



U.S. DEPARTMENT OF
ENERGY



SRS Groundwater Cleanup and Technology Update

Jeff Thibault

EC&ACP Engineering Remediation Support

Citizens Advisory Board Meeting

May 21, 2024

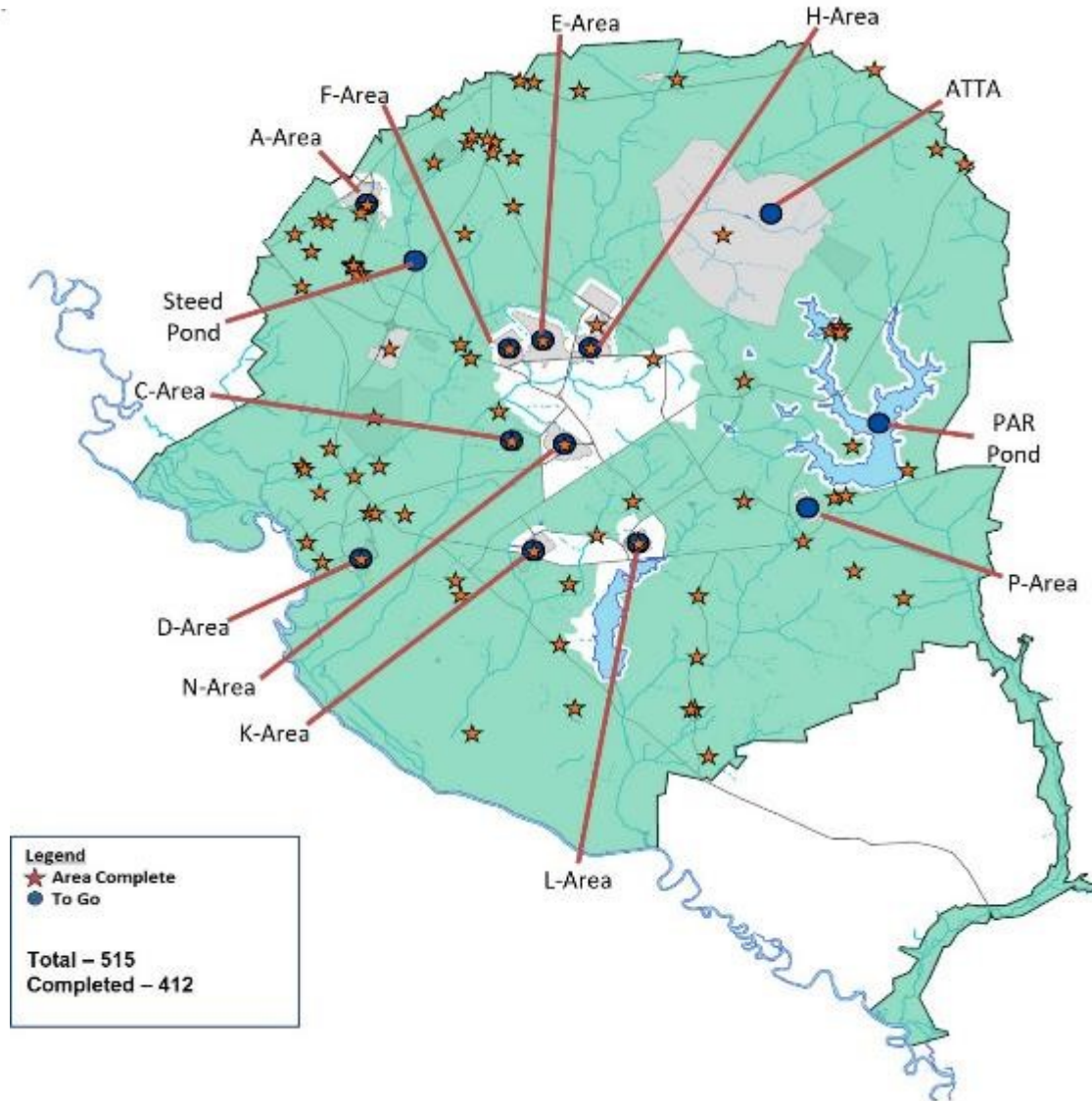


Acronyms

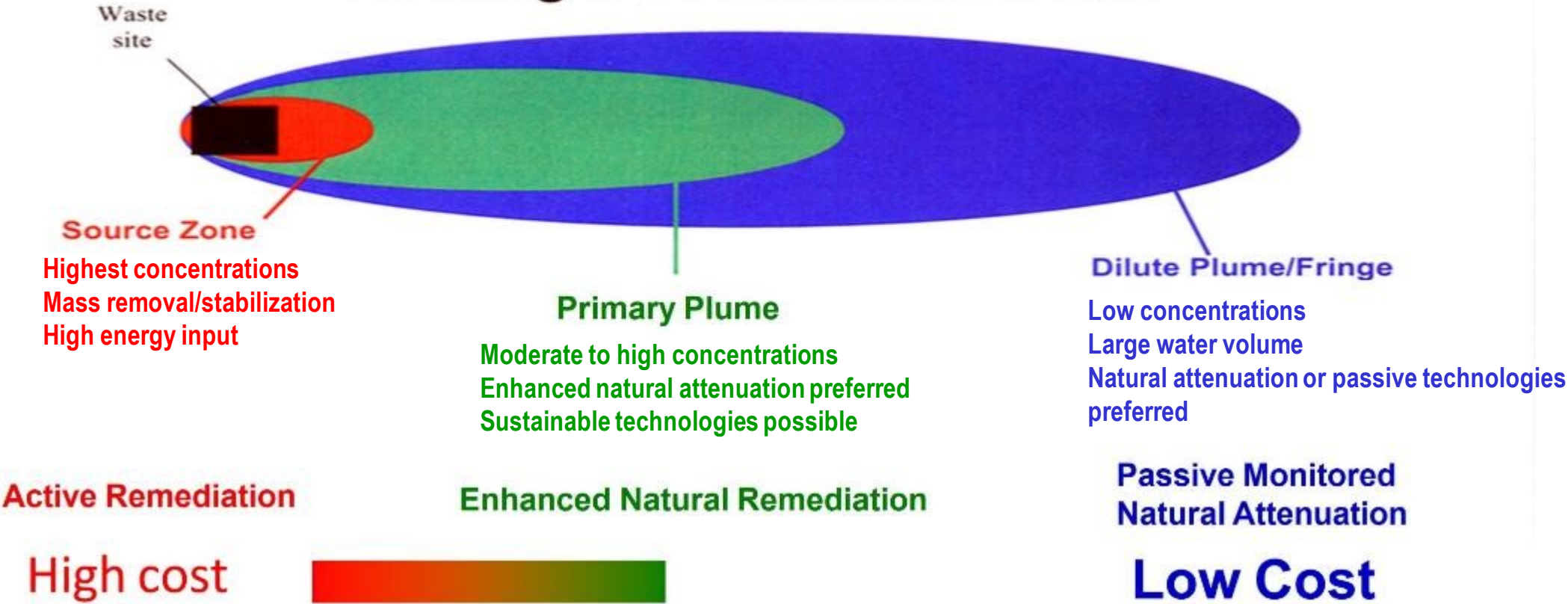
- bgs – below ground surface
- DNAPL – dense non-aqueous phase liquid, a phase of VOCs (solvents) in the subsurface
- DOE – Department of Energy
- DUS – Dynamic Underground Stripping
- EC&ACP – Environmental Compliance and Area Completion Projects
- FFA – Federal Facility Agreement
- lbs. - pounds
- MNA – Monitored Natural Attenuation
- OU – Operable Unit
- PFAS – Per- and Polyfluorinated Substances (emerging contaminants)
- RCRA – Resource Conservation and Recovery Act
- SCDHEC – South Carolina Department of Health and Environmental Control
- SRS – Savannah River Site
- SVE – Soil Vapor Extraction
- USEPA – United States Environmental Protection Agency
- VOCs – Volatile Organic Compounds

Groundwater Cleanup at SRS

- Cleanup started in late 1980's; sitewide groundwater cleanup continues and is ongoing
- Two regulatory mechanisms – RCRA Permit (DOE and SCDHEC) and FFA (DOE, USEPA and SCDHEC)
- Groundwater remedies moving from active to sustainable technologies
 - 3 Active Remediation Systems
 - 13 Enhanced Natural Remediation Systems
 - 25 Passive Natural Attenuation Remedies
 - 27 Remediation Systems Shut Down (cleanup criteria achieved)



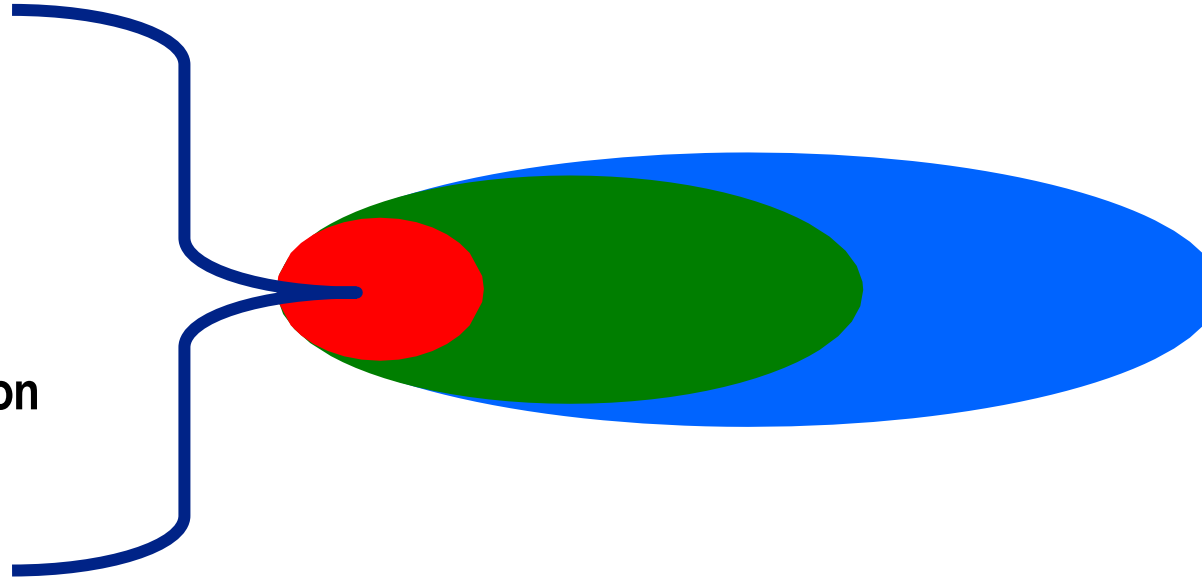
Treating a Contaminated Site



Source Zone – “Hot Spot” Cleanup Technologies

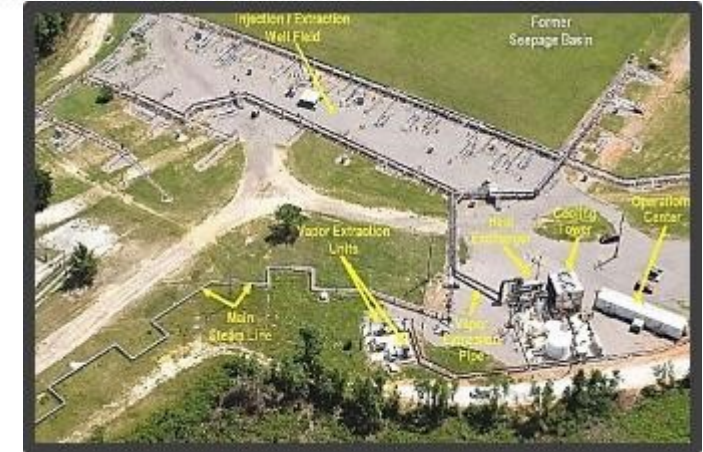
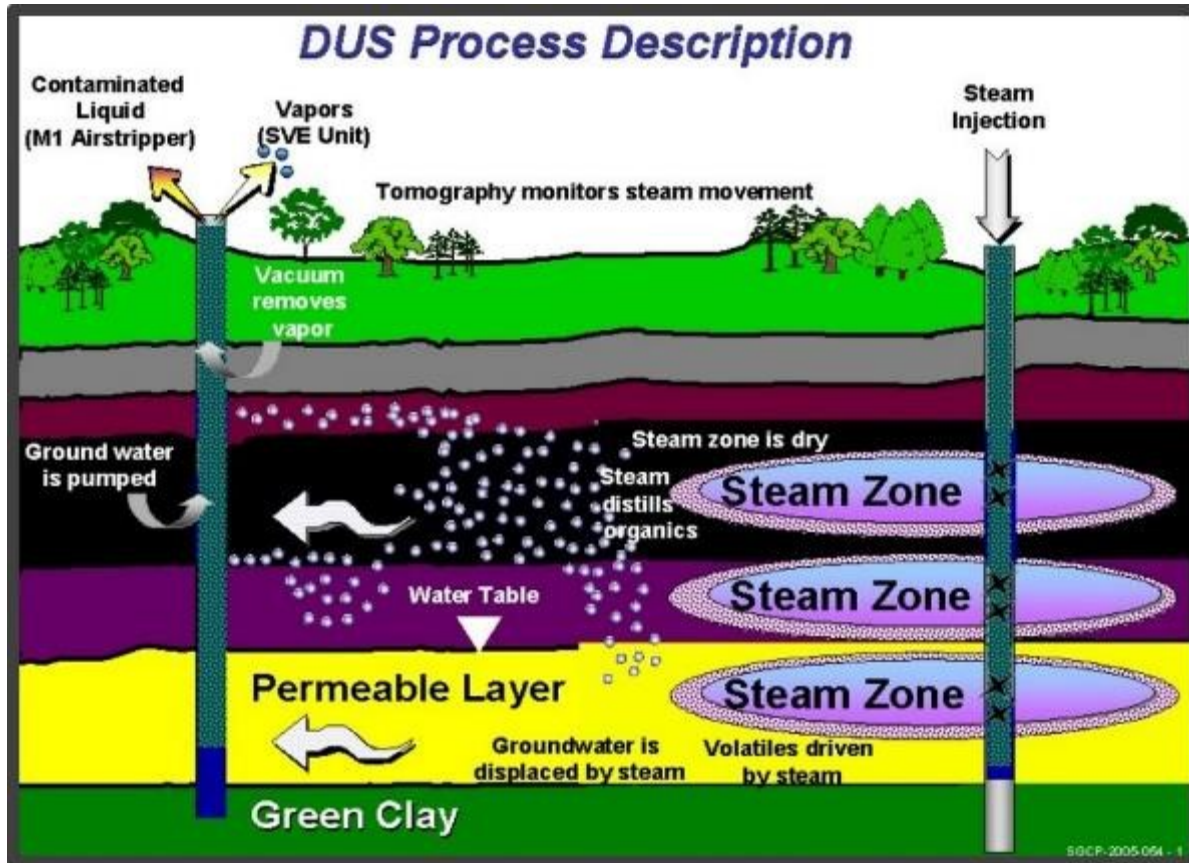
Aggressive, often higher cost technologies are used to treat the source zone; typically, smallest area of the plume

- Source Control
- Product extraction
- Thermal technologies
- In-situ chemical oxidation
- In-situ biodegradation



Example of Source Zone Remediation - Dynamic Underground Stripping

- 2 million pounds of solvent released to M-Area basin
- Inject Steam, extract and treat vapor and water (operated 2005-2012)
- Over 450,000 pounds of solvent removed



Dense Non-Aqueous Phase Liquids (DNAPL)

Primary Plume – Containment and Enhanced Natural Attenuation Technologies

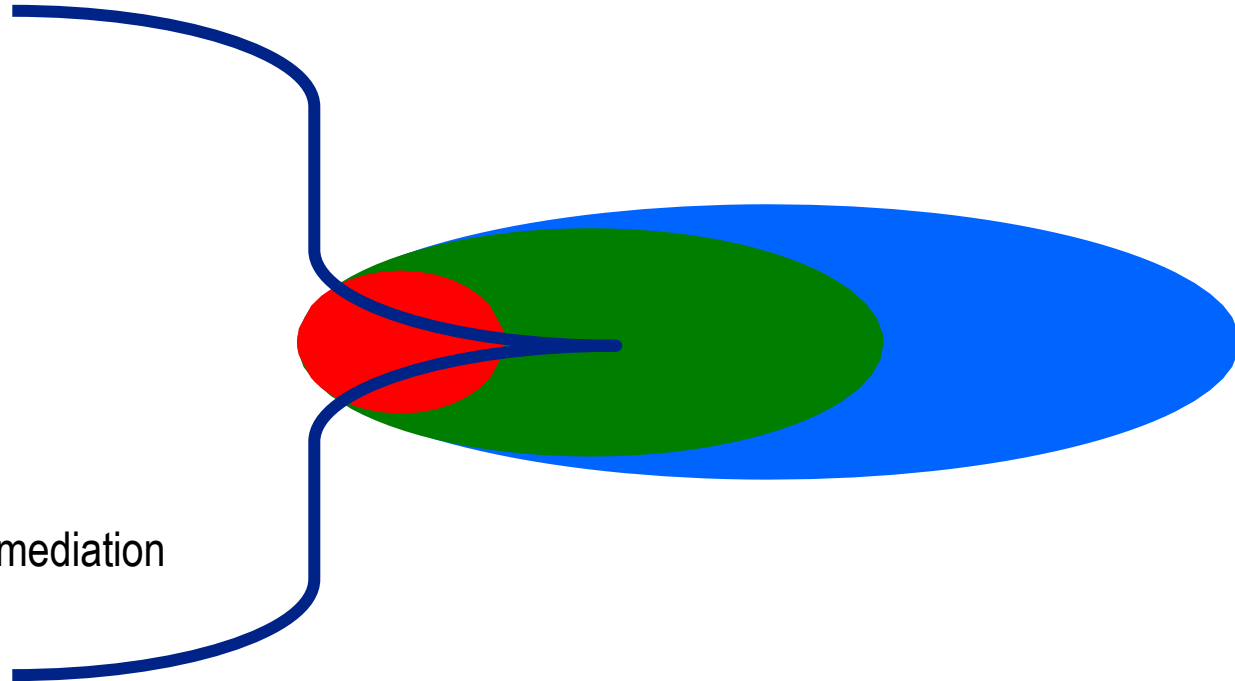
Generally lower energy and cost remedies than source zone treatment
Opportunity to deploy enhanced natural attenuation sustainable remedies

- **Hydraulic Control**

- Pump and Treat
- Groundwater barriers
- Phytoremediation

- **In situ**

- Recirculation wells
- Chemical injection
- Nutrient injection to enhance bioremediation
- Permeable Reactive Barrier

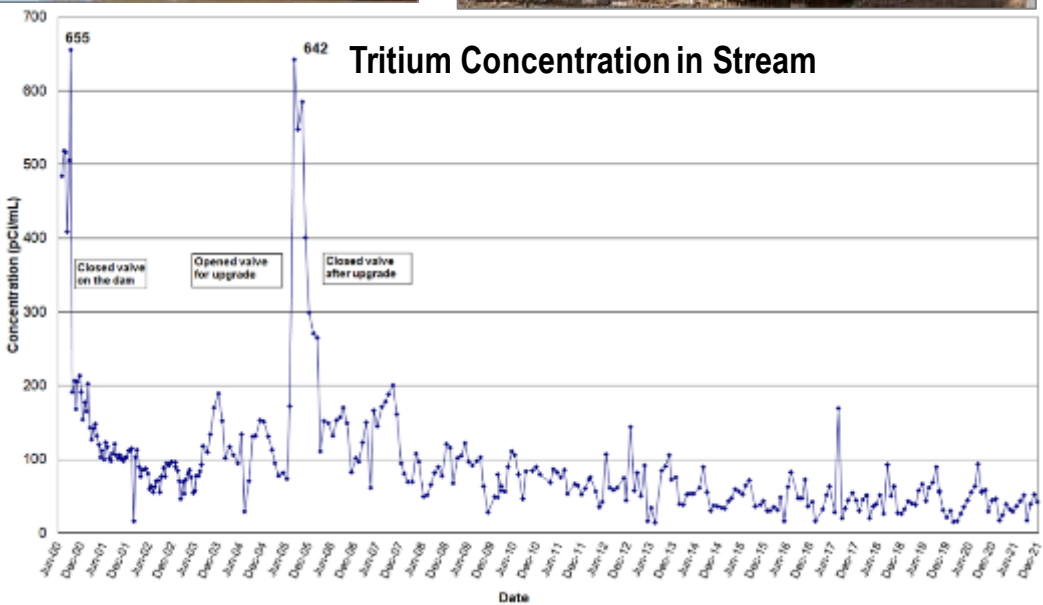


Example of Primary Plume Remediation - M1 Air Stripper Groundwater Recovery Wells: Active System

- VOC plume in A/M Area
- Recovery wells capture most contaminated portion of aquifer 150 – 200 feet bgs
- Nearly 40 years operating, removed ~600,000 lbs. of VOCs and treated via air stripping
- Continuous operation of groundwater recovery well system ~500 gpm, 10 wells, ~10,000 lbs. per year
- Optimize with well additions and subtractions

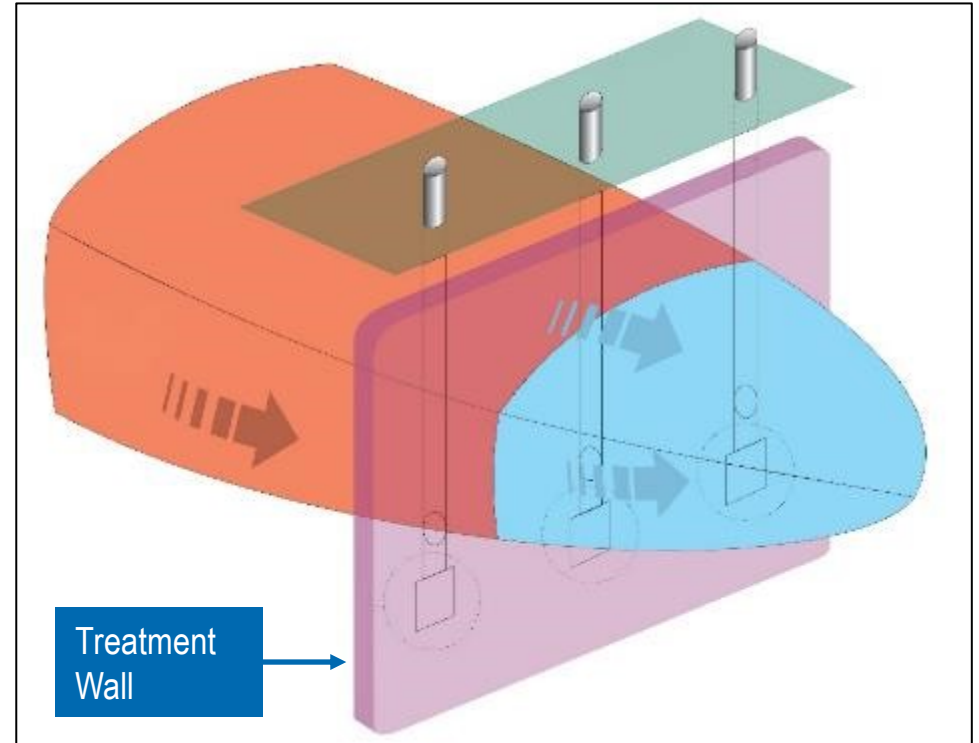


Example of Primary Plume Remediation - Phytoremediation: Enhanced Natural Remediation for Tritium



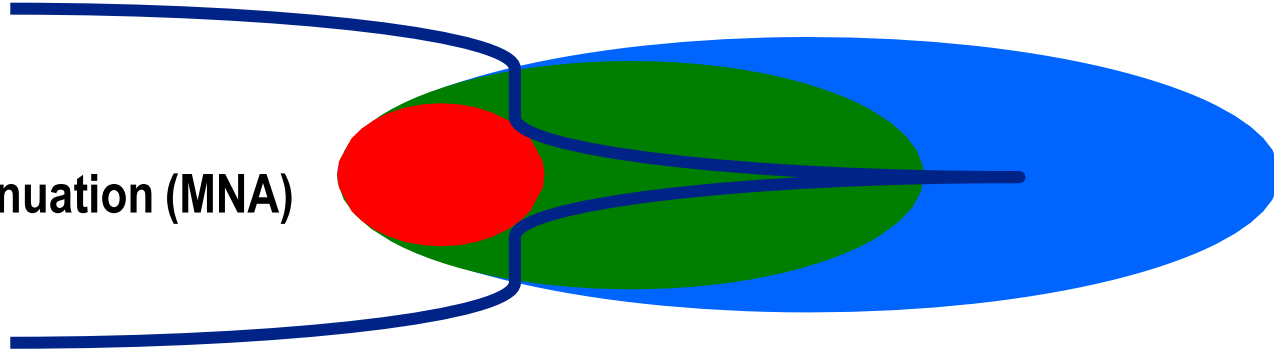
Example of Primary Plume Remediation - Permeable Reactive Barrier: Enhanced Natural Attenuation

- P-Area VOC plume in ancient stream channel
- Injected zero-valent iron recycled from engines to form 250-foot wall in 2019
- >95% destruction of VOCs in wall



Plume Fringe - Passive, Sustainable Cleanup Approaches

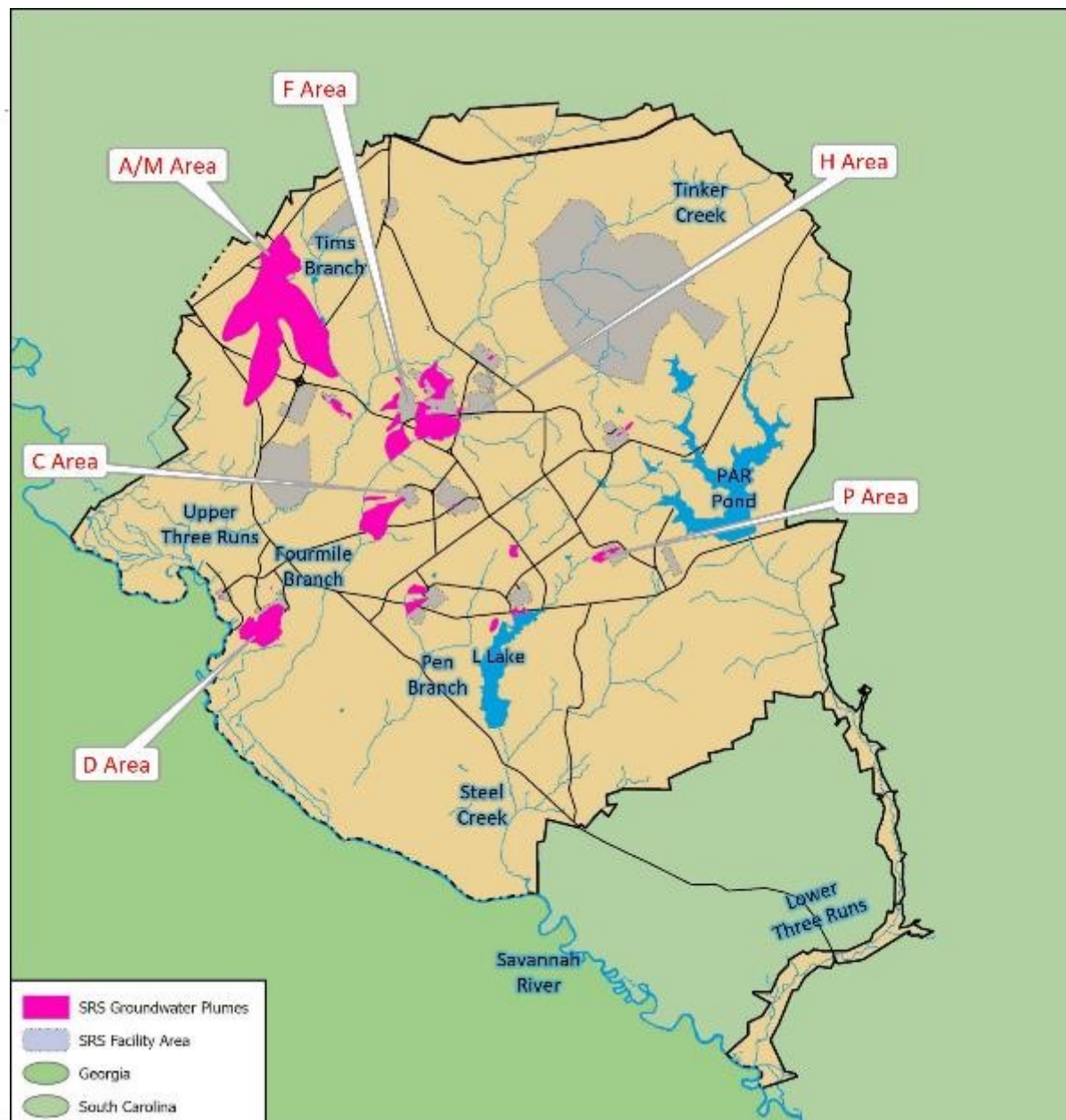
- **Bioremediation**
- **Monitored Natural Attenuation (MNA)**



- **Natural attenuation remedy at 3 groundwater Operable Units**
- **Monitored Natural Attenuation remedy at 9 groundwater Operable Units**
- **Attenuation is effective where:**
 - Source control
 - No one exposed to groundwater
 - Not impacting surface water above regulatory limits
 - Plume not significantly expanding
 - Long-term monitoring and reporting to verify

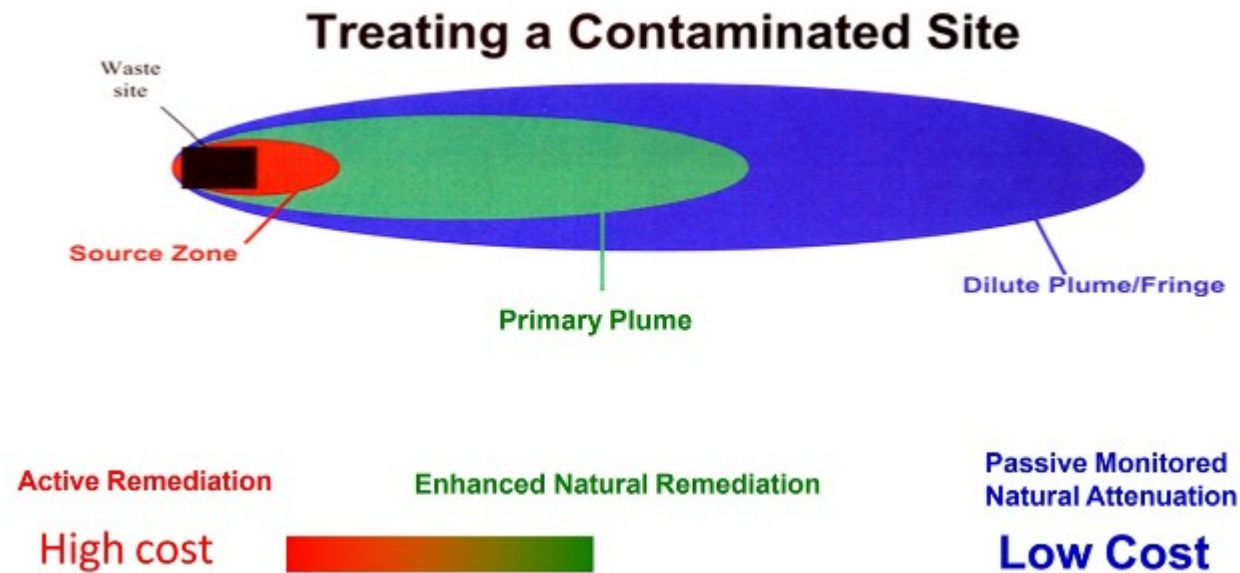
Work in Progress Next 5 Years

- P Area Groundwater OU – Final Remedial Alternatives for VOCs and Tritium
- C Area Groundwater OU – Final Remedial Alternatives for VOCs and Tritium
- D Area Groundwater OU – Final Remedial Alternatives for VOCs, Tritium, metals, and PFAS
- A/M Area Groundwater under RCRA Permit – Implement Characterization and Corrective Action Plans for VOCs
- F/H Area under RCRA Permit – Continue Implementing Approved Corrective Actions



Summary

- Accomplished much (33 groundwater remediation decisions are ongoing or complete, final decisions are still needed in 9 areas)
- Remedies are matched to plume-specific conditions with emphasis on sustainable natural remediation
- Deployed innovative remedies that leverage natural processes and incorporate green technologies into the groundwater cleanup process
- Multiple projects recognized by DOE for sustainable remediation practices



Questions?

