



THE HANFORD SITE

Approaches to 100 K Area Strontium-90 Contaminated Groundwater

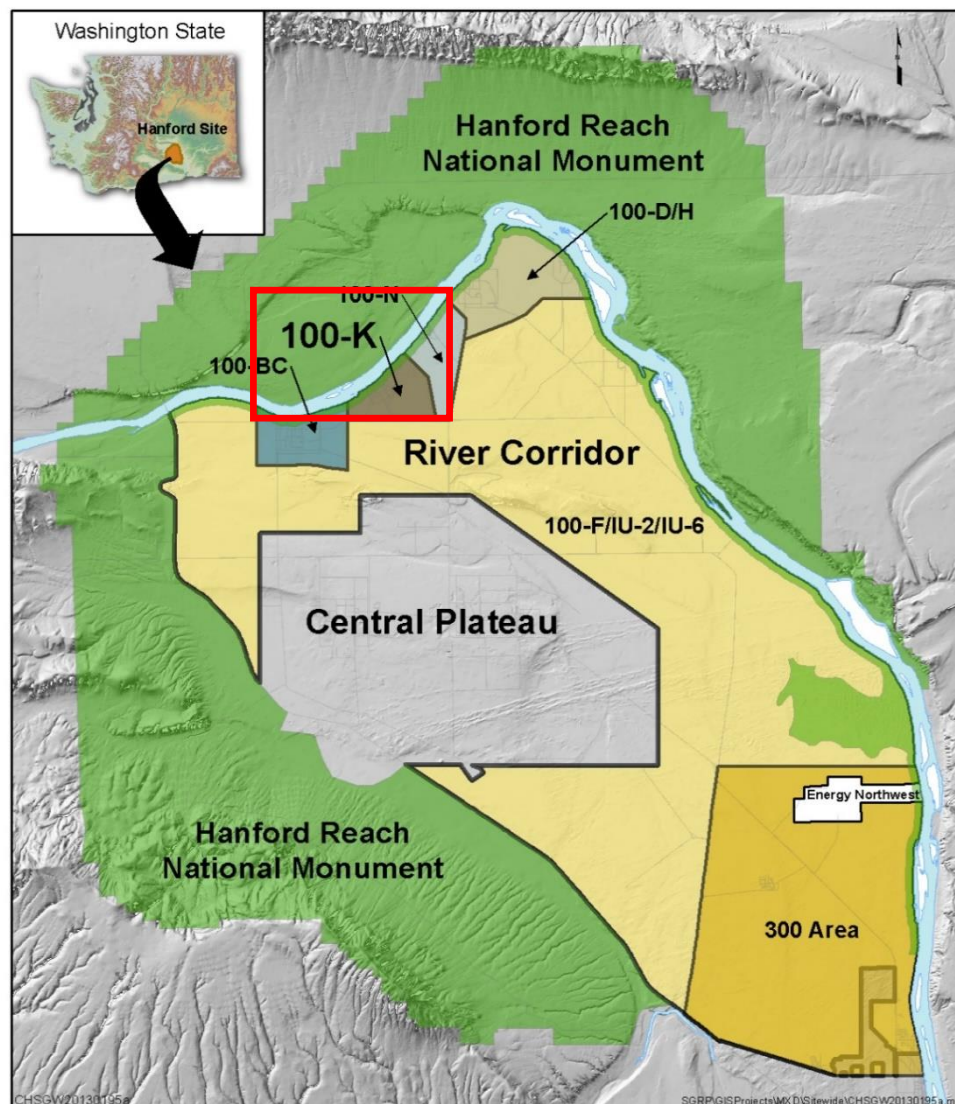
Presentation to the
Hanford Advisory Board River and Plateau Committee

Presented by: Ellwood Glossbrenner, U.S. Department of Energy

October 16, 2019

- Share background information on strontium-90 (Sr-90) in 100 K Area groundwater
- Discuss applicability of Technical Impracticability (TI) waiver and Monitored Natural Attenuation (MNA) for Sr-90 in 100 K groundwater
- Receive feedback on TI waiver and MNA

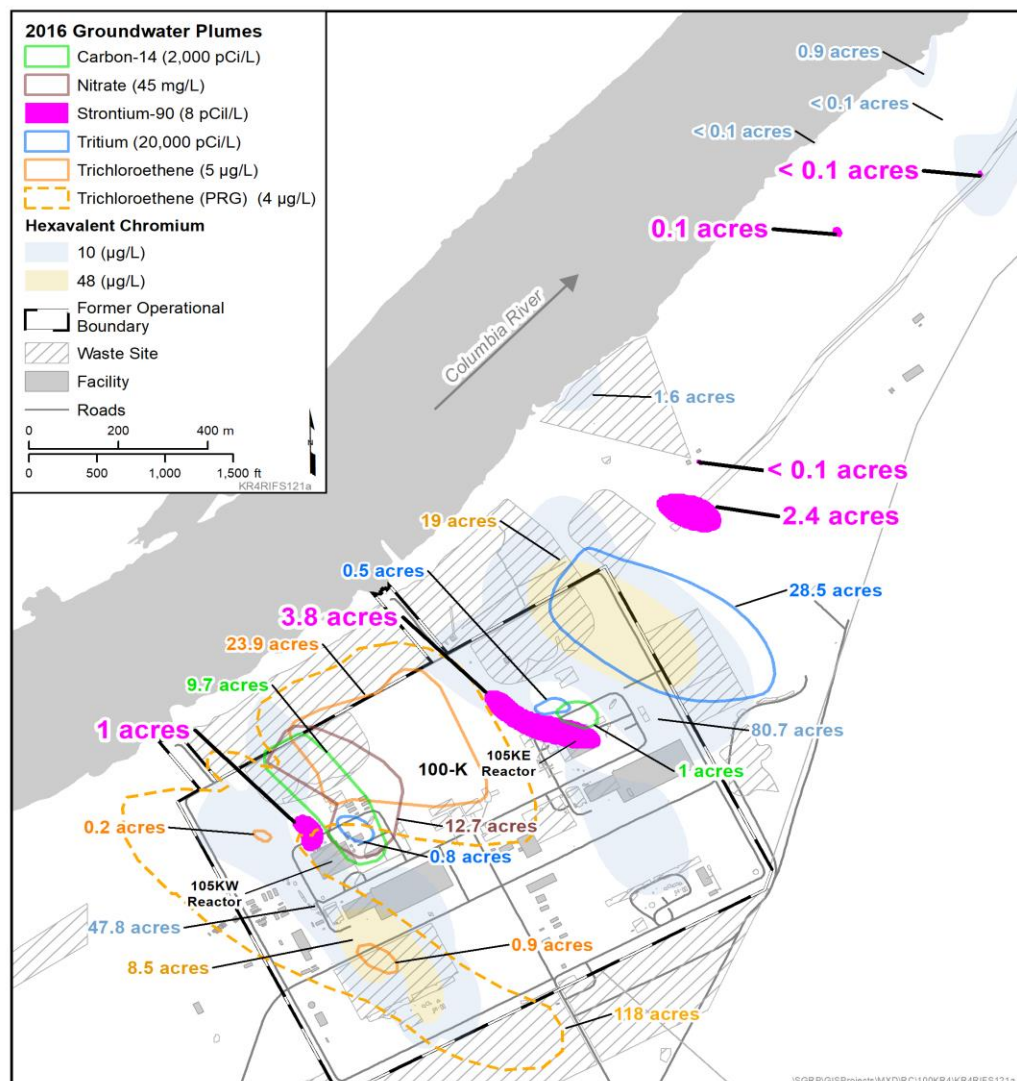
THE HANFORD SITE | 100 K Area



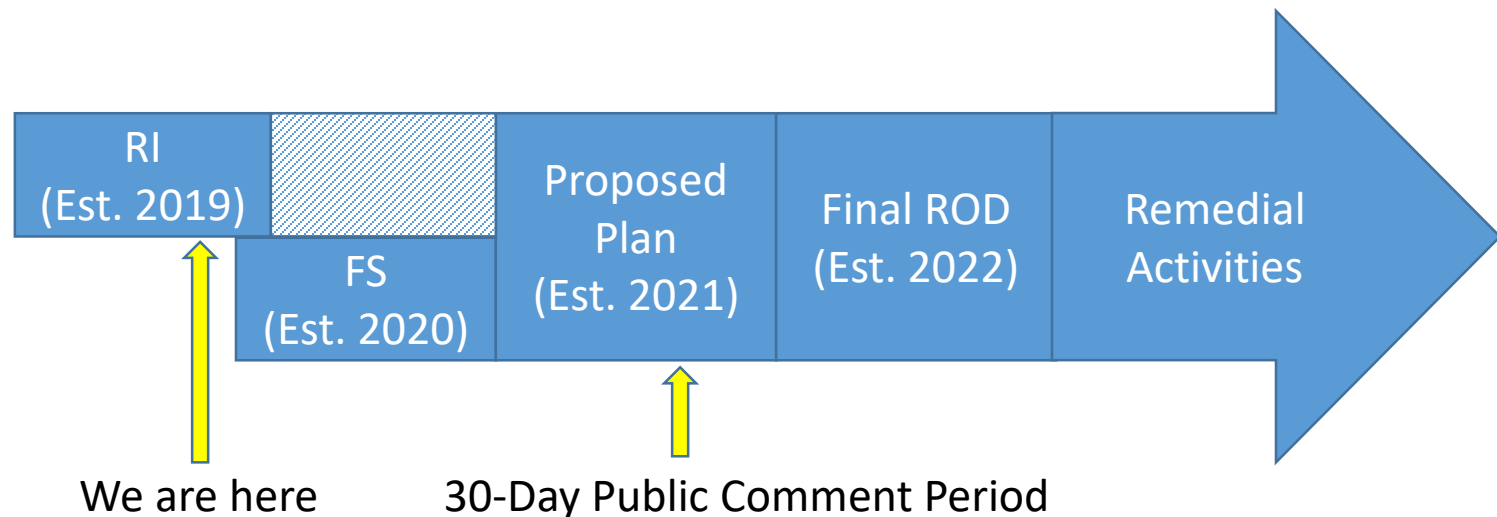
THE HANFORD SITE | 100 K Area During Construction (1954)



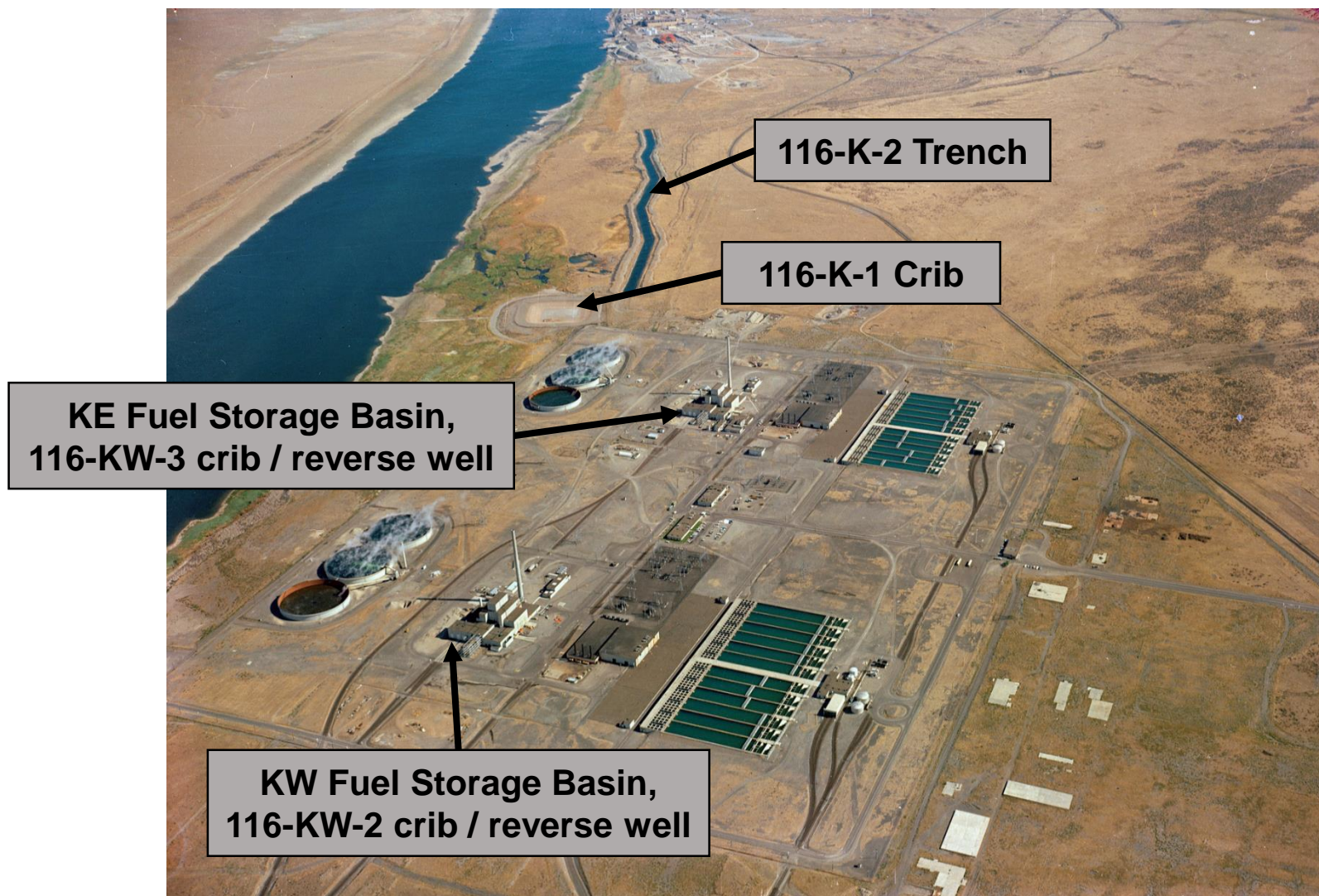
CHPUBS1105_2010-97_DD_01.1-5



- Sr-90 in groundwater exceeds drinking water standards (DWS)
- The current Interim Record of Decision (ROD) addresses hexavalent chromium through pump-and-treat systems. Other contaminants of concern are being evaluated in the final remedial investigation and feasibility study (RI/FS)
- Interim action pump-and-treat systems will continue until final ROD is issued, then may continue pending the decision in that ROD



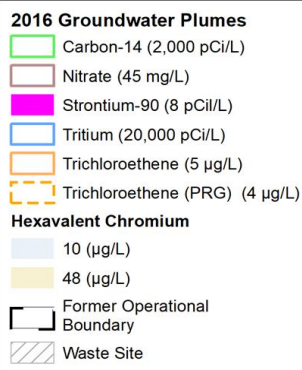
Primary 100 K Sr-90 Sites



- During operations, Sr-90 was pushed through the vadose zone by large volumes of discharged liquids that leaked from the fuel storage basins or infiltrated from the reverse wells, cribs, and trenches
- Sr-90 binds to soil and aquifer sediments, making it not readily mobile
- Sr-90 has a half-life of 28.8 years
- The Sr-90 plumes are not projected to reach the river above the DWS, even if the pump-and-treat system is not operating
- The Sr-90 plumes will naturally decay to below the DWS in 200-300 years



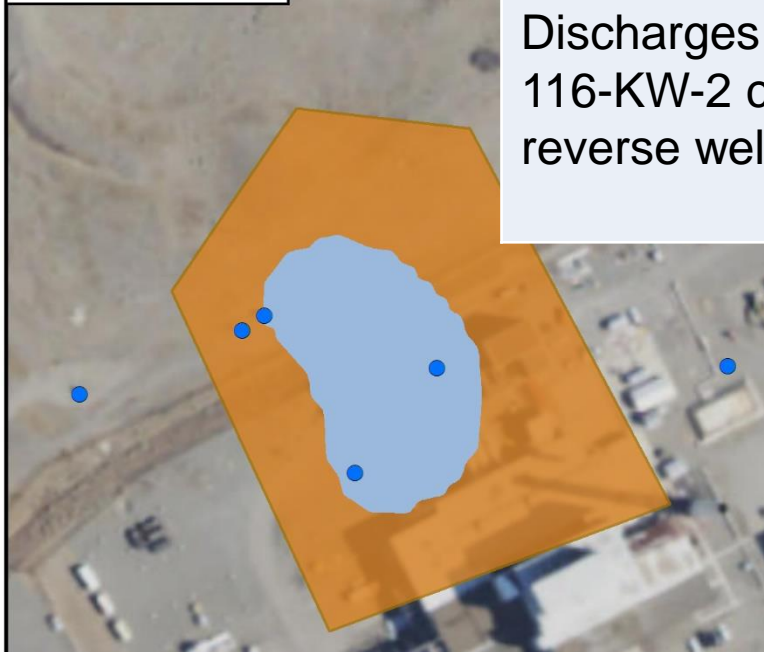
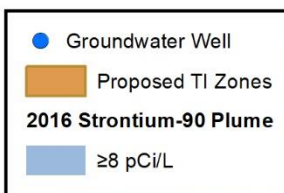
Sr-90 Plumes in 100 K Groundwater

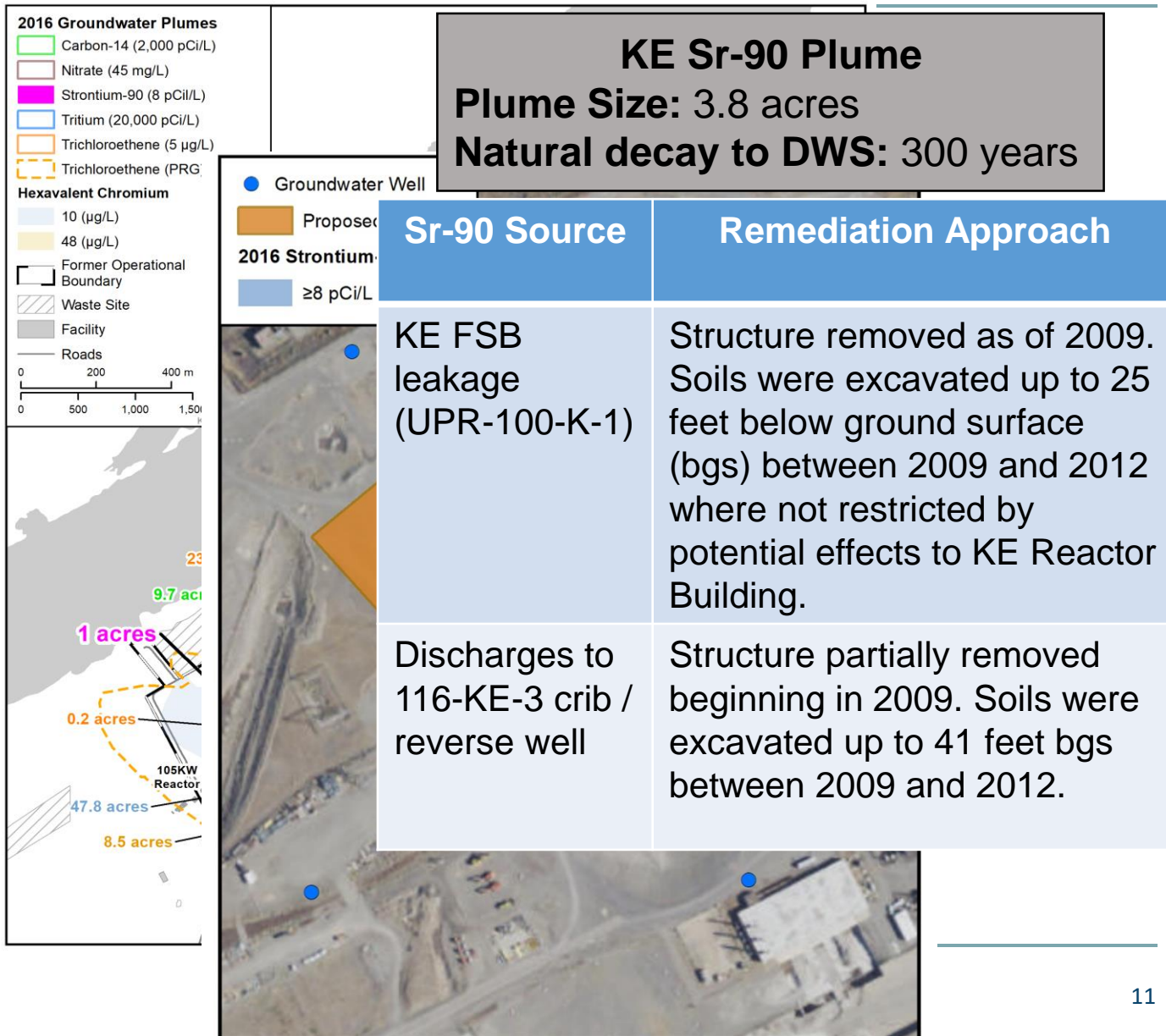


KW Sr-90 Plume
Plume Size: 1 acre
Natural decay to DWS: 134 years

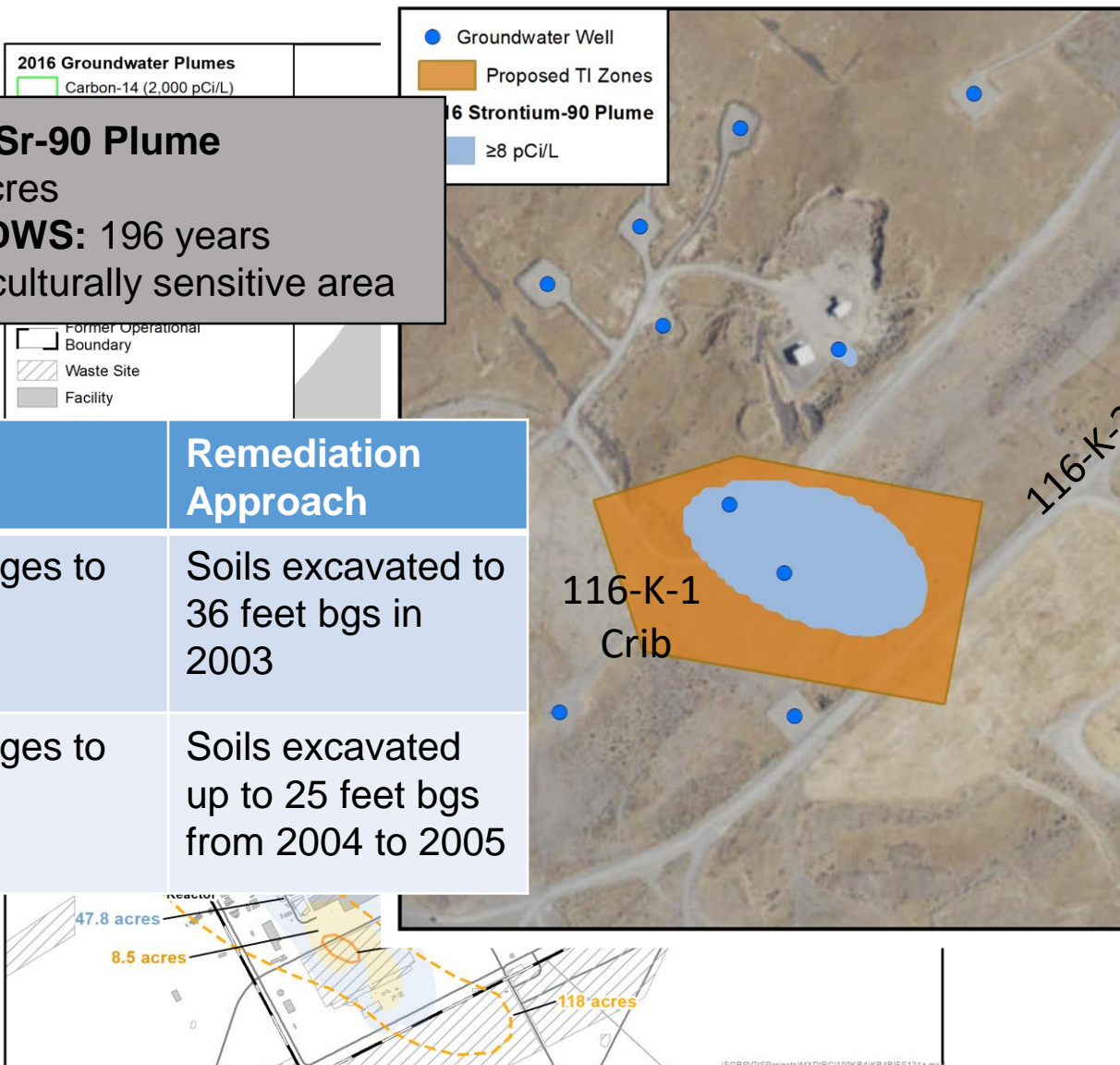
0.1 acres

Sr-90 Source	Remediation Approach
KW Fuel Storage Basin (FSB) leakage	Future soil excavation (limited extent due to reactor)
Discharges to 116-KW-2 crib / reverse well	Future soil excavation (limited extent due to reactor)





Sr-90 Plumes in 100 K Groundwater



Sr-90 Source

Remediation Approach

Wastewater discharges to the 116-K-1 crib

Soils excavated to 36 feet bgs in 2003

Wastewater discharges to the 116-K-2 trench

Soils excavated up to 25 feet bgs from 2004 to 2005

Sr-90 Groundwater Response Technologies

The Innovative Treatment and Remediation Demonstration program evaluated approximately 40 technologies relevant for Sr-90 remediation. Additional reviews as part of feasibility study planning have not identified additional technologies.

Retained technologies to remediate Sr-90	Media	Previously implemented at Hanford?	Applicable to Sr-90 at 100 K?
Pump and Treat	GW	Yes	Yes (but shown to be ineffective at attaining DWS)
Impermeable Barrier	GW	Yes	No (will not migrate to river)
Apatite Permeable Reactive Barrier	GW	Yes	No (will not migrate to river)
Soil Flushing	Soil	Yes	No (low mobility, negative secondary effects)
Removal, Treatment and Disposal	Soil	Yes	Yes (with physical excavation limitations)
Institutional Controls	Soil/GW	Yes	Yes
Monitoring	GW	Yes	Yes

Note: GW = groundwater

- Even under the most active remediation scenario, (reactor- removal, treatment and disposal [RTD] and long-term pump and treat), **long-term monitoring and land-use controls will be necessary** at 100 K until Sr-90 naturally decays (about 200-300 years)
- Long-duration restoration period warrants consideration of TI waiver and MNA

TI Waiver vs. MNA at 100 K

TI Waiver Administrative Action (40 CFR 300.430(f)(1)(ii)(C)(3))	Common Attributes	MNA Response Action
<ul style="list-style-type: none">• Documented in the Proposed Plan and ROD as a waiver from specific Applicable or Relevant and Appropriate Requirements that cannot be met within a reasonable period• Only applicable to the DWS for Sr-90 within limited areas of 100 K• Typically evaluated for periods greater than 100 years• Environmental Protection Agency's (EPA) TI review process provides an additional independent review of TI• Increases period for documentation process	<ul style="list-style-type: none">• Reviewed by the public as part of the Proposed Plan• Source control required• Institutional Controls required• Monitoring required to confirm continued protectiveness• Monitoring required to confirm the plumes are not expanding• Can be used in conjunction with multiple response strategies• DWS met through decay of Sr-90 in 200-300 years• Protectiveness determined as part of 5-year reviews	<ul style="list-style-type: none">• Documented in the Proposed Plan and ROD as part of the selected remedy• 200-300 year period for Sr-90 is beyond what is typically considered for MNA• Additional monitoring may be required to confirm reductions of Sr-90 concentrations are occurring as expected

- The Department of Energy and the EPA will continue to engage with the Hanford Advisory Board during review of the FS (2020), Proposed Plan (2021), and ROD (2022)
- Draft A of the FS will have TI waiver in some of the alternatives. EPA will evaluate this during its review of the FS.

- Sr-90 plumes in the 100-KR-4 area will naturally decay below the DWS in 200-300 years. Other technologies are unable to significantly reduce the cleanup period.
- Long-term monitoring will be necessary to confirm that decay occurs as expected and no unexpected migration occurs
- DOE is exploring the applicability of a TI waiver as a component of the remedies in the FS