API and BP Training Initiatives

LNAPL Cleanup Alliance RTDF Meeting

Sacramento, Ca

April 17, 2002

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ASSESSMENT OF LNAPL SOURCES:

Distribution, Mobility, Risk and

Risk Reduction

A Workshop Presented by

The American Petroleum Institute

March 21, 2002

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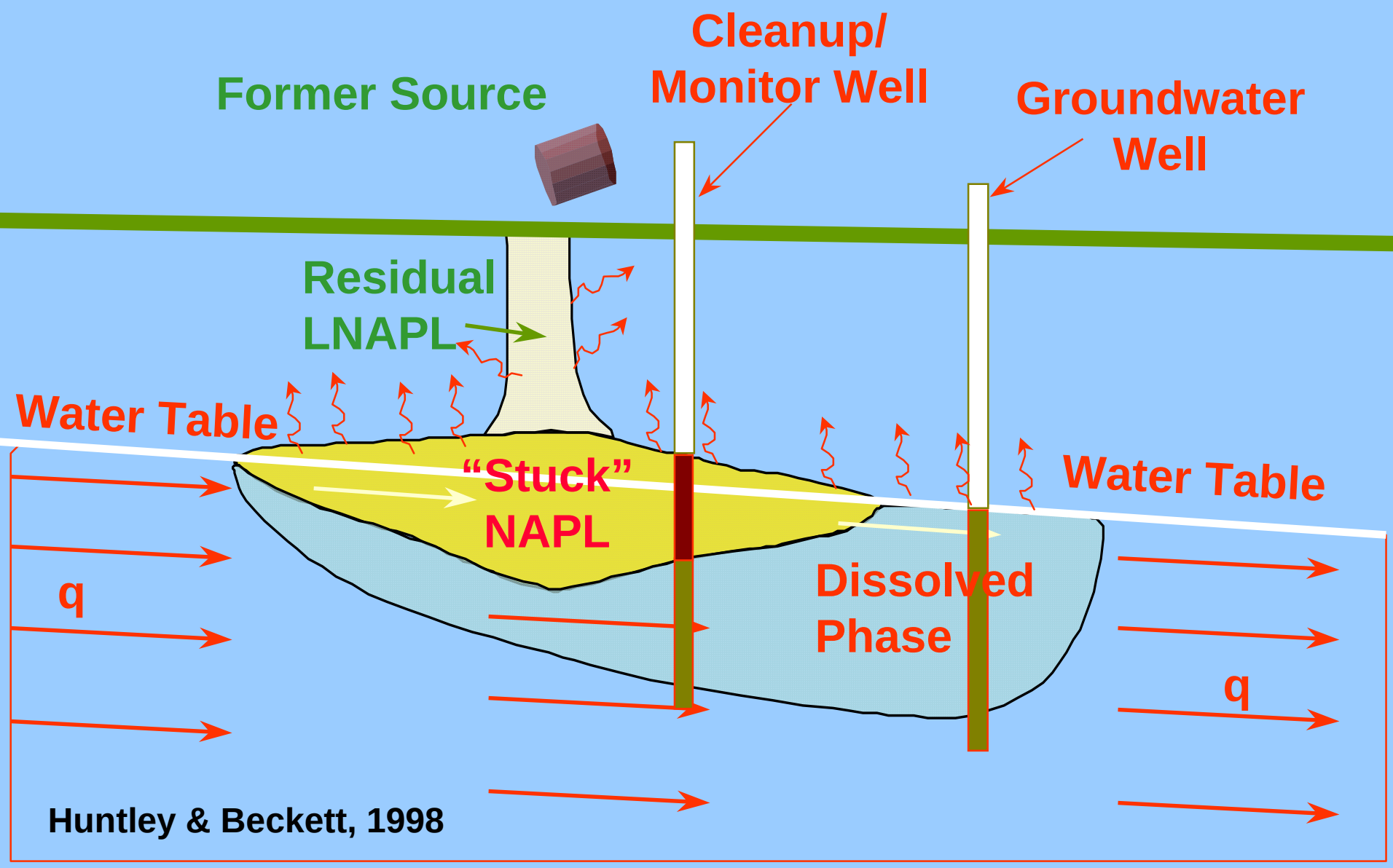
LNAPL Spill Scenario



Terminology

- **LNAPL: light nonaqueous phase liquid,**
  - **– Hydrocarbon, fuel, oil, petroleum, etc.**
  - **• Multiphase: the presence of more than one fluid phase in soil pores**
  - **• Multicomponent: the fractional presence of multiple chemicals**
  - **• Saturation: fraction of available pore space occupied by a fluid**
  - **• Residual saturation: saturation at/below which fluid is immobilized**
  - **• Source removal: reduction in LNAPL mass, natural or active**
  - **• Mobility: capacity of LNAPL to move under prevailing conditions**
  - **• Risk: quantitative health risk of specific compounds in petroleum products (above or below de minimis)**
  - **• Risk reduction: the decrease in risk magnitude or longevity from source reduction**
  - **• Mixed units: you bet, sorry, but the lessons stand regardless of units**

Talk Outline

- Introduction to LNAPL & issues
  - Terms, jargon & FAQs
  - Additional reference materials & NAPL tools
  - Overview of some key issues & observations
- Tech talk
  - Capillarity, saturation, mobility
  - Local area vs plume-wide mobility
  - Chemical aspects
  - Questionable ROT (rules of thumb)
- Remediation & recoverability
- Problem solving using screening tools
- Wrap-up & open discussion

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Workshop Context

- Develop issues related to LNAPL recovery & risk
- Provide background to assist in LNAPL decisions
- Forum for brainstorming issues & problems
  - We're here together, let's talk about this
- This workshop is not a regulatory forum
  - We have no specific proposals for change
  - We are as confused as anyone else
  - We all do better when using solid principles
- Keep in mind the inherent uncertainty in geology..

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Contributors

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- BP-Amoco
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LNAPL

Distribution, Recovery, and Regulatory Approach

February, 2002

Our Purpose

- LNAPL distribution in soil, the volume present, and it's potential recovery are not very well understood
- Scientifically sound understanding and the ability to make quantitative calculations are now becoming readily accessible
- The subject is very complicated
- The data acquisition and analysis could become quite costly
- But we believe that expectations of LNAPL recovery should be practical and realistic and meet the needs of the interested parties
- Thus our goal is to educate the interested parties on the science, and work with them to fulfill all our needs

Questions: How much LNAPL is there,
How much can be practicality recovered, and
Will that which remains pose a risk?

- Topics

- Distribution of free phase in soils
  - Capillary Pressure, Soil and Fluid Properties
- Monitoring well thickness vs. volume of LNAPL in soil
  - Generally the primary measurement we have
- Mobility of hydrocarbon phase in soils
  - Affects spreading and recovery
- Recovery of free phase: API models
- Dissolved phase plumes
  - Affect of source removal on plume length and life
- Risk
- Regulatory Approaches

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Analysis of LNAPL Contamination Distribution and Recovery

Vic Kremesec, Mark Adamski, Ravi Kolhatkar

November 29, 2001

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CLASS AGENDA

- Introductions
- Overview and Basic review of capillarity, saturation, and mobility — Vic
- Review of LNAPL Distribution and Recovery Models
- API Characterization Manual- sampling techniques — Mark
- Charbeneau/API Spreadsheets — Ravi
- Kremesec Spreadsheet for LNAPL Distribution — Vic
- Comparison of field observations of mobility with other measurements: — Ravi
- FFD and baildown tests
- Lunch
- Case Study 1 Fine grained soil — Mark
- Introduction of Sugar Creek data
- Capillary pressure data - fitting with RETC
- Apply API model for distribution, saturation and recovery inputs
- Case Study 2: Coarse grained soil — Ravi
- Whiting data and model application
- S/GW CoE data: Comparison of predictions with site data — Vic
- API LNAPL Project Updates — Vic

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