



ADVANTAGES OF SONIC DRILLING FOR WATER WELL CONSTRUCTION

- World's most advanced drilling technique for installing water wells and for the exploration and quantification of groundwater resources.
- Patented technology exclusive to Sonic Drilling Ltd.
- Fast drill rates, due to the efficient sonic drilling method, reduces on-site time and oversight cost of field personnel.
- Holes are drilled and cased by rotating and vibrating the drill rods and casing at sonic resonant frequencies.
- The sonic drill has the ability to handle difficult ground conditions such as lost circulation zones, cobbles, boulders, saturated sands and unconsolidated formations.
- In many instances, holes can be drilled without the use of any drilling mud, thus minimizing well development time and site clean-up costs.
- Pumping tests can be carried out in discreet zones at any depth during the drilling process to collect groundwater samples in order to assess the quality of all aquifers that may be present at a particular location.
- The sonic drill can produce core samples of all types of geological material which greatly enhances knowledge of the subsurface conditions for better water well design and construction.
- The sonic drill can also be used as a conventional air or mud rotary drill rig, if required, as well as an all-purpose drill rig for many other applications.



■ Installing PVC well casing through temporary sonic outer steel casing.

SONICOR 50K DRILL HEAD

- The patented sonic drill head, manufactured by the Sonic Drill Corporation, provides the rotation and vibration forces necessary to rapidly drill and case holes for the installation of water wells.
- High frequency resonant vibrations are sent down the drill string to the drill bit. The operator controls the frequency to suit specific conditions of the soil/rock geology.
- Resonance magnifies the amplitude of the drill bit, which fluidizes the soil particles surrounding the bit body, allowing for fast and easy penetration in most geological material.
- The vibratory motion of the drill bit also provides the impact forces to allow the carbide inserts at the bit face to fracture rock. This enables penetration of the bit through boulders and bedrock.
- An internal air spring isolates the vibration forces from the rest of the drill rig structure.



- A sonic drill is the ideal tool for hydro-geological explorations and for investigating the water supply development potential of an aquifer.
- In addition to installing domestic water wells, test pumping wells and observation wells, the sonic drill's unique features also provide the ability to take an intelligent approach to prospecting for the best locations for larger municipal and irrigation wells.
- The sonic drill has the ability to produce accurate continuous cores from surface to bedrock of any geological formation.
- The retrieved cores can easily be logged, photographed and stored for future reference. The information derived by examining the cores can be used to create an accurate site profile which can be used to evaluate the potential of all water bearing strata as well as to locate the optimum position for one or more well screens.
- Core samples of an aquifer can easily be subjected to a sieve analysis to determine the correct slot sizing for the well screen in order to minimize sand intake while maximizing water flow rate into the well. The use of nested casing allows the sonic drill to penetrate and investigate multiple aquifers without the need for permanent surface casing.



■ Installing poly core bag over core barrel prior to core extraction.



■ Extruding core sample using vibratory action.



■ Core samples of gravel aquifer in core boxes ready for storage.



■ Continuous core sample showing interface between sand aquifer and confining clay layer.



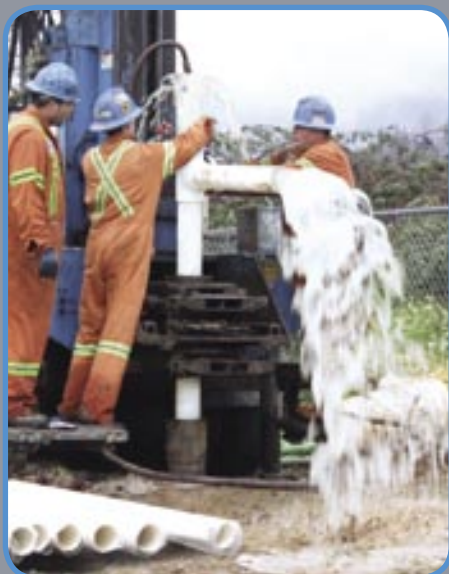
■ Installing stainless steel well screen with PVC riser pipe.



■ Pouring filter sand through temporary sonic outer steel casing.



■ Grouting of bore hole.



■ Well development in progress.



■ Finished observation well.



TYPICAL WATER WELL CONSTRUCTION WITH THE SONIC DRILL

- The sonic drill utilizes a positive method of constructing water wells.
- The hole is first cased to the full depth with a temporary protective steel casing.
- The well is then constructed inside the temporary threaded sonic outer steel casing.
- The well screen, riser pipe, sand pack, bentonite seal and grout are all safely inserted inside the casing without worry of damage.
- This is followed by gentle extraction of the outer casing using vibrations.
- The vibratory action eliminates concerns about getting stuck and helps to center the well screen and riser pipe within the borehole. In addition, the vibratory energy prevents bridging of the sand pack and bentonite seal and also ensures that the filter sand flows evenly around the well screen.
- The borehole can easily be grouted to the surface by the tremie line method within the outer casing.
- Building the well inside the casing creates a nearly perfect well installation and eliminates the worry of down hole problems such as borehole collapse, heaving sands or other installation problems.
- This superior well construction method also causes minimal disturbance to the surrounding borehole wall, resulting in more efficient well development and performance.

