

Maximizing Insight and Data Capture from Borehole Logs: The Graphical Approach to Geologic Logging and Its Benefits

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Background/Objectives. One of the largest, and arguably most important, data gaps existing in nearly all groundwater remediation studies is the lack of high quality subsurface geologic data in digital formats. This data gap is not due to a lack of geologic data collection. Rather, this gap is due to collection of the wrong types of data in an inefficient way that leads to inaccurate, inconsistent, and incomplete data and a poor return on the investments made in drilling. Borehole logs provide an elementary and critical piece of data which must not be neglected during a high-resolution site characterization program. Improving log quality and resolution of observations via graphical logging and the practices presented here will positively impact all other facets of site characterization, conceptual site model development, and remediation system design.

Approach/Activities. Traditional forms capture geologic data in paragraph format where the description of important parameters is often inconsistent. Graphical geologic logs are set up with a series of vertical panels, one for each geologic parameter being logged. Within these vertical panels there are columns containing the acceptable values for each parameter. For each depth interval representing a consistent set of geologic materials the data is captured by shading in the correct cell-value for each parameter. The visual format of the log form provides a clear roadmap of the parameters to log and their possible values, helping to ensure accurate and consistent data collection by loggers with a range of experience. The demonstrated graphical logging approach facilitates rapid, accurate capture of sedimentological data and easy digitization for long term storage of all the geologic data in a relational data management system. The graphical geologic log and complementary database are designed to be customizable and transferable between hydrogeologic settings providing a new tool to advance geological data collection and management at groundwater remediation sites.

Results/Lessons Learned. A completed graphical shading log provides a depth-discrete visual representation of the changes in geologic characteristics that is immediately useful for designing wells or multilevel systems, selecting samples for analysis, comparison with other continuous downhole geophysical data, and planning future characterization and/or remediation activities. Applications in the field and training materials developed to date show that this technique is easily learned, efficient, and promotes high resolution observation and standardized data quality across multiple teams/loggers. Graphical logging formats make digital capture of the geologic information easy; ideal for integration with field computers/tablets. Digital data sets that place geologic observations into 3-D space along with analytical and hydrologic data are critical when considering contaminant fate and transport, developing conceptual site models, or optimizing remediation system design.