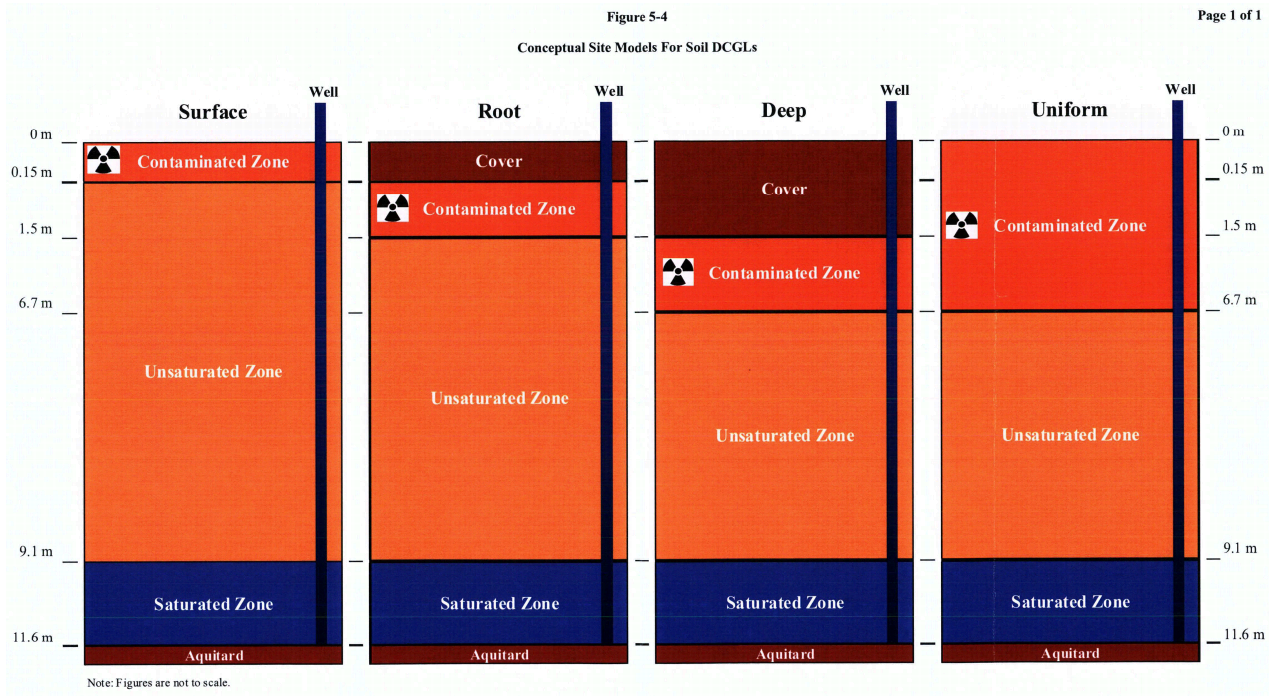


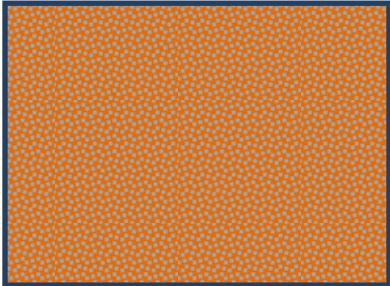
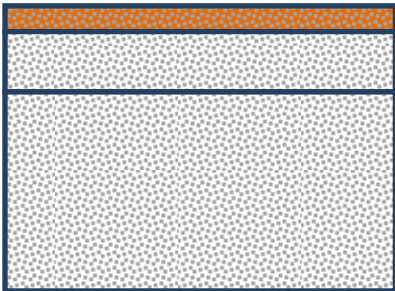
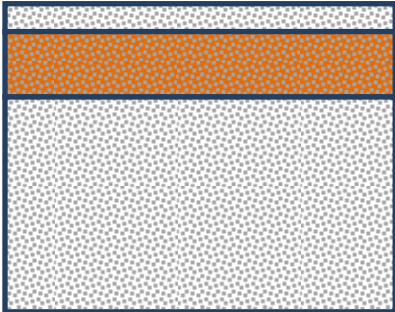
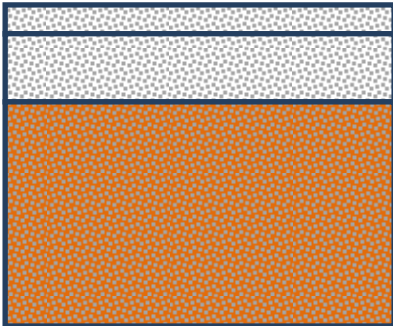
Approaches to demonstrating compliance with the dose criteria in 10 CFR 20.1402 approved in Hematite's decommissioning plan

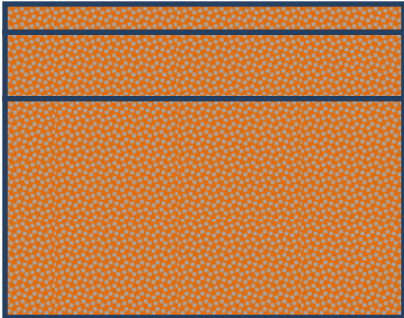
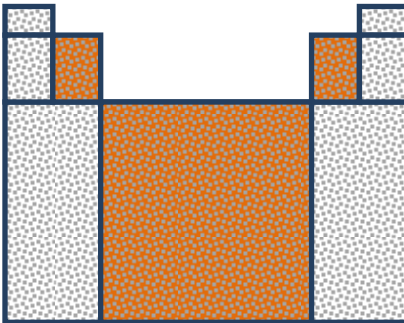
Conceptual Site Models (CSMs) used by Westinghouse in development of DCGL values in the Hematite Decommissioning Plan (Fig 5-4 in the decommissioning plan [DP]):



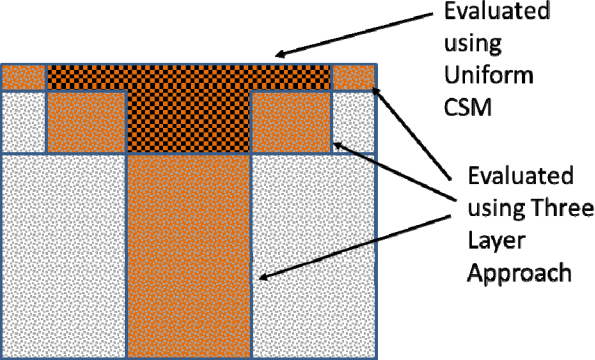
- Two subsurface geometries were considered in the DP (Section 5.3.3.1):
 - a soil column comprised of surface, root, and deep layers,
 - one stratum with uniform contamination.
- DCGL values equivalent to 25 mrem/yr were derived by Westinghouse for each radionuclide for each CSM assuming the soil in other layers was clean.
- Because of the manner in which the DCGLs were derived in the three layer approach (i.e., surface, root, deep CSMs), soil being at the DCGL in each layer would lead to a dose of >25 mrem/yr. A sum of fractions approach must be used to account for contamination in multiple layers.
- NRC's Dose Assessment Conclusions in safety evaluation report (SER) for the DP:
 - "The use of the alternative CSMs is appropriate as long as each area is determined to fall under either the Surface, Root, Deep CSM (applying the sum of fractions rule as appropriate), or the Uniform model."

NRC Summary of Approaches Approved in Hematite's DP

Approach	Westinghouse Reference	NRC Comments
<i>Uniform DCGL Approach</i>		
Use Uniform DCGLs 	Section 5.3.3.1 in DP	<ul style="list-style-type: none"> Simplest method of demonstrating compliance
<i>Three layer DCGL Approaches</i>		
Use Surface DCGLs 	Section 5.3.3.1 in DP	<ul style="list-style-type: none"> Applies to the top 15 cm Need to justify that contamination does not exist outside of 0-15 cm depth
Use Root DCGLs 	Section 5.3.3.1 in DP	<ul style="list-style-type: none"> Applies to soil between 15 cm and 1.5 m deep Need to justify that contamination does not exist outside of 15 cm to 1.5 m depth
Use Excavation DCGLs 	Section 5.3.3.1 in DP Response to RAI 5-Q9 (ML102850223)	<ul style="list-style-type: none"> Applies to soil between 1.5 m and 6.7 m deep Need to justify that contamination does not exist outside of 1.5 m to 6.7 m depth Westinghouse committed to using excavation DCGLs for depths below 1.5 m (RAI 5-Q9 response)

Approach	Westinghouse Reference	NRC Comments
Three layer DCGL Approaches (cont)		
Use Sum of Fractions (SOF) to account for multiple contaminated layers 	Section 5.3.3.1 in DP Equation 14-15 in DP $SOF_{Total} = SOF_{CSM-A} + SOF_{CSM-B} + \dots + SOF_{CSM-n}$	<ul style="list-style-type: none"> Determine the SOF for the surface, root, and deep layers based on the surface, root, and excavation DCGLs respectively Sum of SOF from the three layers must be less than 1 The uniform CSM <u>can not</u> be combined with the three layer approach using this equation
Use Fractional Areas for multiple contaminated layers that do not overlap 	Equation 14-44 in DP $\begin{aligned} &Average\ SOF_{Weighted} \\ &= f_{RZ} \sum_{i=1}^n \left(\frac{C_{i,RZ}}{D_{i,RZ}} \right) \\ &+ f_{DZ} \sum_{i=1}^n \left(\frac{C_{i,DZ}}{D_{i,DZ}} \right) \end{aligned}$ <p>f= fraction of survey unit at given depth (root or deep) C= Average concentration of ith radionuclide in layer D= DCGL of ith radionuclide in layer</p>	<ul style="list-style-type: none"> Justify that only one contaminated layer exists in any vertical slice Equation 14-44 only includes the root and deep layers. If contamination exists in the surface layer, a term must be added to the equation to represent that layer (see equation on last page of Attachment 1 to HEM-15-81 Rev1)

Procedure HDP-PR-FSS-721

Approach	Westinghouse Reference	NRC Comments
	HDP-PR-FSS-721	<ul style="list-style-type: none"> Step 8.4.5 C of HDP-PR-FSS-721 implies that the approach shown in the above picture can be used This approach is inconsistent with Westinghouse's DP and the conclusions in NRC's SER and is unacceptable

Path Forward:

- (1) Correct the procedure (HDP-PR-FSS-721) to be consistent with the DP (i.e., modify the procedure to prohibit the combining of the uniform and three layer approaches in any given vertical column). The presence of contamination in multiple layers should be accounted for using one of the previously approved approaches described above.

or

- (2) Alternatively, provide the NRC with a revised approach for demonstrating compliance with the dose criteria in 10 CFR 20.1402. Note that any changes to the DCGLs would require a license amendment.