Q. What was the nature of your testimony or opinions in that matter?

A. It was the source and transport of arsenic and chromium in the groundwater, and it was sort of an adjunct case to the civil action, the one that was described in the civil action. The Mouvious (phonetic) Civil Action.

Q. Any other experience in providing opinions or testimony in connection with groundwater basins?

A. I'm trying to think. Oh, yes. In the San Gabriel -- San Gabriel basin. It was a litigation between Miller Brewing and an agency of -- the San Gabriel agency.

Q. Who was your client in that matter?

A. Miller Brewing.

Q. And if you could describe for me your involvement in that matter. Were you an expert witness?

A. I was an expert witness.

Q. And did you have your deposition taken?

A. Yes, I think I actually went to court also.

Q. Okay.

A. I can't recall. It was a while ago.

Q. I was going to ask you when that matter went to trial.

A. Maybe 15 years ago.

Q. Do you recall who the trial attorneys were?

A. It was Rogers & Morton.

Q. Okay. That's who you worked with?

A. Yes.

Q. Do you recall the name of the attorney?

A. Yes. A Japanese fellow who became an attorney at Nossaman and subsequently has retired because he had multiple sclerosis. His name will come to me in a minute.

Q. Okay. Any other matters than the three that you've just identified where you provided expert opinions or testimony in connection with groundwater basins?

A. Yes. There is another one up in Ventura that involved a dispute between the operator of a landfill in the Regional Water ~~Control~~ Quality Control Board.

Q. What was the nature of your involvement in that matter?

A. Determining where the water came from and where it went to and how it moved around.

matter?

A. To investigate the fate and transport of the material from the site.

Q. I believe --

A. I'm sure there are others, but I can't think of them right at the moment.

MR. EVERTZ: Let's go off the record.

(Short break.)

MR. EVERTZ: Back on the record.

THE WITNESS: I recall one other case I was involved in, too. It was called EPA -- involved a litigation between EPA and AstraZeneca, again involving ~~High~~ Iron Mountain Mine in Redding, California.

BY MR. EVERTZ:

Q. When were you retained in that matter?

A. Probably -- well, it went on for years. Probably 10 years ago.

Q. Okay. And who was your client in that matter?

A. AstraZeneca.

Q. What were your job responsibilities?

A. To find the flow paths for the copper that was leaching out of the ~~High~~ Iron Mountain Mine into the Sacramento River.

Q. How did that matter resolve itself?

1 of your report, it says, "There is also clear evidence that groundwater development in the East Antelope basin has not influenced the West Antelope basin," and then it goes on.

Does groundwater pumping in the West Antelope basin impact flows to the East Antelope basin?

A. Not currently. I believe.

Q. What do you base that opinion on?

A. The groundwater contours over the basin divide.

Q. Has pumping in the West Antelope basin ever influenced groundwater flow moving towards the East Antelope basin?

A. I think that certainly occurred in the past. The difficulty with this is to establish what time we're talking about. If you go back before there was any development in the area, then the water that fell in the Tehachapis and the San Gabriel mountains that was -- north of what I call the bedrock ridge. The only consumption for that water would have been evapotranspiration and the excess of that water would have, because of gravity, would have flown and spilled over into the east basin and ultimately became part of the Rosamond dry lake which

Of the order of eight, 8,000.

Q. Okay. Looking at page 5 of your report, there's a discussion about the Neenach or Neenach fault?

A. Yes.

Q. Actually on page 4 and 5. Is it your conclusion that the Neenach fault does not provide a barrier to groundwater flow?

A. Yes. I don't think the Neenach fault even exists in the ~~alluvion~~ alluvium.

Q. Moving forward to page 6, figure five. It refers to section AA prime across West and East Antelope basins?

A. Figure.

Q. Figure five on page 6?

A. Yeah.

Q. Would you describe for me what this is?

A. This is a reproduction of plate 6 out of the USGS open file report 67-21 which was done by Bloyd back in 1966. What he did was take a number of well logs and tried to interpret from those well logs where the groundwater profiles were and he shows a dislocation in the groundwater profile through the Neenach fault which may have been just an artifact of -- which I think -- my interpretation is that it's an

So far as I'm aware, nobody has done those geophysical surveys. So if you're depending on well logs, well logs are really only giving you an indication of what things are like because the probability that the well actually went down on the very top of the ridge line is very unlikely.

Q. I think you're anticipating my next question. It looks like you've moved forward to figures 11 and 12.

On figure 11 on page 13, there's a line there that's AA prime. Can you describe for me what that is?

A. Oh. The way we constructed this figure was to accumulate as much information as we could about the depth of the basement rock, by looking at specific well logs, and the red and blue dots on here are well logs that we looked at and tried to assess where the depth of the basement rock was, and using that information, along with the -- knowing where the alluvium basement rock actually comes out of the ~~alluvion~~, plus some other oil well information, we developed these groundwater contours -- bedrock contours which is the depth of the bedrock.

Now, what AA prime is is describing a section that we've plotted on figure 12.

Q. Okay.

A. And if -- where there is substantial groundwater pumping, it's pretty much always subsidence. Long Beach, there was oil. Delano, Modesto, up in the Central Valley. There's huge depressions that have been caused by pumping. Huge groundwater, huge subsidences occurred here in the east basin. There's no major subsidence in the west basin. So that if the pumping in the east basin had lowered groundwater levels, we'd expect to see some subsidence.

Q. Does that hold true regardless of the makeup of the material within the respective basins?

A. Yeah. What happens is if you have clay layers, then the subsidence is irreversible. You can't pump it back up again. If it's just regular alluvium, groundwater levels come back, and it's possible to get it back up again.

Q. Are you aware if there are any -- if there's clay in either the West Antelope basin or East Antelope basin?

A. Yes. There's some clay layers in the West Antelope basin, accompanying the foothills of the Tehachipis.

Q. How about in the east basin?

use -- whether the Randsburg Mojave fault was a serious impairment to groundwater flow, and so I spent some time trying to analyze the well water levels that were involved in the neighborhood of the Randsburg Mojave fault.

It became clear that the northeastern part of that fault up towards the Willow Springs area did support -- was a significant impairment to groundwater flow. There was a substantial drop across the fault, but as you came through the west down to where the Centennial project was, it appears that there's no impairment to flow at that area, and so it seemed that as a separate thinking of that -- thinking of that as a separate basin was not as obvious as the two big sedimentary basins you had east and west of the bedrock ridge.

Q. Because it was a common water supply, it did not appear to be --

A. It was a common water supply and because the area -- the area to the north of Randsburg Mojave fault was receiving its water from the same source as the water south. All it did was run along the fault and turn around and run through the Centennial project and then run off towards the east again.

Q. That's essentially your basis for differentiating between basins is whether it's a common water source, common water supply?

A. That's my interpretation, yes.

Q. Were there any other areas that you analyzed for purposes of evaluating whether the Centennial project would be in a different basin and would have different water supply than the area where Palmdale and Lancaster is located?

A. Only the fact that that whole area west of the bedrock ridge is receives -- its native yield is off of infiltration in the Tehachapis and the part of the San Gabriel Mountains which are north of Antelope Buttes, and it's clear that the rock barrier between Little Buttes and Antelope Buttes doesn't allow water to pass at the current groundwater levels because the bedrock is up above the water level between that Little Buttes and Antelope Buttes and so that water that falls on the San Gabriels south of Antelope Buttes is effectively part of the native yield of what I call the east basin and the San Gabriel -- what falls on the San Gabriels north of Antelope Buttes is -- goes into the -- what I call the west basin.

Q. Was there any other area or geologic,

Mountains north of Antelope Buttes.

There is one other barrier in here which effectively separates off part of the Tehachapi native yield and that's the Willow Springs fault. It's clear that water that goes into the ground north of the Willow Springs fault tends to flow east/north of the Willow Springs fault, and there's a very substantial drop in the groundwater elevation north and south of the Willow Springs fault. It appears to be quite an impediment to flow.

MR. ZIMMER: I'm going to let Mr. Joyce talk to you about that. I'm sure he's infinitely interested. I'm having trouble figuring out why you suddenly got in the game so to speak. I mean --

MR. KUHS: Argumentative.

BY MR. ZIMMER:

Q. Somebody retained you for some purpose. You didn't just say, hey, guys I think I need to give you some information.

A. No. I don't market at all.

Q. Who contacted you and what did they want you to do?

A. Well, Mr. Fudacz -- Mr. Fudacz was the attorney for Tejon Ranch at the time, and he was looking for a consultant to help him understand how

the east basin is coming out of the Tehachipis and the San Gabriels north of the Antelope ~~Valleys~~ Buttes and the source of water for the east basin is out of the San Gabriel Mountains.

And so you have flux lines that are coming from either direction towards the bedrock ridge.

Q. Has any other investigator over the past 30 years concluded that, other than you on behalf of Tejon in your most recent endeavor on behalf of Tejon?

A. I haven't seen anybody draw any flux lines. Let's put it that way. And when you draw the flux lines, that's the only conclusion you can come to. So as soon as some other investigator starts drawing the flux lines, then you're going -- they'll arrive at that conclusion.

Q. Well, has any other investigator over the past 30 years concluded that the water for the West Antelope Valley basin is -- the water source is separate from the water source for the East Antelope Valley?

MR. KUHS: Asked and answered.

THE WITNESS: I haven't seen it in print.

BY MR. ZIMMER:

Q. That's not my question. My question is --

A. No. That answers your question.

Q. No. My question is this: Over time, we know that depending upon what's happening in the basin, the water movement over the bedrock ridge has changed.

A. It's changed from predevelopment.

Q. Correct?

A. It's changed from predevelopment.

Q. Right. And development is not a static thing. Development changes over time, doesn't it?

A. Of course.

Q. So depending upon what happens in the future, the development may change, the development may increase, water levels can continue to change on one side of the ridge or the other?

A. They may.

Q. If there's pumping on the westside, that could change how the water moves?

A. There is pumping on the westside and there's pumping on the eastside, and there's pumping in the whole neighborhood of the bedrock ridge, and what the records show is over the last 40 -- 30 to 40 years, the groundwater flow ~~duration~~ direction has been towards

the ridge from the west and been toward the ridge from the east.

Q. That doesn't mean it's not going to change in the future?

A. Oh, I can't project what's going to happen in the future.

Q. All right. And if pumping increases or decreases either on the westside or the eastside, that could change how the water's moving across the bedrock ridge; correct?

A. Oh, yes. Of course. If people on the west decide to pumping like fury, it's going to change the groundwater contours and vice-versa.

Q. Are you giving some opinion as to the current amount of water moving across the bedrock ridge, whether it's moving east or west, west to east, north to south or the amount thereof?

Do you intend to give some kind of opinion like that at trial?

A. Yes. And the opinion is going to be based on the contour -- groundwater contour ~~patents~~ pattern that have been extant since 1975.

Q. What's the opinion?

A. The opinion is that groundwater is flowing towards the bedrock ridge from the east basin

change the whole groundwater contour path.

Q. But do you have any --

A. And the groundwater ~~content~~ contour is consistent with the fact that water is flowing towards the ridge from the east and towards the ridge from the west, in that general neighborhood. The evaluation 2,200 -- if you look at the evaluation 2,200 groundwater contour, it represents a -- a depression in the groundwater contour profile.

Q. So we can have the other experts eventually look at those contours that you're relying on in that respect, can you identify that for us?

A. Identify the contours? Unfortunately, as I mentioned at the outset here, the groundwater contours which are included here as figure 16, 17, 18 -- 16, 17 and 18 are in fact privileged under the -- because they're part of the Technical.

I didn't realize this was happening when they went in here. So what I'm in the process of doing is redrawing these contours with my own information, having -- using publicly available information.

Q. Could you make a sketch for us that shows --

A. Well, see the reason I put these in

here is I drew my own contours, and I didn't have the software to be able to make pretty pictures like this. So when I was producing this report for Fred Fudacz and Babs Akinde, I wanted to -- it was very convenient to use these contours which Bill Leever had made such a nice job of, and since they didn't differ from what I had drawn, I said these are prettier than I drew, so I'll use these because they're, in essence, exactly the same.

Mine are a little more comprehensive because what I did is I extrapolated using the rules that I said before, the fact that groundwater contours have to be orthogonal to the flow net and so that if you draw a groundwater -- if you sketch a groundwater contour that shows an inconsistency in the flow net, then it's a bad contour. Also since you know that the Randsburg Mojave fault -- in the northeast part of the Randsburg Mojave fault is an impairment and you know that the Willow Springs fault is an impairment, you have to have the groundwater contours parallel to that impairment.

It enables you to draw the contours, and Bill Leever didn't use that information here. So my groundwater contour is actually better than his in the regions where he has omitted something.

west and the east sides?

A. That's what the groundwater contours imply.

Q. But you have no way to currently as we sit here right now put any kind of number to that?

A. I can't put a number to that as we sit here now. I could -- what you'd have to do to do that is look at the pumping records of the pump -- of who's pumping within the 2,200 ~~evaluation~~ elevation of 2200 contour.

Q. Even if you were able to do that now, that would likely change going into the future?

A. Well, I don't know -- I don't know what's going to happen in the future in the Antelope Valley. People may -- may decide the Antelope Valley is no longer attractive and it may stay static for a while. I don't know.

Q. Or they may decide it's a great place to live, nice, dry climate and build lots of houses?

A. I don't know what -- what's going to happen in the Antelope Valley.

Q. Right. So the answer to my question, even if you could do it right now, this slice in time, it wouldn't be accurate in terms of what happens in the future potentially?

capture where you can draw the stream lines that come into the well and then the stream lines that bypass the well.

Now, it is possible that there are specific wells down in the valley here whose capture zone splits and goes back into both the San Gabriel or the -- and the Tehachapi Mountains, but it's unlikely. Because if you draw the stream lines, it would be very -- the stream lines diverge as you leave -- as you go up the valley, the stream lines diverge because the stream lines coming off of the Tehachapi Mountains and the ~~steam~~ stream line is coming off the San Gabriel Mountains.

If I draw the capture zone for any specific well down in the bottom of the valley there, the capture zone is unlikely to have stream lines from both the San Gabriel and the Tehachapi Mountains zone.

BY MR. ZIMMER:

Q. You haven't done that analysis?

A. Well, you can do it.

Q. You haven't done it as you sit here right now?

A. I've done it mentally.

Q. You haven't actually looked at the

A. Right.

Q. Will subsidence also be affected by the volume of pumping and how fast the water is pulled out versus how fast it can recharge?

A. Well, if you pull the groundwater -- groundwater ~~evaluation~~ elevation down, you can end up -- if you're in a stable situation where you're pumping at the rate at which water is being supplied, then it's unlikely that you're going to create subsidence, but if water is supplied to the neighborhood where you're pumping, it is such that you keep reducing the groundwater surface evaluation, then you'll end up with subsidence.

Q. If you pull all the water out faster than it recharges, you're more likely to have subsidence?

A. Yes. That's exactly what happened here, and it's shown in figure 19 and figure 20 and 21.

Q. And in the Antelope Valley, water moves very slowly?

A. Excuse me?

Q. Water moves very slowly, groundwater, in the Antelope Valley?

MR. KUHS: Objection, vague.

BY MR. ZIMMER:

Q. We had some testimony from Mr. Rhone yesterday and he said it could take a thousand years for water to get from the western side of the basin to the eastern side.

Would you agree with that?

A. In actual water molecule?

Q. Correct.

A. Yeah, but that's true, but likely. But in fact changes in water surface evaluation can propagate a whole lot faster than the water molecules themselves move. What a lot of people don't realize is you can get waves on the surface of groundwater just the same as you can get waves in an ocean.

The fact that the wave propagates from China to here doesn't mean that the water particle comes from China to California and the same thing happens in groundwater. You can put in groundwater -- when you produce a wave, the waves tend to have a speed of propagation which is fixed by bulk modulus and the transmissivity.

Q. If you have a wave of groundwater, does that mean that the groundwater level can actually be higher groundwater than it would be otherwise?

A. Well, let me explain how waves

redundant?

A. It's redundant information really. It has not much bearing on the conclusions that I've drawn here other than the fact that it helped me draw the groundwater contours. Because if the Neenach fault had actually been an impairment to the flow, it would have shown me that the contour should have been parallel to that fault as they are parallel to the Willow Springs fault in the northern part of the Randsburg Mojave fault.

Q. Okay. I suppose someone else would ask this if I don't ask it right now, but in the flash drives that you've provided here today -- and thank you for doing that -- does it have that analysis or any of that work product in there that you've just talked about?

A. Yeah. It's in there. You'll see there's a PowerPoint presentation that's got the slides in it.

Q. It's in a PowerPoint format?

A. Yes.

Q. Normally, a PowerPoint format is intended for a presentation usually to a group of individuals.

Did you have an opportunity to use that

ridge area as you go -- there's a line that can be drawn, say, from the big buttes to the Little Buttes, but as you go forth --

MR. KUHS: Antelope.

MR. DUNN: Yes, thank you. Antelope Valley Buttes to the Little Buttes.

Q. But as you continue in that same direction leaving the Little Buttes area, there's some uncertainty in your mind at least as to where you would map or can specifically map the bedrock ridge area. Is that a fair statement?

A. No. There's no uncertainty as to where the bedrock ridge area is. The uncertainty in my mind is where the actual ridge line is, in other words, and what the greatest ~~attitude~~ altitude is because I don't know whether these wells have actually been drilled on the ridge line. It may be that the ridge line is actually higher than what's shown in these sections that I've drawn here.

So I know that the ridge line is likely between the sections AA, A prime and DD prime that I've drawn here.

Q. Yes.

A. But what the actual elevation of that ridge line is or the trace on the ground where the

ridge line is is more than what you can sort of infer from the -- from the aero-magnetic surveys and the gravity surveys that it's likely to be between the Little Buttes and Willow Springs.

So we know it's in that general area and I would -- if I had to take a wager, I would draw a line from the Little Buttes over to Willow Springs.

Q. All right. Thank you. And are you going to draw that line?

A. No. I'm not going to draw it because I don't have the information to draw it, but I know that if I were -- that the bedrock ridge lies within half a mile of that line in either direction, but where the actual ridge line is, I don't know, and I don't think anybody else does at this point, but in terms of the ~~impairment~~ impedirment to the flow, I mean it's there, and we know from the sections AA and DD that -- on the one that I modified there --

Q. Exhibit 110?

A. This one here.

Q. Exhibit 109?

A. Yeah. You can see from exhibit 109 if you project DD on to -- DD prime on to AA prime, there's not a very large amount of saturated material unless -- unless there is a sort of a valley that's

MR. DUNN: Okay.

Q. Now, when you say this --

A. This area between the Garlock fault and the San Andreas fault forms a groundwater valley and where water flows up to the Tehachapis and water flows off the San Gabriels. That comes down into this zone here between the Little Buttes and the Willow Springs and this contour here is a closed contour.

Q. What I'm going to do is see if I can get something in color and just shade it as the valley.

MR. BARRON: I've got a couple of colors.

MR. DUNN: What do you have?

MR. BARRON: Red and blue.

(Off-the-record discussion.)

BY MR. DUNN:

Q. Here's a red.

A. When I talk about a groundwater valley, you think of these as the contours which are coming down here, and this is the groundwater valley which is in here.

Q. Which is in red. Okay.

MR. ZIMMER: Like a topographic map.

THE WITNESS: Like a topographic map. The

A. No. Never seen it.

Q. I would assume then that you've never seen the plate that he created to illustrate what he had described textually within the memorandum?

A. No.

Q. I'll represent to you that he was attempting to overlay various mapping efforts by earlier investigators. By way of example, Carlson and Phelps, Bloyd and I believe others as well and essentially illustrate the differences to the extent that they did differ, but the one universal feature that I observed that appeared to be consistent by most all of the earlier mappers was that the northern boundary in the western portion of the Antelope Valley groundwater basin was fixed at the Willow Springs and Cottonwood fault lines.

A. Well, I can understand why because there's a serious impairment to groundwater flow.

Q. Well then --

A. Groundwater ~~evaluation~~ ~~contents~~ suggest there's a serious impairment.

Q. Now you've kind of got ahead of me because that's where I was going with my question. What I really want to know is I presume in your efforts in connection with this matter you've kind of

A. No.

Q. All right. Do you have -- if I understand you correctly, your analysis suggests that at least in the more contemporary time frame, the last 30 to 40 years that if you analyze three or four different approaches to viewing the same problem, you come to the conclusion that there is an obstruction to flow or to interconnectedness running between the buttes that you've identified?

A. There's an obstruction to flow between Antelope Buttes and Little Buttes.

Q. That's running from the south to the northeast up towards the Willow Springs area?

A. That's right.

Q. All right. And in part, that being confirmed by the fact that there's kind of a -- it appears by the groundwater ~~evaluations~~ elevations that you were discussing, and in the ones you intend to in fact draw to illustrate that in that generalized area, water -- the water table is moving from a higher ~~evaluation~~ elevation consistently towards a lower ~~evaluation~~ elevation with that being the focal point?

A. The focal point is in the neighborhood of the bedrock ridge, yeah.

Q. Got you. And as such then, at least

be the case.

Q. So if we were looking for an explanation, we'd want to look north of the Willow Springs/Cottonwood fault lines to find out why the springs have now disappeared to see if there is an answer available?

A. I'd need to study it before offering an opinion about that.

Q. Well, I will represent to you that my client owns a fair amount of acreage north of the Willow Springs fault line. My client pumps groundwater and my client farms.

And what I really want to know is can you -- strike that.

In your opinion, does the pumping that's occurring down in the Lancaster and Palmdale area, primarily for the municipal maintenance of households and the like, have any significant or, more importantly, quantifiable impact upon the water supply available to pumpers north of Willow Springs and Cottonwood?

A. No. It's not likely that that would occur because the water surface ~~evaluation~~ elevation north of the Willow Springs fault is 250 feet high and south of the Willow Springs fault.

So it's not conceivable that any activity south of the Willow Springs fault is going to have a significant effect through that level of impairment.

Q. Mother nature doesn't create completely impermeable barriers, but there's a fairly significant barrier, correct?

A. It's a fairly significant barrier if it can support differences in water surface ~~evaluation~~ elevation of that, but clearly if you draw down groundwater and increase --

Q. The head --

A. -- increase the head, then the amount of flow is going to increase.

Q. And then the issue is whether or not it is -- the magnitude of the leakage is enough to make it worth being concerned about?

A. That's right.

Q. Okay. Based upon your investigation of the area, that groundwater level differential has stayed fairly consistent over time. Am I correct?

A. It appears to have, yeah.

Q. That same 250 to 300 feet ~~evaluation~~ elevation change has been pretty much, going back to Bloyd and coming forward, been a consistent reported feature of

DECLARATION

OF

PENALTY OF PERJURY

I declare under penalty of perjury, under the laws of the State of California, that I have read the foregoing transcript, I have made any corrections, additions or deletions that I was desirous of making in order to render the within transcript true and correct, and

IN WITNESS WHEREOF, I have hereunto subscribed my name this 8th day of October, 2008.

E. JOHN LIST, Ph.D., P.E.