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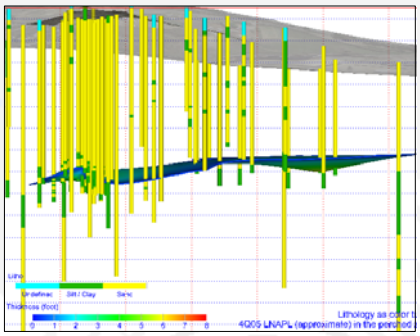
Consulting Scientists, Engineers, and Geologists

AME invites you to attend the NGWA/API Petroleum Hydrocarbon Conference in Houston, Texas. Our staff will lead a post-conference Workshop on NAPL Environments. During the conference, we also will present three technical papers on monitoring well optimization programs, NAPL characterization tools, and approaches to differentiate natural and anthropogenic hydrocarbon releases. If you cannot attend, please call (916) 939-7550, and we will provide further information on these topics.



WORKSHOP

NAPL Environments: How Hydrogeologic Conditions Influence NAPL Distribution, Mobility, and Remediation

AME Presenters: Jeffrey A. Johnson, Ph.D., P.G. and Meng Ling, Ph.D.
Also Presenting: Mr. R. Yilmaz, Fugro Geosciences

About the Workshop: The attendee will learn the importance of characterizing the key hydrogeologic factors that influence NAPL movement in the subsurface. The workshop will discuss how the distribution, mobility, and remediation of separate phase liquids are influenced by lithologic and hydrologic conditions. The concept of facies will be utilized to describe common NAPL environments and how fundamental understanding of the lithologic and hydrologic conditions can produce cost-effective characterization and remedial programs. Technologies and tools useful in characterizing the subsurface lithology and NAPL will be presented. In particular, hands-on demonstrations with cores, CPT, and LIF-ROST technologies will be conducted. Attendees will apply actual site information for problem-solving activities. Course materials will be provided in a notebook and in electronic format on a CD.

For more information, go to: http://www.ngwa.org/pdf/e/course/5040nov06W.pdf

Who Should Attend: This workshop is suitable for managers, scientists, and engineers involved with NAPL problems. A basic understanding of NAPL concepts and general site characterization and remediation is recommended. It is assumed that attendees will have at least 5 years of professional experience.

Fees: NGWA member—$150; Nonmember—$250 (price good for 11/06 offering only)

Course Information
November 8, 2006
JW Marriott by the Galleria
5150 Westheimer
Houston, Texas 77056
(713) 961-1500

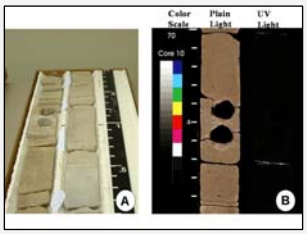
Improving LNAPL Characterization Using Petroleum Exploration Tools

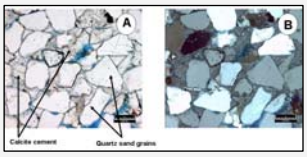
Jeffrey A. Johnson, Ph.D., Acton • Mickelson • Environmental, Inc.
Meng Ling, Ph.D., Acton • Mickelson • Environmental, Inc.
Mark E. Lewallen, ExxonMobil Global Remediation

Abstract

The petroleum industry utilizes a wide variety of tools to understand the geology and distribution of oil in the subsurface. Surprisingly these tools are rarely utilized by the environmental industry. For example, many environmental investigations of sites impacted by light non-aqueous phase liquids (LNAPLs) utilize only well product thickness measurements and observations documented in boring logs prior to initiating remedial activities. This approach may produce an inaccurate conceptual site model that substantially overestimates the amount of recoverable LNAPL, thus leading to the selection of an inappropriate and costly remedial strategy. This paper documents the application of relatively standard petroleum exploration tools in conjunction with visual imagery to comprehensively characterize the LNAPL in the subsurface.

Geophysical logging, petrographic analysis, core photography, and saturation measurements, which are common exploration practices, can be valuable components in an LNAPL characterization program at particular sites. These analyses were utilized to further characterize a subsurface release of crude oil from a production well. Initial characterization activities involved the installation of monitoring wells and the measurement of fluid levels, which are standard industry practices. Observations during drilling indicated that the subsurface was extremely heterogeneous, and was composed of a series of interbedded shales and sandstones. Over 40 feet of LNAPL were measured in three of the monitoring wells suggesting that the release was in excess of several million gallons of oil based on equilibrium conditions in a porous media. Based n these initial findings, an additional characterization program was conducted using gamma ray geophysical logging, rock coring in the source and downgradient areas, petrographic thin section analysis, and saturation measurements. This data was compiled into three-dimensional interactive visual images for spatial analysis. Results of the analyses indicated that the LNAPL was confined to discrete, thin fracture zones and that the oil had not invaded into the pore network of the sandstone. Subsequent volume estimates based on the new site information indicated the original volume estimates were in error by orders of magnitude. Results of the physical characterization program were essential in developing an accurate and reliable site conceptual model that enabled proper management of the site.





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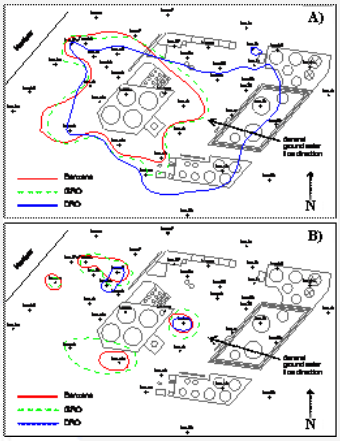
Ground Water Monitoring Program Optimization at an Active Industrial Terminal

Meng Ling, Ph.D., Acton • Mickelson • Environmental, Inc.
Jeffrey A. Johnson, Ph.D., Acton • Mickelson • Environmental, Inc.
James C. Twiford, P.E., Acton • Mickelson • Environmental, Inc.

Abstract

An evaluation of the ground water monitoring program was conducted for a port facility on the west coast that was the site of former bulk petroleum fuel terminals. Today the site is dedicated to intermodal container operations and the storage of containers and container truck trailers. Environmental investigation and remedial activities at the site include ground water monitoring with a network of 51 monitoring wells sampled at a semi-annual basis. A vapor extraction/air sparging (VE/AS) remediation system operating since 2003 has removed more than 500,000 pounds of gasoline hydrocarbons and methane from the subsurface. As remediation has progressed, concentrations of the major chemicals of potential concern (COPCs) have decreased significantly, and are now less than reporting limits (RLs) at a number of monitoring wells. The observed effects of the remediation suggest the ground water monitoring effort can be reduced while still obtaining sufficient data for ongoing assessment of ground water conditions and remedial progress. Optimization of the ground water monitoring program would not only reduce costs, but reduce worker risk and disruption to operations at this cargo terminal.

Statistical methodologies adapted to quantitatively evaluate and optimize ground water monitoring programs at other sites were applied to evaluate the ground water monitoring program at the subject site. The statistical methodologies include trend analysis, spatial analysis of monitoring well locations, and temporal analysis of monitoring frequencies. In support of the statistical analyses, 3-dimensional (3-D) visual imagery and animations were produced to qualitatively assess site hydrogeology and concentration trends. Some results from the statistical analyses were modified based on site-specific considerations to develop final recommendations for optimizing the monitoring program with respect to monitoring locations and frequency. Of the 51 wells, the conclusion from this evaluation is that six wells can be eliminated from the sampling schedule without impacting the technical integrity of the monitoring program. Of the 45 remaining wells, the sampling schedule can be reduced to annually for 34 wells, leaving 11 wells to be sampled semi-annually. The recommended changes in the monitoring program reduce the sampling effort by 45 percent.



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