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Practical Considerations for Effective Use of Expert Witnesses and Computer Models in Complex Groundwater Litigation

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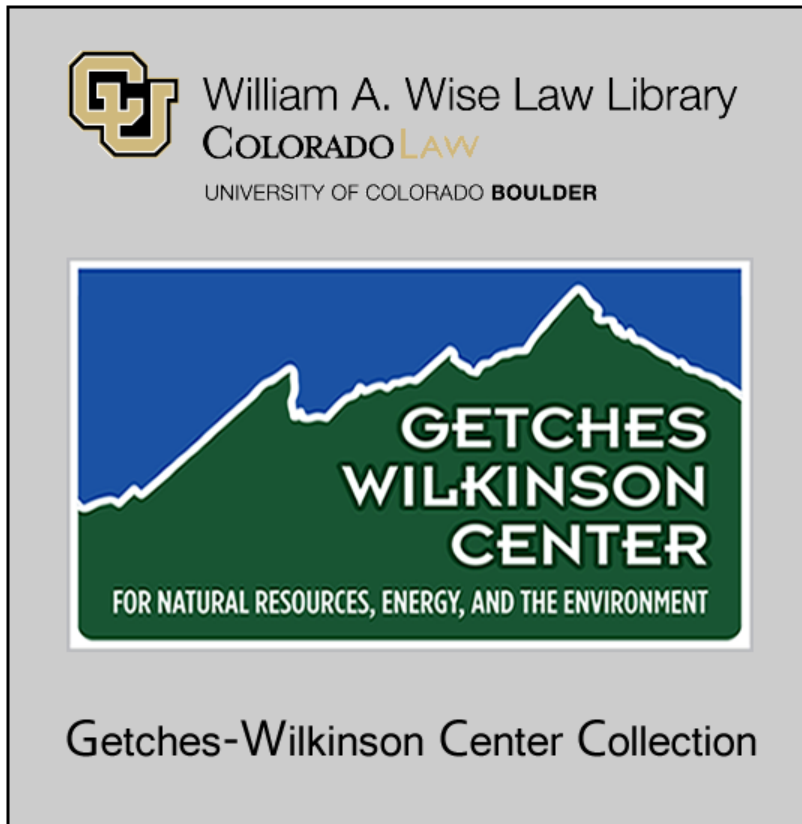


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**Practical Considerations
for Effective Use of
Expert Witnesses and Computer Models
In Complex Groundwater Litigation**

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**Uncovering the Hidden Resource:
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and Policy in the 1990s**

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Practical Considerations for
Effective Use of
Experts and Computer Models
In Complex Groundwater Litigation

Trying to tell a group of experienced trial lawyers and technical experts about how to present a case and when to use expert witnesses is a little like carrying coals to Newcastle. Moreover, since the law on the use of experts and their opinion testimony is well developed, it does not bear restatement here. Rather, in what follows I have drawn on my own experience with the use of computer models in groundwater cases and have tried to make suggestions about what I have found useful practices and what I have found needs to be watched for in this type of litigation.

I. Role of the Expert Witness

Complex groundwater litigation is the domain of expert witnesses. Lay witnesses rarely play a role in such litigation except to establish foundation facts for experts. Under FRE 702-705 and their state law counterparts, anytime the court can be convinced that scientific, technical or other specialized knowledge will assist the trier of fact to determine an issue of fact, a properly qualified expert may testify in the form of opinion or otherwise. Due to the liberality of the rules of evidence, the use of experts in all types of court proceedings has become quite common. This has resulted in judges hearing from a great many expert witnesses, and hearing the same experts many times. As a consequence, many judges now approach the testimony of expert witnesses with some justifiable reservations.

Because of the crucial role such experts play in most complex groundwater cases, and the increasing sophistication of judges hearing such cases, the selection of an expert and the presentation of his or her testimony demands great care. There are a number of principles that a lawyer needs to bear in mind in working with experts. The first principle to bear in mind is that you are the

lawyer and the expert is not. You should not simply turn the case over to an expert: You make the legal decisions; you make the strategic and tactical decisions; and you decide how to present the case. You should listen to your expert's thoughts and carefully consider his or her suggestions, but you must make the legal judgments and you must run the case.

Second, as a lawyer, you should carefully think through what facts need to be proved with expert witnesses, and obtain the experts needed to prove these facts. If more than one expert is needed, clearly define the role of each, know what facts each will prove and what opinions each will offer. In this process I recommend that you avoid or minimize overlapping testimony by your experts. This reduces the potential for inconsistent testimony.

In deciding whether to use more than one expert and in deciding the scope of each experts' testimony, look carefully at the qualifications and experience of each expert. There is a risk of "over burdening the camel" if you ask an expert to testify to facts or opinions in an area where he or she is not well qualified or is less experienced than the opposition's expert. An error or weakness in testimony in an area of insufficient experience can undermine the expert's credibility in the areas where he or she is most qualified.

In selection of your expert witnesses be sensitive to the number of times the witness has testified as an expert, the number of appearances in the same forum, the types of cases in which the expert has testified, and the opinions given. Some experts that appear frequently before a court build a wonderful rapport with the judge and have excellent credibility. Likewise, an expert that is familiar to the judge and who has taken stubbornly consistent or seemingly inconsistent positions before the same judge can be an unnecessary handicap, no matter how well qualified. An expert who seems to testify to anything helpful to his client will eventually get caught in inconsistent opinions, or be labeled as a mere hired gun; you do not want that to happen in your case.

II. Qualification of the Expert

It is not difficult to get a person qualified as an expert to give opinion testimony. What is more difficult is to distinguish your expert from the other experts in the case and to convince the judge that your expert is uniquely qualified to give the opinions that you will elicit. This is important because the judge, when faced with a number of excellent experts, must decide whom he will believe. If you have convinced the judge that your witness is uniquely qualified or the best qualified to give a particular opinion, all other things being equal, your witness will be believed.

Qualification of the witness should also be tied closely to the opinions to be offered by the expert. Even when it is necessary to qualify a witness broadly, particular emphasis is often appropriate on his or her experience in the most important areas of testimony. For example, if your expert is going to give the opinion that your opponents' manner of use of a particular model violates the mathematical principles upon which the model is based, you will want to emphasize your witness' expertise in the mathematical principles underlying computer models in preference to his or her skill in the operation of such models. You want your witness to be recognized as the expert on the important points that are in dispute.

III. Preparation of an Expert Witness

Your expert will need to conduct thorough and comprehensive investigations into the subjects on which he or she will testify, or be comprehensively educated by those who have conducted them. I recommend the former. You will also need to keep yourself thoroughly informed about the nature and scope of the expert's investigations, the findings, and the formation of the expert's opinions by this process. As the attorney you will have to work closely with your expert to understand his work and to be certain it addresses the issues in the case.

While you have to educate yourself to what is going on, you

also have to retain your ability to step back and see if the work of the expert makes sense and if it fits your legal theory. If it doesn't make sense to you, it probably won't make sense to the judge. You also have to retain your ability to put yourself in your opponent's position and try to find everything that is weak, questionable, or otherwise vulnerable to attack in your expert's work. It is your job to help your expert ferret out the potential weaknesses and be prepared to defend them. If you do not do this, it may well be too late to fix or explain the problems in the testimony after your opponent has pointed them out to the judge.

Likewise, in the discovery process you need to work closely with your expert. Your expert must be thoroughly prepared for his or her deposition. The expert needs to know how his or her testimony fits the case strategy, where your opponent is likely to attack the expert's work, what issues are most important for your opponent, and the pitfalls that your expert must avoid. A well prepared expert can control the deposition.

For testimony, it is essential that the lawyer and witness communicate clearly. This is particularly important for areas such as groundwater hydrology and modeling where the concepts are complex and a specialized terminology is required. In complex cases I generally prepare a script of each question I plan to ask the expert. I then practice the testimony with the expert, refine the script to be certain it accomplishes my objectives, and then practice again. I do this until both the expert and I are comfortable with the script, and know what will be asked and what the answers will be. This way neither of us is surprised and the direct testimony goes in smoothly and effectively. In this process, I never let the expert see or have a copy of my script and therefore the expert cannot be asked to produce it.

There are numerous advantages to this laborious process. In complex litigation it allows you to carefully and confidently present difficult evidence. It helps you learn how to make your points simply, clearly and effectively. It allows you to effectively emphasize and repeat your most important points. It

also allows you deal with, on your own terms and in the best light, potential weaknesses in your case. Finally, by carefully controlling the scope of direct examination and presenting expert evidence on your strongest points, it affords you some control over the scope of and issues for cross-examination.

IV. Suggestions For Making Expert Testimony More Effective

Good expert testimony should be like a good story. It should be interesting, it should be understandable, it should not drag, and it can even be humorous or have surprises. To accomplish this you need a story line to follow, and that is simply the theory of your case.

In presenting the expert's testimony you need to keep it simple and only tell the judge the important points that truly make a difference. In structuring your expert's testimony use the concepts of primacy, recency and frequency. Start with an important point, repeat the important points in a non-objectionable manner and end on an important point.

There are often many things to criticize about a particular application of a computer model in a groundwater case. Yet, after days (or weeks - God forbid!) of listening to technical experts be examined and cross-examined, judges aren't interested in a lot of little criticisms that don't make much difference. What the judge wants to know, and what you must tell him or her as clearly and convincingly as possible, is the important thing that your opponent did wrong that makes his model unreliable. To do otherwise risks diluting the impact of the important points that can make the difference between winning and losing.

You must make the important points in a manner that the judge can understand. After months or years of working with a case, you know far more about the complexities of the case than the judge ever will. Because of this you may not appreciate the complexity of the evidence and what the judge can be expected to understand after hearing only a few days or weeks of conflicting testimony. Therefore, you might want to have some of your colleagues sit in on

a practice of the expert testimony to see if they can understand it. Whatever you do, be careful to present your expert's testimony, indeed your entire case, including all voir dire and cross-examination, in a way that educates the judge to the issues that are important and make a difference.

Try to insure that all of your participation in the case helps to educate and prepare the judge for what your expert will be saying. These education efforts should start in your opening statement. There you can give a description of your case, advise the judge what to watch for, and why it will be important. In your voir dire of opposing experts, make a point of their more limited knowledge, training, or experience in the areas of expertise of your experts. In cross-examination of the opposing experts begin to make the points that you will be addressing with your expert. Try to get the opposition's experts clearly pinned down on the issues where you will be attacking them. When you put on your own case, carefully lay the foundation with your witnesses and exhibits to tell your story and support your experts' opinions.

V. Methods for Attacking Groundwater Computer Models

The purpose in most challenges to a groundwater computer model is to show that in some or all respects the model is unreliable or cannot make accurate or meaningful predictions. The foundation for any such challenge of a groundwater computer model is for you and your expert to understand thoroughly the model, its particular application, and all of the data and assumptions it relies upon. This requires complete disclosure by your opponent or thorough written discovery, document production, and most likely one or more depositions. You will need to work closely with your expert in the discovery process to know what to ask for, how technically to describe what you are asking for and to know whether you got what you asked for and whether you have gotten all of the information that your expert needs to understand the model thoroughly.

Once you have a thorough understanding of what your opponent's model is, how it is put together, and how it operates, you must

decide where it can be effectively challenged. The following are the some of the general areas to examine for potential challenges to a model's accuracy and reliability:

A. The Model's Framework

1. Type of model selected.
 - a. Appropriateness of simulations being performed.
2. Mode in which model is run e.g. McDonald-Harbaugh in the impact mode or head mode, linear and non-linear etc.
3. One, two or three dimensions.
4. Time steps and stress periods.
5. Number and thickness of layers.
6. Model domain.
7. Grid cell size.
8. Stream-aquifer interaction.
9. Solute transport model.

B. Calibration and its Adequacy

1. Process of calibration.
 - a. Steady State.
 - b. Transient.
 - c. What variables were adjusted in order to achieve what prediction and with what was the prediction compared.
2. Quality of Calibration.
 - a. Data used for calibration.
 - (1) Completeness of data base.
 - (2) Reliability of data base.
 - b. What other data is there that could or should be used for calibration but was not used?
 - c. Statistical measure of goodness-of-fit.
 - (1) Weaknesses of statistical measures.
 - (2) Other checks of goodness-of-fit.
3. Verification of Model.
 - a. Time period and data used for verification.
 - b. Results of verification.

C. Adequacy of Data base

1. Model domain and number of layers.
 - a. Data points/sources for the entire domain.
 - b. Distribution of field data.
 - (1) Areas where data is lacking.
 - (2) Effect of missing data on ability to model make accurate and reliable predictions.
 - c. Filling of gaps in data.
 - (1) Basis for filling-in data.
 - (2) Nature of assumptions or estimates made.
 - (3) Reliability of process employed.
- D. Adequacy of representation of physical system
 1. Mechanisms included and those excluded.
 2. Layering and effects of layers in aquifer system.
 3. Aquifer characteristics.
 4. Stream/aquifer interconnection.
 5. River nodes.
- E. Errors in assumptions, effects of approximations on a Model's accuracy and reliability
 1. The problem of cascading error.
 2. Analysis of error and how it effects accuracy of results.
- F. Sensitivity Analysis of important model parameters
 1. Variables tested and not tested.
 2. Testing the entire range of uncertainty in the variables.
- G. The Problem of Non-unique Solutions
 1. Does the model yield a unique result?
 2. Are there other equally or more probable solutions to the problems using different, but equally probable assumptions?

VI. When Computer Models Generally Work Best

The difficulty most frequently encountered in the use of a computer models in groundwater litigation is the lack of or uncertainty in the data needed to create a model that can make

reliable and accurate predictions about the operation of the physical system. Therefore, the greater the amount of good data available and the smaller the area to be modeled, the greater the likelihood that a defensible computer model can be prepared and presented.

For such models to work properly it is essential for both the model calibration and model verification to be satisfactory and for these steps to have been taken correctly in the modelling process. In addition, all mechanisms exerting an influence upon groundwater flows must be represented properly. Finally, the ranges of possible variables in data values for crucial mechanism, must have been correctly investigated and adequately tested.

If a qualitative assessment rather than precise quantitative answers is all that is sought, then the lack or absence of data is less critical. However, when using the results of such models one needs to exercise caution not to treat the results as anything more than qualitative. Governmental entities are frequently the authors of such basin wide qualitative models which are used for gaining a general understanding of a resource. An example of this is the current U.S.G.S. Regional Aquifer Study program. While such reports may provide a generally reliable overview of an aquifer system, they are not properly relied upon for a precise quantitative analysis of an aquifer system because they were not designed or implemented for that purpose.

VII. Deciding to Use a Computer Model

It can be very difficult to defend a complex computer groundwater model of any consequence in the face of determined and skillful opposition. As a consequence the party who must rely upon a computer model to carry its burden of proof in a contested complex groundwater case often loses. If the model's use is not carefully thought out and the correct preparations are not made, the proponent of the model can expect to lose a fair fight.

To increase your chances of success when using a model you need to consider carefully what you are trying to accomplish with

the model and whether, given the available data, the model is the appropriate means to do so. You should consider whether you could prove the same things by a means less vulnerable to a sustained and skillful challenge. If you have other means at your disposal to prove important facts, can the model be used to confirm, validate or synthesize facts proven by other methods? Is there any value in doing so? Can you limit the role of the model to a discrete area or issue where it is the best proof on that issue? If you must rely upon a model, what will be your fall back position if the model gets discredited in trial? Can you afford to go to trial without such a contingency plan?

VIII. Defending Without a Computer Model of Your Own

Simply because your opponent has a computer model does not mean that you need to have one as well. Often you may not be able to afford your own model and if you could afford one, you might not need it. In fact, if you believe your opponent has a model you can successfully discredit you may be better off not preparing or offering your own model. In considering this remember that your opponent will turn your criticisms back on your model. If you were not able to construct a model that cures the problems you criticized in your opponent's model, your criticisms will look like the pot calling the kettle black, not an impressive show for the Court.

In deciding whether to have your own model, remember your opponent's burden of proof, usually by a preponderance of the evidence. While this is not a heavy burden, it nonetheless must be carried. It is not carried if your opponent fails to convince the Court that there are no other equally probable or more probable answers. Your task then becomes to use your opponent's model to derive a series of equally or more probable outcomes that defeat your opponent's claims. This will often be possible by isolating one or more of the critical factual assumptions made in your opponent's model, by changing those assumptions in a way that better fits known data and by then running your opponent's model to

obtain a different result.

One example of this approach is the values used for stream bed conductance or for RBOT in modeling stream-aquifer interaction with the McDonald-Harbaugh model. If you make realistic and justifiable changes in these assumptions and run your opponent's model, you may well be able to show equally probable or more probable results wholly at odds with your opponent's claims. By using this approach you also gain some measure of control over the critical factual issues in dispute. It puts you in the position of only having to prove a few facts more convincingly than your opponent in order to prevail.

IX. Use of Exhibits

The operation of a groundwater model is difficult to conceptualize. This means there is an important opportunity to help the judge understand the use of a model and its role in the case by means of a reasonable number of good graphical exhibits. Graphical exhibits are very helpful in portraying the model domain, grid cell sizes and location, river node locations, model layers and their inter-relationships, data distribution within the model domain, both horizontally and vertically, aquifer characteristics assigned to grid cells, adequacy of calibration, and the like. Select your best potential exhibits for presentation and detailed explanation at trial. The best exhibits should be used to explain the really important points in your expert's testimony.

X. Some Risks in the Use of Models in Litigation

Models have become demystified as their use has become more common. The demystification has led to a more realistic appraisal of models, the many approximations they often contain and the opportunities to adjust a model to obtain a desired result. In the presentation of any model it is important to rely upon sound empirical data and have good explanations for the assumptions or approximations made where data is incomplete or altogether lacking. It is also important to have a good sense for the limitations on

the accuracy of the model's predictions. If you are candid about the limitations and try to define those for the judge, your chances of having your model believed will increase substantially. If you try to over sell the model or represent its predictions as more accurate than they really are, you may find yourself in trouble.

The increasing level of sophistication of the bench, bar, and technical community often necessitates higher quality and more advanced modeling techniques. Rapid advances in the state of the art in modeling create one of the risks of using models in litigation -- that is, that it may take several years to prepare a model before litigation, and then it may be several more years before actual trial. In that period of four or five years much can change in the world of computer modeling, and you can be at risk of having an out-dated model at trial. Advances in the art of modeling create similar problems in agreeing to rely upon a computer model to make predictions in the future under some form of consent decree or retained jurisdiction of the Court. A model may seem adequate by today's standards, but in five or ten years the model may be out-dated and you may be stuck with it.

In the final analysis when deciding whether to use or attack a groundwater computer model in litigation, you should always remember the words of Mark Twain: "There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment in fact."