Understanding Subsurface Stratigraphy for PFAS Environmental Characterization Using Modern Analogs

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Background/Objectives. Understanding the subsurface stratigraphy and facies architecture of a contaminated site is essential to determining preferential contaminant flow pathways . However, limited or low-confidence borehole information in absence of continuous geophysical logs often presents a major challenge in accurately delineating the subsurface. In this study, we test if modern analogs from DEM and Google Earth images can effectively supplement subsurface interpretations where borehole information is insufficient.

Approach/Activities.
We produce stratigraphic cross-sections at the subject site that combine borehole information with modern analogs (DEM and Google earth images), as well as other areas with similar geological settings. Results of the study are then compared to previous lithostratigraphic interpretations at the site.

Results/Lessons Learned. While previous studies in the area treated the deposits as simple glaciofluvial sediments of gravels, sands and clay, our investigation indicates a more complex and heterogeneous facies architecture for the region. A conspicuous lake-level fall of the proto Lake Huron controlled by a Pleistocene glacial event lead to the development of an incised valley that down-cut into the previous glacial deposits. The base of the incised valley was then partially infilled by fluvial channels during Lowstand. Subsequently, with rising lake-level, the valley was subject to inundation and a muddy estuarine condition established within the valley. By the end of this transgression, sedimentation started to keep pace with a relatively stable lake-level. As a result, fluvial channels, lagoons, wave-dominated strand-plains and other deltaic deposits accumulated at the Site. This new approach demonstrates that using modern analogs in conjunction with lithologic data can be an effective tool that helps us to visualize the subsurface at a high resolution, even with very limited data. Eventually this approach could be used to refine remedial strategies based on better informed conceptual site models.