

Evaluating Natural Source Zone Depletion at Sites with LNAPL (LNAPL-1)

EXECUTIVE SUMMARY

Light, nonaqueous-phase liquid (LNAPL) refers to an organic compound that is immiscible with, and lighter than, water (e.g., crude oil, gasoline, diesel fuel, heating oil). When an LNAPL is released to the subsurface, it can migrate downward under the force of gravity and laterally at the water table. Larger LNAPL releases may migrate to the water table while leaving residual, immobile LNAPL along the migration path.

The constituents, or chemicals, that compose the LNAPL may be removed over time by various mechanisms, such as sorption, volatilization, and dissolution. If not removed, the LNAPL “body” can function as a potentially long-lived source zone for secondary impacts to adjacent soil, soil gas, and groundwater.

A simple, quantitative mass balance assessment of source zones could conclude that, if some quantities of constituents are **naturally** being lost from the source zone at some rate due to natural processes, then the source zone itself must be depleting to some degree. The key question then becomes, at what rate is this natural source zone depletion (NSZD) occurring? This document addresses this and other questions associated with NSZD, including the following:

- What are the NSZD processes?
- What are the NSZD rates?
- What will the NSZD look like in the future?

NSZD is of significance because it occupies a position in the spectrum of remediation options that can be used as a basis for comparing the performance and relative benefit of other remediation options. It is also of significance because engineered remedial actions typically do not always completely remediate soils and NSZD may be useful to address the residual hydrocarbon.

Although the challenging issue is deciding the applicability of NSZD, this document addresses only the technical process for evaluating NSZD in the context of the questions listed above. It does not discuss applicability of NSZD in the remedial decision-making process. Regulatory matters, such as the applicability of NSZD in a remedial decision-making process, will be addressed in a forthcoming LNAPLs Team technical/regulatory guidance document to be entitled *Evaluating LNAPL Remedial Technologies for Achieving Project Goals*. This technical overview document is a companion to that guidance document.

The LNAPLs Team comprises representatives of state and federal regulatory agencies, the U.S. Department of Defense, public stakeholders, oil companies, the American Petroleum Institute, environmental consultants, and vendors. This technical overview document was developed by a subgroup of the LNAPLs Team that reflects the general composition of the team as a whole.