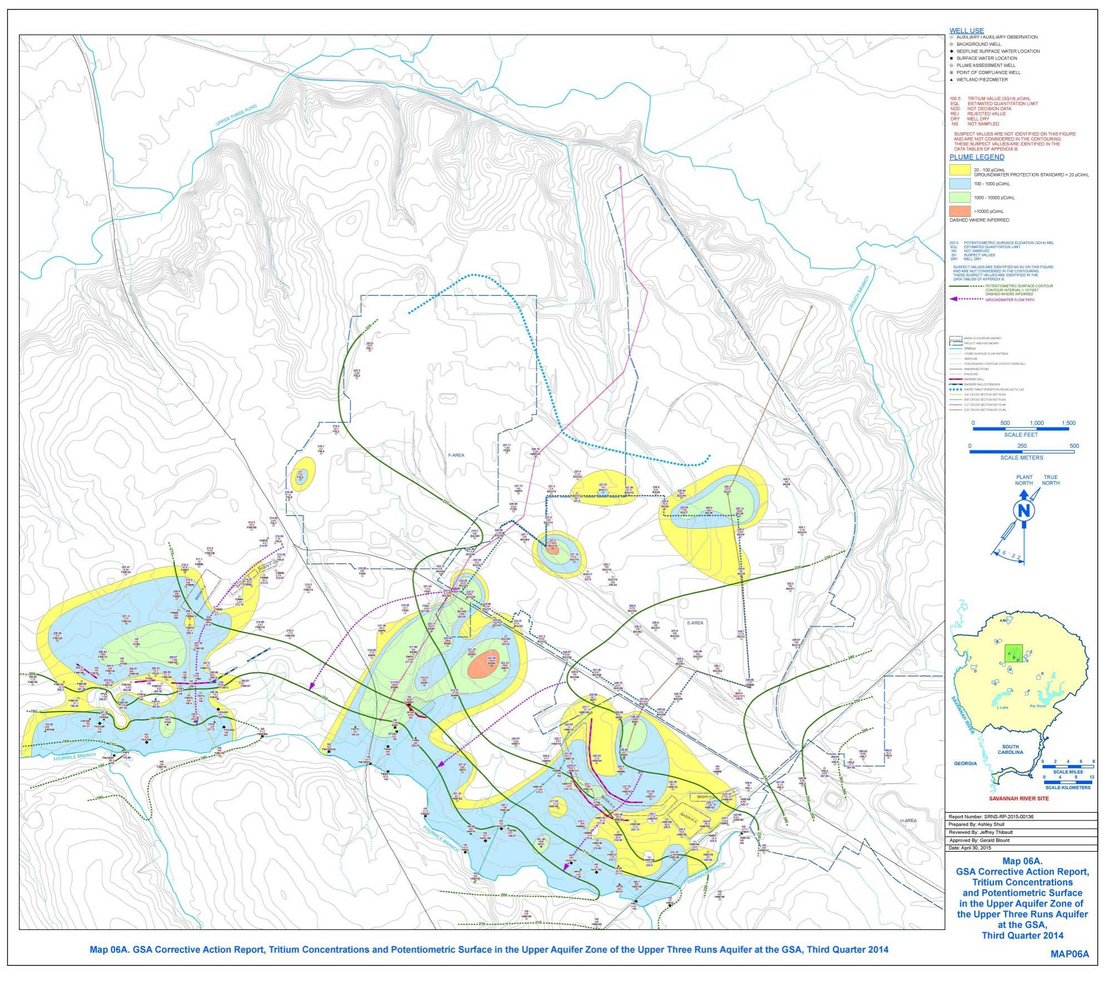
Innovative In-Situ Groundwater Remediation for Tritium, Metals, and Radionuclides in Acidic Groundwater

History and Original Pump & Treat Strategy

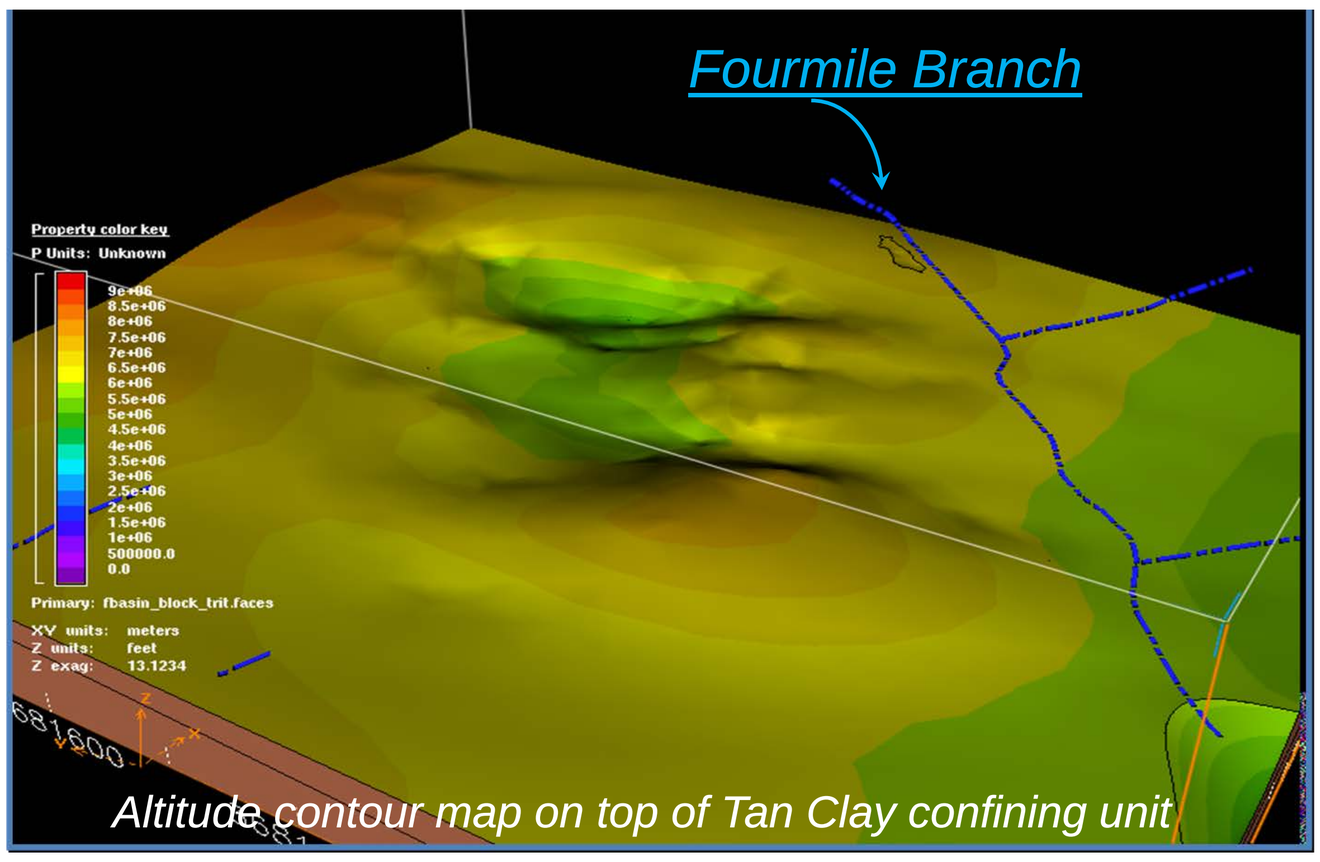
- Seepage Basins operated 1954 -1988
- Received 12 billion liters of acidic, radioactive process water from chemical separations facilities
- Capped in early 1990s
- Shallow, persistent, low pH contaminant plume stripped the formation of metals (including natural radionuclides) and minimized the retardation of contaminants
- Plumes discharge into Fourmile Branch
- Treatment system employed extraction and injection wells to manage releases to surface water
- Hydraulic containment of tritium was ineffective
- Systems were costly; projected 90-year operation (until tritium compliance achieved) would have been >$10B



Map 06A. GSA Corrective Action Report, Tritium Concentrations and Potentiometric Surface in the Upper Aquifer Zone of the Upper Three Runs Aquifer at the GSA, Third Quarter 2014

Emergence of Technical Issues

- Extraction wells did not fully capture contaminant plumes
- Additional characterization required to understand hydraulic controls



Altitude contour map on top of Tan Clay confining unit

Contaminant Movement in Irwinton Sand

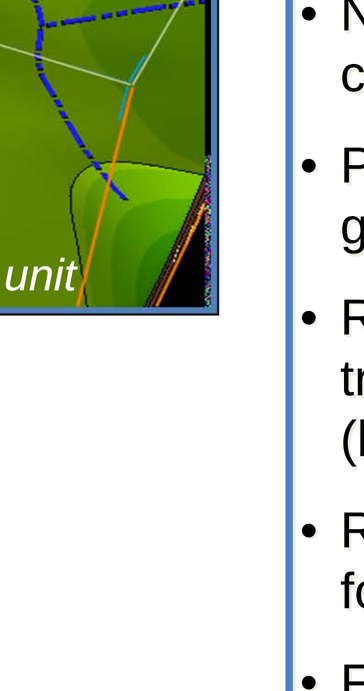
- Core studies and CPT data revealed physical properties and erosional structure of Tan Clay confining unit
- Channels control contaminant migration in overlying Irwinton Sand

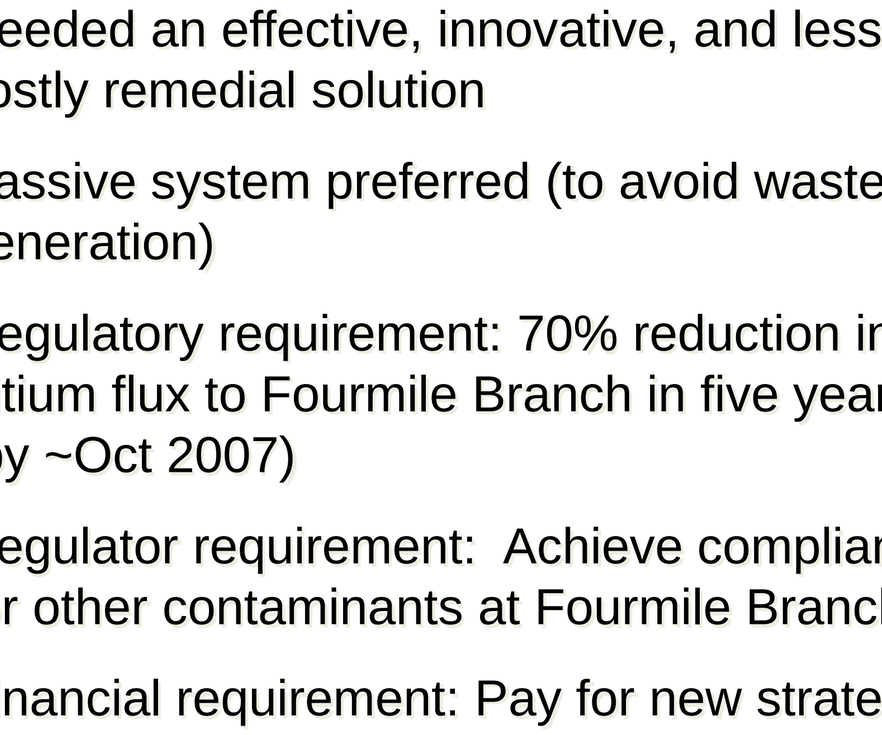
New Approach Required

- Needed an effective, innovative, and less costly remedial solution
- Passive system preferred (to avoid waste generation)
- Regulatory requirement: 70% reduction in tritium flux to Fourmile Branch in five years (by ~Oct 2007)
- Regulator requirement: Achieve compliance for other contaminants at Fourmile Branch
- Financial requirement: Pay for new strategy with savings from shutdown of P&T system

Innovative Remedial Solution

- Exploit the preferential flow path in the Irwinton Sand and the erosional structure atop the Tan Clay
- Control and direct the flow of contaminated groundwater using a funnel and gate system
- Inject base solution at the treatment gates to precipitate dissolved metals and radionuclides
- Also achieves 70% reduction in tritium flux to Fourmile Branch





Slurry wall drilling and conceptual design of funnel & gate