

Kuwait Environmental Remediation Program (KERP): Oil Lakes Remediation in Southeast Kuwait

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Background/Objectives. The United Nations Compensation Commission (UNCC), Kuwait National Focal Point (KNFP) and Kuwait Oil Company (KOC) cooperated in a joint project to undertake comprehensive and collaborative efforts to remediate 26 million m³ of contaminated soil that had resulted from the Gulf War. The damage caused by the war includes features such as wet and dry oil lakes, contaminated piles, coastal deposits, oil-filled trenches, and wellhead pits. This contaminated soil has altered the desert soil's properties and ecological landscape, causing the deaths of plants and animals; the contamination has also penetrated deeper into the subsurface soil layers and threatened to pollute precious fresh-groundwater resources. UNCC initially recommended to construct engineered landfills to encompass the contaminated soil. KOC developed construction-type contracts on a re-measurable basis to construct 2 million cubic meters of landfill. Under the Kuwait Environmental Remediation Program (KERP), Kuwait Oil Company is fully responsible for planning and executing remediation and restoration projects in the KOC oil field areas. Moreover, KOC in conjunction with KNFP has obtained UNCC approval to revise the KERP program by incorporating the Total Remediation Strategy (TRS), which provides a number of tools to address the legacy of contamination.

Approach/Activities. The TRS comprises various elements: Risk-Based Approach, Site Soil Characterization, Unexploded Ordnance Program, Remediation Treatment Technologies, and Sludge Disposal through Beneficial Reuse and Containment in engineered landfills of untreatable wastes. As part of the KERP, the Oil Lakes Remediation Project will be implemented within select areas in KOC's operational southeast Kuwait oil field. The Oil Lakes Remediation Project is the first project under KERP to utilize treatment processes to address the contaminated soil features.

Results/Lessons Learned. The purpose of this paper is to demonstrate one such type of technology, known as bioremediation treatment for soil contaminated with total petroleum hydrocarbon. Bioremediation exploits the ability of certain micro-organisms to degrade petroleum hydrocarbon constituents to carbon dioxide, inorganics salts and biomass. However, the microbes require a sustained source of nutrients, water, and electron acceptors to degrade the hydrocarbons. Enhanced bioremediation of hydrocarbon contaminated soil involves the addition of nutrients, water and oxygen into the excavated soil to stimulate the microbes capable of degrading crude oil.