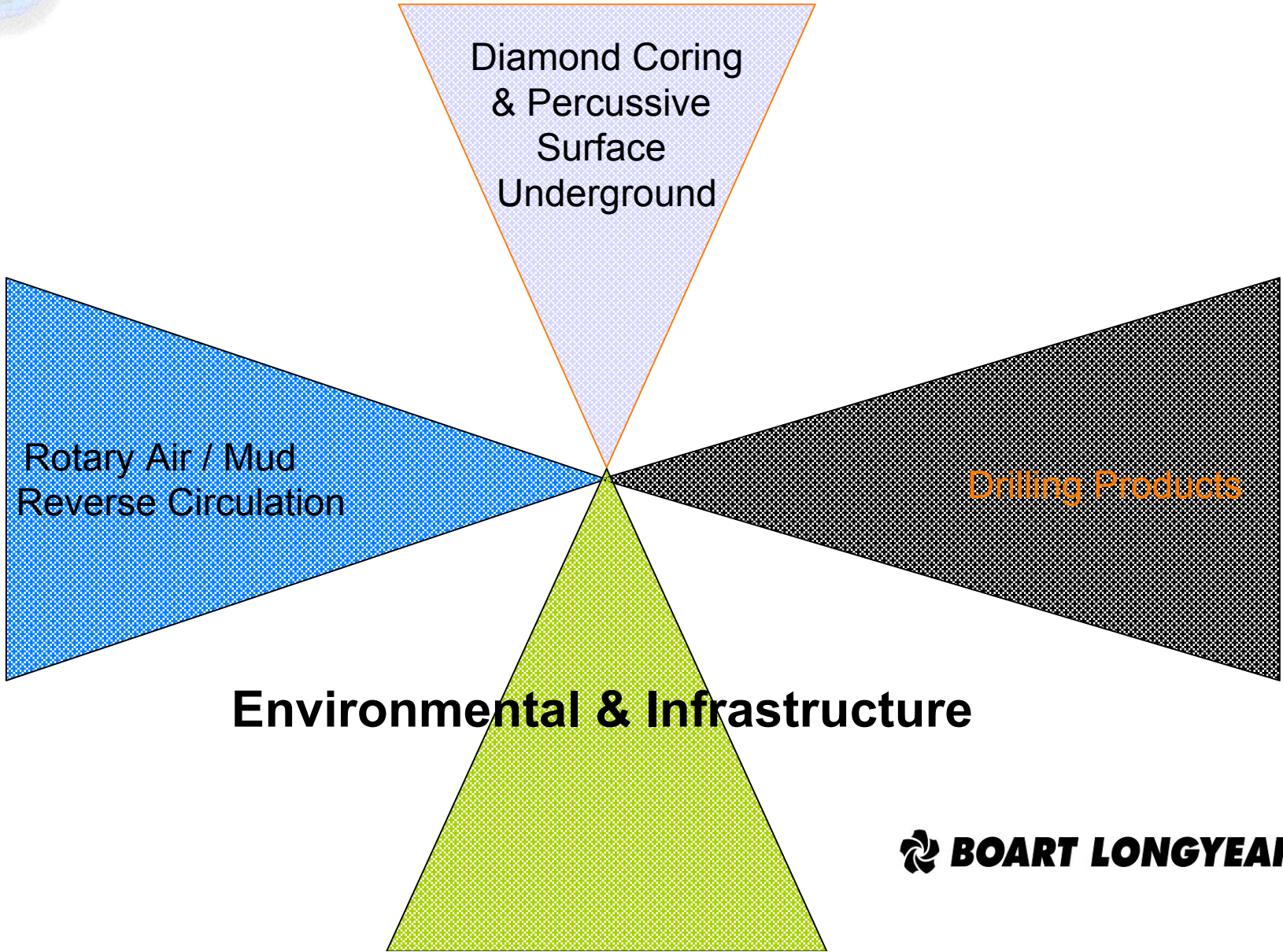
U.S. Locations - E & I

We service Canada & operate Internationally





Boart Longyear Company





Environmental & Infrastructure Drilling Services

Speciality Contractor & Innovative Drilling Solutions

115 Years Experience

Serving Environmental and Infrastructure Drilling Markets

Drilling is our Business !

 **BOART LONGYEAR**





Drilling Equipment

- **DPT (Geoprobes truck/tracked)**
- **Hollow Stem Augers (truck/tracked)**
- **Air/Mud Rotary (including Dual Rotary)**
- **Cable Tool**
- **Coring**
- **Sonic (Truck/Tracked/Mini)**



Sonic Drilling Technologies



 **BOART LONGYEAR**



SONIC DRILLING





Basic Principle of Sonic Drilling

VIBRATORY FORCE

ROTARY FORCE

**AXIAL FORCE OR
'FEED' FORCE**

- **Energy @ face of bit** achieves **localized displacement** to shear and penetrate

- **slow rotation** to enhance vibratory effects & penetration of hard layers

- **steady down pressure** to aid advancement





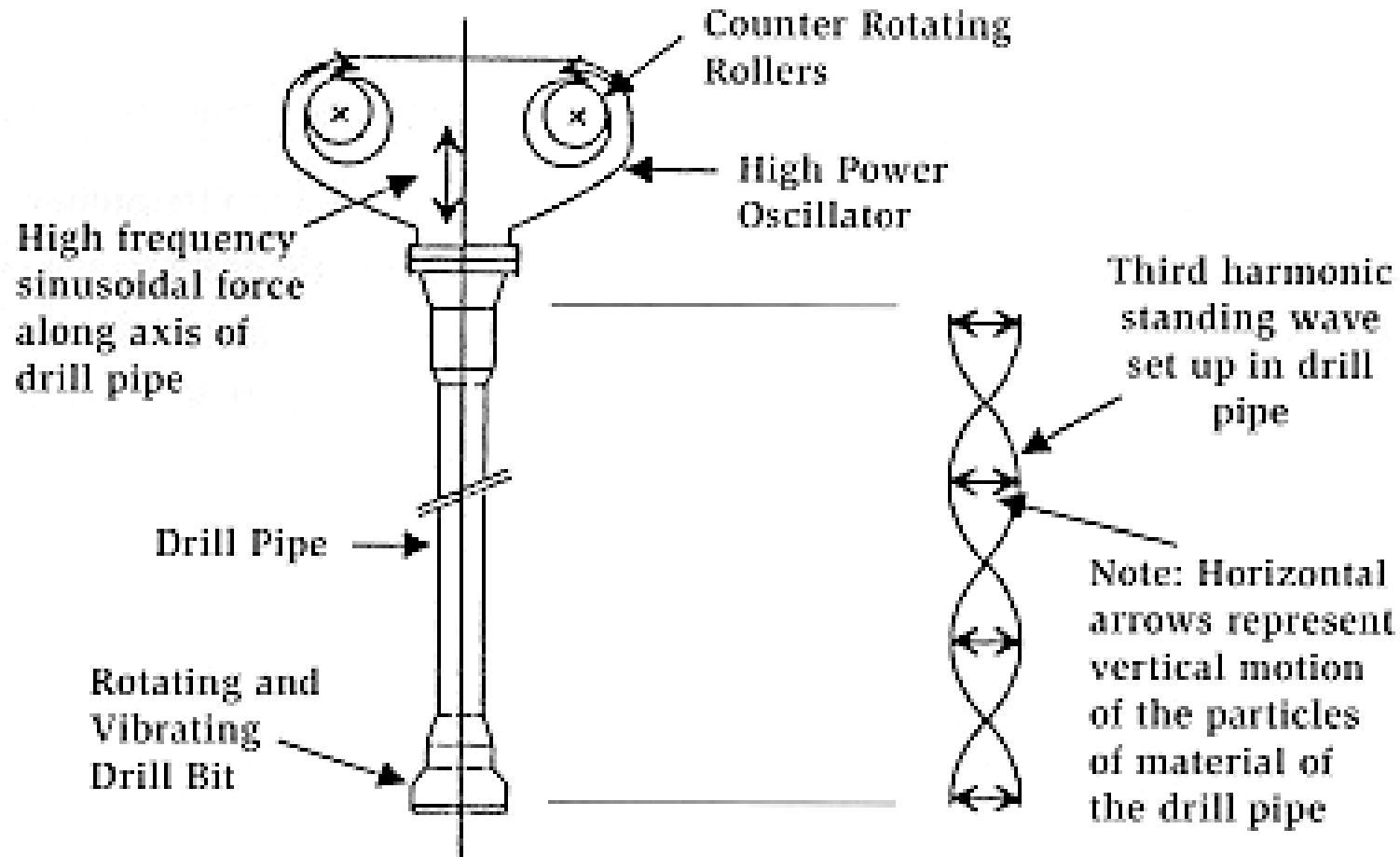
Principles of Sonic Drilling

- **High-speed eccentric counter-rotating rollers**
- **High-frequency low-amplitude mechanical vibration with rotation & down-pressure.**
- **Resonance occurs - vibrations coincide with the natural resonate frequency of the drill string - resonant energy is delivered to and focused at the bit face.**
- **Borehole advancement a result of shearing & displacement.**





Basic Principle of Sonic Drilling



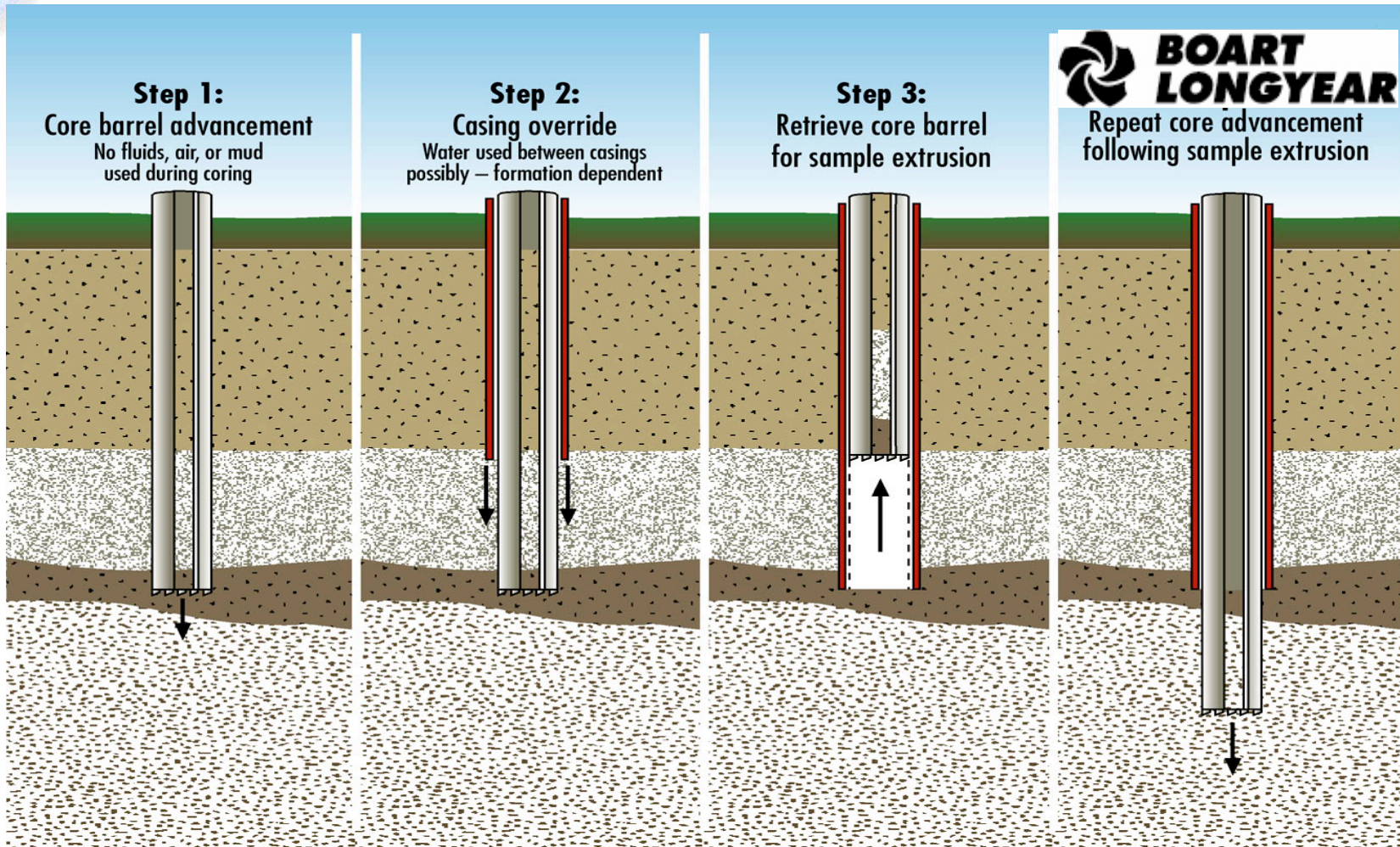


How Does Sonic Deliver Your Subsurface Information?



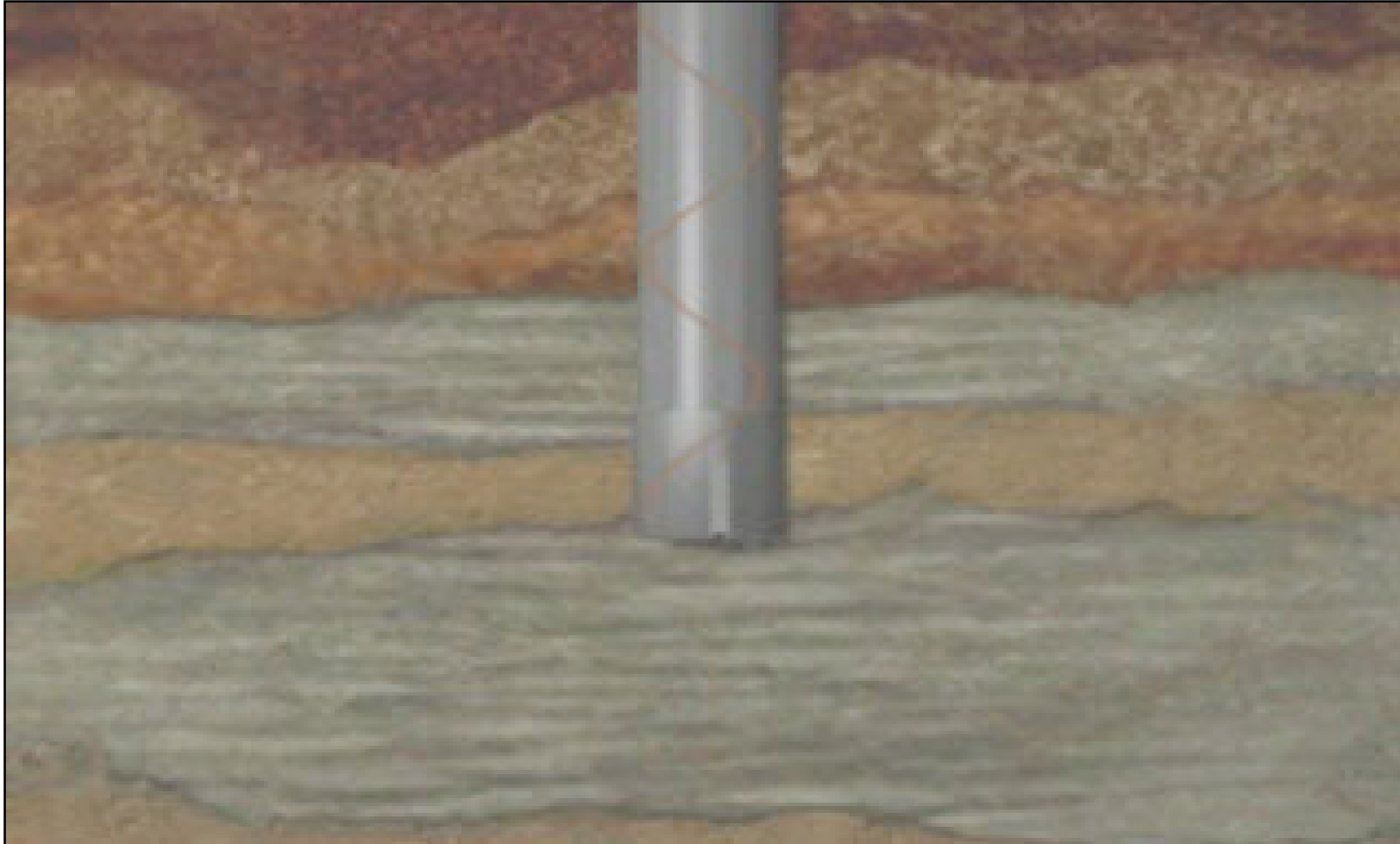


Core Barrel Advancement - Sonic



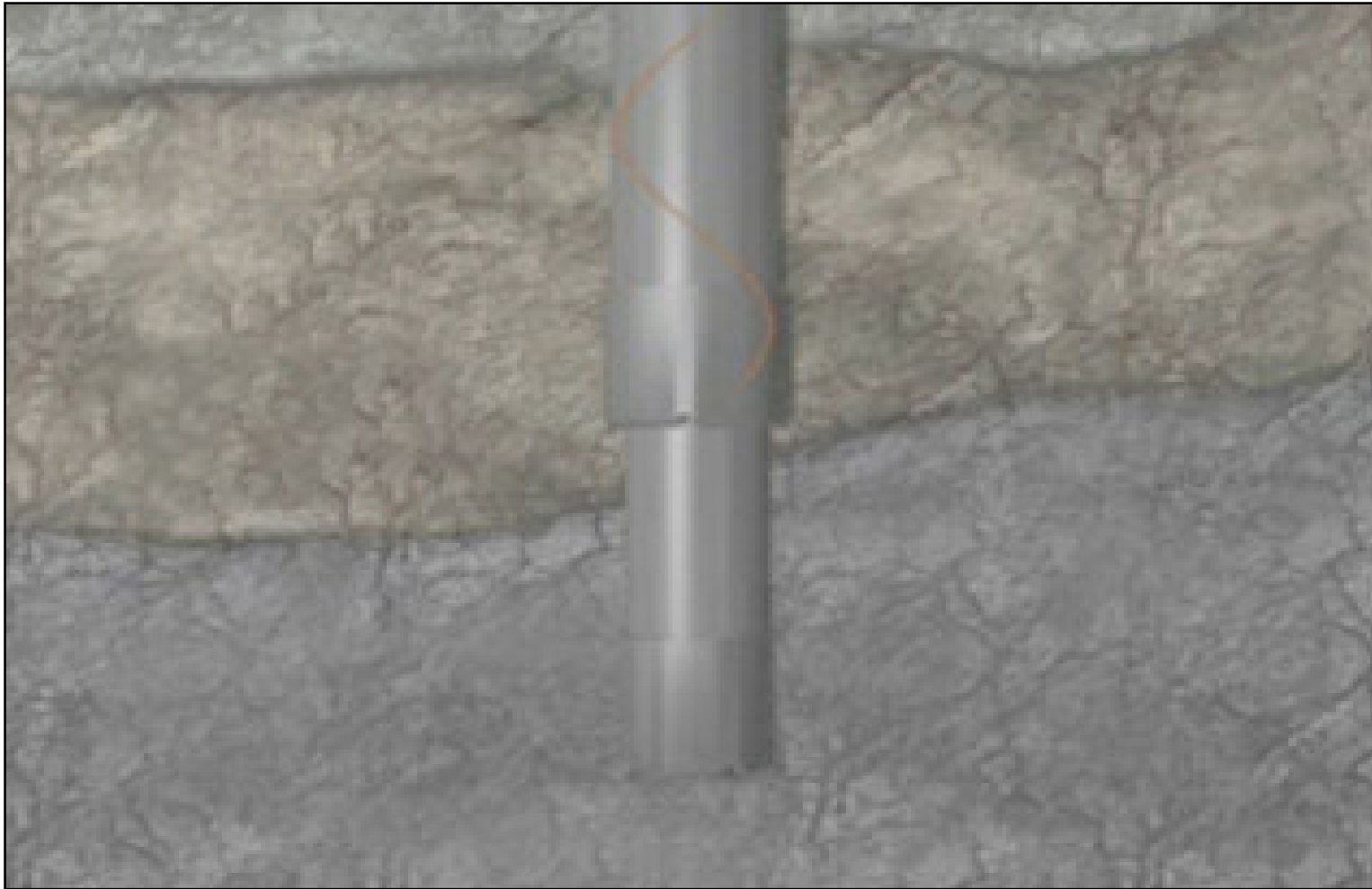


Sonic Core Barrel Advancement



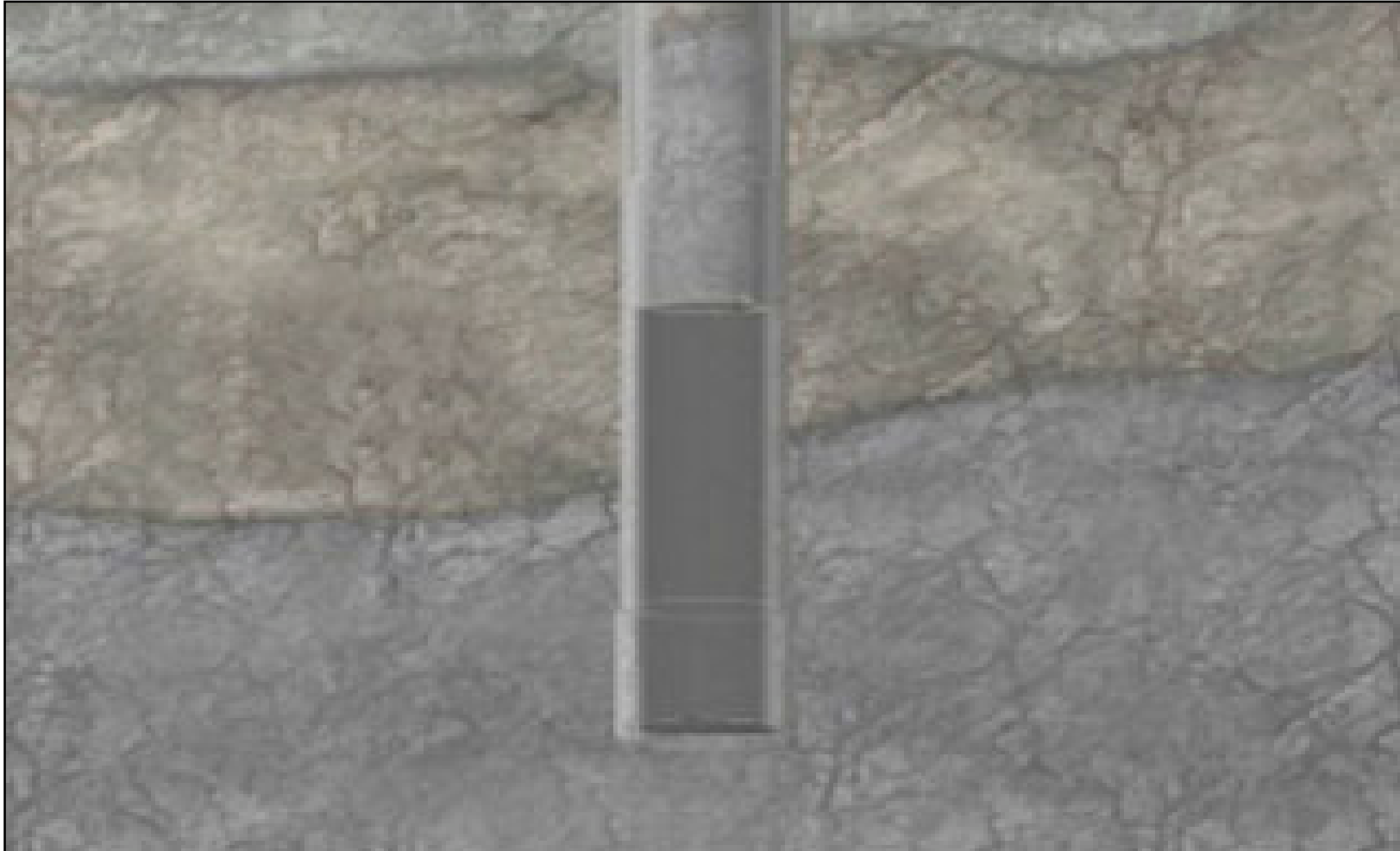


Casing Over Drilling Process





Sonic Sample Extraction





Why Use Sonic?

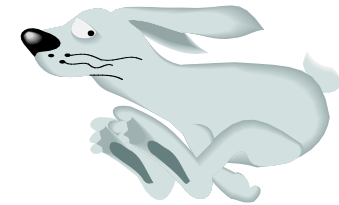
- **Speed**
 - ✓ 2-4 times faster than conventional drilling
- **Superior Information (continuous core sample)**
 - ✓ Lithology/geochemistry/hydrogeology
- **Waste Minimization**
 - ✓ ~ 70% less IDW than conventional drilling methods due to cased hole
 - ✓ Ability to "dry" drill
- **Better Well Construction**
 - ✓ Less development time/better yield
- **Safer and Cleaner**
 - ✓ No flights – just smooth drill tooling
 - ✓ Elevated platform
- **No refusal**
 - ✓ Drills through cobbles, boulders, & hard layers/lenses
 - ✓ Great for heaving sands
- **Reduced Risk for Mistakes**
 - ✓ Better info to make decisions
 - ✓ Angle wells/multi-cased wells w/o leaving casing in ground





Sonic Benefit - Fast

- **2- 4 times faster than HSAs when sampling**
- **Advances at rates up to 1' / second drilling friendly formations**
- **Automated rod make up and break out – enhances speed & safety**
- **Reduces Site Time - lowers project cost for your client (compressed time line), lower management cost, lower per diem cost, reduced down time of an operational site**





Sonic Benefit – Sample Quality

- **Clearly displays lithology in delicate, hard-to-recover material – Sample quality is basis of your remedial strategies**
- **Samples virtually any overburden formation or obstruction**





Sonic Benefit - Remarkable Sampling & Recovery

- **Overburden**
- **Cement Rebar (reinforced)**
- **Rip-Rap**
- **Sands**
- **Gravels**
- **Cobbles**
- **Boulders**
- **Bricks**
- **Wood**
- **Tires**
- **Compacted Garbage**
- **Slag Piles**
- **Bedrock**
- **Steel - Train Rails**
- **Delicate Formations**





Sonic Samples





Samples Delicate Soils & Hard-rock Interfaces





Sonic Samples



Till



6" Granite





Modeling Applications





Sonic Samples - Aggregates





Gas Station Sample - Drilled dry





Sonic Sample - Hard Clay





Penetrates Reinforced Concrete





Sonic Sample - Steel Train Rail





Sonically Cored Conglomerate





Hard Rock Sample

Diamond

Cored using Speed increaser on Sonic Drill





Acrylic Liners – Carolina Coastal Studies



Split Barrel Sample -





Telescoping Capability

- Sample Sizes – 3,4,5,6,7 and 8 inch
- Casing Sizes - 5,6,7,8,9,10, and 12 inch





Sonic Drilling Platforms





Sonic Truck Drills



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Full-Size Sonic Drills



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Off Road – Full size All Terrain Vehicle (ATV)



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Off Road – ATV to access most sites





“Pre-collaring” Diamond Core Holes

- Drill Through Difficult Overburden Materials (glaciated tills, high permeability formations, flowing sands, etc)
- Low Water Use Required
- Angle Drilling Installations
- Extremely straight hole drilled due to “guided” system of Coring / Casing





Inside Building – Small Footprint





Inside Building - Compact footprint & ability to sample soil and rock with same drill



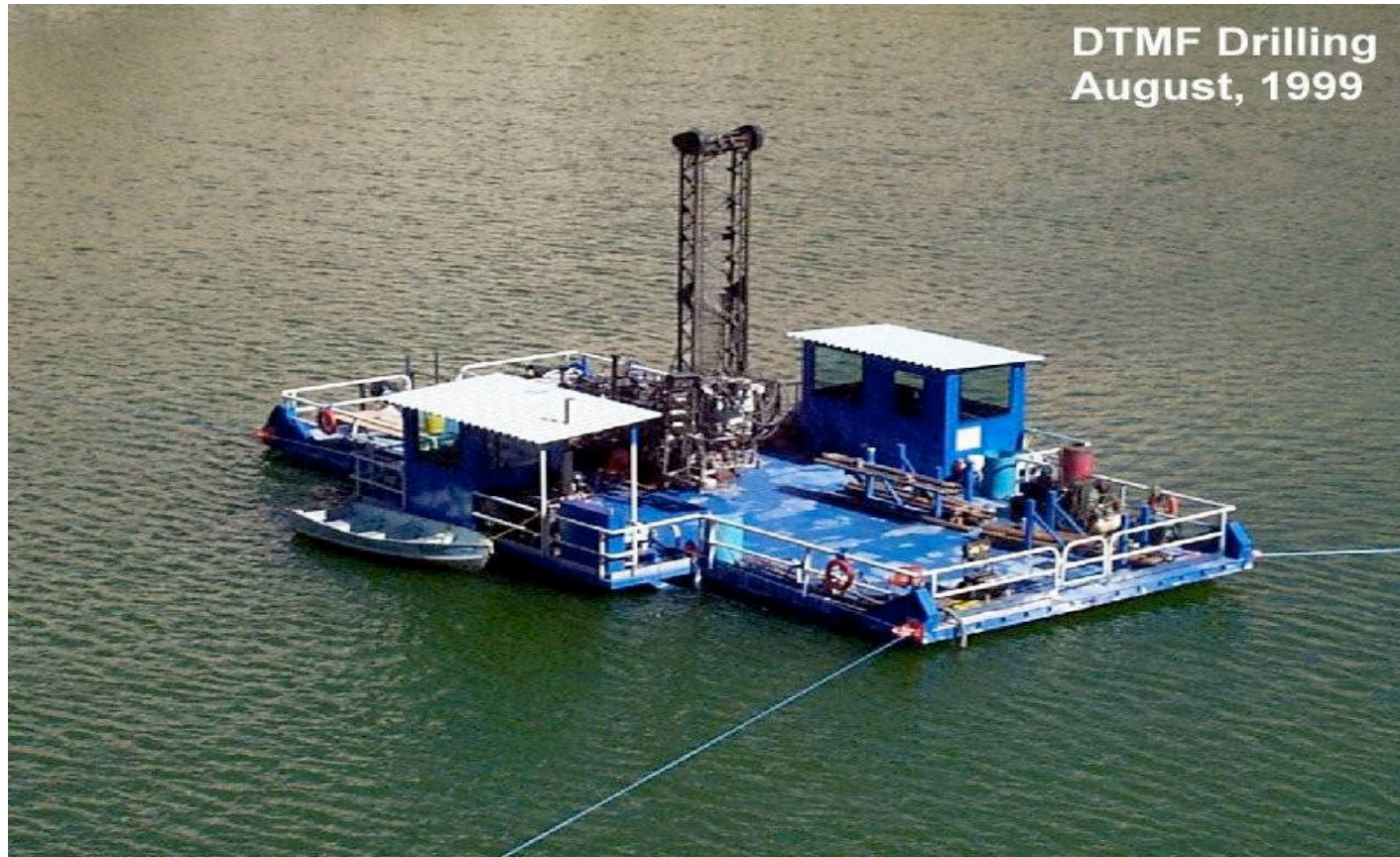


Maneuverable in tight spots





Barge Work – lagoons, lake, river & ocean bottoms





Sonic Benefit - Clean Site





Multiple Programs – One Rig

Demonstrating a wide variety of our capabilities with Sonic

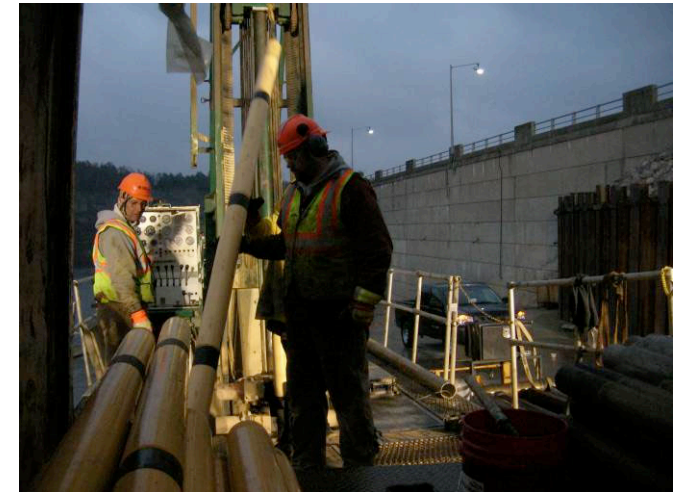
Shelby Tube Sampling



Split Spoon Sampling



Grout Borings



Deeper, larger diameter,
targeting 'features', sleeve
ports, barrier bags



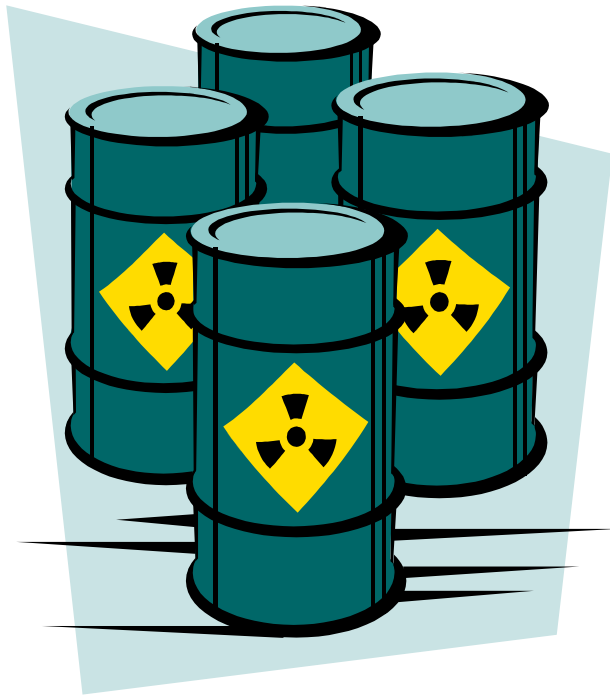


How Will Sonic Benefit Your Project?





Sonic Benefit – Minimizes IDW

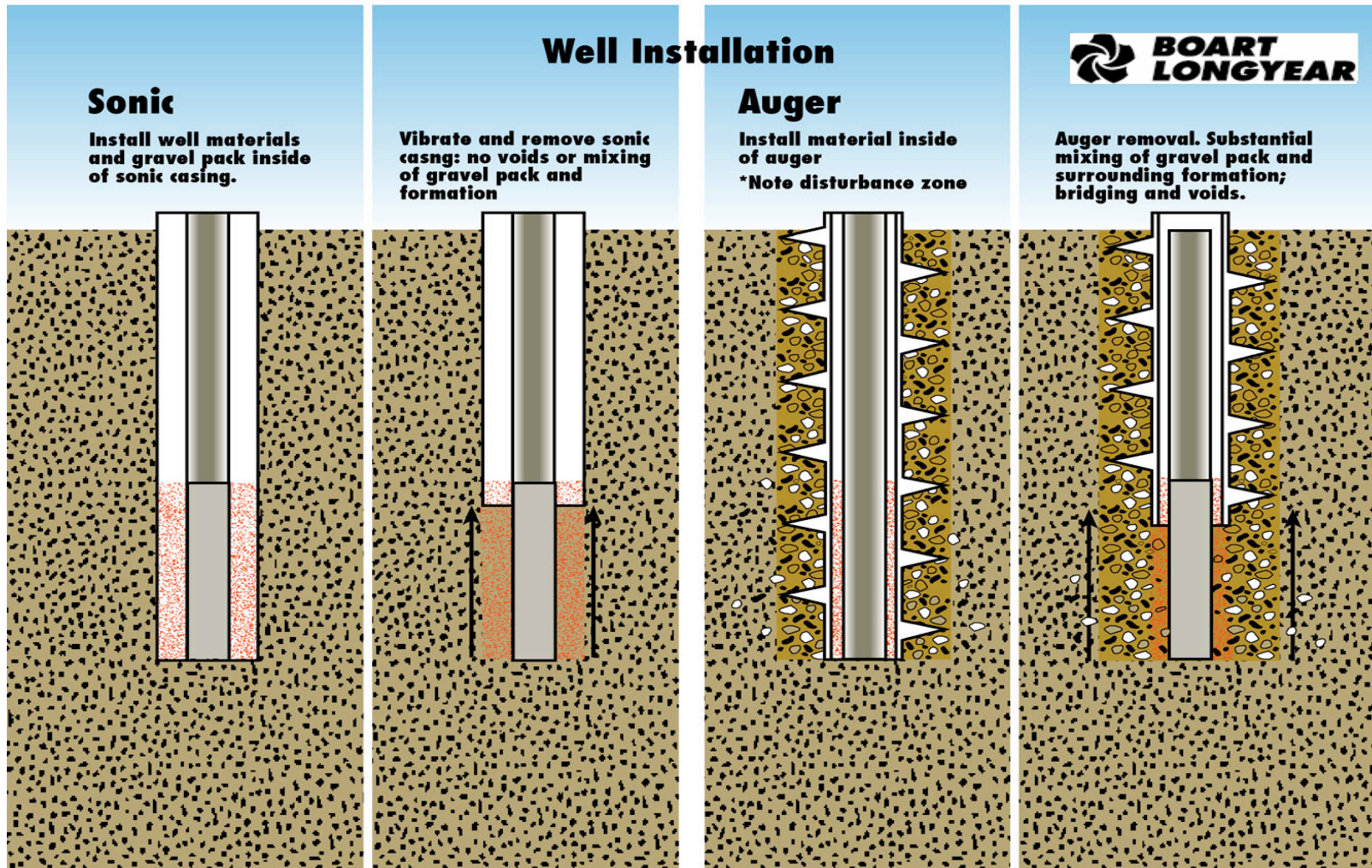


- **Cuttings are expensive to dispose of and require time & dollars to characterize them**
- **Sonic drilling reduces the amount of Investigative Derived Waste (IDW) by 70 – 80% compared with Hollow Stem Auger or Rotary Drilling operations.**





Sonic – Minimizes Bridging





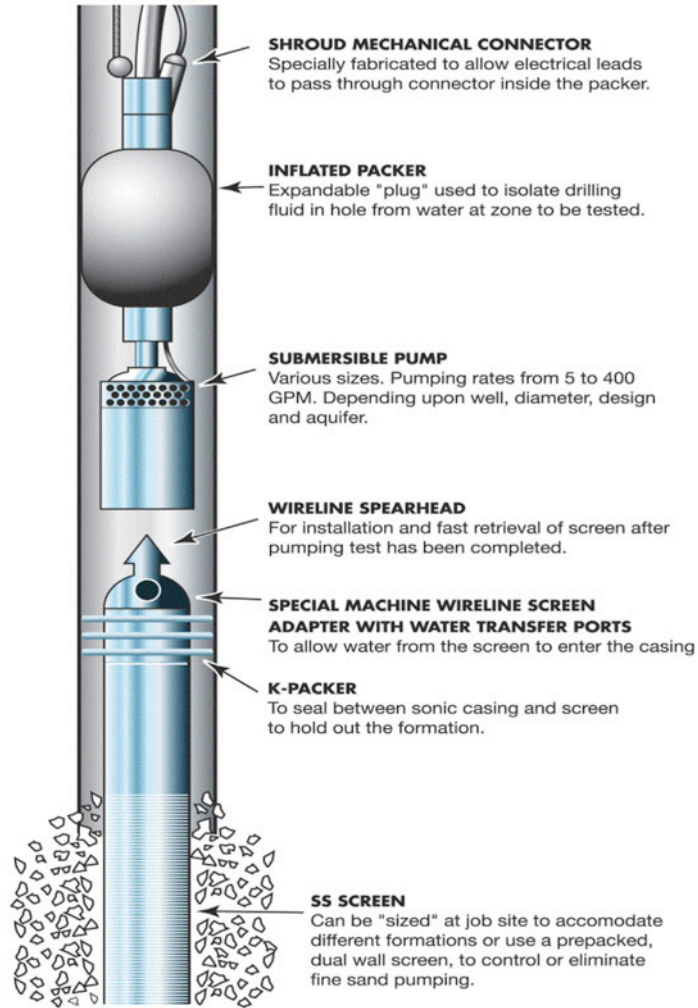
Water Sampling – Vertical Profile Aquifer





Vertical Water Profiling

BOART LONGYEAR BOREHOLE PUMPING SYSTEM





Sonic Applications

- **Contaminated Soil and Groundwater Investigations**
- **Plume Delineation – Vertical Aquifer Profiling**
- **Monitor Well/Recover Well Installation**
- **Air Sparge Installations**
- **Remedial Injections**
- **Deep Earth Dam and Levee Investigative Sampling**
- **Karst Formation Exploration**
- **Landfill Investigations/Expansion**
- **MGP site characterizations**





Sonic Applications

- **Mine Tailings – Coal Bing Investigations**
- **Freeze Hole Boring – Earth Stabilization**
- **Quantification of Aggregate Resources**
- **Micro-Pile Installation**
- **Earth Anchors Installation**
- **Grout Verification Sampling**
- **Sampling of Soil Mixing Applications**
- **Grouting -- Grout Curtain Installation**





Additional - Sonic Benefits

- Angle Borings (Up to 22 Degrees from Horizontal)
- Standard penetration test (Automatic Hammer)
- Shelby Tubes
- Dennison Samples
- Piston Samplers
- Pressure Meter Testing
- Geophysical Logging
- CMT Wells
- FLUTe Liners
- Multiple Casing installations
- Excellent for Nested Well installations





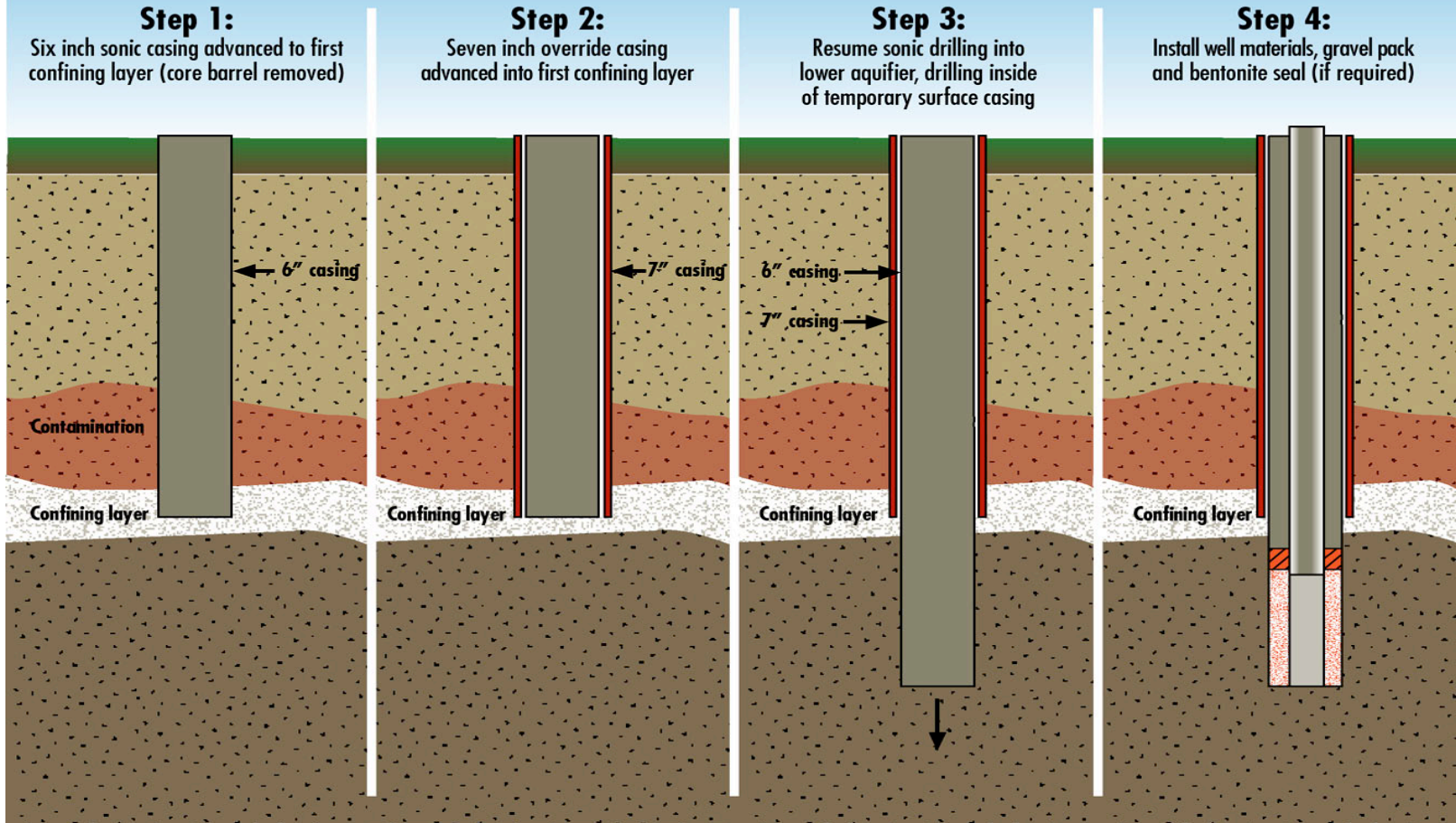
Angle Boring





Multi-cased Wells - Sonic

Sonic multicase system to seal off contamination (in upper zones) and prevent cross-contamination for well placement and investigation into lower aquifers.





Sonic Value – Superior Information

- **Complete accurate geological information – Enables precise site investigations**
- **Visibility of delicate formations – Recovers delicate sand seams and other easily altered geology**
- **Penetrates Faster – Compresses time line – reduces overhead and management cost**
- **Drills Deep – To define lower contamination boundaries – such as Chlorinated Solvents**
- **Drills & Samples toughest geology without refusal**
- **Drills Dry - Avoiding sample bias & cross contamination**





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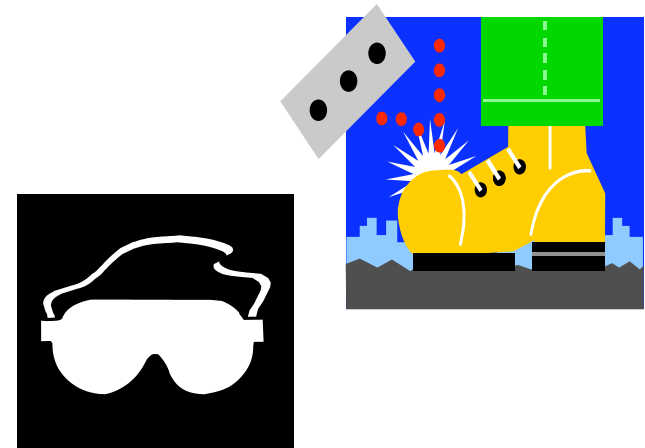
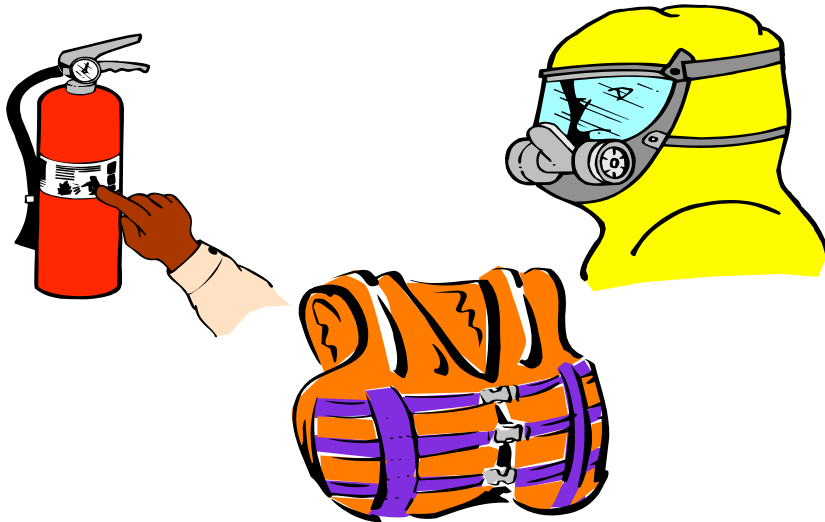


Safety and Training

SAFETY AND TRAINING _ We are an ISO 14001 company which means we are trained to lower environmental risks on each project we undertake. Boart Longyear has attained ISO 14001 and ISO 18001 certification.

Boart Longyear is committed to safety; it's our number one priority, as we have determined that efficiency and production go hand in hand.

Comprehensive, ongoing training and surveillance program that is second to none. We employ safety officers focused on our Behavior Based Safety (BBS) system to ensure regular reviews of all crews with a continuous circle of modification and improvement.



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