

## UAA Professional Development Seminar Series

# Challenges of contaminated site remediation in the Arctic; twenty-five years of studies at the former naval Arctic Research Laboratory (NARL) in Barrow, Alaska

Presented by Keith Torrance



**Abstract:** Accidental releases of fuel on to soils underlain by continuous permafrost are challenging to delineate because of the difficulty in predicting the migration of hydrocarbons through the active layer; that is the shallow sub-surface zone that melts during the summer. Permafrost is an effective aquitard but movement of water through the active zone is constrained by low hydraulic gradients, inhomogeneous aquifers and the morphology of the underlying permafrost surface. Consequently, the movement of contaminants within the active layer is complex. Further, microbial breakdown and oxidation of contaminants is

retarded by the low temperatures, so that contaminants remain at elevated concentrations for much longer than at more temperate latitudes. The Naval Arctic Research Laboratory (NARL) was operational from 1947 until 1980 occupying a 350-acre site north of the city of Barrow. Most of the original structures at NARL are still intact and have been put to other uses. However, complete utilization of the facility is limited by soil contamination dating back to its former use. Most of the contamination relates to fuel spills but metals, PCBs and chlorinated solvents are also present at some locations above action levels. Characterization and remediation efforts have been ongoing since the Navy left NARL and are expected to continue for another decade or more. As one of the most intensely studied sites in the Arctic, NARL is an ideal location to investigate long-term migration within the active zone.

**Biography:** Keith Torrance is a practicing environmental geologist employed by UMIAQ Environmental, LLC, and works on contaminated site characterization and remediation projects throughout Alaska. Most of his current projects are around Barrow and other North Slope Communities. He is a Chartered Geologist, a Certified Professional Geologist and a Professional Hydrologist.

Keith has an undergraduate degree in Geology from the University of Glasgow in Scotland. He initially worked in the mining and energy sectors in Australia and the United Kingdom then got sidetracked into compound semiconductor processing for a number of years. He completed a Master's degree in geo-environmental engineering at the University of Strathclyde in Glasgow, investigating arsenic-rich semiconductor waste, before completing the circle with his PhD thesis on arsenic geochemistry in surface water at historical mine sites in Alaska and Scotland. He recently completed a graduate certificate in Environmental Regulations and Permitting at UAA.

Keith is active in many professional societies; he is currently vice president of the Alaska Geological Society and the Alaska Chapter of the Association of Environmental and Engineering Geologists. He is active in the Alaska Miners Association and a member of the Community Advisory Board for UAA's geoscience program.

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