US Environmental Protection Agency
Region 10
Hanford Project Office

Emerald Laija

Hanford Site, 200-UP-1

Remedy Review Board Briefing

March 27, 2012

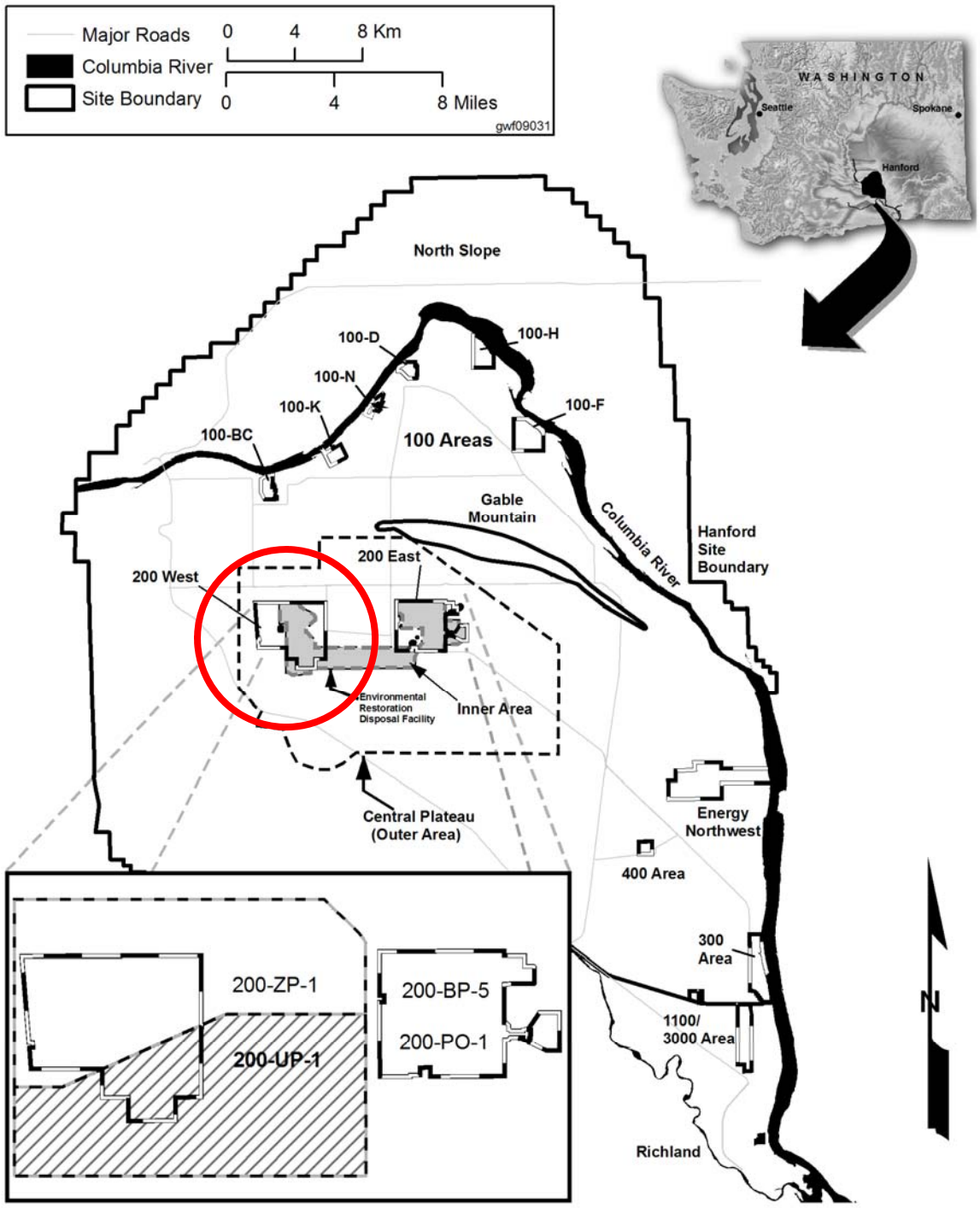
Overview

- Background Information
- Site Summary
- Risk Summary
- RAOs and Remediation Goals
- Description of Alternatives
- Preferred Alternatives
- Stakeholder Views

Background Information

- 200-ZP-1 OU Record of Decision
  - Groundwater OU adjacent to 200-UP-1
- Major Remedy Components
  - Pump-and-Treat
  - MNA
  - Flow-path control
  - Institutional Controls
- 200 West Treatment Facility designed to treat groundwater from 200-UP-1

Site Summary



Location of 200-UP-1 Groundwater OU

Site Summary

Hanford's Central Plateau
200 West and East Areas

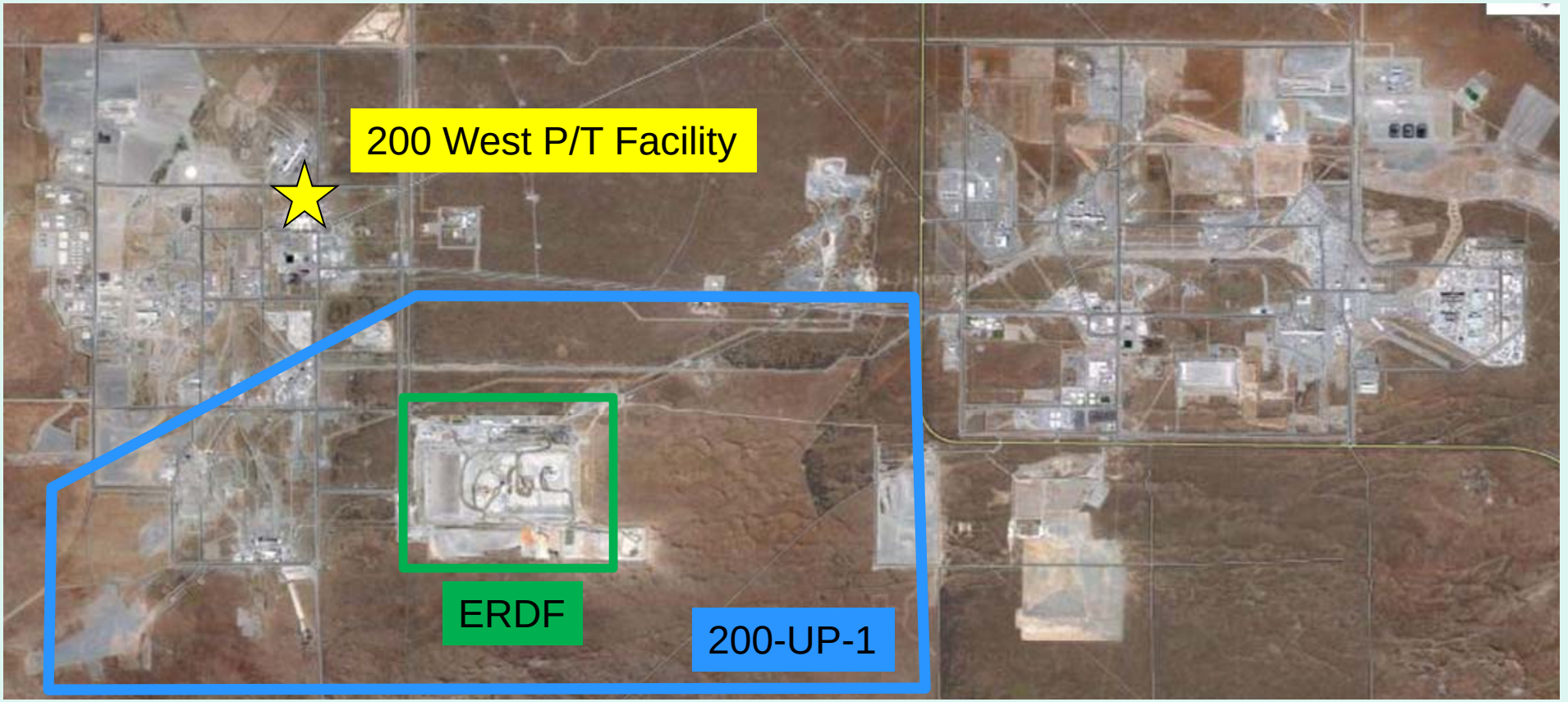


Image taken from Google Maps

Land Use

- Current Use
  - Industrial land-use
  - Public access is restricted
- Anticipated Future Land Use
  - Industrial use

Surrounding Land-Use: Primarily Agriculture

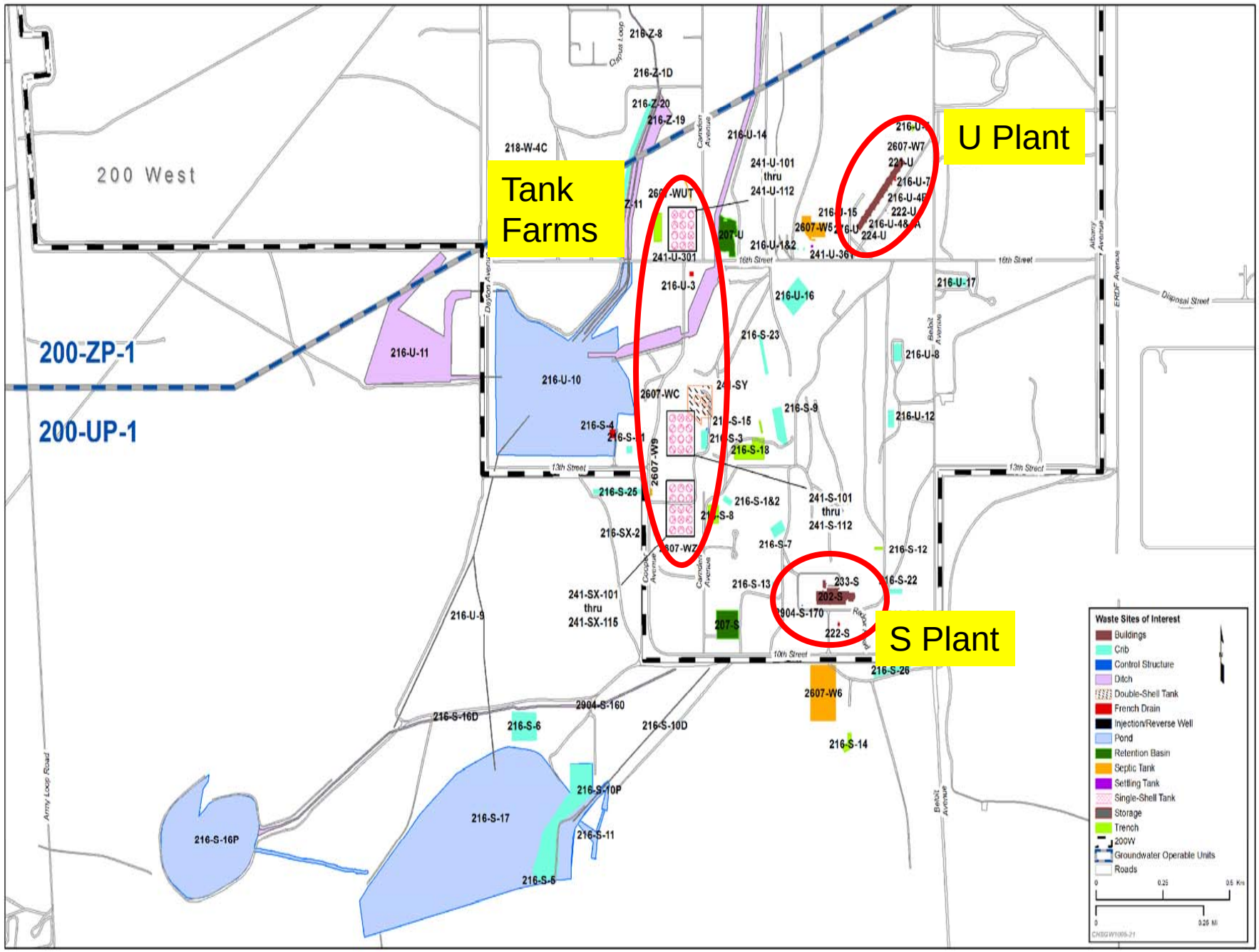
Image taken from Google Maps

Contamination History

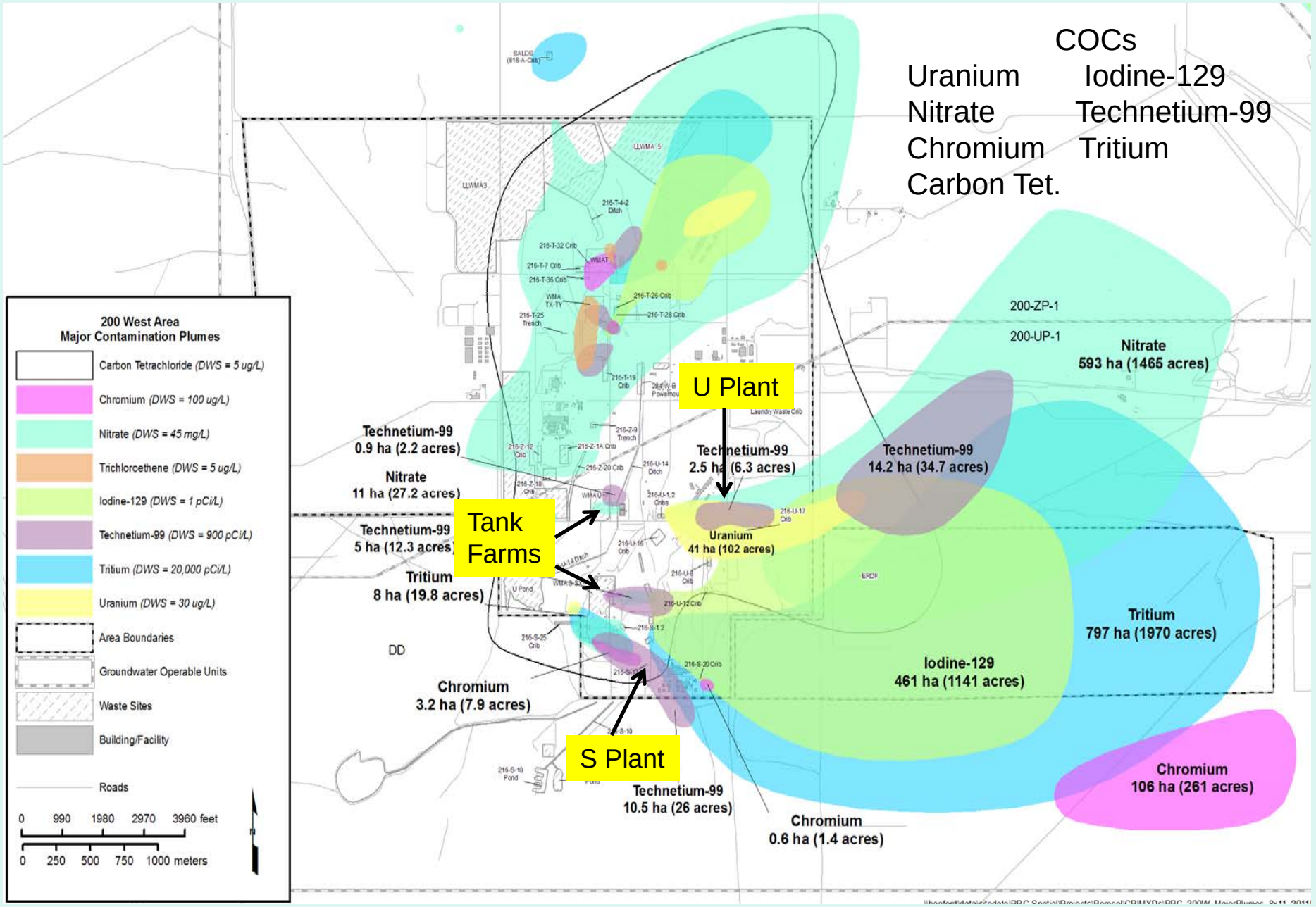
- Central Plateau was used for chemical processing activities
- Operations & disposal of process liquid waste associated with plutonium recovery processes
- Disposal of liquid waste in engineered structures
  - Cribs, French drains, reverse wells, ditches, and ponds

Contamination Sources

- U Plant
  - Uranium Recovery Plant
- S Plant
  - Reduction-Oxidation [REDOX] Plant
- Tanks Farms
  - 241-S-SX Waste Management Area
  - 241-U Waste Management Area


Tank Farms
U Plant
S Plant
200 West
200-ZP-1
200-UP-1
216-Z-8
216-Z-1D
216-Z-20
216-Z-19
218-W-4C
216-U-14
241-U-101 thru 241-U-112
241-U-301
216-U-3
216-U-11
216-U-10
216-U-16
216-U-17
216-U-8
216-U-12
216-S-23
216-S-9
216-S-15
216-S-3
216-S-18
216-S-4
216-S-1
216-S-25
216-S-1&2
216-S-8
216-SX-2
241-S-101 thru 241-S-112
216-S-7
216-S-12
216-S-13
233-S
216-S-22
241-SX-101 thru 241-SX-115
216-U-9
216-S-26
2607-W6
216-S-14
216-S-16D
216-S-6
2904-S-160
216-S-10D
216-S-10P
216-S-17
216-S-16P
216-S-11
216-S-5
Waste Sites of Interest
Buildings
Crib
Control Structure
Ditch
Double-Shell Tank
French Drain
Injection/Reverse Well
Pond
Retention Basin
Septic Tank
Settling Tank
Single-Shell Tank
Storage
Trench
200W
Groundwater Operable Units
Roads

200 West Groundwater Contaminant Plumes



Hanford Central Plateau OUs

Location/Operable Unit	Scope
200 West Groundwater/200-ZP-1	Contaminated groundwater associated with T Plant and Z Plant wastes and T, TX, and TY WMAs.
200 West Groundwater/200-UP-1	Contaminated groundwater associated with S Plant, U Plant, S-SX, SY, and U WMAs.
200 East Groundwater/200-BP-5	Contaminated groundwater associated with B Plant and C Plant and B, BX, BY, and C WMAs.
200 East Groundwater/200-PO-1	Contaminated groundwater associated with PUREX Plant and A, AN, and AX WMAs.
200-PW-1/3/6 and 200-CW-5	Past process-liquid disposal sites.
200 West Inner Area/200-WA-1	Majority of the waste sites in the 200 West Area.
200 East Inner Area/200-EA-1 and Pipelines/200-IS-1	Majority of the waste sites in the 200 East Area. Includes the majority of pipelines across the Inner Area (200 East and West Areas).
Deep Vadose Zone/200-DV-1	Key waste sites in the Inner Area representing significant deep vadose zone contamination. Many sites are associated with the Central Plateau's tank farms.
Burial Grounds/200-SW-2	The 200 Area Radioactive and Hazardous Waste landfills.
B Plant Canyon and Associated Waste Sites/200-CB-1	One of the four remaining canyon decisions.
PUREX Canyon and Associated Waste Sites/200-CP-1	One of the four remaining canyon decisions.
REDOX Canyon and Associated Waste Sites/200-CR-1	One of the four remaining canyon decisions.
U Canyon/200-CU-1	U Canyon final decision documented in 2005.
Outer Area/200-OA-1, 200-CW-1 and 200-CW-3	All areas of the Central Plateau beyond the Inner Area.

Risk Summary

Future Use of Groundwater

- 200-UP-1 groundwater is currently contaminated and not withdrawn for use
  - Alternative source of water derived from the Columbia River
- Goal is to return the aquifer to beneficial use
  - Potential future drinking water source

Exposure Assessment

- Currently no known or actual exposures of human or ecological receptors
- Hypothetical future groundwater users exposure pathways are:
  - Ingestion
  - Inhalation
  - Dermal contact
  - External radiation

Summary of 90th Percentile Current Groundwater Concentrations and Associated Cancer Risk and Non-Cancer Hazard Index

Final COPC	Units	90th Percentile Value	WAC 173-340-720 Cleanup Levels			
			Non carcinogens	HQ/HI	Carcinogens at 10^{-6} Risk Level	ELCR
Carbon Tetrachloride	µg/L	189	5.6	34	0.34	5.6×10^{-04}
Chloroform	µg/L	7.2	80	0.09	1.4	5.1×10^{-06}
1,4-Dioxane	µg/L	6.0	800	<0.01	4.0	1.5×10^{-06}
Tetrachloroethene	µg/L	1.0	80	0.01	0.081	1.2×10^{-05}
Trichloroethene	µg/L	3.3	--	--	0.49	6.7×10^{-06}
Total ELCR					--	**5.8×10^{-04}**
Chromium	µg/L	99	24,000	<0.01	--	--
Hexavalent Chromium	µg/L	52	48	1.1	--	--
Nitrate	µg/L	133,000	113,600	1.2	--	--
Nitrate as N	µg/L	30,060	25,600	1.2		
Uranium	µg/L	206	48	4.3	--	- -
Hazard Index				**41**		

ELCR = excess lifetime cancer risk

RAOs and Remediation Goals

Remedial Action Objectives

- RAOs are based on anticipated use of 200-UP-1 as a future drinking water source
- Anticipated industrial land use for land located above 200-UP-1

RAOs

- **RAO 1**: Return the 200-UP-1 OU groundwater to beneficial use by achieving the cleanup levels.
  - Risks addressed by achieving cleanup levels
- **RAO 2**: Apply ICs to prevent groundwater use until the cleanup levels are achieved.
  - Risks addressed by preventing exposure until cleanup levels are achieved
- **RAO 3:** Protect the Columbia River and its ecological resources from degradation and unacceptable impact caused by contaminants migrating from 200-UP-1
  - Risks addressed by monitoring contaminant migration to ensure contaminants to not reach the river

Key ARARs for Drinking Water

- Federal
  - "National Primary Drinking Water Regulations," 40 CFR 141
- State
  - "Model Toxics Control Act," WAC 173-340

Description of Alternatives

Remedial Alternatives

Remedy Components	Alternative 2 – 45 Years Active Remediation and MNA	Alternative 3- 35 Years Active Remediation and MNA	Alternative 4- 25 Years Active Remediation and MNA
Pump-and-Treat	P/T for technetium-99, uranium, carbon tetrachloride, chromium (total), and concentrated nitrate plume areas	Moderately aggressive P/T for technetium-99, uranium, carbon tetrachloride, chromium (total) and concentrated nitrate plume areas	Highly aggressive P/T for technetium-99, uranium, carbon tetrachloride, chromium (total), and all nitrate plume areas
MNA	Tritium	Tritium	Tritium
Monitoring and MNA (up to 125 years)	Diffuse parts of nitrate plume, remaining parts of carbon tetrachloride plume	Diffuse parts of nitrate plume, remaining parts of carbon tetrachloride plume	Remaining parts of carbon tetrachloride plume
Hydraulic Containment	Iodine-129	Iodine-129	Iodine-129
Active Remediation Timeframe	45 years	35 years	25 years
Cost (NPV)	$304 M	$319 M	$342 M

Remedial Alternative Elements	Remediation Area	Alternative 2—45 Years Active Remediation and MNA	Alternative 3—35 Years Active Remediation and MNA	Alternative 4— 25 Years Active Remediation and MNA
Estimated Groundwater Extraction and Injection Wells and Flow Rates				
Pump and Treat[a,b]	S-SX Remediation Area	3 extraction wells operating at **300 L/min (80 gpm)** total flow rate		
	U Plant Remediation Area	2 extraction and 2 injection wells operating at **380 L/min (100 gpm)**total flow rate	2 extraction and 2 injection wells operating at **570 L/min (150 gpm)** total flow rate	
	Northeast Nitrate Remediation Area	MNA for diffuse nitrate plume and tritium		1 to 2 extraction wells operating at **380 L/min (100 gpm)** total flow rate
	Southeast Chromium Remediation Area	2 extraction and 2 injection wells operating at **570 L/min (150 gpm)** total flow rate	2 to 3 extraction and 2 to 3 injection wells operating at **760 L/min (200 gpm)** total flow rate	
Hydraulic Containment Only	Central I-129 Remediation Area	3 injection wells operating at **570 L/min (150 gpm)** total flow rate for 10 years while treatability study and technology evaluation is performed		
Groundwater Treatment Facility Requirements	Use of 200 West Treatment Facility	**Total Feed 1,250 L/min (330 gpm)**	**Total Feed: 1,630 L/min (430 gpm)**	**Total Feed: 2,010 L/min (530 gpm)**
MNA	Tritium Plume Area Remaining Carbon Tetrachloride	MNA for tritium and remaining portions of carbon tetrachloride plumes		
Estimated Time (years) to Reach Cleanup Levels				
Time to Reach Cleanup Levels	S-SX Area (Tc-99)	15	15	15
	U Plant Area (uranium)	40	25	25
	NE Nitrate Area (nitrate)	35	35	20
	SE Chromium Area (chromium)	45	25	25
	Tritium Plume Area (Tritium)	25	25	25
	Central I-129 Area (I-129)	10[c]	10	10
	Carbon Tetrachloride	125	125	125

Remedial Alternative Costs

Item Description	Alternative 2-45 Years Active Remediation and MNA	Alternative 3-35 Years Active Remediation and MNA	Alternative 4- 25 Years Active Remediation and MNA
Capital Cost	$88,048,000	$131,346,000	$141,629,000
Total O&M/Periodic Cost (non-discounted)	$340,790,000	$266,854,000	$282,253,000
O&M Duration (years)	50	40	30
Average Annual O&M Cost (overall duration)	$6,8156,000	$6,671,000	$9,408,000
Total Non-Discounted	$428,837,000	$398,200,000	$423,881,000
Total NPV (Discounted) [a]	**$304,043,000**	**$319,083,000**	**$342,180,000**

Notes: Present Value discount percent used is 2.7%.

a. The total net present value cost, capital cost, O&M cost, and periodic costs do not include design, construction and O&M allowances for the I-129 final remedy.

NPV = net present value

O&M = operations and maintenance

EPA’s Preferred Alternative

EPA's Preferred Alternative

- Alternative 3 – 35 Years Active Remediation and MNA
- Active restoration through pump-and-treat for technetium-99, uranium, carbon tetrachloride, and total chromium.
- MNA for tritium, the diffuse parts of the nitrate plume, and the remaining portions of the carbon tetrachloride plume.

Remedial Alternative Elements	Remediation Area	Preferred Alternative Alternative 3—35 Years Active Remediation and MNA
Estimated Groundwater Extraction and Injection Wells and Flow Rates		
Pump and Treat[a,b]	S-SX Remediation Area	3 extraction wells operating at **300 L/min (80 gpm)** total flow rate
	U Plant Remediation Area	2 extraction and 2 injection wells operating at **570 L/min (150 gpm)** total flow rate
	Northeast Nitrate Remediation Area	MNA for diffuse nitrate plume and tritium
	Southeast Chromium Remediation Area	2 to 3 extraction and 2 to 3 injection wells operating at **760 L/min (200 gpm)** total flow rate
Hydraulic Containment Only	Central I-129 Remediation Area	3 injection wells operating at **570 L/min (150 gpm)** total flow rate for 10 years while treatability study and technology evaluation is performed
Groundwater Treatment Facility Requirements	Use of 200 West Treatment Facility	**Total Feed: 1,630 L/min (430 gpm)**
MNA	Tritium Plume Area Remaining Carbon Tetrachloride	MNA for tritium and remaining portions of carbon tetrachloride plumes
Estimated Time (years) to Reach Cleanup Levels		
Time to Reach Cleanup Levels	S-SX Area (Tc-99)	15
	U Plant Area (uranium)	25
	NE Nitrate Area (nitrate)	35
	SE Chromium Area (chromium)	25
	Tritium Plume Area (Tritium)	25
	Central I-129 Area (I-129)	10 (for tech. evaluation and development)
	Carbon Tetrachloride	125

Preferred Alternative Costs for the 200-UP-1 Groundwater OU

Item Description	Alternative 3-35 Years Active Remediation and MNA
Capital Cost	$131,346,000
Total O&M/Periodic Cost (non-discounted)	$266,854,000
O&M Duration (years)	40
Average Annual O&M Cost (overall duration)	$6,671,000
Total Non-Discounted	$398,200,000
Total NPV (Discounted) [a]	**$319,083,000**

Notes: Present Value discount percent used is 2.7%.

a. The total net present value cost, capital cost, O&M cost, and periodic costs do not include design, construction and O&M allowances for the I-129 final remedy.

NPV = net present value

O&M = operations and maintenance

Major Issues

- Iodine-129 technology evaluation and development requried

Questions

200 West Treatment Facility