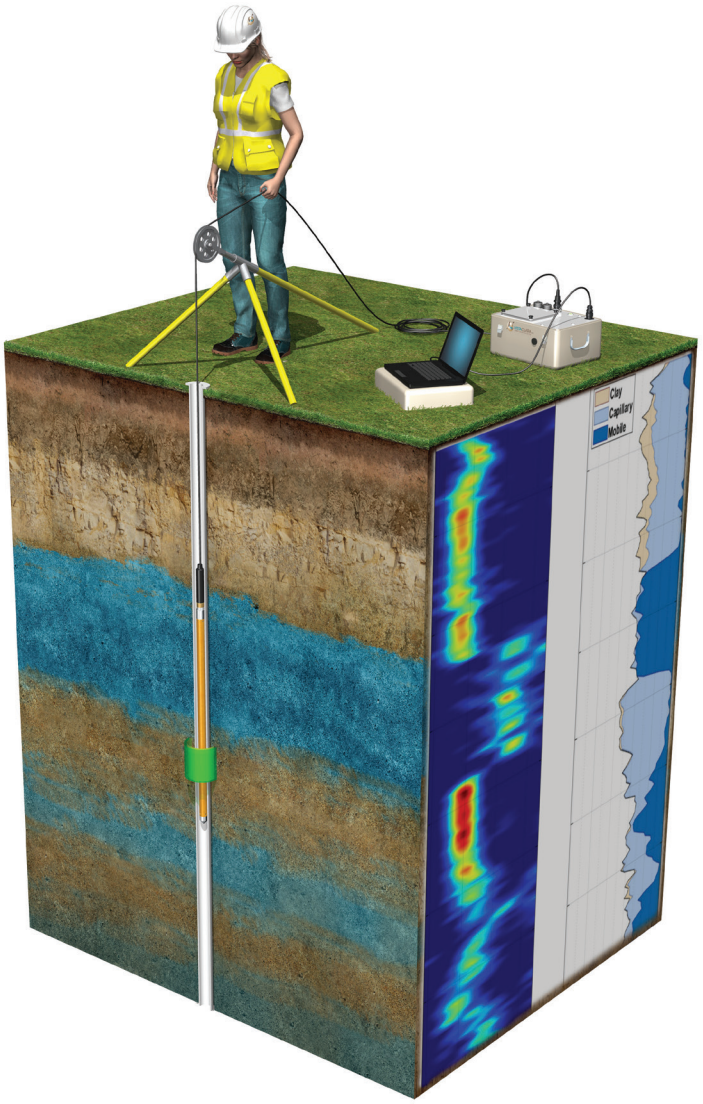
DART™

Hand-Portable NMR Logging System With Direct Push and CPT Deployment Options



BOUND AND MOBILE WATER CONTENT

PORE SIZE DISTRIBUTION & POROSITY

HYDRAULIC CONDUCTIVITY

TRANSMISSIVITY

SEDIMENT CLASSIFICATION

High-Resolution In Situ Measurement of Hydrogeologic Properties

VISTACLARA INC.
NMR GEOPHYSICS

MEASURE GROUNDWATER DIRECTLY

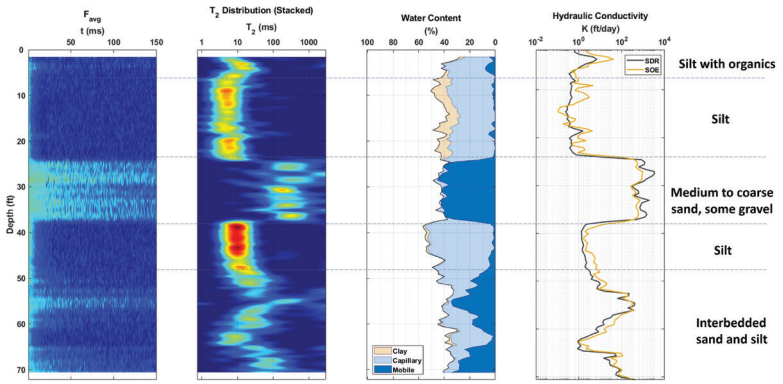
GROUNDWATER EXPLORATION AND WELL SITE SELECTION • GEOTECHNICAL ENGINEERING • GROUNDWATER RESOURCES • GROUNDWATER MODELING

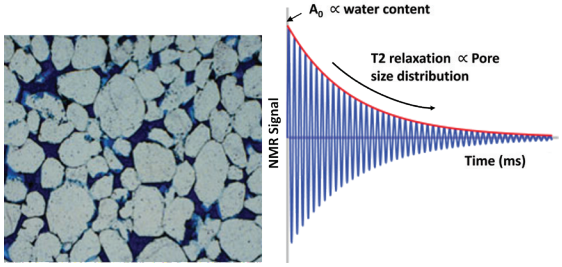
DART™ Portable NMR Logging System

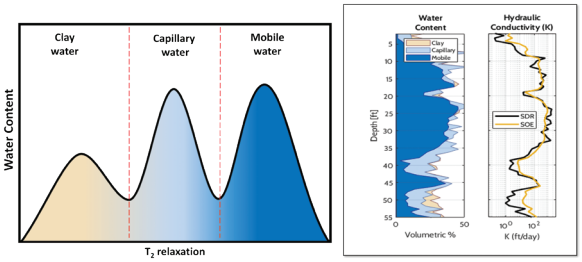
Harness the power of Magnetic Resonance (MR) logging with this compact, low-cost, battery powered system. Easily operated by a single user in the near surface critical zone to 100 m (330 ft), DART can collect MR data at very high vertical resolutions up to 4 cm (1.5 inch).

Direct Measurement of Hydrogeologic Properties

DART provides high-resolution measurement of volumetric fluid content in the native formation via stepped, or continuous logging modes. DART MR measurements are directly sensitive to pore size distribution, bound vs. mobile fluid in the pore space, and provide quantitative estimates of porosity and hydraulic conductivity up to 3000 m/day (10,000 ft/day). Visual analysis of the T2 relaxation time distribution enables accurate and high resolution classification of sediments.





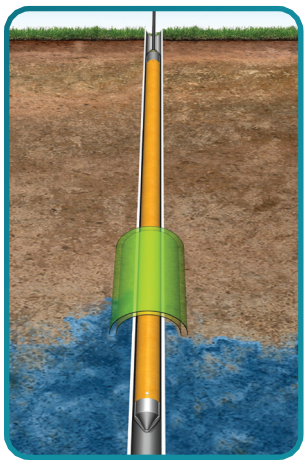


The Magnetic Resonance Advantage

DART incorporates a MR-based technology that uses the same physics as medical MRI. This technology provides inherently non-destructive detection of water, using static and alternating magnetic fields to polarize and excite hydrogens of fluids in the native formation outside the annular space of a well or boring. The initial amplitude of the MR signal observed after this perturbation is linearly proportional to the volumetric fluid content, or porosity if the formation is saturated. MR relaxation times are strongly correlated with the size of the pore space and are used to distinguish between water bound in small pores from more mobile water in large pores and fractures.

Multiple Shells Yield Superior Measurements

The DART tools feature dual-frequency operation enabling it to see radially outward in two distinct diameters outside the zone of disturbance within a single log. This exclusive capability reduces the likelihood of electro magnetic interference and increases logging speeds.



†Protected by US Patents # 7,466.128 B2; 8,451,004 B2; 8,581,587 B2; USRE43264 E1; 9,429,673 B2; 9,599,688 B2; 10,585,204 B2; 10,145,915 B2
Additional patents: US EP 1651974; US 9551807; US 9688068.
DART is a trademark of Vista Clara Inc.
Geoprobe is a registered trademark of Kejr, Inc

DART™ Portable Logging Tool Configurations

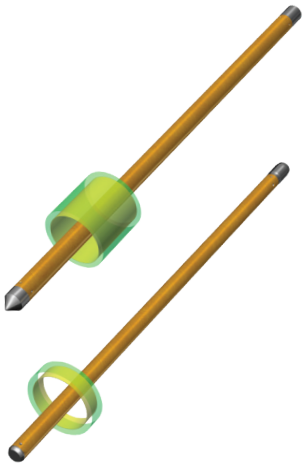
DART's flexible design architecture not only enables it to be easily carried to the job site by one person, but also has the unique ability to utilize Direct Push or CPT technologies for areas without an existing borehole.

Standard for PVC Wells

Dart probes can be deployed in small diameter open or PVC-cased wells with IDs of 3.8 cm to 5 cm (1.5 to 2 inches). The Dart probe can be logged manually or using a small winch and collect the MR signals in two sensitive shells with diameters of 12 and 15 cm (5 and 6 inches).

Direct Push and CPT Deployable

Direct-Push ready DART features the world's only Geoprobe® compatible NMR probes capable of deployment through standard 5.7 cm (2.25 in) drilling rods. In this combination, the empty rods are advanced to the desired depth with an expendable point on the bottom of the rod string. A Direct Push DART (DP140N or DP140J) probe is then deployed using extendable and removable push rods. MR measurements are performed in stepped mode, with the drill string raised at regular intervals and MR measurements collected with the tool in static locations.

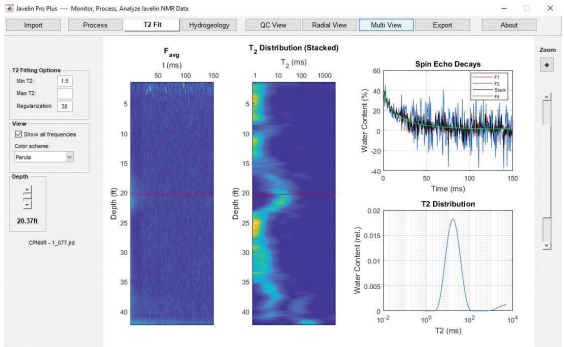


DART Control Unit

Portable and light-weight (7.7 kg or 17 lbs), the DART Control Unit houses 24V rechargeable battery power, electronics, and telemetry. It connects to DART probes via 20-120 m logging cable and to laptop by USB connection. Power can optionally be supplied externally. In addition, the Dart control unit can be used to run portable Helios Trek that is used for high resolutiion analysis of core samples.

Data Processing and Software

While in the field, see everything you need for your log with full-featured professional DART data acquisition, analysis and visualization software. The software performs real-time data processing, quality control, and interpretation of the most critical hydrogeological properties. The acquisition software measures water signals using a dual-wait-time dual-frequency CPMG pulse sequence. The Dart software can also collect NMR data using advanced T1-T2 and diffusion-T2 pulse sequences which are useful for NAPL investigations. Results can be exported in standard formats including LAS and LAS-2.

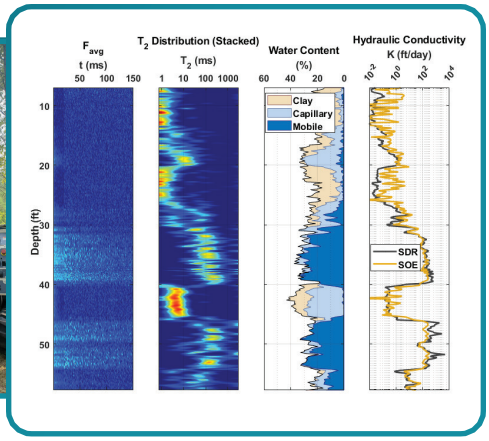


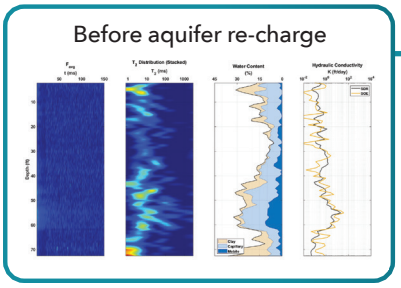
DART™ APPLICATIONS

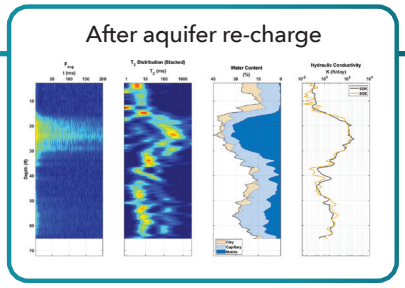
DART's portability and ease of use make it an excellent multi-purpose hydrogeologic tool for use by universities, government agencies, and groundwater and environmental consultants. DART provides high-resolution in-situ measurement of hydrogeologic properties such as sediment classification, bound and mobile water content, total porosity, pore size distribution and hydraulic conductivity. DART can be utilized with Direct Push or CPT deployment options eliminating need for well drilling.

High Resolution Site Characterization (HRSC) for Environmental Remediation

- Volumetric water content, bound and mobile porosity
- Provide accurate high-resolution conceptual site model
- Direct detection and quantification of non-aqueous phase liquids (NAPLs)
- Informing design of remediation plans
- Direct Push enables logging without drilling that could impact sensitive sites







Groundwater Resources

- Shallow aquifer characterization (to 100 m (330 ft))
- Vadose zone investigations
- Managed aquifer recharge

Mining

- Shallow ore moisture content
- Brine mining operations management
- Mine water management
- Mine tailings investigations
- Heap leaching - mineral recovery

Geotechnical and Construction

- Soil structural properties characterization for construction
- Liquefaction management
- Earthen dam and levee investigation

VISTACLARA INC.
NMR GEOPHYSICS

Sales, Rentals, and Services

www.vista-clara.com +1-425-493-8122

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