Pre-Proposal

Locating and Predicting Contaminant Migration to the Columbia River

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Statement of the Problem

Current efforts to fully understand and predict contaminant migration to the Columbia River have met with increased scrutiny and criticism. As noted in Congressional report on H. R. 2419[1], there is concern about DOE's efforts to "analyze contaminant migration to the Columbia River" and to solve contamination migration issues. Past analyses have produced uncertain and sometimes conflicting results. This is due in large part to uncertainties and inconsistencies in conceptual models and the parameter estimates used in these assessments as well as conflicting approaches regarding the complexity and dimensionality of numerical models.

– As noted by DOE 2000[2], "there are few standardized tools or accepted methodologies for developing conceptual models. This has led to ad hoc and inconsistent approaches. Additionally, methods are needed to integrate data collected at different spatial and temporal scales to better estimate contaminant and subsurface properties and processes, and to integrate such data into conceptual models".

Starting in the late 1990's/early 2000's the Groundwater/Vadose Zone Integration Project initiated efforts to manage the development of conceptual models and to consolidate orphan (e.g. project specific) flow and transport datasets into consistent, traceable, defensible and easily accessible databases. Efforts continue today but at reduced levels.

Proposed Approach

We propose to accelerate the development and deployment of improved technologies to integrate, manage, and analyze technical baseline information. These efforts will produce controlled raw and interpretive databases that are fully integrated with state of the art analysis and visualization tools. This, in turn, will enable integrated data gap analysis to facilitate controlled stepwise improvement to the technical baseline information and conceptual models.

The primary objective of this effort will be aimed at improving our understanding of the natural system along the primary transport pathways through the vadose zone and

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[1] Conference Report on H.R. 2419, Energy and Water Development Appropriations Act, 2006

[2] DOE (U.S. Department of Energy). 2000. Research Needs in Subsurface Science. U.S. Department of Energys Environmental Management Science Program, National Research Council. National Academy Press, Washington, D.C.

groundwater. Specifically, we would develop the databases and analysis/visualization capabilities to develop a three-dimensional representation of the geologic framework that can be sampled and/or represented at both the local (waste site specific) and regional (site wide) scales. This 3D model of the geologic framework will be used to constrain the spatial distribution of physical, hydraulic and geochemical properties with an understanding of the heterogeneity and anisotropy of the framework. In addition, the development of translation and interpretation tools such as pedotransfer functions will enable us to extrapolate parameter estimates to areas lacking data and to address scale up and other technical issues.

Anticipated Results

This effort to accelerate the development of critical raw and interpretive databases and to improve management and dissemination of conceptual models and technical information promises to

- Improve our understanding of the natural system
- Improve defensibility/traceabilty of conceptual models and key parametric data sets
- Reduce rework and facilitate consistency
- Improve/Facilitate cleanup decisions/approvals

Scope of Work and Schedule

The principal work elements of this work are:

- Develop/Deploy Data/Information Access and Dissemination Capability
- Develop/Deploy Management and control system for conceptual models, parametric data sets, and uncertainties
- Develop critical raw databases
- Develop key translation, interpretation, and analysis tools (e.g. pedotransfer functions)
- Develop/Deploy geologic model and key parametric databases

This work will be conducted and completed over the course of 18 months. The anticipated budget is $1.5M