Waste Disposal History of the 300 Area Process Ponds

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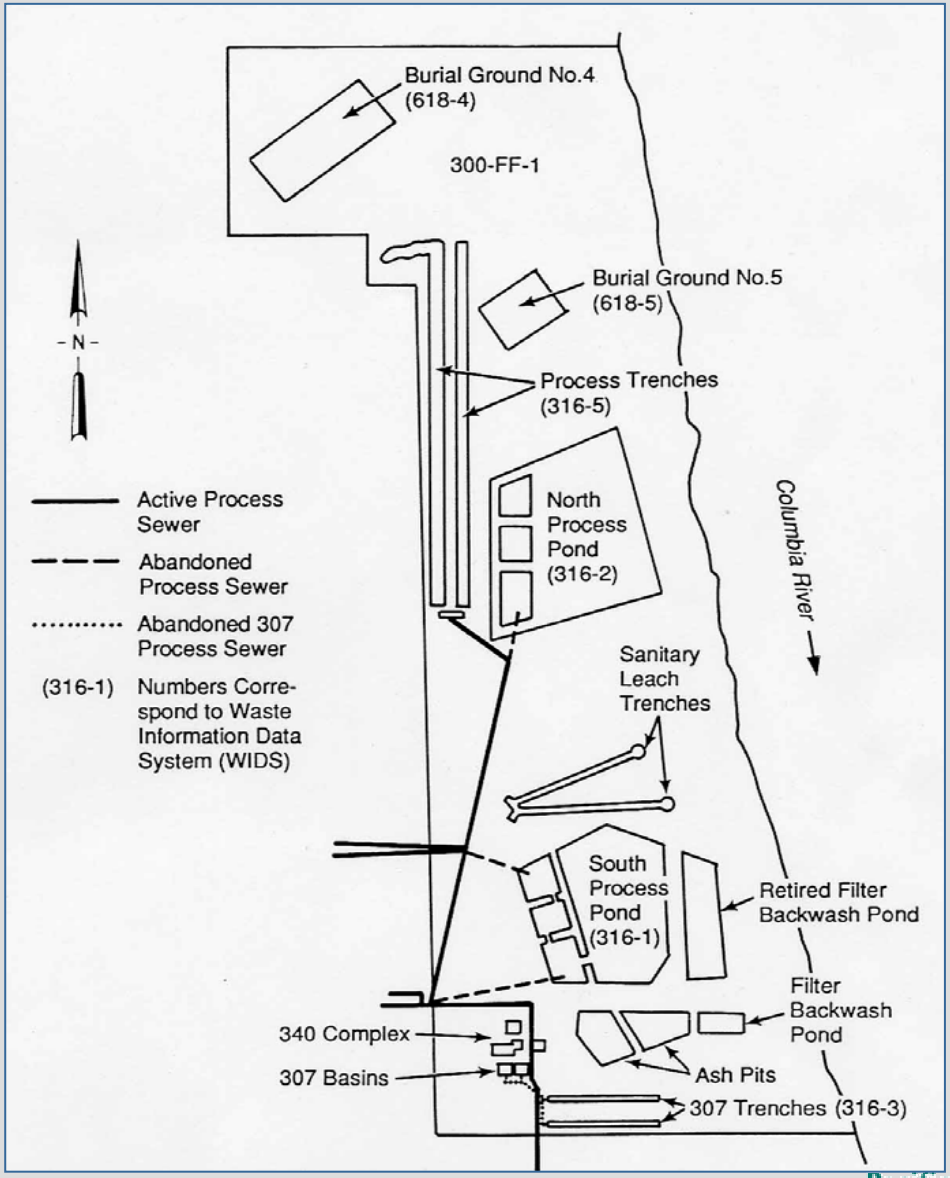
Hanford 300 Area in 1962

The 300-FF-1 Operable Unit



Operational History and Inventory of 300 Area Process Ponds

- Operational dates:
  - NPP and SPP – 1943 to 1975
  - Process trench (316-5) – 1975 to 1985
- Primary chemical inventory in NPP and SPP:
  - 74,000 – 130,000 lbs of U; 532,000 lbs of Cu; 258,000 lbs of F; 4,543,000 lbs of NO_3
- Waste streams:
  - Process wastes (fuels fabrication)
  - Radioactive liquid wastes
  - Sewage wastes
  - Laboratory wastes
  - Coal power wastes

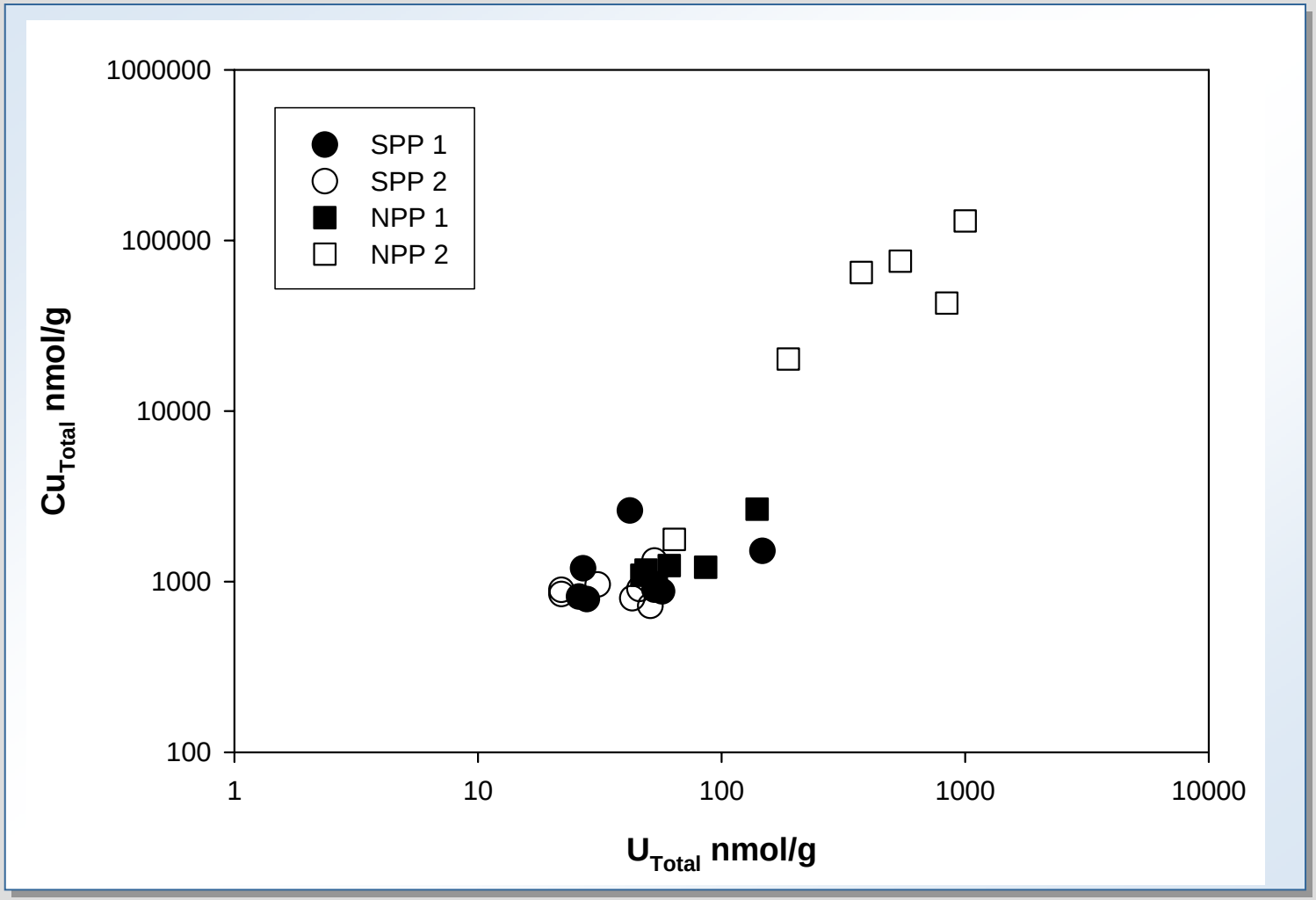
Process Wastes

- Sodium aluminate (to ~1956)
  - Dissolved Al cladding from rejected fuel assemblies
  - 15% NaOH
  - Density of 1.5
  - Precipitated in pond bottom
- Effluents from REDOX and PUREX process development (1944 – 1954)
  - Nitric acid solutions containing uranyl nitrate
  - ^{235}U-depleted uranium from 321
- N-reactor fuels fabrication wastes (1978 – 1986)
  - Nitric acid solutions containing U and Cu
- Different grades of enriched U as well as natural and depleted U
- Complex, poorly documented history

Anecdotal Observations

- pH of pond water – 1.8 to 11.4
- NaOH added to prevent Cu leaching to the Columbia
- Pre-clean up pond sediments contained slimes rich in carbonate and Al (white) and Cu (green)
- Higher concentrations of calcite in near surface, pond sediments, then in background sediments
- Shallow vadose zone sediments with greenish have observed in various locations (NPP)
  - Flakes interspersed with gravels and sands
  - Thinly laminated layers
  - Thin clay-like coatings on gravels and coarse sands

Correlation Between $[U]_{TOT}$ and $[Cu]_{TOT}$ in SPP and NPP Vadose Zone Sediments



Estimated Contaminant Inventory (in kg) for South and North Process Ponds in 300 A

Chemical	South Pond	North Pond
Sodium[b]	2,000,000	2,000,000
Sodium hydroxide	1,000,000	800,000
Nitrite	900,000	700,000
Mercury	60	40
Chromium (VI)	5,000	3,000
Cadmium	80	60
Lead	4,000	2,000
Fluoride	7,000	5,000
Trichloroethylene	100,000	100,000
Uranium	40,000	30,000
Sodium aluminate	2,000,000	2,000,000
Nitrate[c]	1,000,000	800,000
Sodium silicate	100,000	90,000
Nickel	10,000	8,000
Zinc	5,000	3,000
Silver	1,000	900
Beryllium	40	30
Copper	60,000	50,000
Nitric acid	1,000,000	900,000

(a) U. S. Department of Energy (DOE). 1986. Draft Phase I Installation Assessment of Inactive Waste-Disposal Sites at Hanford, Richland, Washington.

(b) Includes sodium from compounds other than those listed.

(c) Includes nitrate from compounds other than those listed.

Summary of Operation Data for 300 Area Process Ponds

Characteristics	South Pond	North Pond
Period of use	1943-1975	1948-1975
Bottom area	8.1 acres (3.3 ha)	10 acres (4.0 ha)
Depth to water table	33 ft (10 m)	33 ft (10 m)
Rate of inflow	410,000 to 2,000,000 gal/day	
Total uranium received	More than 62,000 kg	
Other radionuclides received	Pu, 55 mCi; ^{60}Co, trace; ^{234}Th, trace	
Unplanned releases	^{147}Pm, 750 mCi, 1967; Pu, 1950, trace	
Nonradioactive constituents received	Copper, approximately 110,000 kg	
pH range of pond influent[a]	1.8 to 11.4	
Significant process changes	(1) Changes in 314 Bldg. in 1953 reduced soluble and insoluble U discharges to ponds	
	(2) New laboratory facilities in 1954 eliminated routine Pu and fission product discharges to ponds	
	(3) Copper discharges from N Reactor fuel fabrication, 1959-1974	
	(4) Thorium fuel fabrication in 1969	

(a) The pH of the waste streams to the ponds varied over time as changes occurred in fuel fabrication operations in the 300 Area.