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POTENTIAL IMPACTS OF SEA-LEVEL RISE ON CONTAMINANT MOBILITY AND GROUNDWATER POLLUTION

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Historical industrial activities have resulted in soil contamination at sites throughout the United States and worldwide. Many of these sites are located along coastlines, making them vulnerable to hydrologic and geochemical alterations due to climate change and sea-level rise. Coastal industrial sites in Wilmington, DE, USA commonly contain elevated concentrations of arsenic, lead, chromium, and other inorganic materials, which pose potential risks to both human and ecological health. To assess the potential impacts of sea-level rise on contaminant mobility at one of these former industrial sites along the Christina River, we conducted quantitative comparisons of hydrologic and geochemical dynamics across time scales ranging from hours to months, and throughout seasonal environmental variations. Data was collected from pressure transducers in wells, multi-level redox sensors, and pore water samplers. Results indicate there is significant vertical variation in redox condition. In the tidally impacted variably saturated zone, redox potential varies between oxidizing and reducing conditions depending on the elevation of water table. This strong correlation indicates that a rising water table potentially increases contaminant mobility. Porewater samples also confirm increasing arsenic concentration during the rising tide. Comparison of porewater samples from different depths indicates that deep groundwater with higher salinity contains elevated relative concentrations of arsenic. To understand the chemical processes driving contaminant mobility, the field data are used to inform a parallel laboratory-controlled study that mimics site redox and salinity conditions. This integrated methodology resolves dynamics in both hydrology and geochemistry at a tidally impacted industrial site. Analysis of similar dynamics over different time periods will provide more insights into potential impacts of longer-term sea-level changes as well as intermittent coastal storms. The combined field data and laboratory analysis show that both salinization and rising water tables lead to the release of sediment-bound inorganic contaminants, greater solute mobility, and subsequent contaminant migration, which should be integrated into resource management decisions and adaptation actions.

Session No. 274

T101. Arsenic: Source to Sustainability I
Wednesday, 4 November 2015: 8:00 AM-12:00 PM

Room 337 (Baltimore Convention Center)

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See more of: Arsenic: Source to Sustainability I
See more of: Topical Session

<< Previous Abstract | Next Abstract >>