Site Investigation of Ground Water

Christina Page
New Jersey Department of Environmental Protection
Bureau of Inspection and Review

Ground Water Site Investigation Overview

- Applicable Ground Water Remediation Standards
- How to Conduct a Ground Water SI
- Background Ground Water Investigations

Purpose of a Site Investigation

Determine if remediation is necessary:

- Because contaminants are present at the site or AOC; or
- Because contaminants have emanated or are emanating from the site or AOC; and
- Levels are above any of the applicable remediation standards or criterion

Remediation Standards

- The Remediation Standards, N.J.A.C. 7:26D establish the GWQS as the minimum standards
- The GWQS at 7:9C identifies three ground water designations
- Use or develop the standard that is applicable to the ground water designation

How to Conduct a SI

- Sample locations
- Frequency of sampling
- Data collection
- Important to minimize cross contamination

How to Conduct a SI - Sampling Locations

- Bias both vertically and horizontally to suspected location of greatest contamination
  - Contaminant type
  - AOC history
  - Location of discharge
  - Instrument readings or other field indicators (i.e., visual)
  - Age of discharge

How to Conduct a SI - Sampling Locations

If samples cannot be biased due to access limitations:

- Collect multiple ground water samples surrounding the AOC

OR

- Collect as close to and down gradient from the AOC as practical-
  - Collect down gradient from AOC by predicting GW flow
    - Topographic relief
    - Location of surface water
    - Pumping well
    - Subsurface conduits
    - Adjacent sites
    - Install temporary or permanent wells

How to Conduct a SI - Data Collection

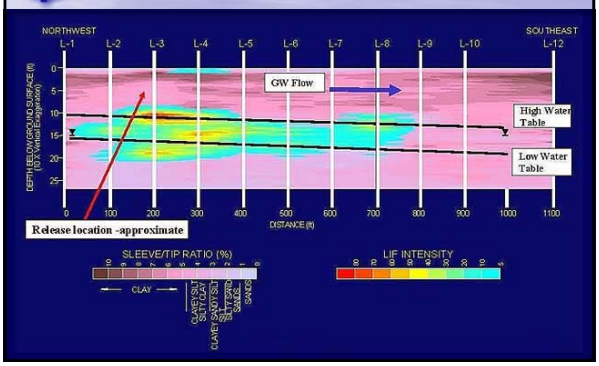
- Log soil cores at each boring location
- Use consistent and approved soil classification systems
- Assists in development of conceptual hydrostratigraphic model

How to Conduct a SI - Vertical Biasing

For contaminants less dense than water:

- Screen soil cores through the water table to account for contamination trapped beneath the water table
- Bias ground water sample to zone of greatest contamination identified during field screening

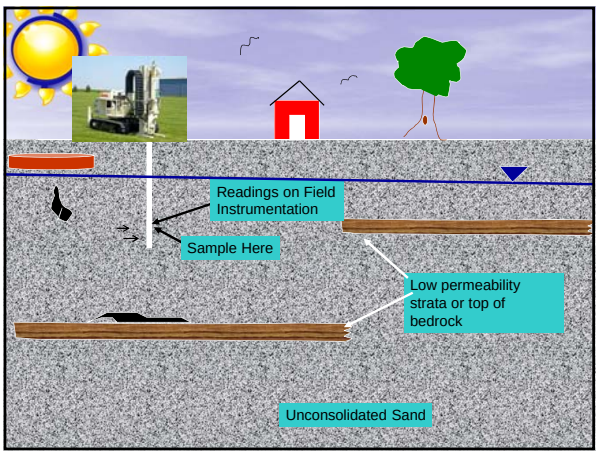
LIF Image Showing Free and Residual NAPL Relative to the Water Table

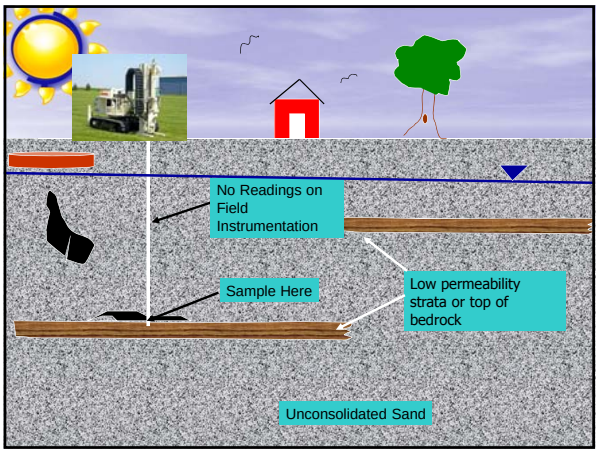


How to Conduct a SI - Vertical Biasing

For DNAPL contaminants:

- Advance core below the water table until:
  - –The first indication of contamination
    OR
  - –The first low permeability strata
    OR
  - –The top of bedrock
- If you encounter bedrock above the water table, sample first ground water in bedrock





Site Investigation Conclusion

Whenever contamination is identified in the site investigation…proceed to the remedial investigation

Background Ground Water Quality Investigation

Why Conduct a Background Ground Water Quality Investigation?

All or part of the contamination identified onsite may be the result of contamination originating from:

- An off-site source; or
- Natural background

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Off-Site Source of Ground Water Contamination Overview

- Scope of background investigation
  - Will depend on site complexity
  - Differentiate on-site vs. off-site contribution
  - Outcome needs to be technically justifiable

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Scope of Background Investigation

- Site complexity may warrant
  - Multiple sampling points
  - Multiple sampling events
  - Multiple water bearing zones
  - Tailor analysis to contaminants of concern, including parent/degradation products
  - Collect hydrogeologic data to support conclusion

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Scope of Background Investigation

- Understand **<u>on-site</u>** contribution
  - Conducting a comprehensive PA
  - Identify all areas of concern SI
  - Delineating source areas RI

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Scope of Background Investigation

- We acknowledge that your role has shifted…
  - From DEP driving decisions
  - To LSRPs driving decisions

- Outcome needs to be technically justifiable
  - Consider that the site "next door" may hire a LSRP to critique the conclusions of your investigation

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Ground Water Remediation Requirements

- No ground water remediation is necessary when:
  - The contaminant was never used on the site
  - The contaminant was never discharged on the site
  - The contaminant is present in the background samples

Call the DEP Hotline to report the upgradient, unknown source contamination

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Ground Water Remediation Requirements

- If there has been a site related discharge, no further ground water remediation is necessary when:
  - All site related contamination associated with the AOC has been remediated, and
  - Contaminant concentrations are greater in the upgradient ground water

Ground Water Remediation Requirements

- Further remediation is required when:
  - There has been site related discharge

AND

  - On-site ground water contaminant concentrations are greater than concentrations coming on to the site

Ground Water Remediation Standard

- The Ground Water Remediation Standard **is the higher of**:
  - The Ground Water Quality Standard for the contaminant

or

  - The background concentration of the contaminant

GWRS Based on Background

- Background ground water concentration may change over time
- Re-evaluate background contaminant concentrations at a regular frequency
- Revise the site specific ground water remediation goal based on current background concentrations

Natural Background

- Support natural background based on:
  - The composition of the formation
  - The ubiquitous distribution of the constituents
  - No elevated concentrations at AOCs

Natural Background Requirements

- No discharge:
  - No remediation required
  - No CEA or remedial action permit required
- Discharge has occurred:
  - Remediate
  - CEA and remedial action permit may be required