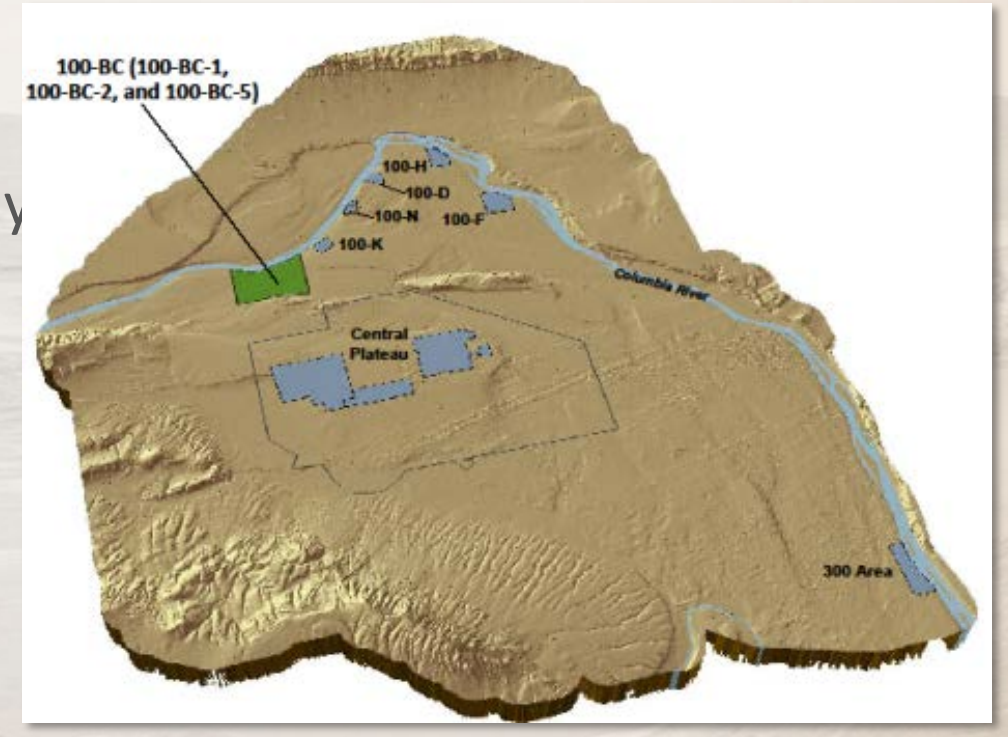
100-BC Area Proposed Plan Overview Presentation to the Hanford Advisory Board, River & Plateau Committee

What is the 100-BC Area?

- Operational and support areas around two deactivated nuclear reactors
- Encompasses approximately 4.5 mi^2



Past Operations

B Reactor in 1944

- B Reactor construction began in 1943 and C Reactor construction began in 1951
- B Reactor was deactivated in 1968 and C Reactor was deactivated in 1969

100-B/C in 1953

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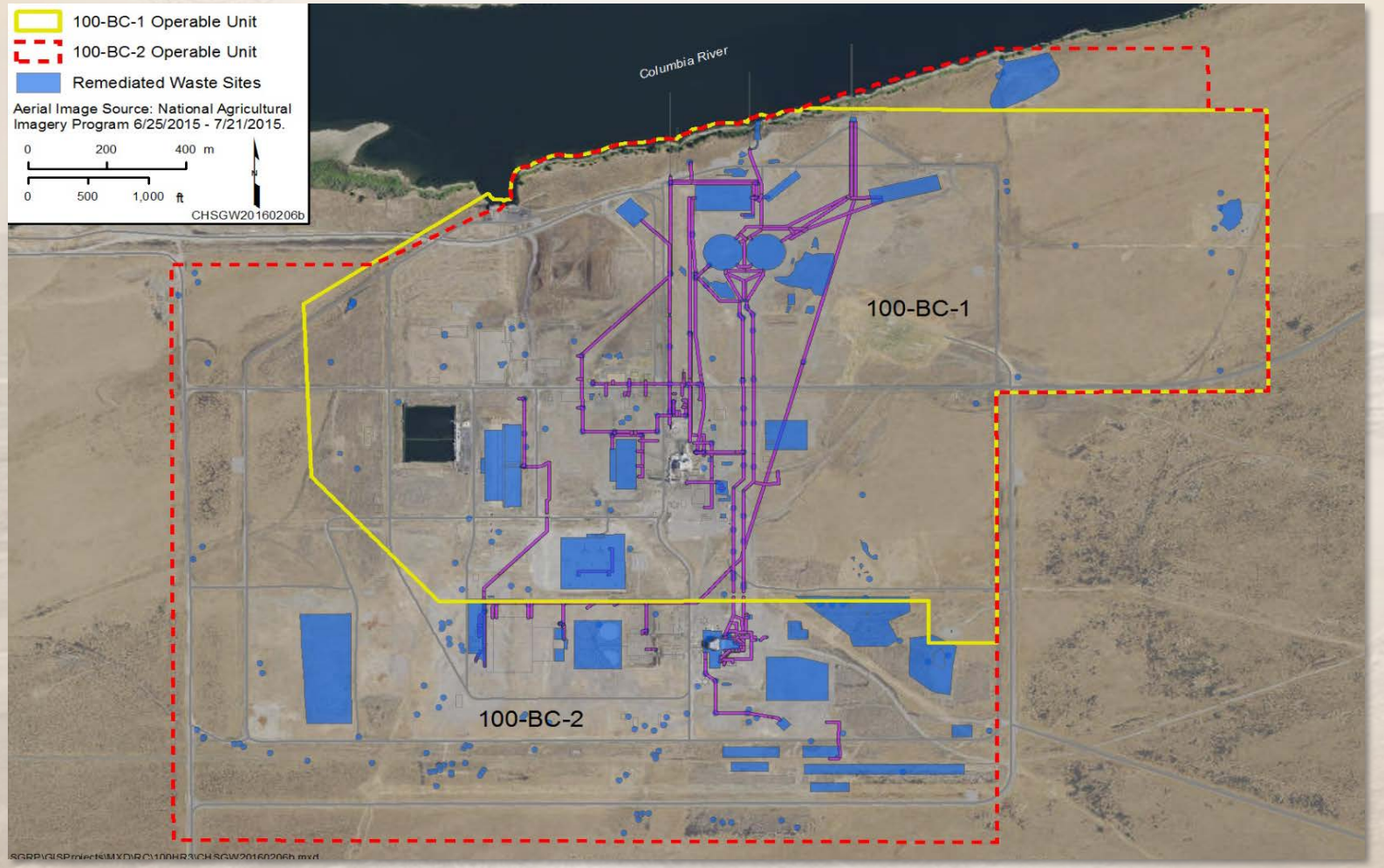
Source Operable Units



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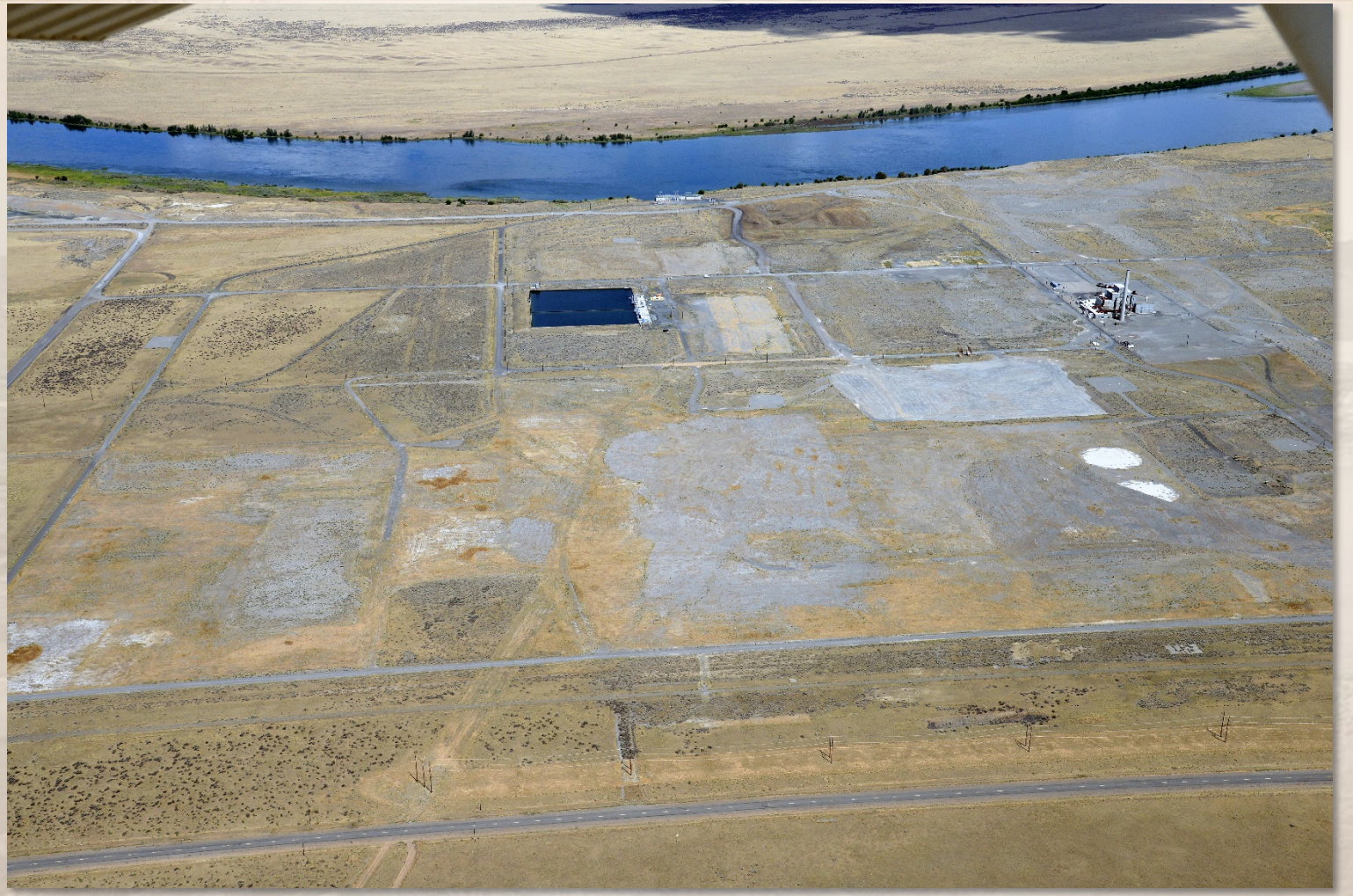
Cleanup Accomplishments: Waste Sites

- Waste site remediation began in 1995
- Remediation consisted of excavating soil and debris, treatment (as necessary), disposal, verification sampling and restoration
- Remediation was performed to remove contamination above remedial action goals for direct exposure, protection of groundwater and protection of surface water

Cleanup Accomplishments: Waste Sites

Excavation of the 100-C-7 and 100-C-7:1 Waste Sites

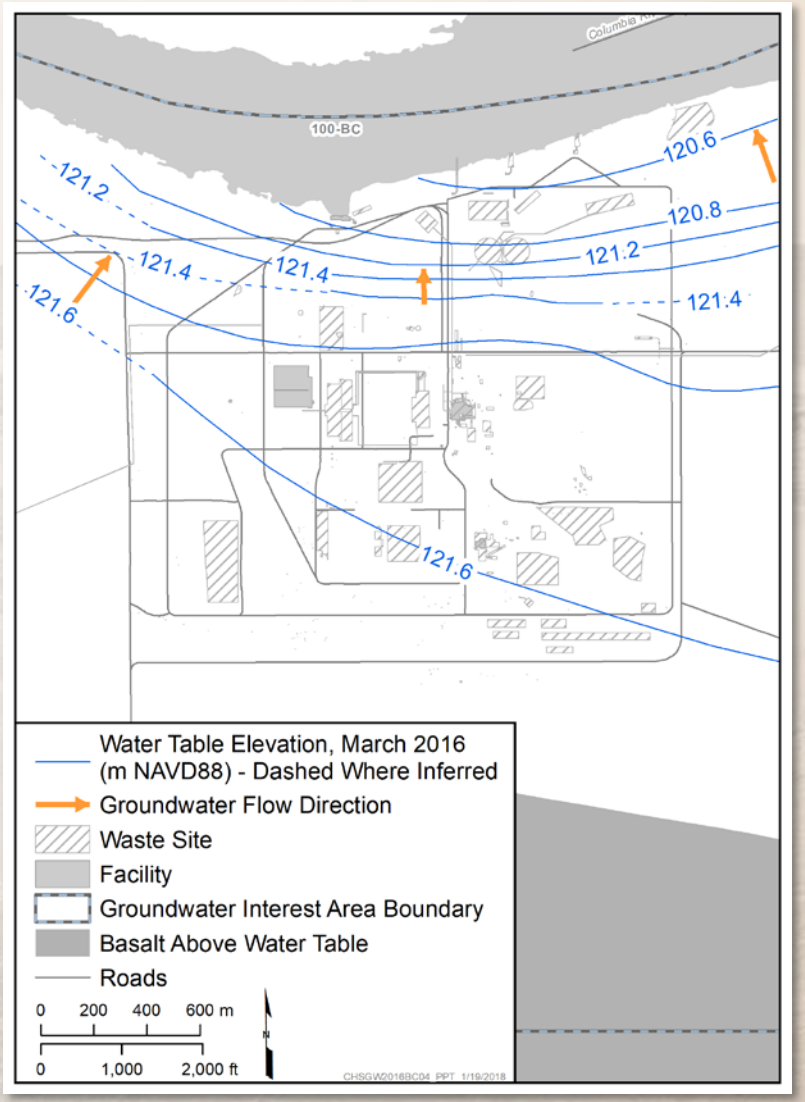
Cleanup Accomplishments: Waste Sites



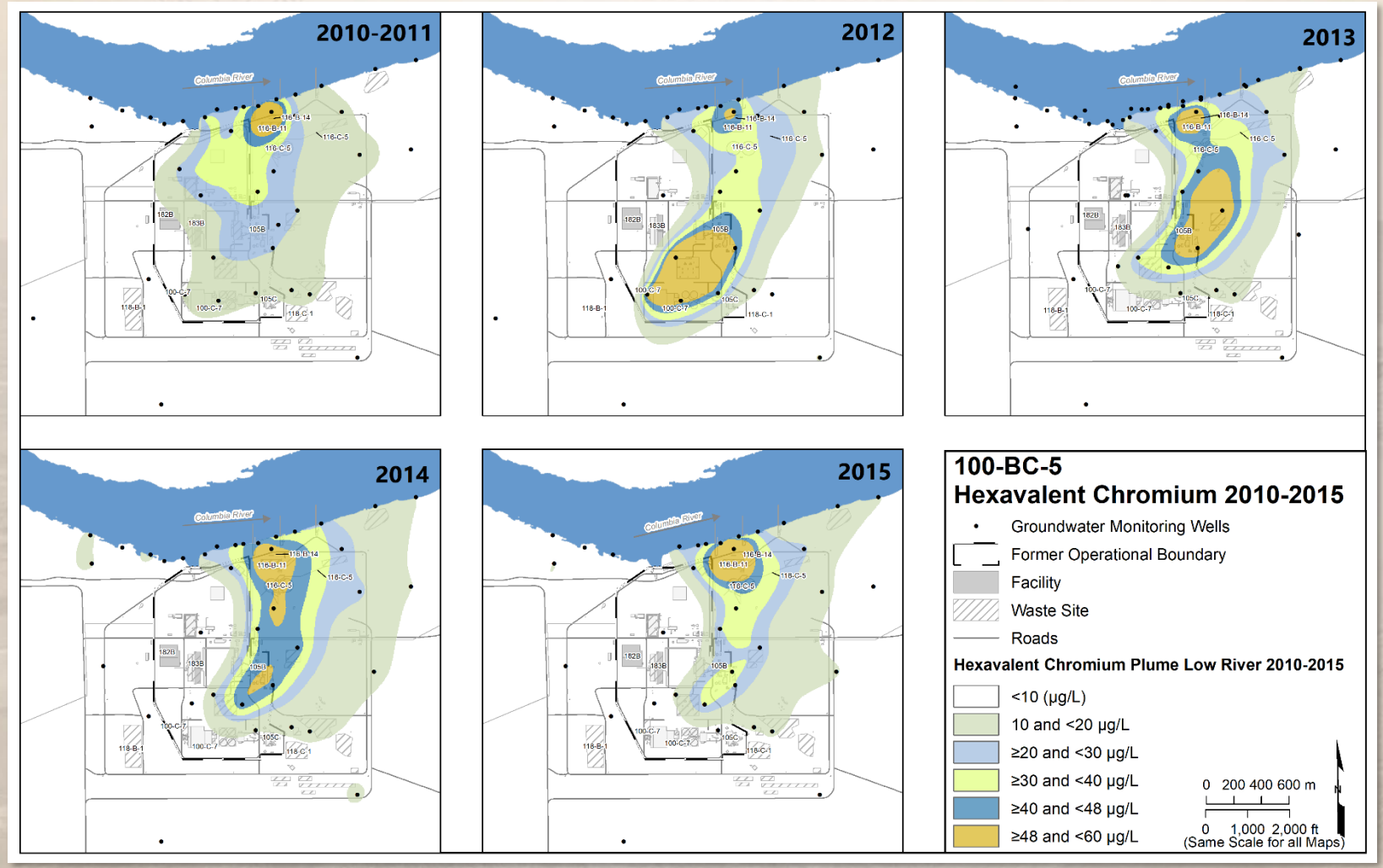
100-B/C in 2015

100-BC Water Table

- Groundwater flows perpendicular to water table contour lines (north and northeast, towards the Columbia River)
- Average flow rate ~1 meter/day in the upper portion of the aquifer
- Flows to the Columbia River



Hexavalent Chromium in the Upper Part of the Aquifer, 2010 to 2015



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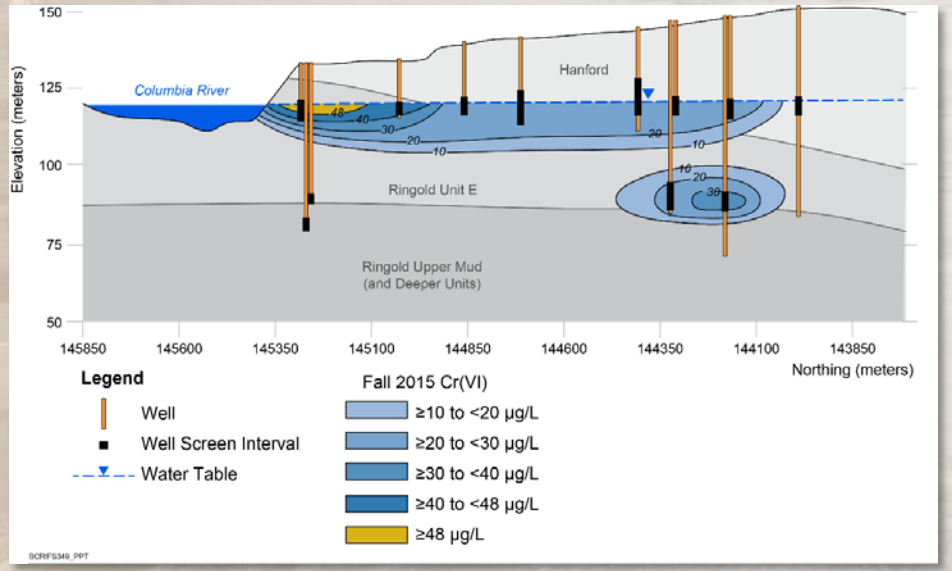
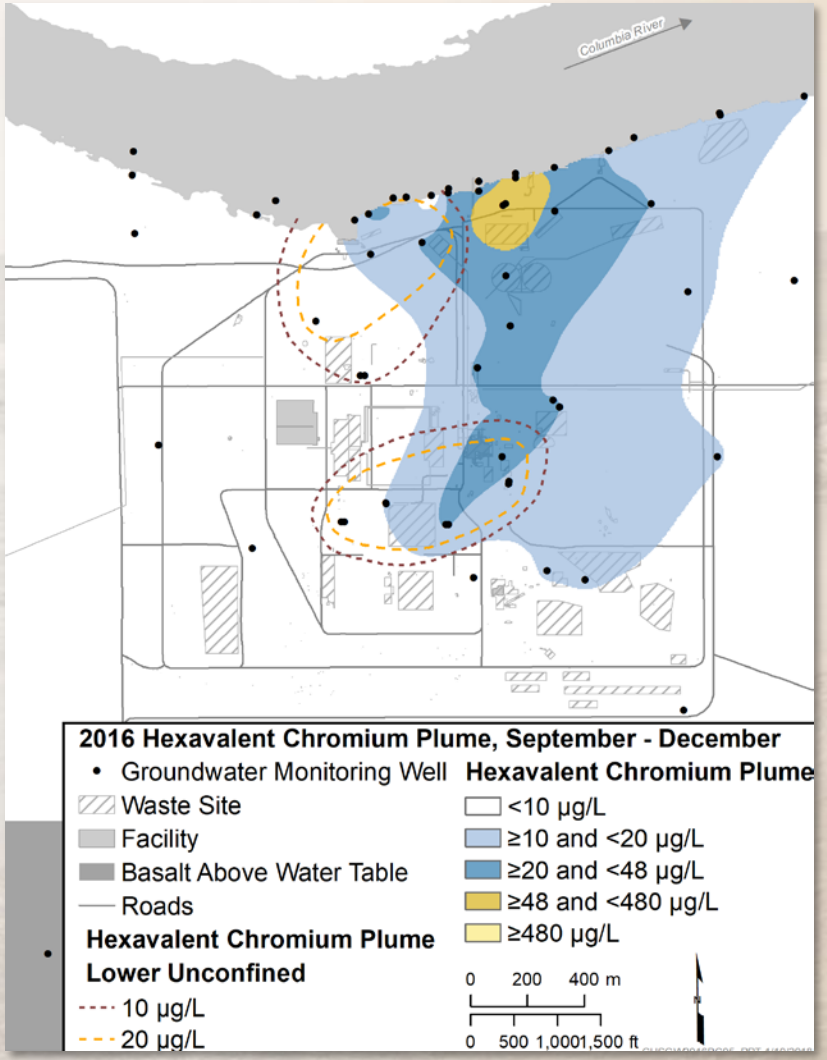
Hexavalent Chromium 2016

- Separate plumes in shallow and deep parts of the aquifer
- Hexavalent chromium groundwater concentrations at the river exceed the 10 micrograms per liter water quality standard along ~1,840 meters (~6,000 feet) of shoreline (2016)





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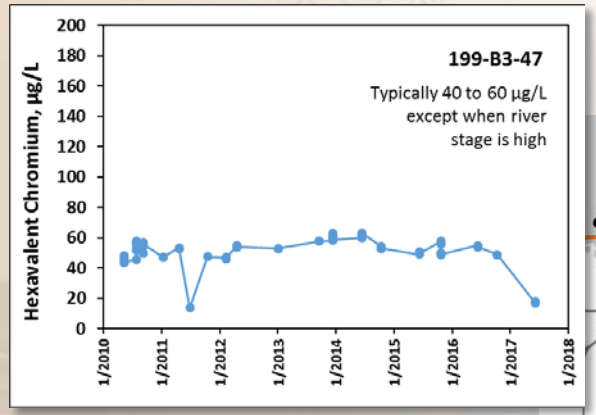
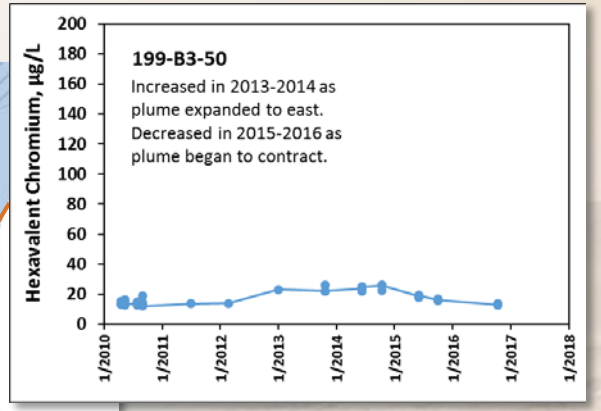
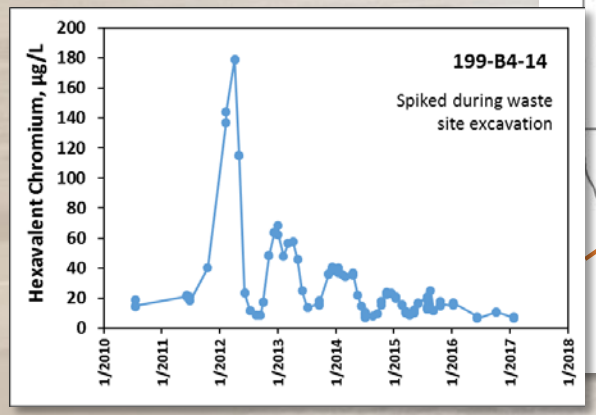
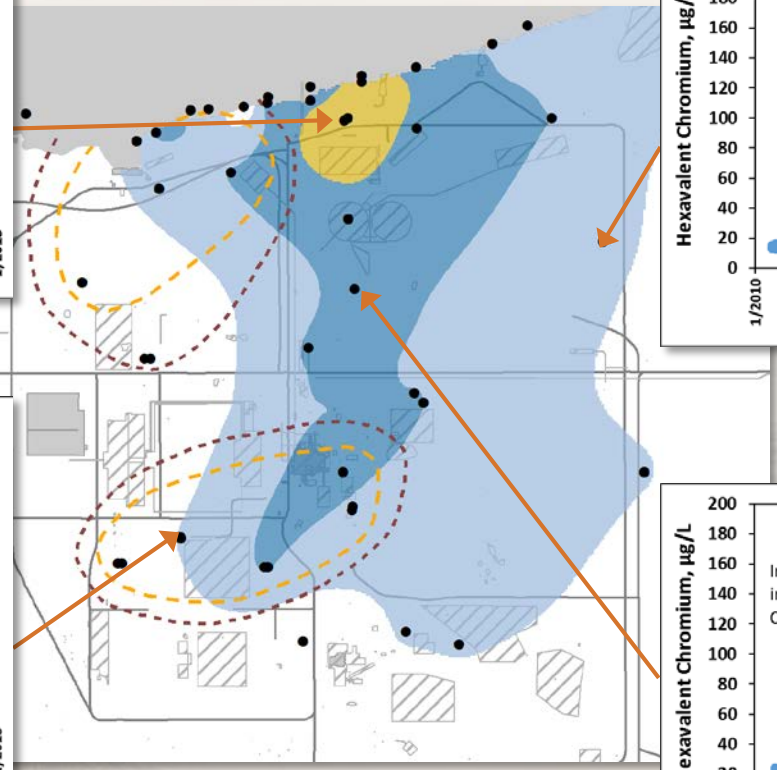
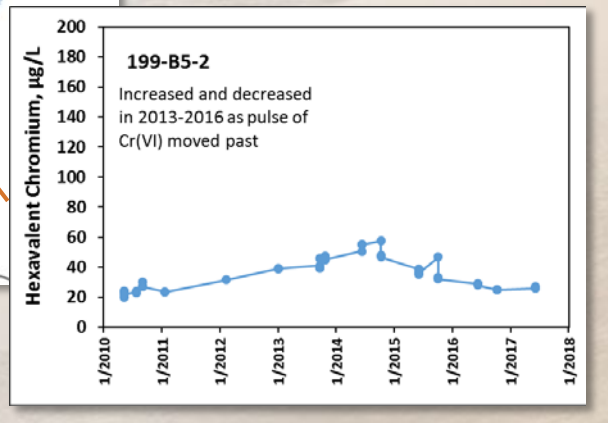
Hexavalent Chromium Trends











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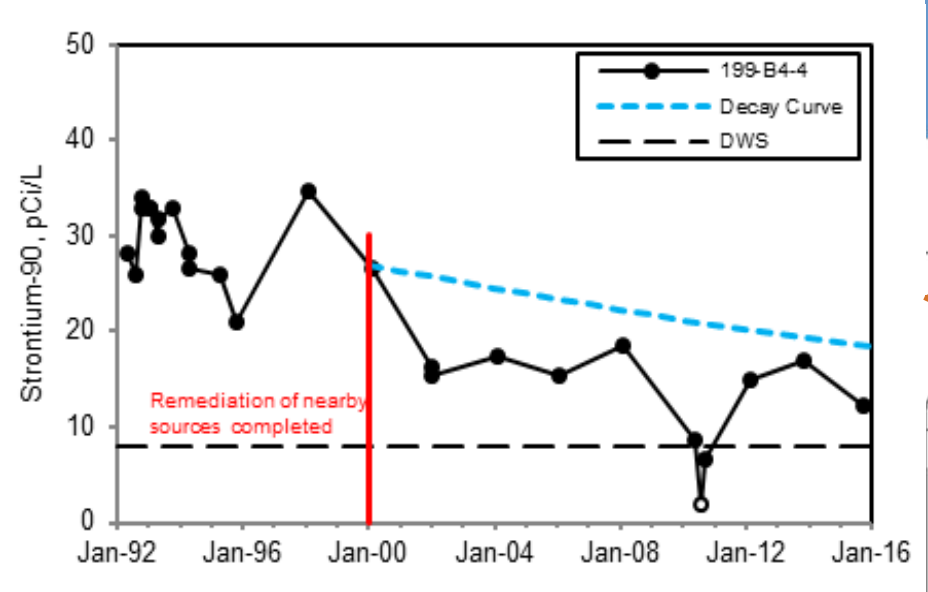
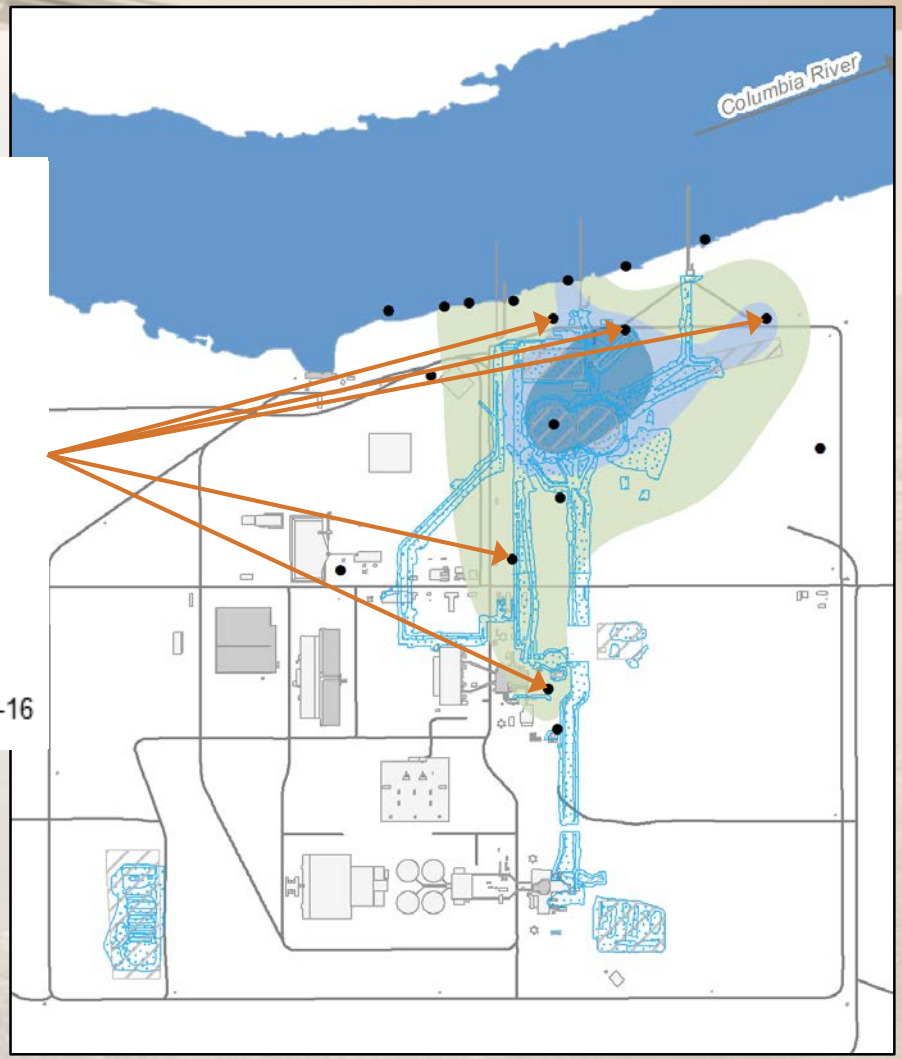
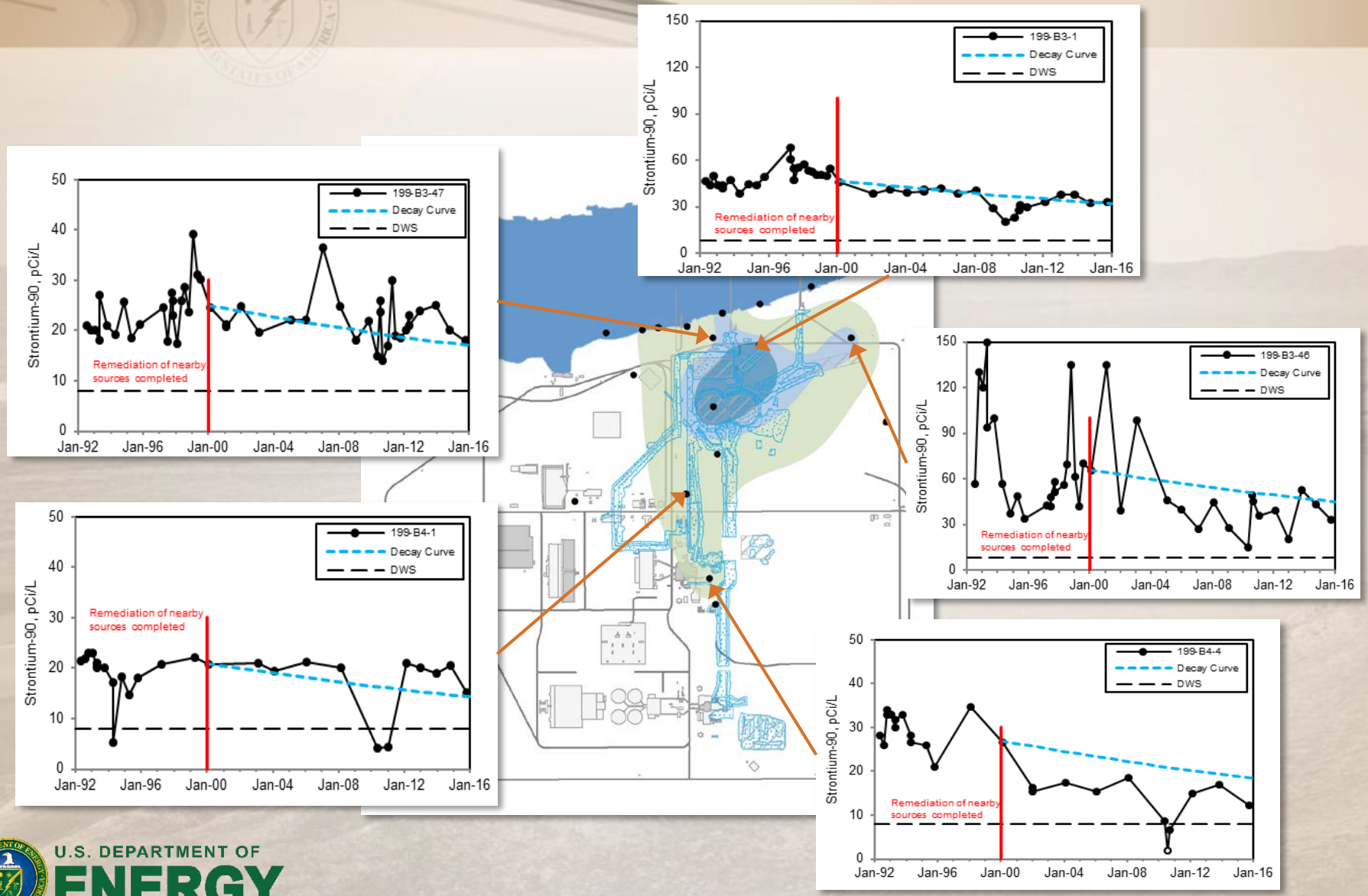
Strontium-90 Trends

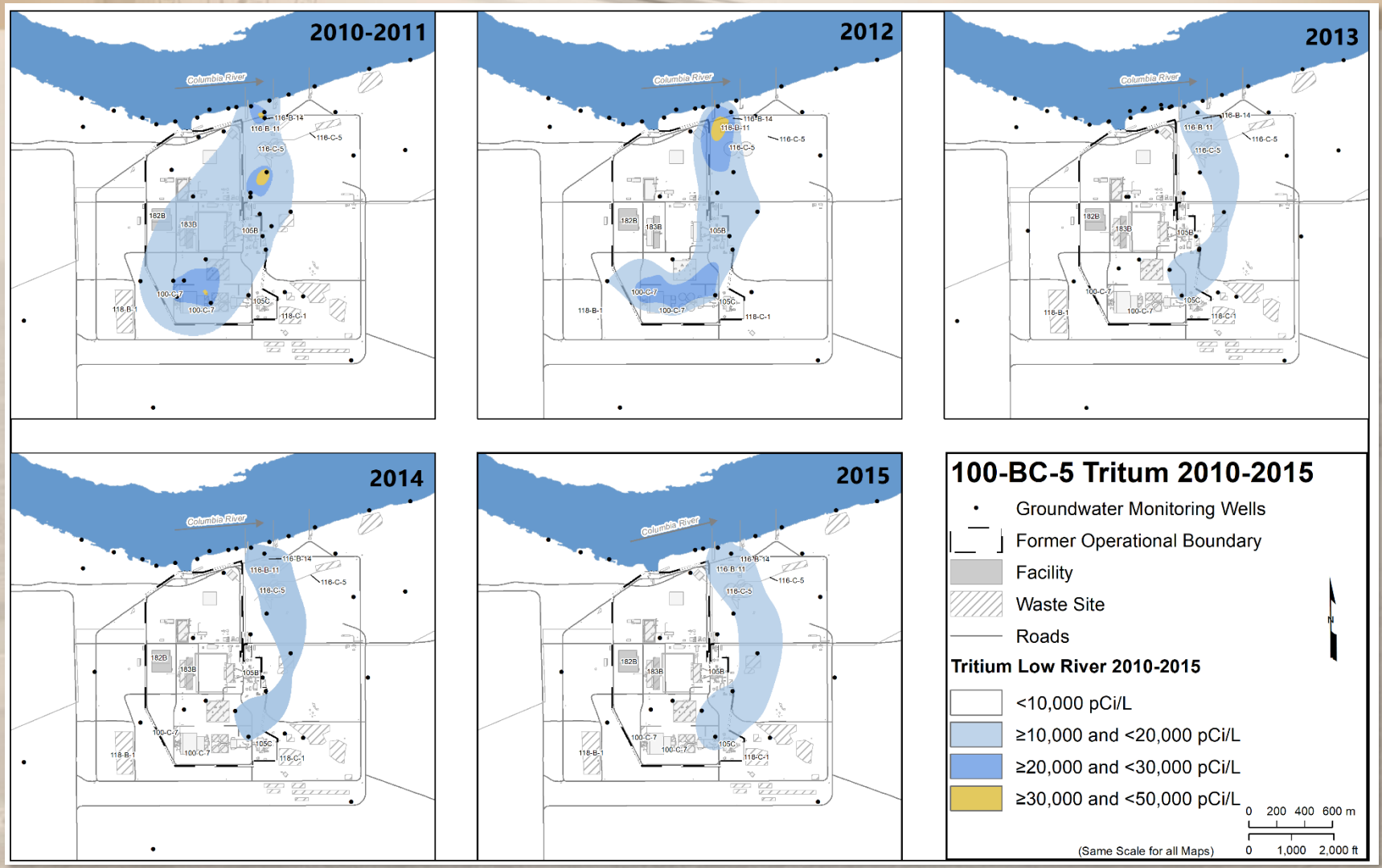




Strontium-90 Trends



Tritium



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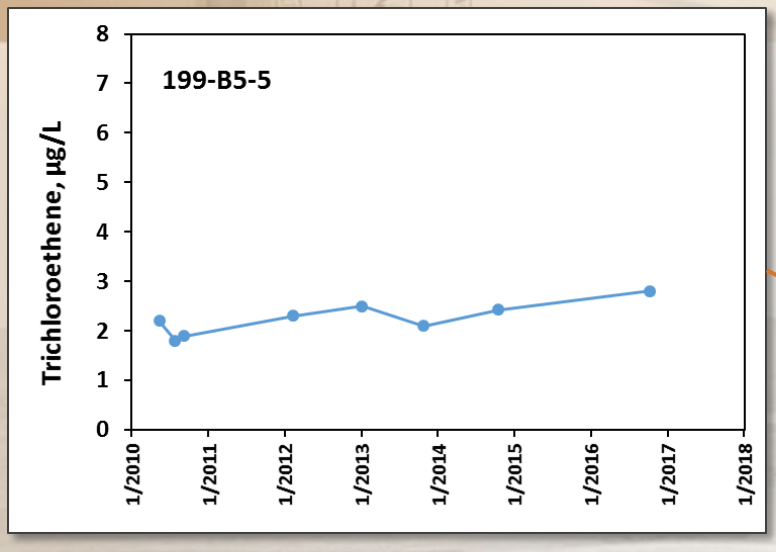
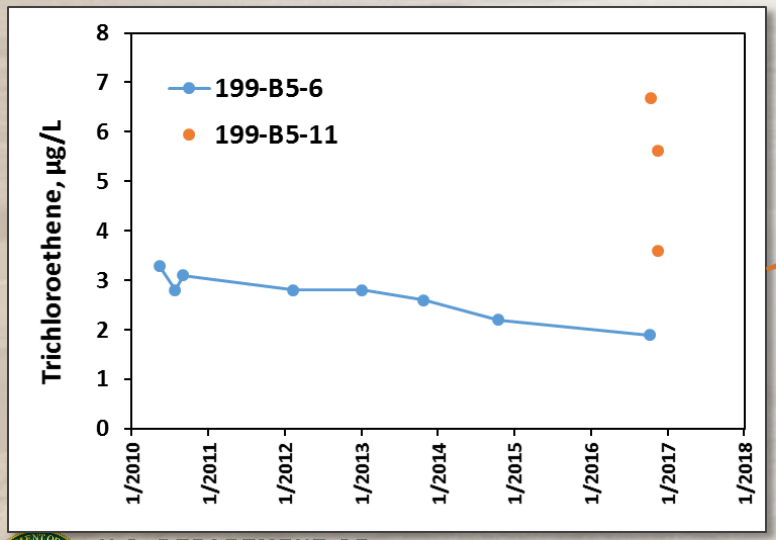
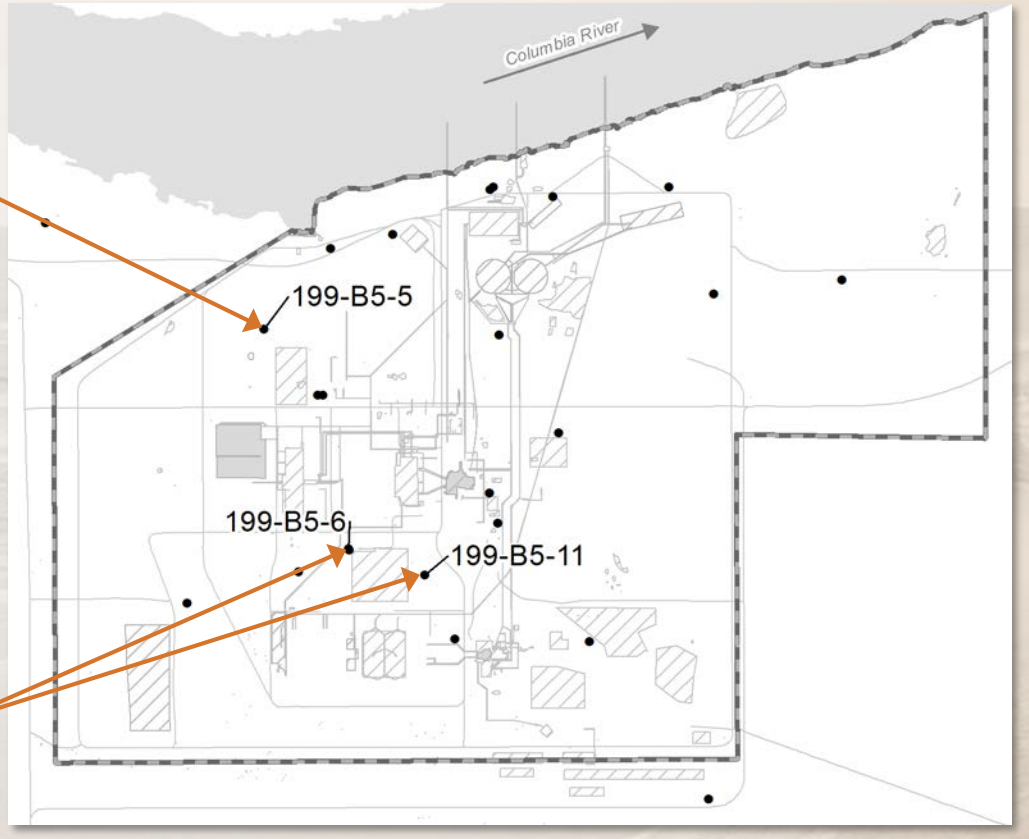
Trichloroethene







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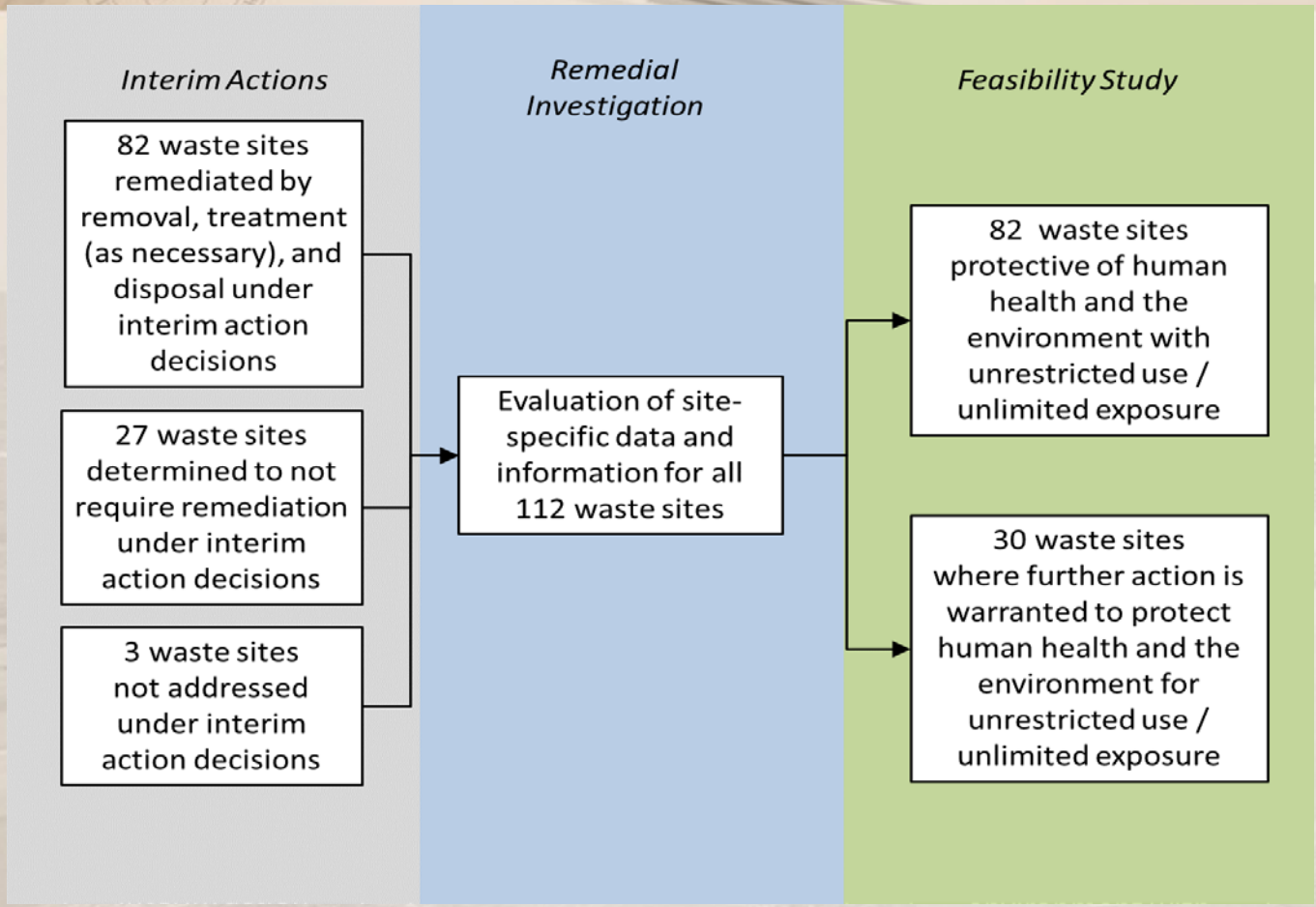
What is the scope of the proposed plan?



Hexavalent chromium, strontium-90, tritium, and trichloroethylene in groundwater

What is the scope of the proposed plan?

- Breakdown of the 30 waste sites where further action is warranted
  - Seven sites with residual contamination that poses a shallow direct contact risk for residential use and/or threat to groundwater or surface water quality
    - One of the seven includes residual hexavalent chromium contamination in the shallow zone (direct contact risk; threat to groundwater and surface water)
    - Two of the seven include residual radionuclide contamination that represents a potential threat to groundwater under an irrigated scenario
    - Six of the seven include residual radionuclide contamination in the shallow zone (direct contact risk)
    - Six of the seven include residual radionuclide contamination in the deep zone
  - There are 23 sites that have residual radionuclide contamination in the deep zone (only) and do not have potential to impact groundwater or surface water
  - No sites have residual contaminant concentrations that pose a potential risk to ecological receptors

Summary of Alternatives Evaluated

Alternative	*Waste Sites*	*Groundwater*
1	No action (required by the NCP)	
2	Natural attenuation with ICs; RTD; no action	MNA with ICs
3		Pump and treat; MNA with ICs
4	Natural attenuation with ICs; aggressive RTD; no action	
5	Natural attenuation with ICs; RTD; no action	Cr(VI) source treatment with pump and treat; MNA with ICs
6	Natural attenuation with ICs; aggressive RTD; no action	

Comparative Analysis of Alternatives

Alternative	Threshold Criteria		Balancing Criteria				
	Overall Protection of HHE	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction in TMV through Treatment	Short-Term Effectiveness	Implementability	Cost (Present Value)
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	Yes	★★★☆	★☆☆☆	★★★☆	★★★★	**$23M**
3	Yes	Yes	★★★☆	★★☆☆	★★★★	★★★☆	**$160M**
4	Yes	Yes	★★★★	★★☆☆	★★☆☆	★★☆☆	**$270M**
5	Yes	Yes	★★★☆	★★★☆	★★★★	★★☆☆	**$99M**
6	Yes	Yes	★★★★	★★★☆	★★☆☆	★★☆☆	**$210M**

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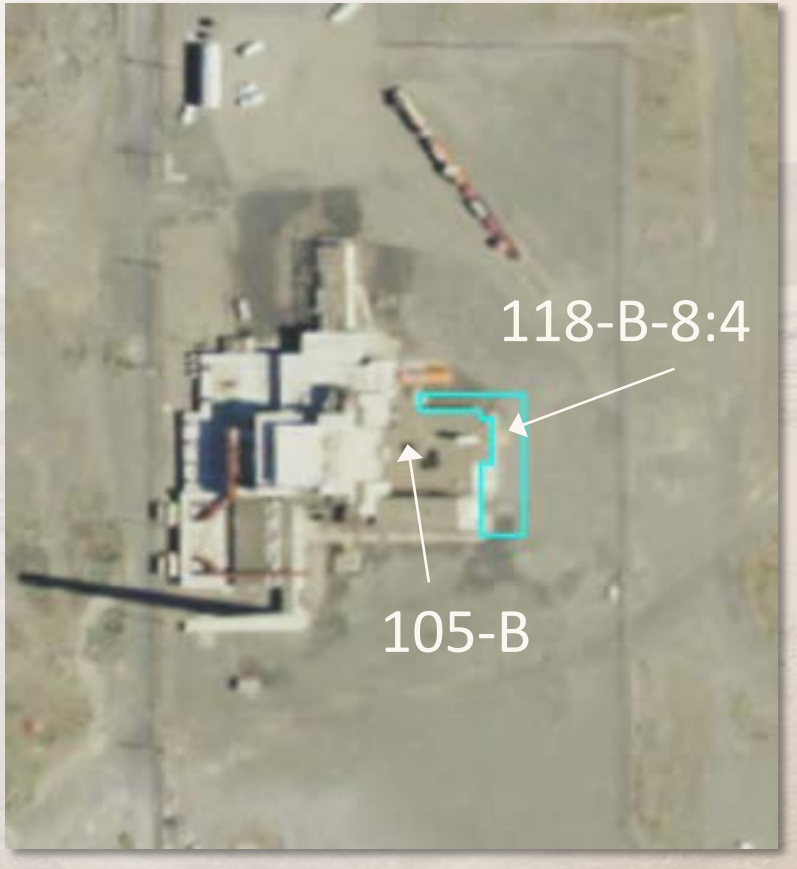
Remediation Timeframes (Years)

Alt.	Waste Sites	Groundwater				
		Cr(VI)	Cr(VI)	Sr-90	Tritium	TCE
		10 µg/L	48 µg/L	8 pCi/L	20,000 pCi/L	5 µg/L
1	5 to 187	60	15	70	N/A	25
2	5 to 187	60	15	70	N/A	25
3	5 to 187	15*	5	70	N/A	25
4	5 to 33	15*	5	70	N/A	25
5	5 to 187	15	5	70	N/A	25
6	5 to 33	15	5	70	N/A	25

*Pump and treat required for an additional 25 years to maintain compliance

Why 187 years for waste sites?

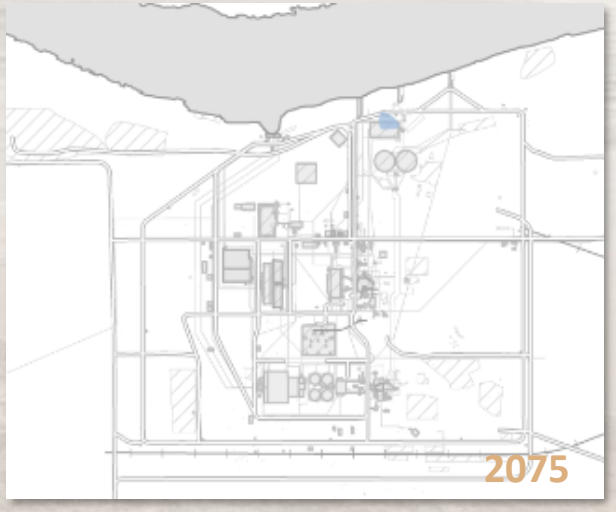
- Timeframe associated with decay of radionuclide contamination at the 118-B-8:4 site
- Radionuclide contamination located at a depth of 13+ feet
- Excavation/removal ability is limited by the immediate proximity of the 105-B Reactor Building

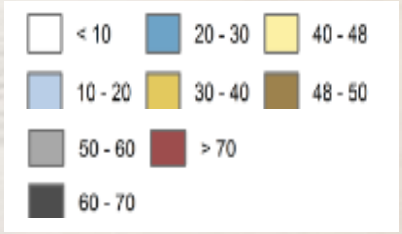


Preferred Alternative: Alternative #2

- Achieves protection of human health and the environment
- Satisfies applicable or relevant and appropriate requirements within a reasonable timeframe
- Removal, treatment and disposal of the remaining, grouted segment of sodium dichromate transfer line
- Natural attenuation with institutional controls for 30 waste sites
- No action for 82 waste sites
- Monitored natural attenuation with institutional controls for groundwater

Hexavalent Chromium Projections – Top of Aquifer





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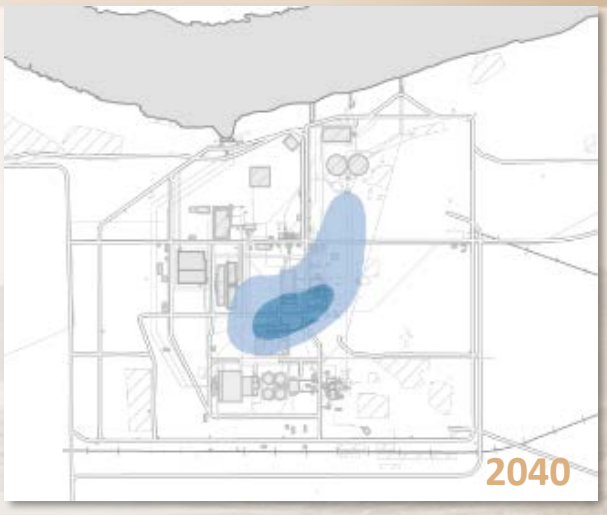
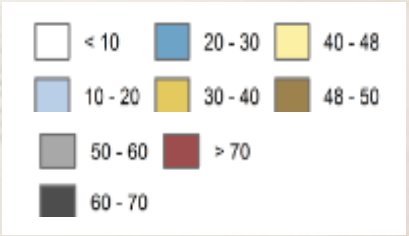
Hexavalent Chromium Projections – Lower Aquifer





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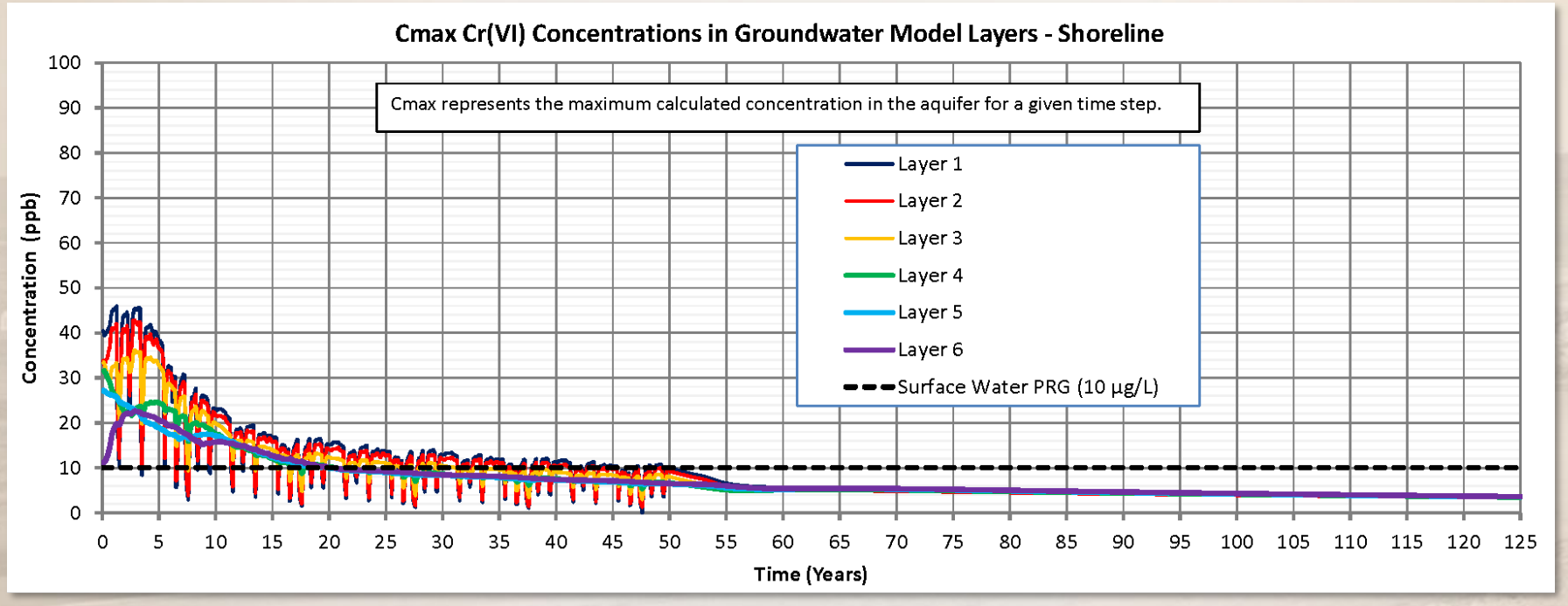
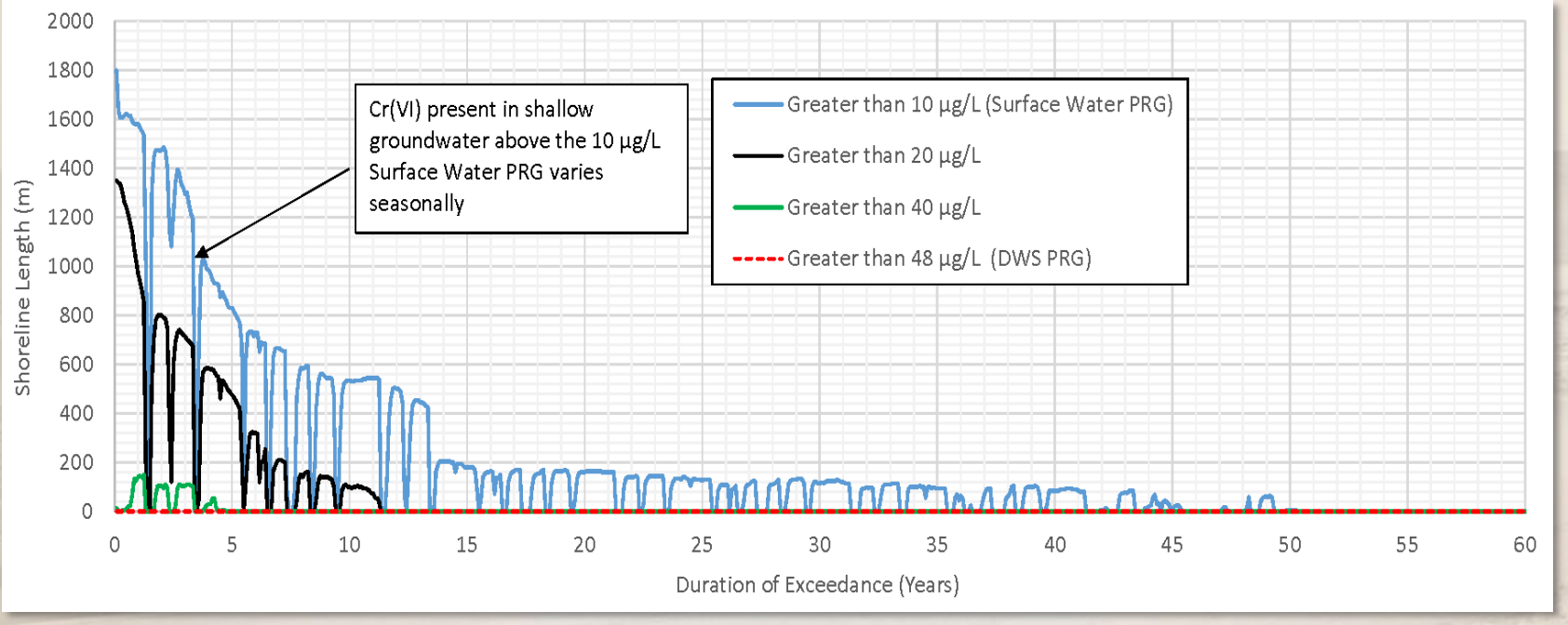
Projected Hexavalent Chromium Concentrations at the Shoreline under the Preferred Alternative

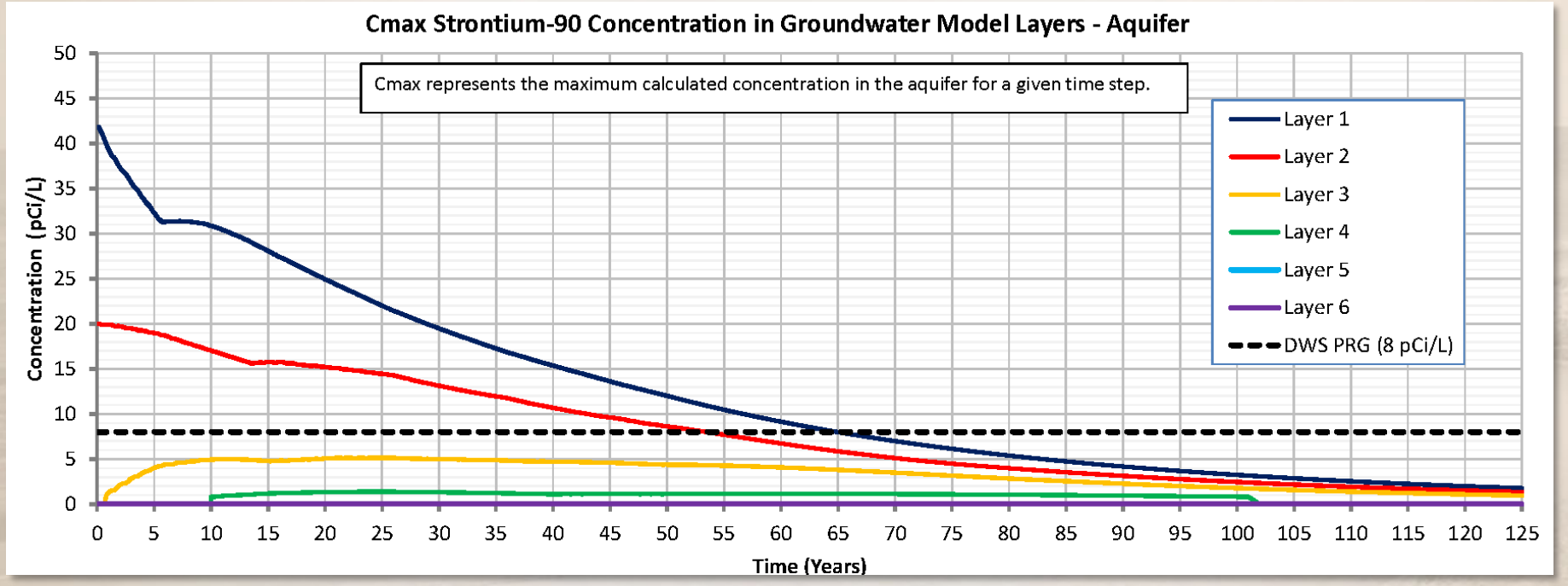


Projected Shoreline Length with Elevated Hexavalent Chromium Concentrations Under the Preferred Alternative



No unacceptable ecological risk based on multiple lines of evidence

Projected Strontium-90 Concentrations in the Aquifer under the Preferred Alternative

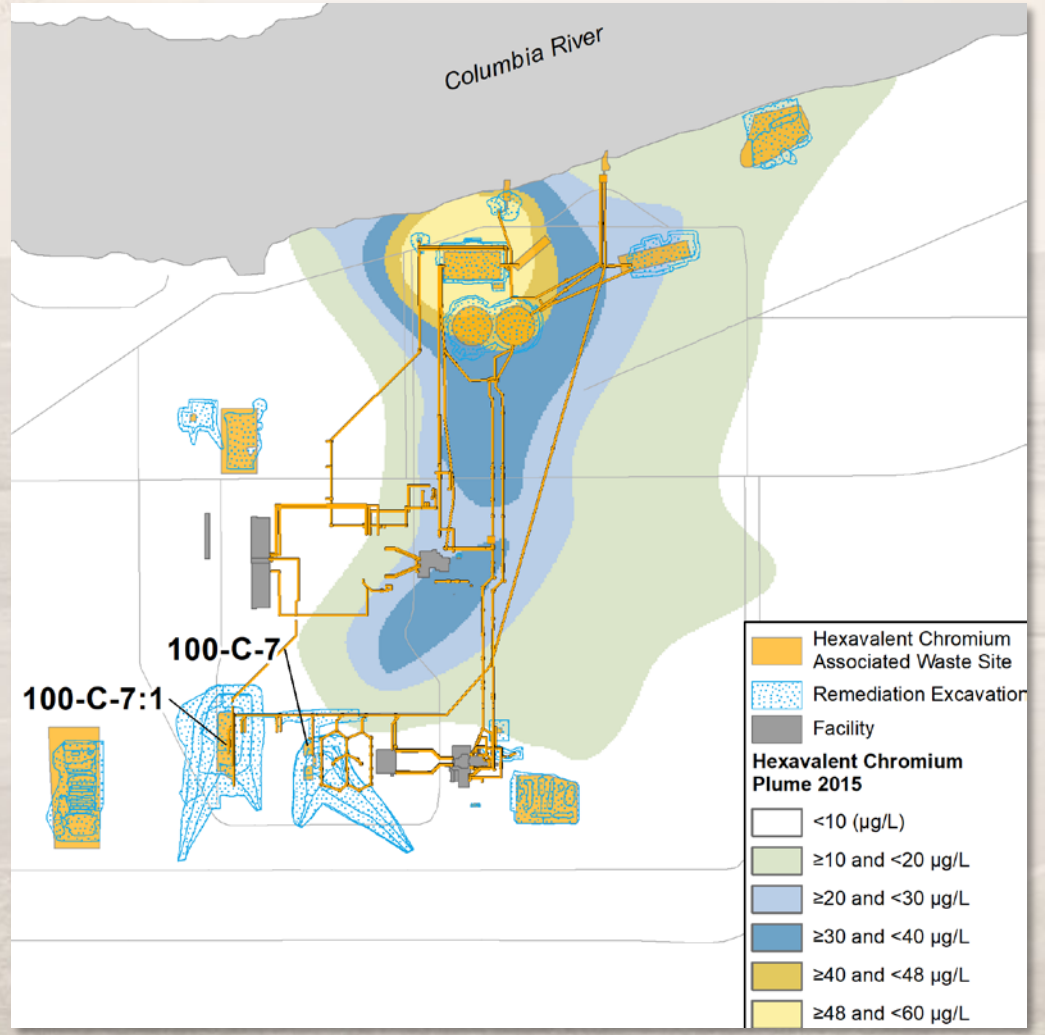


Questions/Discussions

What caused the waste site and groundwater contamination?

- Contamination originated from historical solid and liquid waste disposal, and includes:
  - Radionuclides
  - Metals
  - Organic compounds
- The 100-BC-1 and 100-BC-2 Operable Units address contaminated soil
  - Three interim action Record of Decisions (ROD) for waste sites
- Some contaminants moved through the soil and into groundwater; the 100-BC-5 Operable Unit addresses contaminated groundwater
  - No interim action ROD

Waste Sites Associated with Hexavalent Chromium



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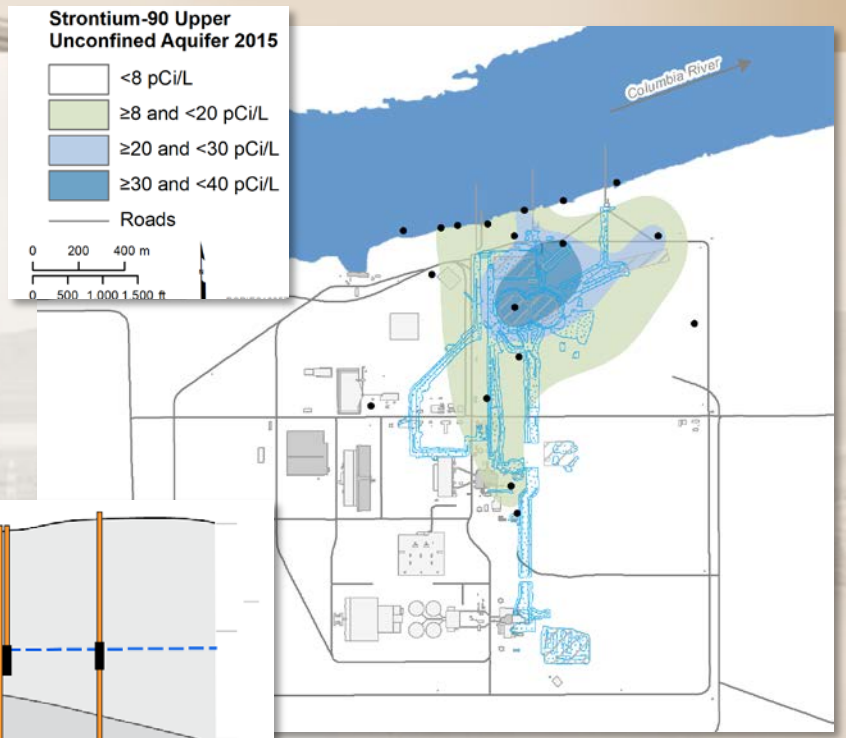
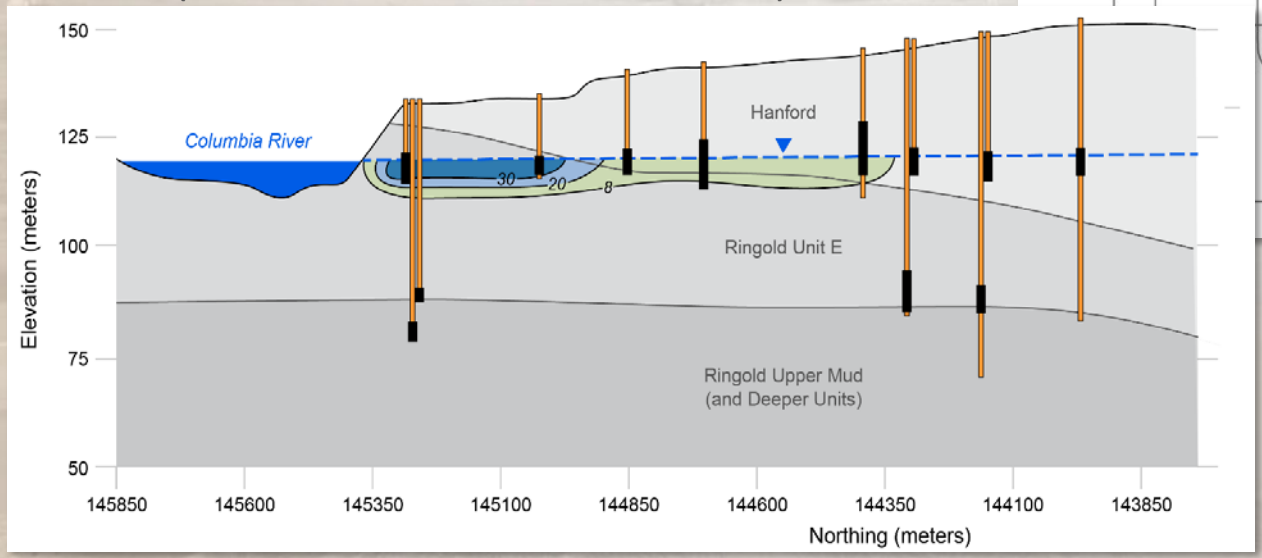
Strontium-90

- Strontium-90 plume changes very little from year to year
- Plume is limited to the upper portion of the aquifer
- Concentrations are below the biota concentration guide in the hyporheic zone (near or below detection limits)





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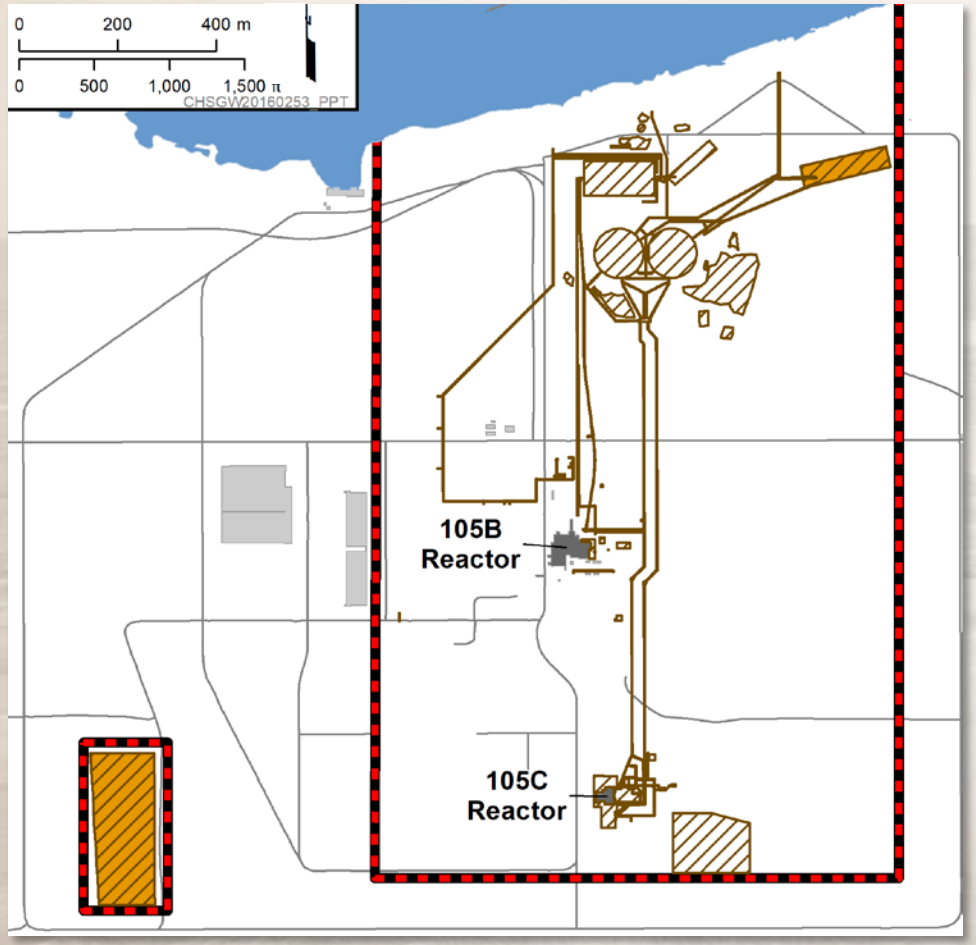
Alternative Components Evaluated for Waste Sites

- No action considered for the 82 waste sites that did not have remaining contaminants at concentrations greater than the proposed cleanup levels
- Natural attenuation (radiological decay) with institutional controls considered for sites with radionuclide contamination (shallow and deep)
- Removal, treatment and disposal considered for residual shallow hexavalent chromium contamination at one site under all alternatives with remedial actions
- “Aggressive removal, treatment and disposal” considered for six sites that have residual radionuclide contamination that poses a shallow direct contact risk and/or a threat to groundwater

Alternative Components Evaluated for Groundwater

- Monitored natural attenuation with institutional controls considered for all groundwater contaminants
  - Includes installation of new monitoring wells and periodic sampling to assess rates of attention and overall protectiveness
- Pump and treat considered for hexavalent chromium
- As a supplement to pump and treat, treatment for in situ reduction considered for one area where a continuing source of hexavalent chromium groundwater contamination is suspected

Preferred Alternative: Alternative #2



Waste sites with institutional controls

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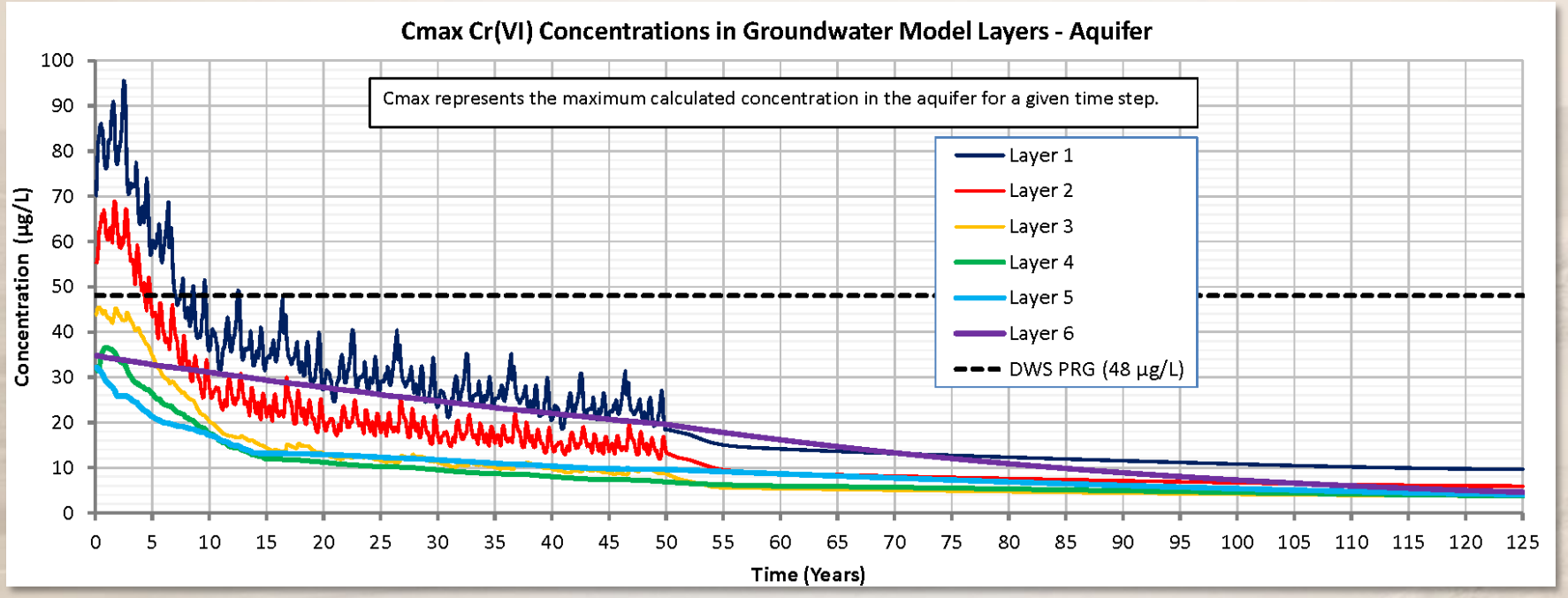
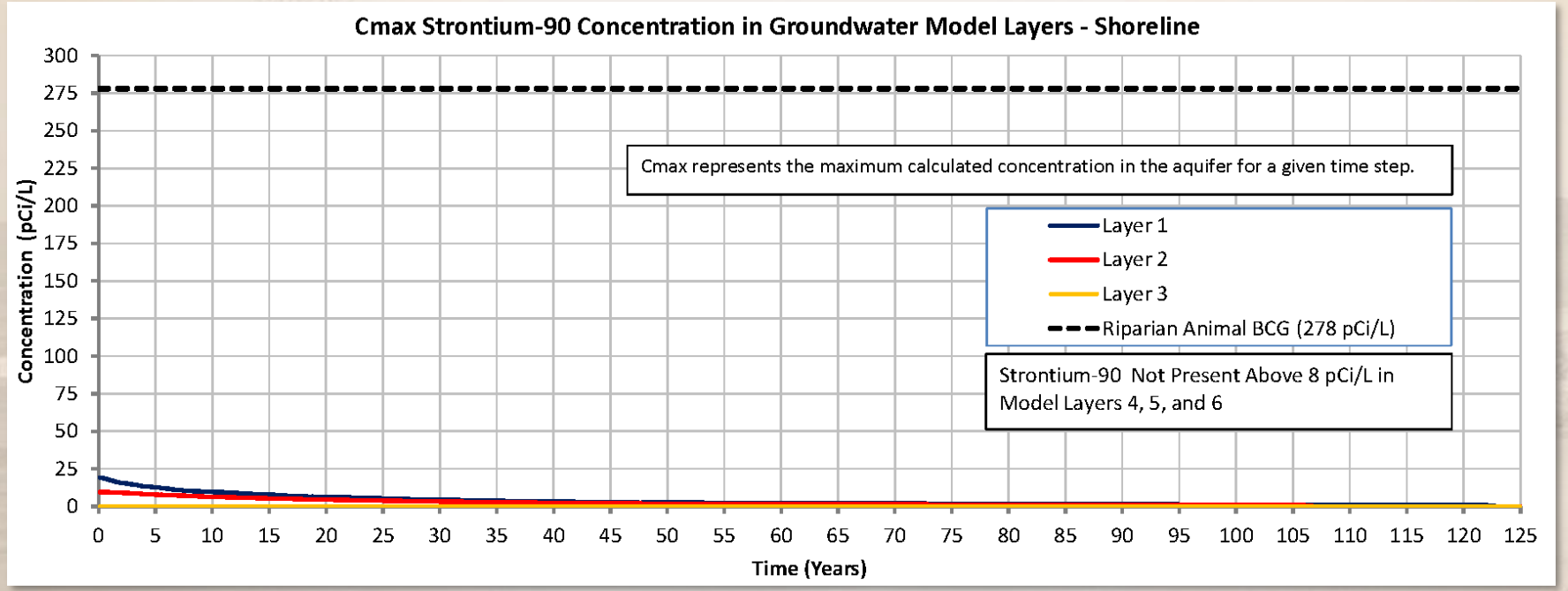
Projected Hexavalent Chromium Concentrations in the Aquifer under the Preferred Alternative



Projected Strontium-90 Concentrations at the Shoreline under the Preferred Alternative



Current and future strontium-90 concentrations do not pose an unacceptable risk to riparian and aquatic receptors in the near-shore area and Columbia River

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