Glossary

A

Apparent NAPL Thickness

The gauged thickness of LNAPL in a well that is screened across the Mobile NAPL Interval. The Apparent NAPL Thickness may be equivalent to the Mobile NAPL Interval in a well at equilibrium under unconfined conditions. Under confined and perched conditions, the Apparent NAPL Thickness may be exaggerated compared to the Mobile NAPL Interval.

B

Biosurfactant

A surface active agent, produced through biological degradation of organic compounds (including petroleum hydrocarbons), that reduced interfacial tension between fluids.

C

C_{Sat}

Threshold bulk soil concentration, which when exceeded, indicates that a non-aqueous NAPL phase is likely to be present in the soil matrix.

C_{Res}

The bulk soil concentration at residual LNAPL saturation.

Capillary Pressure

The pressure difference between the non-wetting phase (i.e., LNAPL) and the wetting phase (i.e., groundwater) in a multiphase system such as an LNAPL-groundwater system.

D

Dual Phase Flow

Dual phase flow refers to the simultaneous flow of two phases, most commonly LNAPL and groundwater within an aquifer, for the purposes of this guidance document. The ability of each phase to flow is impeded by the presence of the other.

E

Effective Solubility

The solubility of an individual compound (e.g., benzene) that will dissolve from a chemical mixture (e.g., gasoline) into water. Effective solubility is usually significantly less than the compound's pure phase solubility. Effective solubility is described by Raoult's Law, which indicates that the solubility limit of any individual component of a complex mixture will be limited by the simultaneous dissolution of the other components of the mixture and will be equal to a component's pure phase solubility multiplied by the mole fraction of the component in the mixture.[1]

I

Interfacial Forces

Forces that arise at interfaces between liquids and/or solids due to differences in the chemical properties (i.e., polarity) of the liquids/solids.

Intermediate Wetting Phase

Fluid phase that occurs between the wetting and the non-wetting phases (i.e. NAPL in a water wet unsaturated media).

In-Well LNAPL Thickness

The observed thickness of LNAPL in a monitoring well, which relates to the pressure and spatial distribution of LNAPL in the subsurface. In-well LNAPL thicknesses in monitoring wells vary with changes in groundwater elevations.

L

LNAPL

A light non-aqueous phase liquid (e.g., petroleum oil, gasoline, diesel fuel) that has a density less than water and is immiscible with water.

LNAPL Concern

An LNAPL condition or potential condition that could: pose a risk to health or safety (composition-based), result in additional LNAPL migration (saturation-based), address an LNAPL-specific regulatory requirement (regulatory-based), or otherwise create some physical or aesthetic impact or require a specific regulatory or stakeholder response.

LNAPL Control

Application of a technology that stabilizes an LNAPL body or impedes LNAPL migration without reliance on a mass recovery or phase change.

LNAPL Hydraulic Recoverability

Historically, a conceptual representation of hydraulic recovery/potential recovery. The concept of volume of LNAPL that can be hydraulically extracted under a particular pressure differential. Potential hydraulic recoverability reflects the volume of LNAPL above the residual saturation; however, due to inherent inefficiencies in extraction, recoverability typically reaches near zero values *before* residual saturations are attained. Not quantitative – points to metrics of recoverability.

LNAPL Management

A process that includes LNAPL site assessment and monitoring, LNAPL Conceptual Site Model development, identification and validation of LNAPL concerns, and application of remediation technologies, if needed to address any LNAPL concerns.

LNAPL Mass Recovery

Application of a technology that physically removes LNAPL without significant reliance on phase change.

LNAPL Phase Change Remediation

Application of a technology that indirectly remediates the LNAPL body via recovery and/or in-situ destruction or degradation of vapor or dissolved-phase LNAPL constituents.

LNAPL Remedial Goal

The desired LNAPL condition to be achieved by the remedial strategy or action that constitutes the end of LNAPL management for a specific LNAPL concern.

LNAPL Remediation

Application of an LNAPL mass recovery, phase change, and/or control technology to achieve a saturation, compositional, and/or aesthetic remediation objective.

LNAPL Remediation Objective

A statement describing how the remedial goal will be accomplished by the technology(ies) to be used. Combined with performance metrics and remedial end points, LNAPL remediation objectives become “SMART” (Specific, Measurable, Attainable, Relevant and Timely).

LNAPL Remediation Endpoint

Achievement of the remediation objective(s) described by the associated specific performance metric(s).

LNAPL Saturation

The LNAPL-filled fraction of the total porosity (e.g., 10% LNAPL saturation indicates that 10 percent of the total porosity is filled with LNAPL).

LNAPL Smear Zone

The zone within the upper portion of the saturated zone and the lower portion of the vadose zone containing LNAPL at variable saturation due to water table fluctuation.

LNAPL Transmissivity

LNAPL transmissivity is a proportionality coefficient that describes the ability of a porous media to transmit a specific LNAPL and is defined as the volume of LNAPL that may pass through a unit width of aquifer per unit time per unit gradient. It is a measure of the potential for LNAPL to flow and thus its potential recoverability.

M

Maximum Extent Practicable (MEP)

Regulatory endpoint concept for UST sites set forth in 40 CFR §280.64 that states "At sites where investigations… indicate the presence of free product, owners and operators must remove free product to the maximum extent practicable as determined by the implementing agency." The determination of what constitutes MEP varies between regulatory entities and has changed over time.

Migrating LNAPL

An LNAPL body that is expanding laterally or vertically into areas previously un-impacted by LNAPL. The term 'migration' describes LNAPL movement on a macro or plume scale, which can occur only if the LNAPL driving mechanisms (e.g., LNAPL head) exceed the resistive mechanisms, and thus displace water in adjacent pore spaces. Natural and manmade preferential pathways may exist at a given site that could allow migration to occur where it would not otherwise be expected.

Mobile LNAPL

LNAPL that exists above residual saturation levels such that it may be observed in wells. Mobile LNAPL has the *potential* to migrate, but not all mobile LNAPL is migrating LNAPL.

Mobile NAPL Interval

The vertical interval of LNAPL that is above residual saturation.

Monitored Natural Attenuation (MNA)

Natural attenuation is the combination of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. In the context of petroleum releases, MNA typically focuses on the documentation of the attenuation of petroleum constituents in the dissolved phase via monitoring over some duration of time.

N

Natural Attenuation

The combination of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. In the context of petroleum releases, MNA typically focuses on the attenuation of petroleum constituents in the dissolved phase, in contrast to NSZD, which focuses on the depletion of mass within the LNAPL source zone.

Natural Source Zone Depletion

The combined action of natural processes that reduce the mass of LNAPL in the subsurface. Key processes include volatilization, dissolution, and biodegradation. Over time, depletion of LNAPL mass will reduce LNAPL saturation and mobility. Natural Source Zone Depletion is an LNAPL phase change remediation technology.

Non-Wetting Phase

Fluid phase that fills the largest pores and is not in direct contact with the solids in porous media (i.e., gases).

P

Performance Metric

The measured data or demonstrated change in site condition(s) that indicates progress toward or achievement of a remediation goal.

Phase Change

Natural or induced partitioning of LNAPL constituents from the LNAPL phase to a sorbed, vapor, or dissolved phase.

Pore Entry Pressure
The capillary pressure that must be exceeded before a non-wetting fluid (e.g., LNAPL) can invade pore space saturated with a wetting fluid (e.g., groundwater).

R

Relative LNAPL Permeability
The ratio between the effective permeability to LNAPL at a partial LNAPL saturation to its absolute permeability at maximum saturation. Typically referenced in terms of dual phase flow (i.e., LNAPL permeability in the presence of GW), and in such systems is inversely related to the relative permeability of GW.

Residual
Saturation in a non-wetting phase that is discontinuous (present as blob and ganglia). The relative permeability of a residual non-wetting phase is zero and correspondingly, the fluid is immobile under typical gradients of pressure or head.

Residual LNAPL
The fraction of an LNAPL body that will remain immobile and hydraulically unrecoverable under prevailing hydraulic conditions (i.e., will not flow into a well).

Residual LNAPL Saturation
The saturation at and below which LNAPL will no longer flow in an aquifer even under applied gradients. Residual LNAPL is immobile/unrecoverable and therefore does not contribute to migration risk; however, it will continue to act as a source of dissolved and vapor phase contamination.

S

Spreading Coefficient
A parameter based on the sum of interfacial forces at the water-NAPL- air contact point describing the potential of a NAPL to spread across water.

Stable LNAPL
An LNAPL body that no longer possesses the potential to migrate or expand into areas previously un-impacted by LNAPL (i.e., a stable LNAPL body is not migrating). Stability is judged by time-series data and controlled by physical processes (capillary pressure and volatilization) and biodegradation.

T

Threshold Metric
Measured data or site condition(s) that can indicate whether an initial LNAPL concern may be eliminated, or carried forward to select remediation objectives.

W

Wetting Phase
Fluid phase that is in direct contact with the solids in a porous media.

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[1] Effective solubility values can be calculated on a site-specific basis where LNAPL composition is known, or can be found in reference material such as the API Interactive LNAPL Guide (2004).