



**U.S.NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

**RIC 2007**

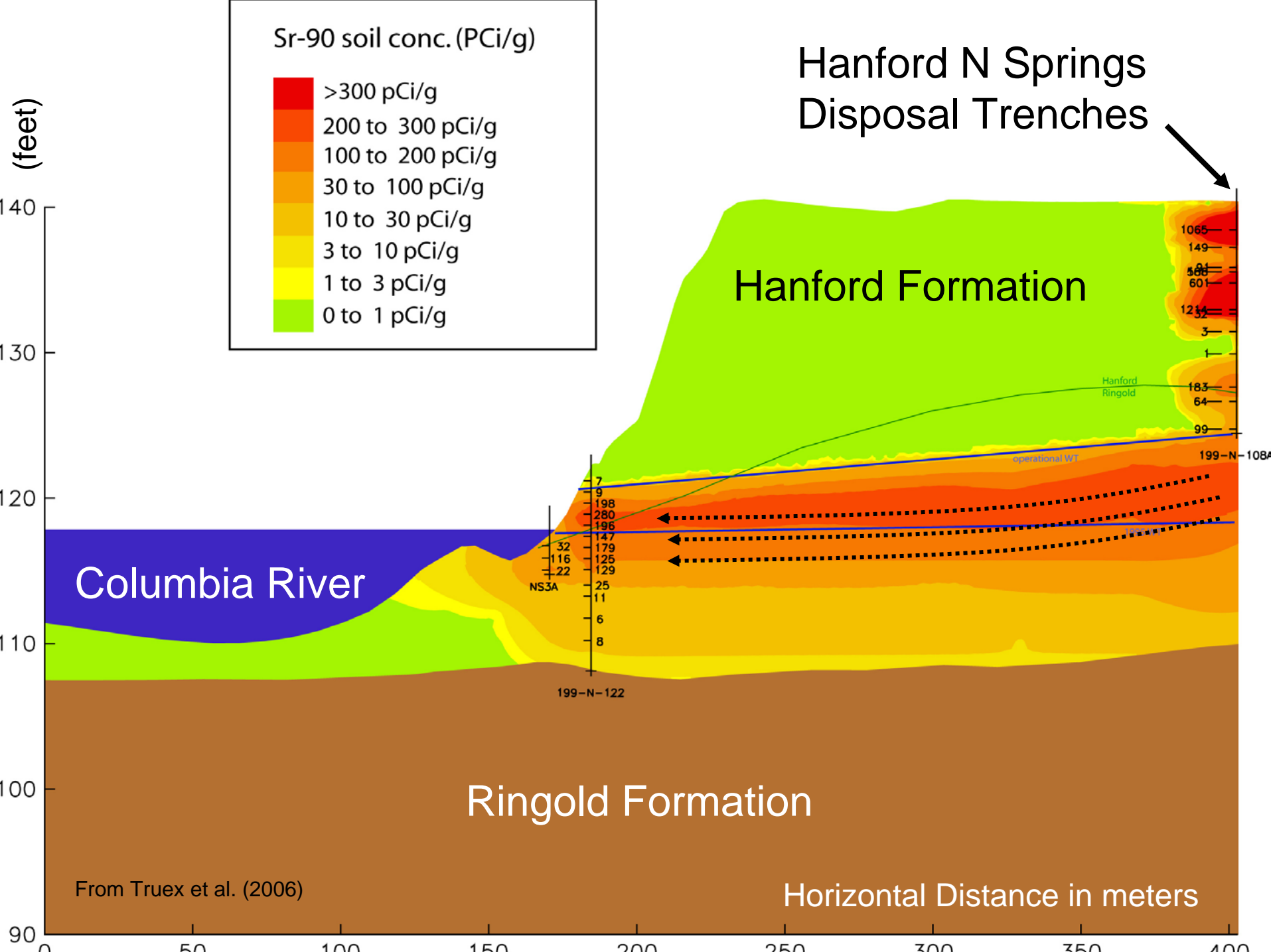
**Multimedia Environmental Models  
for Assessing Contaminant  
Migration and Dose**

Gene Whelan, Ph.D.

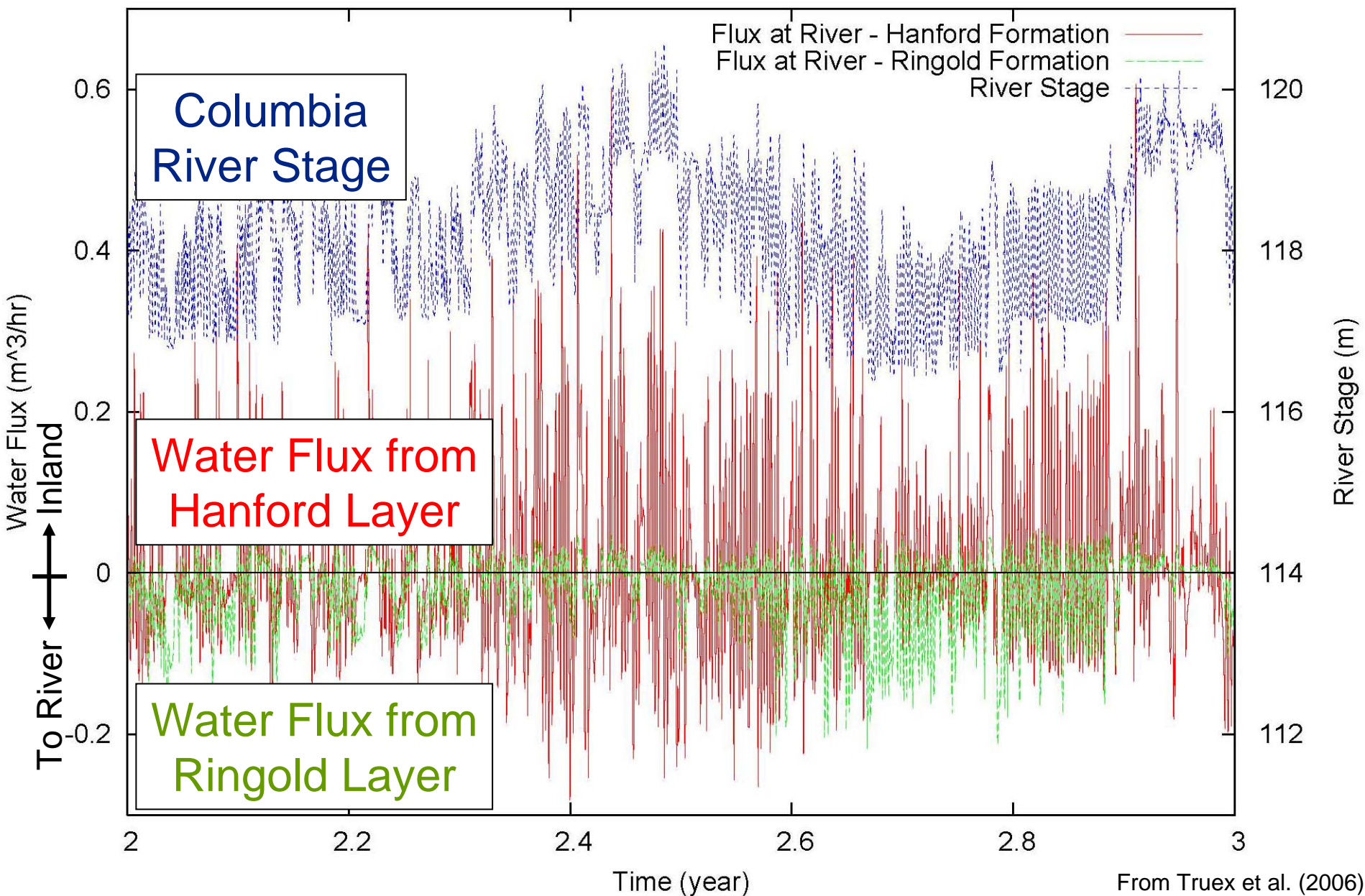
Karl J. Castleton

Pacific Northwest National Laboratory

March 14, 2007



# One-year Variation in River Stage & Water Flowing into The Columbia River at N Springs, Hanford, Washington

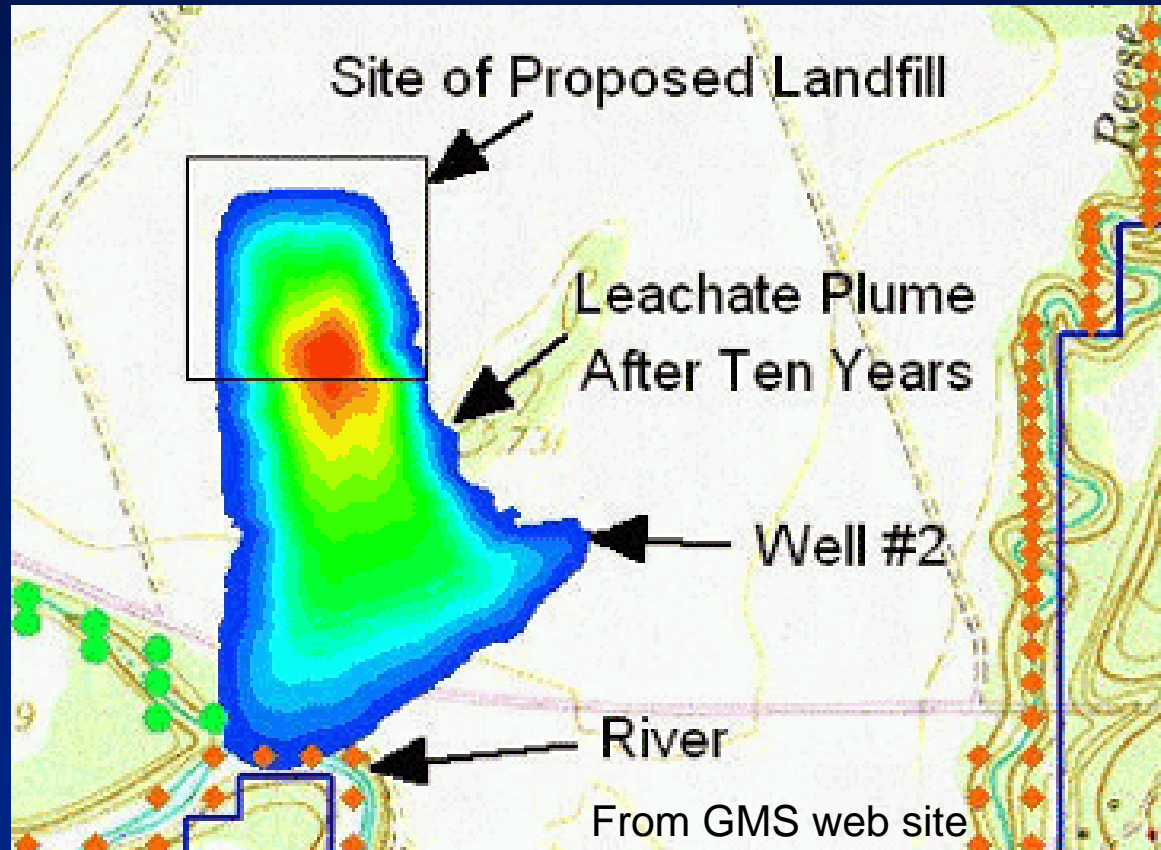


## Objective

- Provide NRC with a more **science-based dose assessment** tool for licensing decisions
- Provide a **mechanism** to access and utilize high-fidelity models
- **Reproducibility** means **Credibility**

# Groundwater Modeling System (GMS)

- High-fidelity groundwater modeling system
- >20 models
- Acceptable to the regulators and in common use



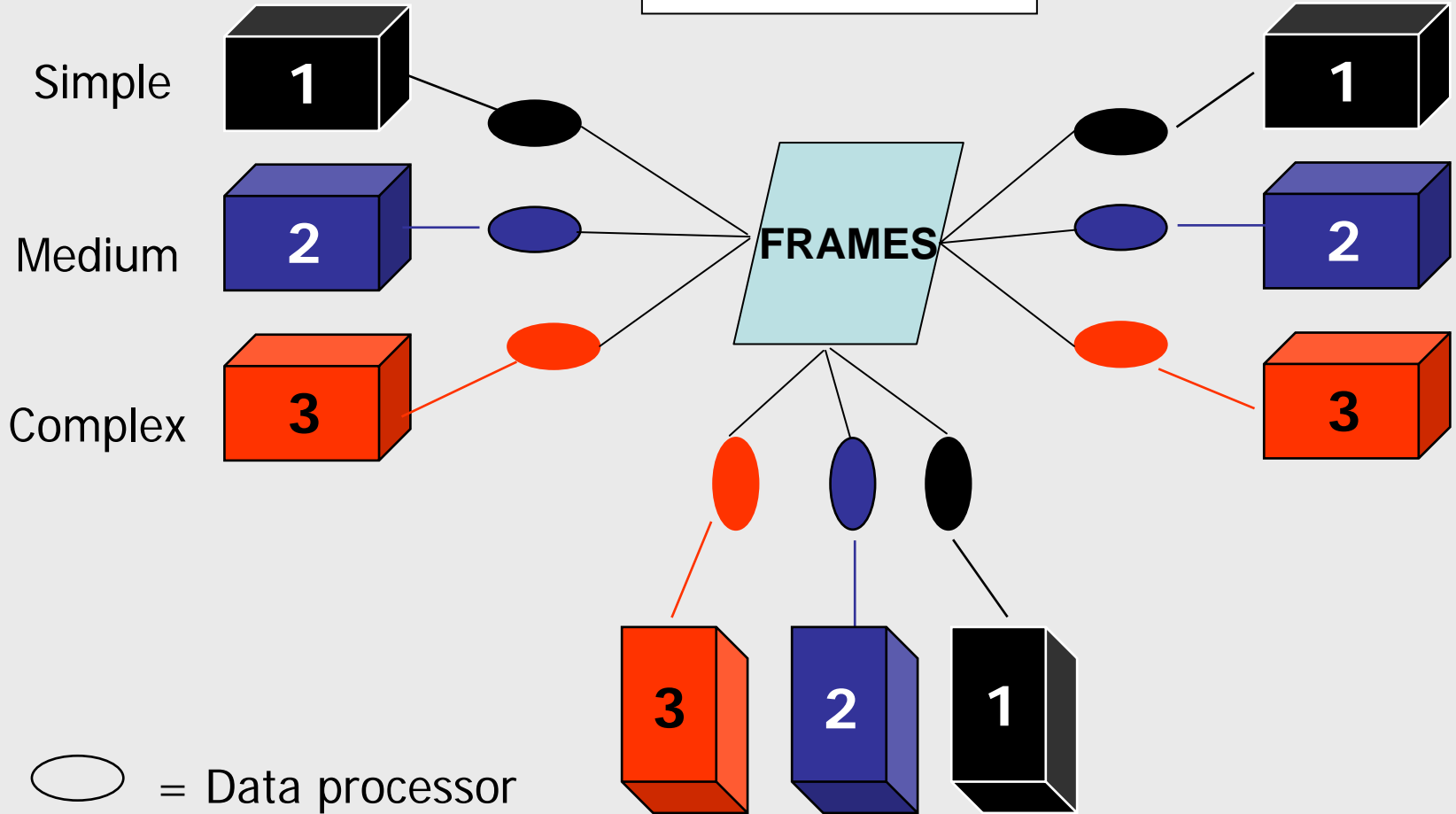
# FRAMES


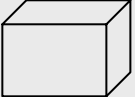
- **Allows user to choose models and databases**
- **Seamlessly links user-defined disparate models and databases**

# Model Type 1 (e.g., Source Model)

# FRAMES

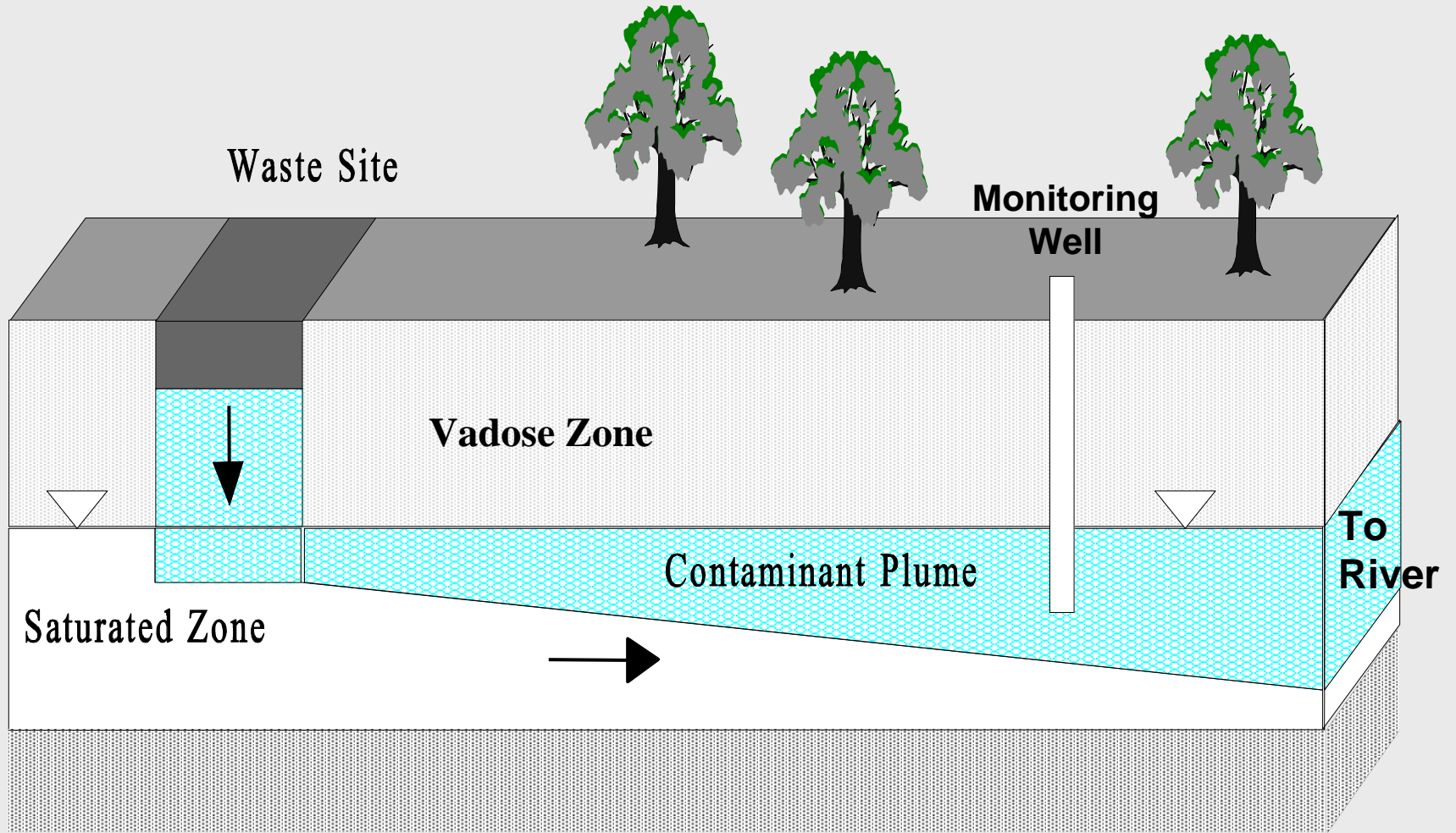
# Model Type 2 (e.g., Aquifer from GMS)



 = Data processor  
 = Modules

# Model Type 3 (e.g., Risk Model)

# N Springs Example

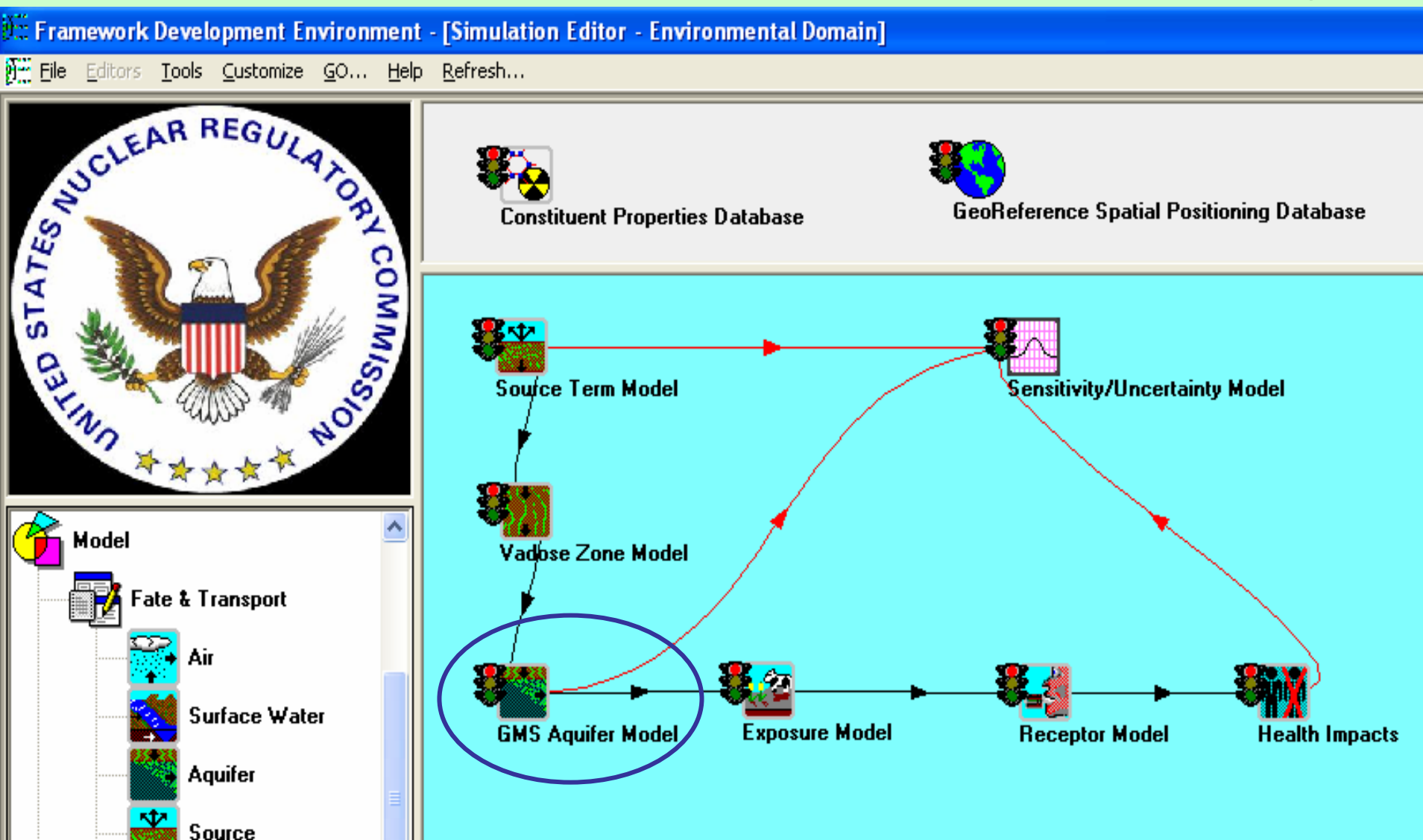




# FRAMES

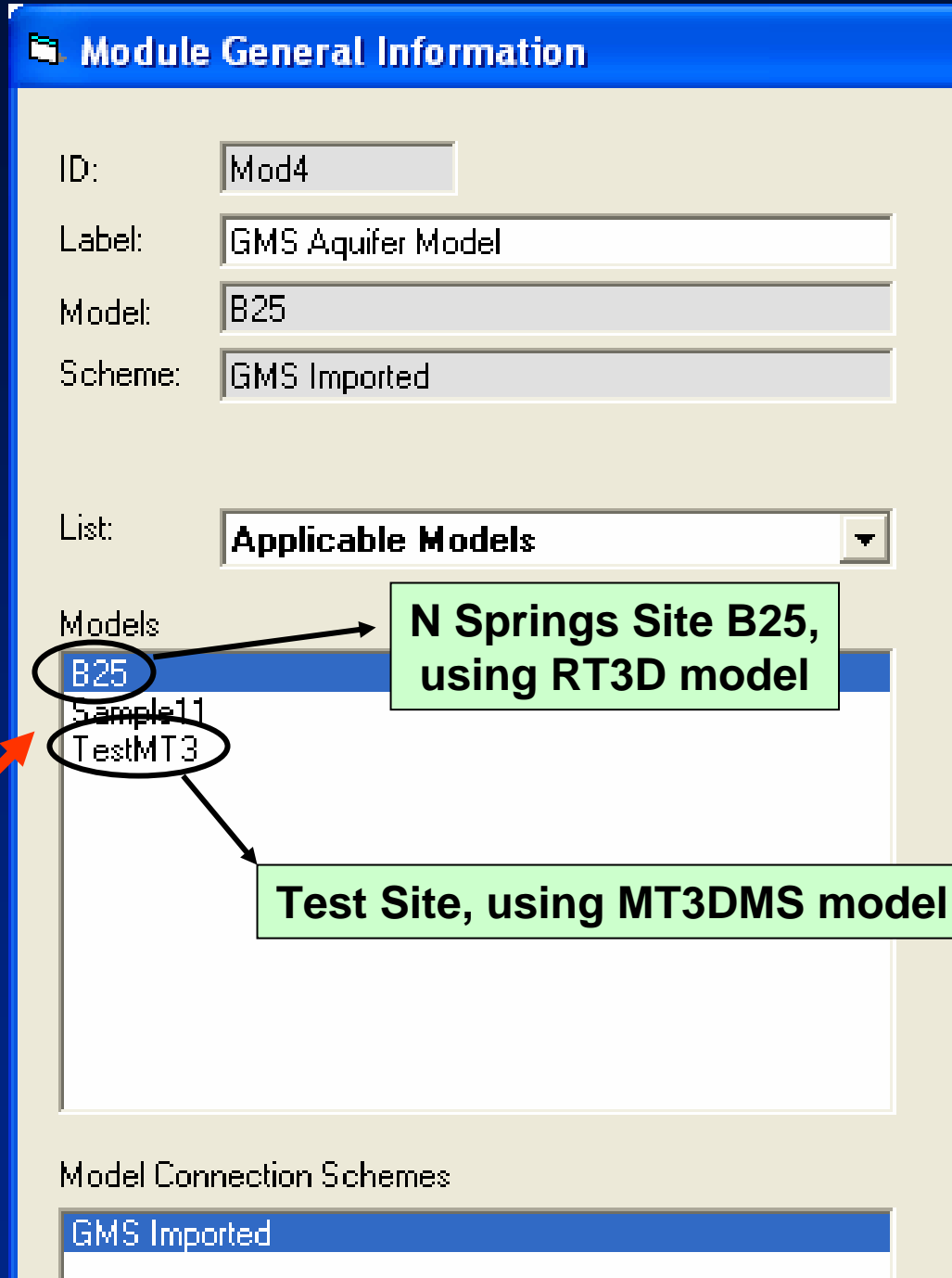
Seamlessly Linking Multiple Models and Databases

Assessors provide the models; FRAMES provides the linkages



# GMS-FRAMES

- Calibrate GMS model outside of FRAMES
- Register calibrated simulation
- Pick GMS model and simulation



**Module General Information**

ID: Mod4

Label: GMS Aquifer Model

Model: B25

Scheme: GMS Imported

List: **Applicable Models**

Models

- B25
- Sample11
- TestMT3

**N Springs Site B25, using RT3D model**

**Test Site, using MT3DMS model**

Model Connection Schemes

- GMS Imported

# Summary

- **Flexibility:** Multiple aspects to assessments
  - Contaminants, Media, Release mechanisms, Different Questions requiring answers
- **Horizontal Variability:** Different model types
  - Source, Groundwater, Exposure, Intake, Dose/Hazard/Risk, Sensitivity/Uncertainty
- **Vertical Variability:** Multiple sophistication levels
  - Reduced-form (DandD, RESRAD, ....)
  - High-fidelity (Groundwater Modeling System, ...)
- **Reproducibility (QA/QC):** FRAMES
- **Current/Former Sponsors:** NRC, DoD, EPA, DOE