South River Conceptual System Model Refinement 2Q 2005
South River Science Team Meeting November 9 & 10, 2004
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A conceptual system model (CSM) is a representation of known or suspected contaminant sources, contaminant migration pathways, exposure mechanisms, and potential human health and ecological receptors. The reason for constructing a CSM is to determine complete pathways to receptors, and assess whether the complete pathways pose a risk. The existing risk or potential future risk may then be addressed. In a general sense, CSMs help us achieve a shared understanding by:

- Defining management objectives
- Guiding problem formulation
- Identifying potential sources and extent
- Analyzing exposure and effects
- Identifying sources of uncertainty in our analysis
- Guiding remedial planning and alternatives analyses

A preliminary CSM has been developed for the South River, which includes potential sources and Hg migration pathways as well as potential exposure pathways. More specific conceptual models, for example food web models or geomorphological models contribute to the overall understanding of the system represented by the Conceptual System Model. Another model - a very general watershed-scale annualized water balance has been prepared. A number of studies designed to evaluate potential sources and pathways are on-going and all feed into the Conceptual System Model.

DuPont has requested and received a proposal from Hydroqual, Inc. to further refine the CSM by incorporating mass balance calculations based on existing data. Hydroqual will evaluate the water budget, the hydrodynamics, the solids balance, and to the degree possible, the mercury mass balance, and compare to observed/existing data. The quality and quantity of existing data may limit the accuracy of the mass calculations, but at the very least, range-finding estimates will be conducted to give approximate qualitative patterns. The early modeling conducted in the 1980s that indicated a natural recovery mechanism is feasible will also be reviewed. The revised CSM will be supported with more detailed conceptual representations and a compilation of existing data such as temporal plots at individual stations or zones and spatial plots at specific times.

In order to conduct this study efficiently, Hydroqual will use the GIS-based relational database that is currently being constructed, and which is scheduled to be completed in early January 2005. The goal of the South River CSM refinement is to eliminate, if possible, some of the working hypotheses regarding Hg sources and migration pathways, and to define critical data gaps that need to be filled to better understand mercury in the river system. The refined CSM and the data gaps defined can also form a good basis for the numerical model development that is planned for South River /South Fork Shenandoah TMDL development.

Hydroqual will work closely with the Science Team and Expert Panel in order to maximize the quality of the refined CSM and to help define critical data gaps.