An Elicited Expert's Critique
of the SZEE Project

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FOCUS:

Some possible weaknesses and limitations of the expert elicitation process and the technical information, and suggestions to improve the defensibility of such products.

TOPICS:

1. Concerns regarding the expert elicitation process

2. Key technical issues and uncertainties

3. Suggested efforts to reduce uncertainty

1. EXPERT ELICITATION PROCESS

ISSUES/CONCERNS

• different views of probability

- subjective probabilities, degree of belief, Bayesians
- inferred from repeated observations, frequentists
- subjective probabilities becoming a substitute for data?

• relationship to performance assessment (PA)

- probabilistic dilution?
- should be a more explicit focus in expert elicitation
- need a simple screening model to explore sensitivities

• link between site characterization and PA

- nonexistent, ill-defined or undocumented
- needs to be documented for defensibility
- PA modeling should be used to help set site characterization priorities

• nature and availability of information

- voluminous, ill-focused
- should have a PA focus with estimates of process and parameter uncertainties by the project researchers
- reviewable written reports vs. oral presentations
- timeliness

2. SOME KEY TECHNICAL ISSUES

SUMMARY COMMENTS ON:

• REGIONAL FLOW MODEL

Currently not useful for defining site conditions but can provide very important insights regarding regional effects and quantify climate change effects.

• SITE-SCALE FLOW MODEL

Geology is not very well resolved along a flow path SE from the site, and, lacking groundwater flux, hydraulic conductivity estimation is indeterminate; should use flux imposed by long term aquifer testing in calibration.

• ADVECTIVE FLUX VECTOR

Based on the measured hydraulic gradient and the conductivity from the aquifer test, the average specific discharge in the volcanic aquifer beneath the site is around 0.5 m/yr and with an effective (fracture) porosity of 0.001 this indicates a rate of movement of a nonretarded contaminant of 500 m/yr.

• SINGLE HOLE HYDRAULIC TESTING

The borehole flow logging data establishes the very important fact that most of the flow occurs in a very small fraction of the vertical section even in the "aquifers". These observations also indicate that the occurrence of high permeabilities is not related in a simple way to lithology. However, single well hydraulic tests, as presently analyzed, are not useful to quantify large-scale hydraulic conductivity because they yield values 2 orders of magnitude lower than the long term aquifer tests.

• AQUIFER TESTING C-WELLS

The responses at very large distances (up to 3 km) indicate that portions of the Crater Flats Tuff are very transmissive (a few thousand m^2/day), indicating an average hydraulic conductivity around 5 m/day for that aquifer. More refined interpretation including heterogeneity, and anisotropy might alter the results somewhat, but major changes are not expected.

• TRACER TESTING C-WELLS

The interpretations of the tracer tests produce unusually large effective (fracture?) porosity, and are ambiguous regarding the significance of matrix diffusion. Three-dimensional and heterogeneous flow field effects are likely complications.

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3. TO REDUCE UNCERTAINTIES

- **Large-scale hydraulic and tracer tests**
  - SSE of the site (south of the C-wells)
  - 500 - 1000 m well spacing
  - dipole configuration to detect matrix diffusion
  - multiple tracers with contrasting diffusion coefficient
  - external technical review of design

- **Re-evaluation of single borehole tests**

  - 3D simulations with discrete fractures?

- **Improvements of the site-scale model**
  - grid refinement to improve representation of geology
  - calibrate using long-term aquifer tests

- **Field measurements of ambient matrix diffusion effects**
  - chemical analyses of fracture and matrix waters
  - lab diffusion cell test on natural fracture surfaces

- **Improved reporting on the C-wells multi-tracer test**
  - detailed documentation
  - transverse dispersion effects?

- **Enhanced reporting on the lab sorption/diffusion tests**
  - overall experimental design re field applicability?