Flux-Based Site Management

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Workshop Objectives

- Show by principle and practice the importance and utility of flux-based data for characterizing, managing, and remediating contaminated sites

- Present state-of-the-science information on measurement of reliable mass flux and mass discharge data

- Examine flux-based remedial design and assessment tools and demonstrate their application
Workshop Agenda

I. Linkage between Triad and flux-based site management

II. Flux-based site management – what is it? why use it?

III. Numerical and management tools to facilitate data application and enhance data utility [REMChlor]

IV. Field measurement of mass flux and mass discharge

V. Application of flux-based site management – Case Studies
The Challenge:

- Residual DNAPL
- Pooled DNAPL
- Dissolved Plume
- GW Flow
- Source Zone
- Source Control Plane
- Compliance Plane

Source Control Plane

Compliance Plane
Why Flux-Based Approach

Pre-Remediation:

Source Zone → Dissolved Plume → DNAPL Mass Reduction → Flux Response → Plume Response → Risk Response

Source Treatment

Plume Treatment
Flux-Based Concepts, cont’d

Flux measurements provide quantitative information about:

- **Source Strength**
  - $M_D$ at the source control plane

- **Source-Plume Dynamics**
  - Dynamics = $f$ (Source strength + plume degradation)

- **Contaminant Degradation**
  - Based on one or more downgradient control planes

- **Spatial Flux Distribution**
Flux-Based Concepts, cont’d

This information can be used to:

- **Prioritize Sources by Strength**
  - Between sites
  - Within sites

- **Focus Source Treatment**
  - Based on flux distribution at source control plane

- **Optimize Resource Allocation**
  - Between source and plume
  - Based on source strength/longevity & contaminant degradation

- **Monitor Remedial Performance & Effectiveness**
  - Shorter time scale
  - More reliable projections
**Flux-Based Concepts**

- **Control Planes**
  - Transect of multiple wells (typically)
  - Perpendicular to mean groundwater flux direction
- **Mass Flux** ($J$, $ML^2T^{-1}$) - mass of contaminant per unit area per unit time
- **Mass Discharge** ($M_D$, $MT^{-1}$) - integration of mass flux across control plane area
- **Source Strength** - contaminant $M_D$ at source control plane
- **Source Mass** – contaminant mass within the source zone (M)
- **Source Architecture** – contaminant distribution and morphology and its relationship to the flow field