The Benefits of Acquiring Continuous Cores for Aquifer Characterization: Lessons from Petroleum Industry Best Practices

Junaid Sadeque (junaid.sadeque@aecom.com) (AECOM, Arlington, VA, USA)

Background/Objectives. Since the underlying geology of a site is the primary control of groundwater flow and contaminant pathways, it is essential that we develop conceptual site models (CSMs) based on robust subsurface data. Borehole information in the form of core materials and well logs provide the ground-truth for such stratigraphic frameworks. However, in the environmental industry, continuous cores are seldom obtained for investigations because of cost considerations. Most environmental studies thus typically rely upon discontinuous core samples and cuttings for direct lithologic information, resulting in stratigraphic interpretations that are often challenged with uncertainties. This shortcoming is further exacerbated by the lack of any standardized workflow for recording lithologic information derived from those discontinuous cores. The purpose of this paper is to highlight the benefit of utilizing continuous cores and applying standardized sedimentological methods for recording grainsize, texture, lithology and facies.

Approach/Activities. Recently conducted subsurface stratigraphic investigations in the Niger Delta, using continuous core and associated well-log data, are presented here as best practice examples from the petroleum industry. The standard workflow of core-description and facies analysis is also shared for comparison.

Results/Lessons Learned. Observations of slabbed continuous cores provide a unique opportunity to implement grainsize information, sedimentary structures, lithology data, and fossils/trace fossils for facies analysis. Applying this approach to the proto-Niger Delta shows valuable stratigraphic details that can help to identify the heterogeneity of permeable and non-permeable rocks. Logging the grainsize using a standardized scale and keeping the textural information separate from grain size information helps us see the stratigraphic trends of the deposits and determine their depositional environments. Furthermore, calibration of well logs with core data offers a reliable tool for inferring lithology and depositional environment in intervals/locations without cores. Finally, directly measured saturation data from core plugs helps us to correctly determine the porosity-permeability of the studied rocks and recognize different flow units. The environmental industry can benefit significantly by taking a similar approach in data acquisition and interpretation.