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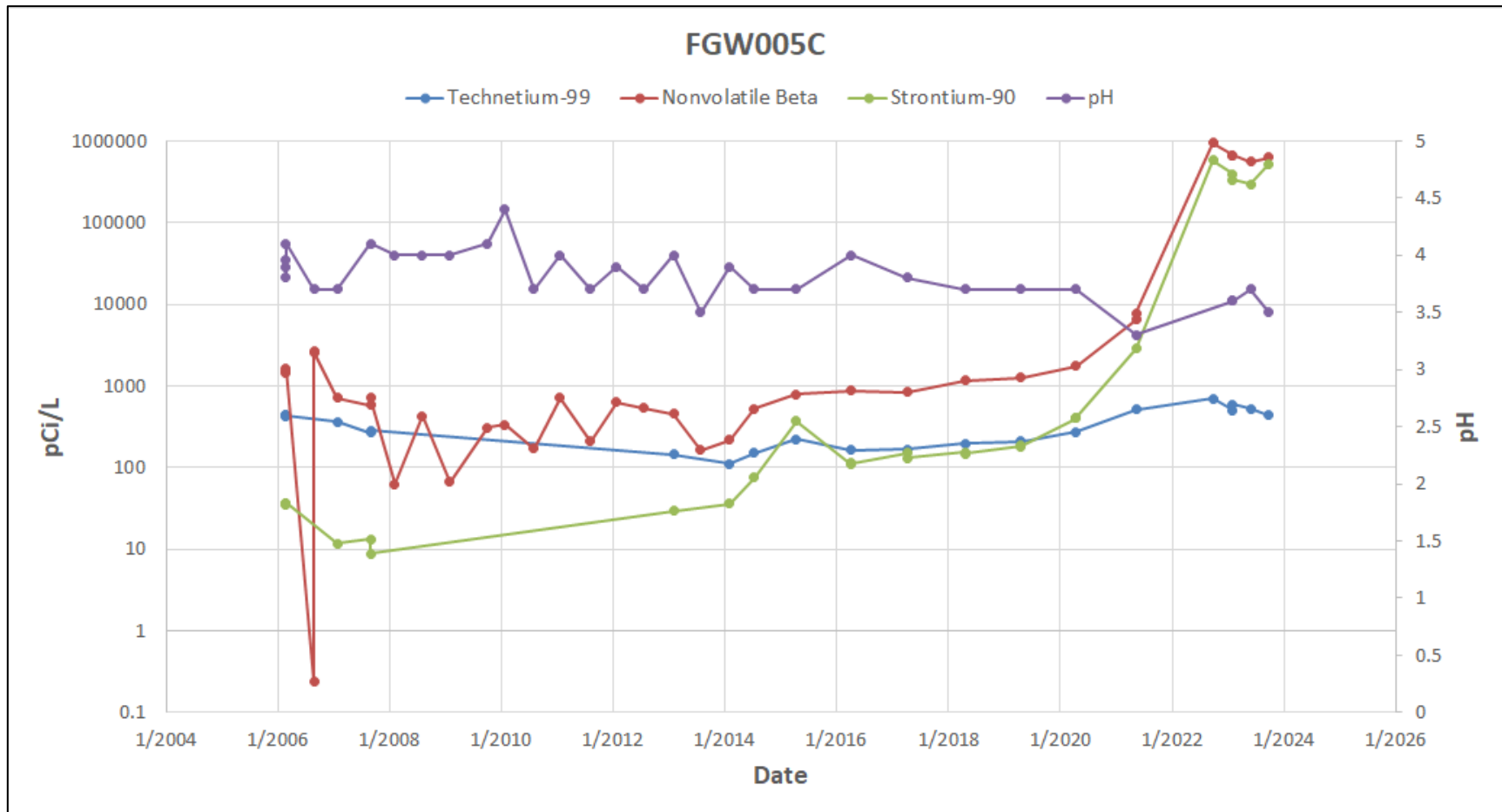
# **Nonvolatile Beta and Strontium-90 in the GSA Western Groundwater OU West Plume**

**SRNS-MS-2024-00286**

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SRNS/ACP

*June 10, 2024*  
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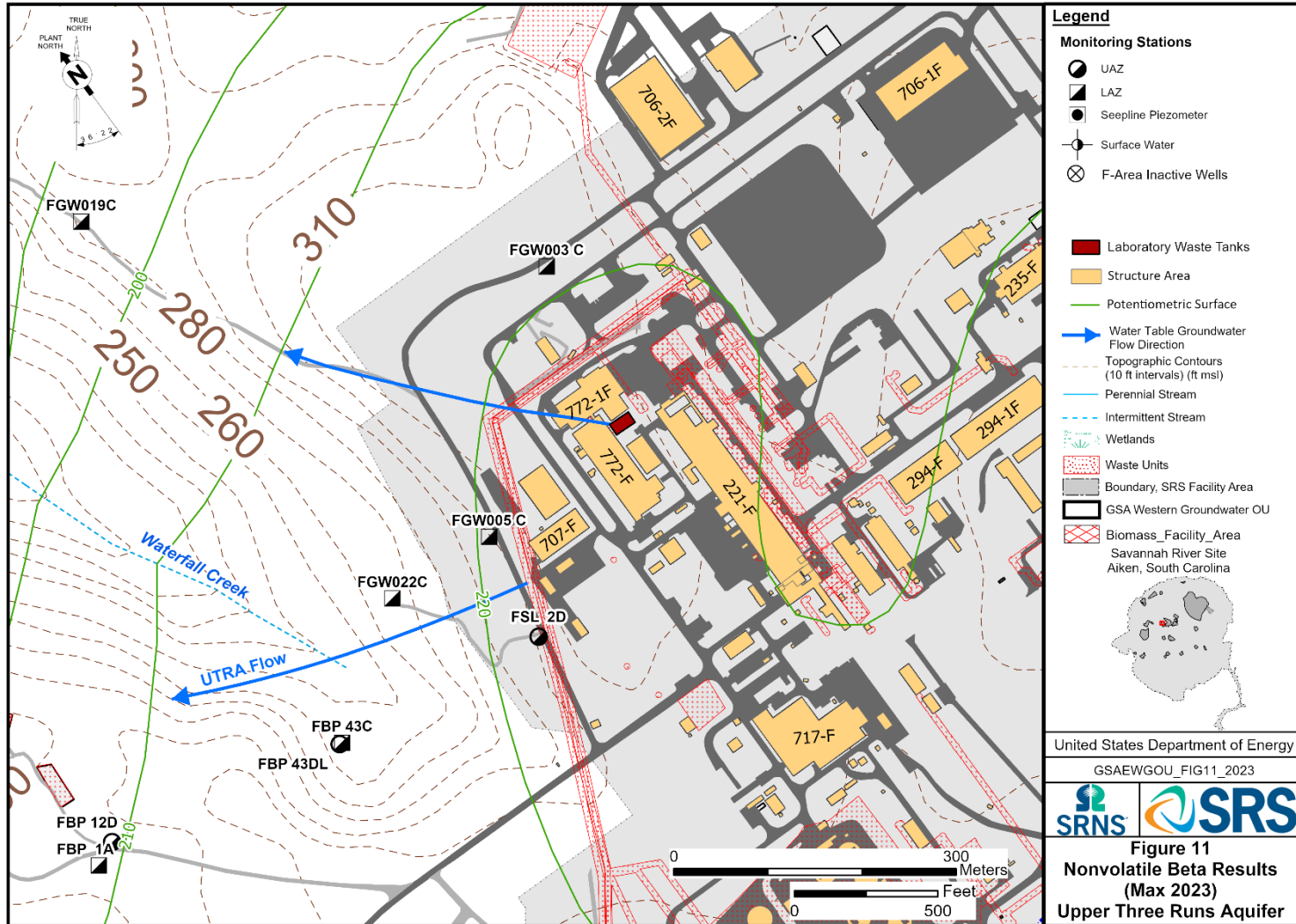
- The West Plume has been monitored since the 1990s and consists of VOC, alpha, and beta constituents that emanate from the west side of F-Area.
- The plume flows toward Upper Three Runs creek but attenuates to concentrations below MCLs prior to reaching the creek.
  - *The primary alpha constituent is U-238; lower levels of Ra-226 are present*
  - *The primary beta constituent is Sr-90; lower levels of Tc-99 are present*
- Well FGW005C measures the highest concentration of alpha and beta constituents
  - *This is a lower aquifer zone well (Screen zone 125 -140 ft bgs) ~ 700 ft from F-Canyon*
- Since 2013, nonvolatile beta (NVB) has increased slowly at FGW005C up to 1,750 pCi/L in 2020
- In 2021, NVB reached 7,766 pCi/L
- In 2022, NVB increased significantly to 938,000 pCi/L (sample date 10/25/2022)
  - *Source of NVB is primarily Sr-90*
- In 2023, NVB decreased 30% to 665,000 pCi/L.



- Mobility of Sr-90 in the groundwater increases as pH decreases below a pH of 5.5.
- The groundwater pH at FGW005C in 2021 was 3.3 (background is 5.5 -6)

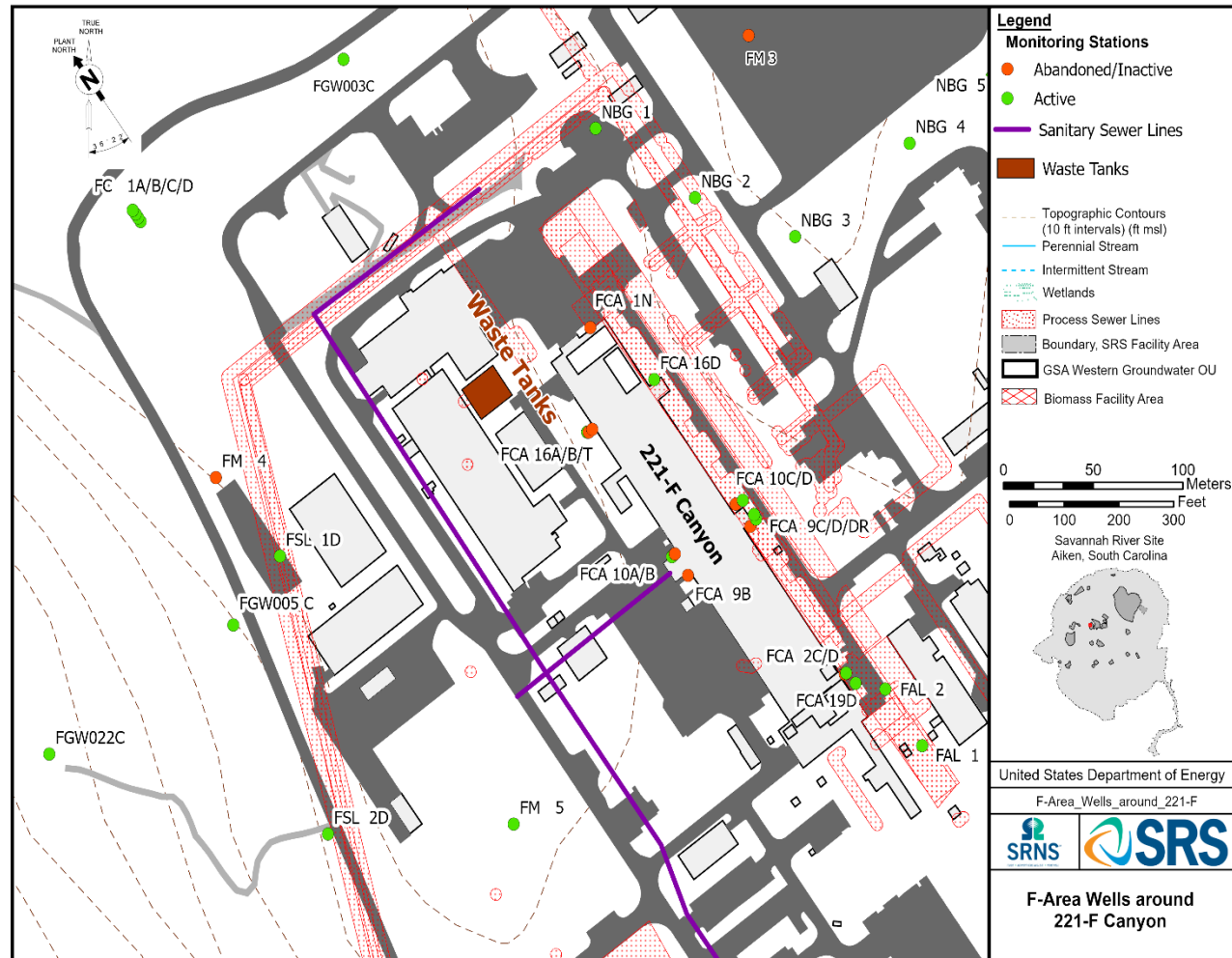
# Potential Sources of Sr-90

- FIPSL and Active F-Area Process Sewer Line
- 772-F Laboratory underground Waste Tanks
- 221-F Canyon and ancillary facilities



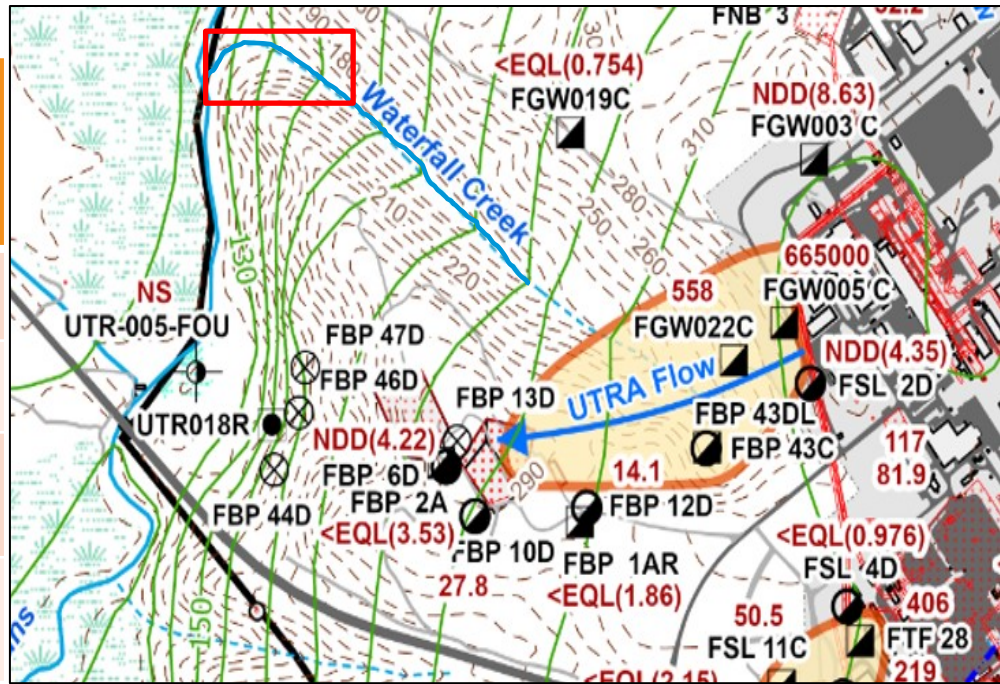
# Monitoring around 221-F Canyon

- In 1990, SRS evaluated the well network around the canyon.
- The wells around the canyon were installed in 1979 prior to current well regulations, except for FCA 19D.
- The construction and integrity of the wells is not known and are believed to be ineffective as future monitoring points.
- The wells could be providing a conduit for water movement from the surface to the subsurface.
- SRS recommends abandoning these wells.



- **The velocity of groundwater in the LAZ is approximately 20 – 40 ft/year**
  - Assuming no retardation of Sr-90, it should take between 90 – 110 years for the plume to reach surface water (seep or UTR creek), ~ 3.5 half lives
  - However, naturally higher pH downgradient of FGW005C (pH over 7 at FBP 43C) reduces transport by attenuating the Sr-90 plume
- **Monitoring of the West Plume historical releases indicate a low potential for discharge to Waterfall Creek (work plan characterization in 2006 indicated no impact to Waterfall Creek)**

Flow Path Distance (Feet)	Travel Time (Years)
221-F to FGW005C (700)	17 - 18
FGW005C to FGW022C (400)	10
FGW005C to UTR Seep (3,600)	90
FGW005C to UTR creek (4,40)	110



- **SRS does not believe the increase in Sr-90 at FGW005C poses an immediate threat to surface water.**
- **Based on significant travel time to reach surface water and favorable natural attenuating conditions down gradient of FGW005C, SRS recommends these changes to the current monitoring strategy to better understand the trend, movement, aquifer pH, and attenuation of Sr-90 in the west plume.**
  - To ensure protectiveness of surface water, evaluate Waterfall Creek for a suitable surface water monitoring location and establish a station for sampling.
    - *Sample annually for nitrates, gross alpha and nonvolatile beta.*
  - Increase sample frequency from annual to quarterly for wells FGW005C, FGW022C, and FBP 43C.
    - *Sample for gross alpha/nonvolatile beta, if trigger levels are exceeded (15 pCi/L gross alpha, 50 pCi/L nonvolatile beta), then speciate for the appropriate alpha/beta-gamma constituents.*
  - Abandon legacy monitoring wells around the 221-F canyon that could be providing a conduit for water movement from the surface to the subsurface.

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