

# Roadmap for Remedy Closure Concept & Discussion

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# Remedy Case

- ◆ P&T remedy
- ◆ In operation for over 5 years
- ◆ Plume restoration is a cleanup goal
- ◆ Final remedy (not interim)

# What is “Remedy Closure”

- Closure for P&T remedy means RA is complete (for OU).
  - ◆ Goals of P&T remedy have been attained,
  - ◆ No further actions are needed for OU.
  - ◆ May be able to shut down all or part of P&T (if not needed to contain plume).
- Site eligible for deletion from NPL (if RAs are complete for all OUs).

# Problems

- How to determine that plume restoration goals have been attained?
- How to determine that attainment of restoration goals is TI, and goals should be changed?
- Process for documenting these determinations.

# For Today

- **Focus on TI determination:**
  - ◆ **Discuss how TI can be applied to long operating P&T remedies (say 5-10 years).**
  - ◆ **Explain how TI decision can facilitate closure of P&T remedy.**
  - ◆ **Suggest methods for analyzing P&T performance data to support TI decision.**

# TI Decision

- TI decision allows cleanup goals to be revised:
  - ◆ ARARs (e.g., MCLs) are waived over all or part of plume,
  - ◆ New goals can be non-restoration only (e.g., plume control).

# TI and Remedy Closure

- With TI decision, revised cleanup goals for P&T can be:
  - ◆ Waive ARARs for some or all of plume,
  - ◆ Attain ARARs over part of plume,
  - ◆ Plume management only (i.e., containment),
  - ◆ Cleanup goals set above MCLs (e.g., to levels achieved to date by P&T),
  - ◆ Other?
- Revised remedy must still protect human health and the environment.

# TI and Remedy Closure - 2

- **Steps to closure of P&T remedy:**
  - ◆ **Optimization of P&T,**
  - ◆ **Data and analysis to support TI decision,**
  - ◆ **Decision documents (Proposed Plan, then ROD Amendment),**
  - ◆ **Final RA Report (this documents that cleanup have been attained).**
  
- **Site eligible for deletion from NPL (if RAs are complete for all OUs).**

# TI Decision Document

- **ROD Amendment to include:**
  - ◆ **TI decision and summary of rationale,**
  - ◆ **Revised cleanup goals for ground water,**
  - ◆ **Criteria for determining that revised cleanup goals have been attained,**
  - ◆ **Remedy components (new or revised) to ensure remedy is protective.**
  
- **Changes to remedy goals and TI decision should be in ROD Amendment, not ESD.**

# Analyzing Data - General

- In general, performance data from P&T remedy will be analyzed:
  - ◆ For individual wells rather than averaging over multiple wells,
  - ◆ For individual contaminants of concern (CoCs),
  - ◆ For each aquifer,
  - ◆ TI evaluation will focus on recalcitrant (resistant) CoCs.

# Analyzing Data - History

- **History of sampling results plotted to show:**
  - ◆ **Large reductions in CoC concentrations after start of P&T,**
  - ◆ **Leveling off of concentrations over time,**
  - ◆ **A “stabilized” trend has been established.**
    - ☞ **How much data needed, over what time, to indicate “stabilized” trend?**

# Analyzing Data – Trend

→ Trend analysis only on “stabilized” portion of data:

◆ **Statistical tests can be used:**

☞ Is there a trend?

☞ Is trend downward, level, or upward?,

◆ **Can trend be projected?**

◆ **What are upper and lower limits of projected trend?**

☞ Graphical and/or statistical analysis.

# Estimating Cleanup Time

- Estimate time needed to reach cleanup goals (e.g., MCLs):
  - ◆ Using projection of trend from:
    - ☞ Upper limit (longer time),
    - ☞ Lower limit (shorter time),
    - ☞ Difference indicates uncertainty,
    - ☞ Level or upward trend indicates infinite cleanup time.
  - ◆ Use incremental concentration reduction per year to estimate cleanup time.
  - ◆ Plot cleanup times on plume map.

# Estimating Cleanup Time - 2

→ Other methods for estimating cleanup time:

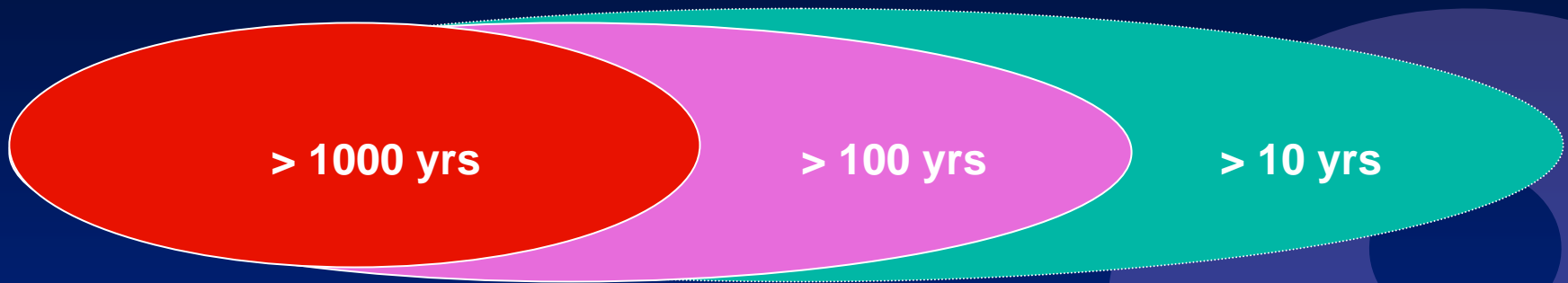
◆ Extrapolate data per total volume pumped instead of per unit time:

- ☞ Additional volume to be pumped to attain goal (e.g., MCL),
- ☞ Time needed for P&T system to pump this volume?

◆ From contaminant transport modeling

◆ Compare results.

# Plotting Time Frames



**Example: estimated cleanup time frames are plotted and contoured on plume map.**

# Reasonable Time Frame

- ➔ **What is “reasonable” for this case:**
  - ◆ **Additional time to attain cleanup goals with long operating P&T, given large uncertainties of trend analysis.**
  - ◆ **Over 100 years?**
    - ☞ **May not be reasonable?**
  - ◆ **Over 1000 years?**
    - ☞ **Clearly, this is not reasonable.**

# Support For TI Decision

- ◆ **Identify site conditions limiting cleanup from CSM:**
  - ☞ Remaining sources,
  - ☞ Geologic conditions.
- ◆ **Corroborate cleanup time estimates,**
- ◆ **Show that P&T remedy is not poorly designed or implemented.**
  - ☞ Was optimization review (RSE) completed?

# Support For TI Decision - 2

- **Discuss why further remedial actions should not be undertaken:**
  - ◆ **Why not further source control,**
  - ◆ **Why not further treatment of plume “hot spots,”**
  - ◆ **Explain that efforts to date have cleaned up sources and ground water to the extent practicable.**

# Support For TI Decision - 3

## → Conclusions from TI evaluation:

- ◆ ARARs to be waived,
- ◆ Proposed extent of TI zone,
- ◆ Basis for extent of TI zone.

# Assessing Attainment - Pumps On

→ History of sampling results plotted to show:

- ◆ Large reductions in CoC concentrations after start of P&T,
- ◆ Leveling off of concentrations over time,
- ◆ A “stabilized” trend has been established,
  - ☞ How much data needed, over what time, to indicate “stabilized” trend?
- ◆ “Stabilized” trend at or below cleanup goal (MCL). Pumps still on.

# Assessing Attainment – Pumps Off

→ Decision to cease pumping.

→ Post shut down monitoring, phase 1:

- ◆ Verify re-stabilization of water levels,

- ◆ If rebound, what are options?

- ☞ Re-start pumps
- ☞ More source control?
- ☞ TI?

# Assessing Attainment – Pumps Off

- ➔ **Post shut down monitoring, phase 2:**
  - ◆ **Collect sufficient data to show “stabilization” of CoC concentrations,**
  - ◆ **Trend analysis on “stabilized” data:**
    - ☞ Is there a trend?
    - ☞ Is trend downward, level, or upward?
    - ☞ Will CoCs remain below MCLs over time?
    - ☞ What is level of confidence?
  - ◆ **If goals not attained, what are options?:**
    - ☞ Collect more data?
    - ☞ Re-start pumps?
    - ☞ TI waiver?

# Need Site Data

- To provide data sets for testing of analysis methods,
- Case studies to be used as examples in guidance:
  - ◆ P&T remedy operating, but MCLs unlikely to be attained over part of plume (TI prior to shut down),
  - ◆ P&T shut down and goals attained,
  - ◆ P&T shut down but goals not attained (TI after shut down).