# Application of ESS to Evaluate Contaminant Migration Risk from a Proposed Dredged Material Containment Facility Design

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**Background/Objectives.** A dredged material containment facility (DMCF) design proposed to incorporate a confining clay formation as a natural liner required additional study. The design includes subsurface excavation of native materials within the footprint of the facility for use in construction of perimeter dikes, providing additional capacity and longevity for the DMCF. Geotechnical borings advanced by others at the site indicated the presence of several small "pockets of sand" within otherwise continuous clay of the "borrow area". The project team recognized that this engineering-centric conceptual site model (CSM) may have misinterpreted the scale and continuity of the sand units, which could have implications for construction and long-term operations. Our firm was contracted to provide additional hydrogeologic and stratigraphic evaluation for the project site. Our objectives were to evaluate: 1) the thickness of the confining unit to aid in assessment of the potential for bottom heave during excavation and potential impact to the aquifer below, and 2) the capacity of the sand units to transmit groundwater and serve as a preferential pathway for groundwater flow.

**Approach/Activities.** An Environmental Sequence Stratigraphic (ESS) approach to CSM development with supplemental aquifer testing was employed to achieve the objectives. Additional data collection was needed because the geotechnical borings were not of sufficient resolution to confidently evaluate the risk factors; they were positioned at substantial distance, vertical sampling was not continuous, and the lithologic descriptions were lacking adequate detail. To evaluate the potential for groundwater infiltration and contaminant migration outward from the future DMCF through the sand units, 10 additional borings with continuous sampling were advanced to depths of 50 to 120 feet below grade to characterize the subsurface lithology in detail; three of the borings were converted into monitoring wells for aquifer testing. The ESS approach incorporated literature review of the regional geological history, borehole data from adjacent properties, interpretation of the comprehensive lithologic dataset, and comparison of the depositional environment to modern analogues. Estimates of hydraulic conductivity, transmissivity, and storativity were generated from the aquifer testing data. Cross-sectional diagrams were developed to more accurately portray the scale and continuity of the sand units of interest. The findings were evaluated by the project team to determine whether the proposed design was satisfactory or if it should be modified based on the refined CSM.

**Results/Lessons Learned.** The investigatory activities and an ESS-derived CSM enabled a more confident assessment of the feasibility of the proposed design. Literature review indicated a backswamp depositional environment on a low deltaic plain. Correlation of additional lithologic features including fining upward successions, distinctive sedimentary structures, scattered lignite, and benthic foraminifera fossils also identified the presence of tidal flats and a paleochannel. While the scale and continuity of the sand units were greater than previously interpreted, aquifer testing results validated the paleochannel geometry and indicated the hydraulic conductivity of the paleochannel features were within typical values for silt and fine sand. The thickness of the confining unit across the site was resolved in greater detail. Based on coordination with the project geotechnical engineer, the risk of contaminant migration to sensitive receptors was deemed acceptably low and the thickness of the confining unit sufficient to proceed as planned. The proposed design is pending final submission for regulatory approval. The presentation will include data and graphics from the study.