

## Potential questions and suggestions for regulators to ask or consider when dealing with models for meeting regulatory requirements

1. How do we know your conceptual model is reliable?
2. Do you have alternate conceptual models?
3. What are the uncertainties from the presumed conceptual model?
4. Are there multiple working hypotheses for characterization and remediation scenarios?
5. Has the worst case scenario been considered as well as the best case scenario?
6. How do we know that your code is reliable? How have you tested your code? What test cases were used and why?
7. How do you know the code is appropriate for the problem?
8. How good is the code database? How do you know?
9. What are all the assumptions made in the modeling computations for water-solution partitioning? What equilibrium assumptions were made and are they warranted? How do you know?
10. What form of the precipitating phase was used in the computations? The most stable form or the least stable form? Why?

11. Was sorption used? What sorption assumptions were made and why? Have these been tested for similar conditions? How was effective surface area determined?
12. If pH was simulated, what assumptions were made? What evidence shows that these assumptions are reasonable?
13. Have you done a comprehensible sensitivity analysis? What are the most sensitive factors for your model output? How does the uncertainty in these factors affect the results?
14. What is the temporal variability in contaminant concentrations, discharges? Has this been included in the inputs?
15. Are prediction being made for longer periods of time than the history-matching/calibration period?
16. If the computational model is a forward geochemical model, were any inverse geochemical models considered as well?
17. Was water quality input data screened for quality, e.g. charge balance, consistency of element ratios, etc.?
18. Are minerals considered in the model based on observation at the site or a reasonable analogue site?

# General problem:

Meeting regulatory requirements does not mean that we understand the hydrogeochemical processes at a site; if we don't understand the processes operating at a site, how can we effectively remediate?