

Regulatory Perspectives on Natural Source Zone Depletion

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The LNAPL Regulatory Landscape

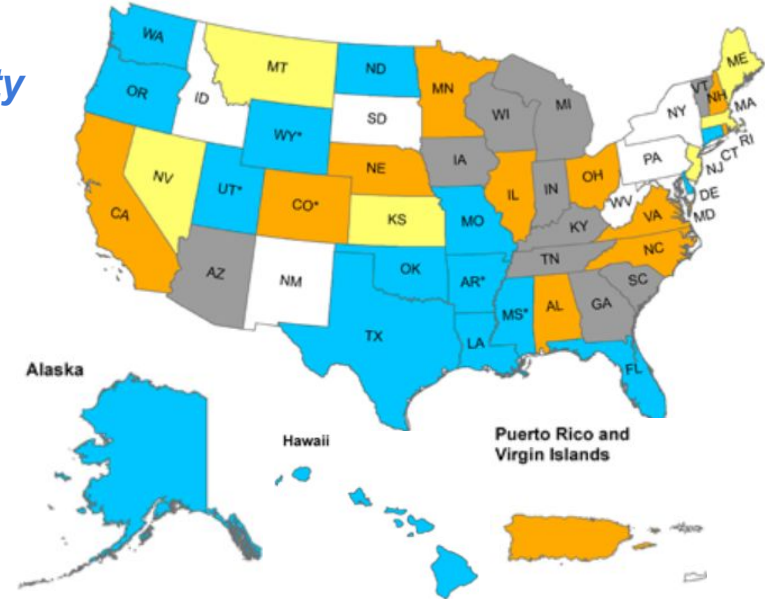
Federally-provided flexibility yields State-level variability

40 CFR §280.12 Free Product - *regulated substance that is present as a nonaqueous phase liquid (NAPL)*

- State implementations: compound-specific regulation vs. TPH regulation
 - Example: LNAPL composed of naphthalene and tetradecane

40 CFR §280.64 Free Product Removal - *...to the maximum extent practicable as determined by the implementing agency...*

- Wide-range of State regulation perspectives:
 - No defined recovery requirements
 - Maximum-allowable thickness
 - Recoverability limits



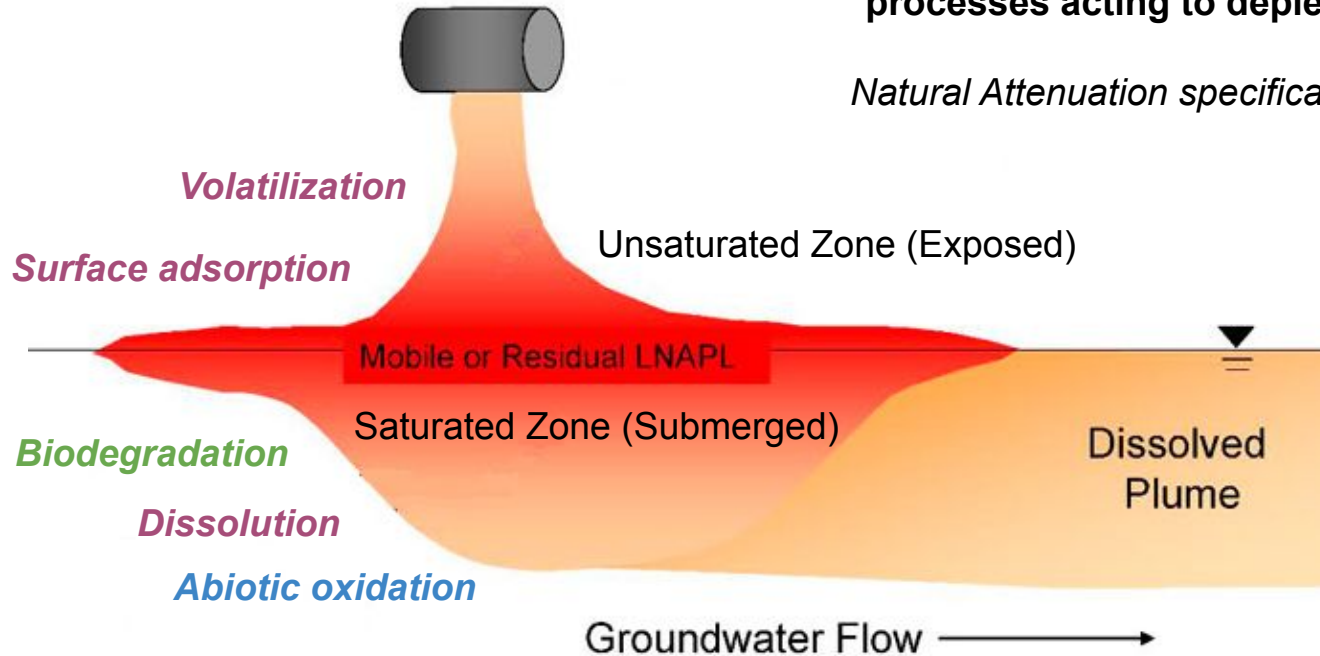
Q17: Does your program utilize screening and/or cleanup/closure levels for TPH contamination in any media?

- No Response
- Yes, fractionated TPH (e.g.- C5 to C35 for Aliphatics and C8 to C35 for Aromatics) only
- Yes, unfractionated TPH (e.g.- TPH GRO, TPH DRO)
- Both unfractionated TPH and fractionated TPH are
- Not Applicable, my agency does not regulate

NSZD: A Tale of Two Regulatory Perspectives

NSZD is the collection of **physical**, **chemical** and **biological** processes acting to deplete the LNAPL body.

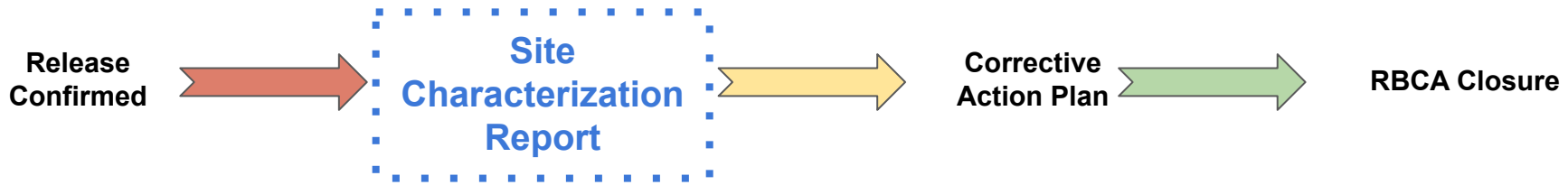
Natural Attenuation specifically addressing LNAPL



NSZD can serve as:

- **Passive remedial alternative**
- **Supporting risk-based case closure**

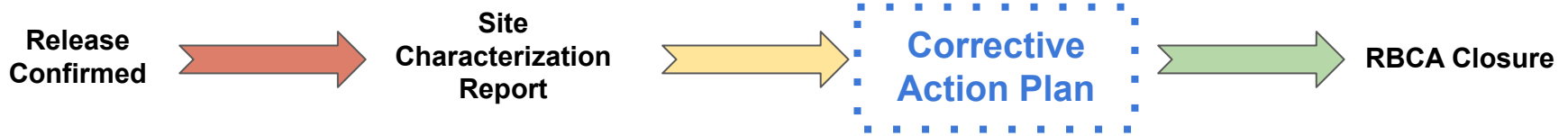
NSZD Assessments Throughout a LUST Investigation



Site Characterization Report & CSM

- Characterization of the LNAPL Body
 - Composition:
 - What components are regulated vs. not-regulated?
 - Are the compositional proportions changing with time?
 - Extent & Magnitude
 - Stability & Mobility
- Demonstrated NSZD acting on LNAPL body as part of natural attenuation assessment
 - Is NSZD occurring in the LNAPL Body & by what mechanisms (multiple lines of evidence)?
 - What is the overall rate of NSZD?
 - Are all regulated constituents attenuating?

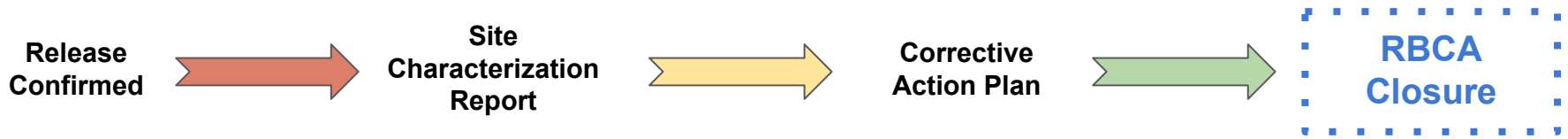
NSZD Assessments Throughout a LUST Investigation



Corrective Action Plan

- Defined site-specific corrective action goals:
 - What is the LNAPL extent reduction required?*
 - Are there specific NAPL constituent concentration goals (e.g. [Benzene] > 100 ppb)?
- Documented proposed remedial method comparisons
 - Sole-remedy vs. multiple-remedy vs. treatment train
 - Time/cost to achieve corrective action goals
 - Proposed performance metrics & responses/contingencies
- Importance of the NSZD rate (Site Characterization)
 - Sole-remedy evaluations - baseline comparison rate
 - Treatment train evaluations - basis for remedy transition

NSZD Assessments Throughout a LUST Investigation



“Is it safe to walk away?”

“How long until risk-based screening levels are achieved?”

LUST Closure (Risk-based Corrective Action Standards)

- Demonstration of achieved correction action goals
- Documentation of continuing NSZD activity
- Evaluation of time remaining to achieve Tier 1 standards
- Documentation & assessment of potentially variable future site factors that might inhibit continued NSZD activity

Documenting NSZD: Lines of Evidence

- Plume Stability
- LNAPL Mass
- Electron Acceptors
- Methane Concentrations in Groundwater
- Soil Gas
- Depletion Rate
- Compositional Analysis



NSZD & Stakeholder Engagement

- Responsible Party
- Regulatory Agency
- Impacted and Potentially Impacted Property Owners
- Municipality
- Utility Companies
- Public

Providing information in the beginning is important but also given the length of time these processes can take periodic updates/reminders may also be important depending on the scenario.

The Regulator's Balancing Act

NSZD as a remedy:

- Feasibility - can all LNAPL remedial objectives be achieved?
- Reasonable timeframe
 - Maintaining site control/access for continued monitoring
 - Potential changes in the use of impacted groundwater
 - Impact to surrounding property values
- Costs vs. active remedial alternative(s)

NSZD supporting a risk-based LUST closure:

- Timeframe to achieve Tier 1 Risk-based screening levels post-closure
- Assessing all potential future groundwater beneficial uses
- Potential changes to site conditions inhibiting NSZD activity
- Impact to future site/area potential development activities