

Introduction to the Ecology Alternative Model for Evaluation of Vadose Zone Heterogeneities in WMA C: Development of a 2-Dimensional Numerical Model using STOMP

A presentation to the Tank Waste Committee,
Hanford Advisory Board
10/15/2019

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Why do we need vadose zone modeling in tank farms?

The basics

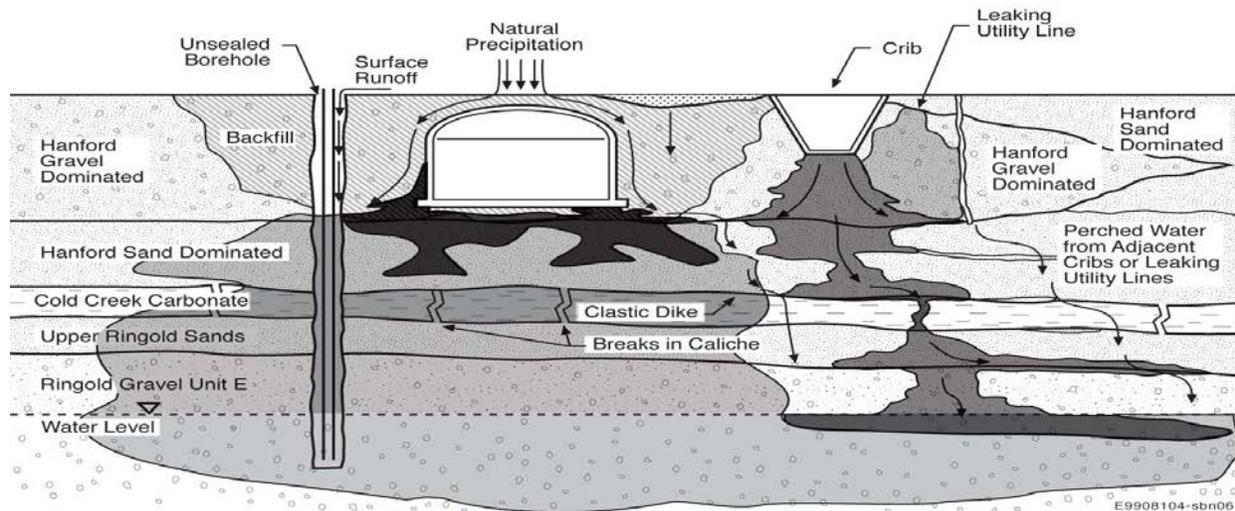
- To estimate the nature and extent of contamination within the vadose zone (the space between the ground surface and the water table) for WMA C – also known as C Farm.
- To assess potential future impact in the groundwater below.
 - How much flux of contamination and at what rate?
 - How long will it continue?
- To plan remediation/corrective action
 - In the soil to stop further migration of contaminants from the vadose zone.
 - In the groundwater.
- To close WMA C.



Challenges to vadose zone modeling in the C tank farm

- The geology of the vadose zone is very complex, with many differences in its physical, hydrologic, and geochemical properties.(e.g. gravel, clay, sand)
 - *We need reliable data and we don't have everything.*
- This geologic complexity, together with waste water and natural precipitation, leads to a three dimensional movement of moisture and contaminants through the vadose zone. Wilson et al. (1995). - *It's an evolving process to understand better as we gather more information.*
- Development of the complex conceptual model is a big challenge!
 - *Another evolving process.*

General Vadose Zone Conceptual Model Concepts after Caggiano (1996) and Johnson and Chou (1998)



Ecology's emphasis on the vadose zone modeling and C tank farm approach

- Involved since mid 2000.
- Many letters* highlighting specific needs such as :
 - Incorporation of small scale heterogeneity.
 - Incorporation of structural features (e.g. sloping beds).
 - Incorporation of a range of hydrogeologic parameters.
 - Use of soil moisture data under different recharge scenarios.
 - Use varied and more sensitive modeling scenarios, such as stratigraphy and moisture content, to address uncertainties of various input parameters.

**(e.g. 14-NWP-240; 17-NWP-07, etc.)*



Today's Specific Presentation: C Farm

- Develop a conceptual model as outlined in the last slides (sloping beds, small scale heterogeneity, moisture data, and hydrogeological properties).
 - Ecology used the small scale heterogeneity as described in the Nez Perce Tribe's 2014 interpretation.
 - Applied published data on various hydrogeological parameters.
 - A 2-D approach compared with the results of USDOE's modeling .
- Using all of these modeling results we can make better closure decisions.



C Farm : Small Scale Heterogeneity

