Status of Corrective Actions Along Fourmile Branch, Savannah River Site

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Acronyms

1pCi/L one picocurie per liter
1pCi/mL one picocurie per milliliter
40Km 40 kilometers
I-129 Iodine, atomic number 129
mrem/yr. millirem per year
pH negative logarithm of effective hydrogen-ion concentration
Sr-90 Strontium-90
MWMF Mixed Waste Management Facility
RCRA Resource Conservation and Recovery Act
SRS Savannah River Site
VOCs Volatile Organic Compounds
Groundwater and Surface Water Quality Goals

• Protect the water quality of the Savannah River
  – Water quality in the river is good
  – No downstream drinking water or ecological issues

• Currently performing three Corrective Actions on Groundwater (Plumes) adjacent to Fourmile Branch
  – RCRA Permit Goals include:
    • 70% reduction in tritium flux to Fourmile Branch
    • Reduce all other constituents to below standards in Fourmile Branch and seeplines along the Branch
Plumes Adjacent to Fourmile Branch

Corrective Action #2

Corrective Action #1

Corrective Action #3

F Area

MWMF

GSACU

H Area

20-100 pCi/mL

>100-1000 pCi/mL

>1,000-10,000 pCi/mL

>10,000 pCi/mL
Corrective Action #1

- Tritium at the Mixed Waste Management Facility
  Southwest Plume
  - Plume is sourced from the Old Radioactive Waste Burial
    Ground consists principally of tritiated water and VOCs
  - Groundwater containing contaminants discharged into a
    spring area that was eventually released to Fourmile Branch
    and the Savannah River (over 1000 curies per year)
  - No treatment for tritium other than decay
MWMF Southwest Plume Seepline Management and VOC Treatment Strategy

Maximum Worker Dose  6 mrem/yr.

Maximum Offsite Dose
SRS Boundary ~ 0.005 mrem/yr.
40Km ~ 0.002 mrem/yr.

Natural Dose General Population  360 mrem/yr.

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Sheetpile Dam

Pumping System

Fourmile Branch

Evapotranspiration of Tritiated Water Vapor

Condensation

Atmospheric Dispersion

Precipitation Washout
Effectiveness of Phytoremediation on Tritium Concentration in Fourmile Branch

68% Reduction

Closed valve on the dam

Opened valve for upgrade

Closed valve after upgrade
Phytoremediation Effectiveness

- System operated since 2000
- Concentration of tritium in Fourmile Branch has been reduced by just under 70%
- We have identified no issues with the system
Corrective Actions #2 and #3
F&H Area Seepage Basins

Background

• The F and H Area Seepage Basins received acidic and radioactive liquids (including Tritium) from the F and H Separations Facilities
• Release created a low pH plume containing radionuclides (metallic and non-metallic)
• The acid stripped the formation of metals (including natural radionuclides) and minimized the retardation of contaminants
• The plumes discharge into Fourmile Branch
Initial Remedial Strategies

- Releases to the basins were stopped in the mid 1980s
- The basins were capped in the early 1990s
- Two pump and treat / reinject systems were started in 1997 and terminated in 10/2003
  - Did not have a significant impact on releases to Fourmile Branch
  - Cost over $1 million a month to operate
  - Generated large volumes of waste
F Area Solution:
Barrier Walls / Base Injection
H Area Solution: Barrier Walls
Effectiveness of Barrier Walls in Reducing Tritium Flux

Date
0 50 100 150 200 250 300 350 400

Curies

F Seepage Basin Flux
H Seepage Basin Flux

77% Reduction
56% Reduction
Base Injection?

Barriers in place


EM Environmental Management

Safety ♦ Performance ♦ Cleanup ♦ Closure
Combined Effectiveness of Corrective Actions in Tritium Reduction at Fourmile Branch

NOTE: Sampled at Road A12.2 (location downstream of F, H, and Mixed Waste)
Remaining Challenges

• Sr-90 and I-129 concentrations occasionally exceed the standard in Fourmile Branch near the plumes (much progress has been made)
  – Perform another base injection campaign at both F&H Areas that will fully treat the Sr-90 between the creek and the barriers
  – Developing a technology to treat I-129 in-situ
• This will take several years to complete
• It will take several years to see the effects
Conclusions

• No water quality issues associated with the Savannah River
• Significant progress has been made in reducing tritium activity at Fourmile Branch
  – Near the permit goals for tritium (70%)
• Need to perform additional remedial actions to meet permit goals
  – Base treatments in F/H Areas for Sr-90
  – Develop technology for I-129 and implement
  – Will take several years to implement and several years to understand the effects