

CHINO BASIN WATERMASTER

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MANAGEMENT ZONE 1)
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 SPECIAL REFEREE WORKSHOP)
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REPORTER'S TRANSCRIPT OF ORAL PROCEEDINGS

DATE AND TIME: Wednesday, May 25, 2005
 10:38 a.m. to 3:10 p.m.

PLACE: CHINO BASIN WATERMASTER
 9641 San Bernardino Road
 Rancho Cucamonga, CA 91730

REPORTED BY: WINIFRED S. KRALL, C.S.R. #5123

OUR JOB NO.: WK-052505

1 APPEARANCES

2
3 SPECIAL REFEREE:

4 Anne J. Schneider, Attorney at Law

5 TECHNICAL ADVISER:

6 Joe Scalmanini

7
8 CHINO BASIN WATERMASTER:

9 Kenneth R. (Ken) Manning, Chief Executive Officer
10 Sheri M. Rojo, Finance Manager
11 Michael Fife, General Counsel
12 Sherri Lynne Molino, Executive Assistant

13
14 WILDERMUTH ENVIRONMENTAL:

15 Mark Wildermuth, Engineer
16 Francis Riley, Hydrologist
17 Andy Malone, Engineer

18
19 ALSO PRESENT:

20 Raul Garibay, Pomona
21 Dennis Williams, Geoscience/Chino Hills
22 Kyle Snay, Southern California Water Company
23 Jim Erickson, City of Chino
24 Dave Crosley, City of Chino
25 Mike Maestas, City of Chino Hills
Robert Tolk, Monte Vista Water Company
Rick Hansen, TVMWD
Craig Stewart, Geomatrix/State of California
Mark Kinsey, Monte Vista Water Company
Boyd Hill, Monte Vista Water Company
Eric Fordham, GeoPentech, City of Chino
Ray Wellington, San Antonio Water Company
Tom Bunn, City of Pomona
Mark Hensley, City of Chino Hills

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RANCHO CUCAMONGA, CALIFORNIA

WEDNESDAY, MAY 25, 2005, 10:38 A.M.

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MR. FIFE: Good morning, everyone. We're going to get started. We're here for the second MZ1 subsidence workshop. I am Michael Fife from Chino Basin legal counsel. And with us today is Anne Schneider, the Court's Special Referee, and Joe Scalmanini, the Court's technical advisor.

We have a lot to do today. It's quite a lengthy presentation so I think we're going to get into it as quickly as possible. I'm going to say a few words just a couple minutes to give background on the presentation and to lay out the procedure of what we're going to do today. I think Anne had a couple words she wanted to say about that also. And then we'll move directly into Andy's presentation.

But first for the benefit of the court reporter and the record, why don't we go around the room and everybody introduce yourself and state the entity that you're here on behalf of.

So again I'm Michael Fife. I am general counsel for Chino Basin Watermaster.

KEN MANNING: Ken Manning, Chino Basin Watermaster CEO.

1 SHERI ROJO: Sheri Rojo, Chino Basin Watermaster
2 Finance Manager.

3 SPECIAL REFEREE SCHNEIDER: Anne Schneider,
4 Special Referee to the Court.

5 MR. SCALMANINI: Joe Scalmanini.

6 MR. MALONE: Andy Malone, Wildermuth
7 Environmental.

8 MR. RILEY: Francis Riley, Wildermuth
9 Environmental.

10 MR. WILDERMUTH: Mark Wildermuth from Wildermuth
11 Environmental.

12 MR. MAESTAS: Mike Maestas, City of Chino Hills.

13 MR. WILLIAMS: Dennis Williams, Geoscience for
14 Chino Hills.

15 MARK HENSLEY: Mark Hensley, City Attorney, Chino
16 Hills.

17 WADE HILL: Wade Hill, attorney for Monte Vista
18 Water District. And Mark Kinsey will be joining us
19 shortly from Monte Vista Water District.

20 KYLE SNAY: Kyle Snay with Southern California
21 Water Company.

22 ROBERT TOLK: Robert Tolk with Monte Vista Water
23 District.

24 RAY WELLINGTON: Ray Wellington, San Antonio Water
25 Company.

1 RAUL GARIBAY: Raul Garibay, City of Pomona.

2 DAVID CROSLY: David Crosley, City of Chino,

3 ERIC FORDHAM: Eric Fordham with GeoPentech,
4 representing the City of Chino.

5 JIM ERICKSON: Jim Erickson, attorney for the City
6 of Chino.

7 CRAIG STEWART: Craig Stewart, Geomatrix
8 Consultants representing the State of California.

9 RICK HANSEN: Rick Hansen, Three Valleys.

10 TOM BUNN: Tom Bunn, attorney for City of Pomona.

11 MARK KINSEY: Mark Kinsey, Monte Vista Water
12 District.

13 MR. FIFE: I think we've got everybody. So
14 please, as a matter of procedure throughout the day, if
15 you ask questions, we're going to ask that you come up to
16 the microphone and please state your name again for the
17 court reporter when you speak. And remember to speak
18 loudly so that she can hear you, especially if you're
19 speaking without a microphone.

20 Again, this is the second workshop regarding
21 subsidence in MZ1. The first workshop was held on
22 August 29th, 2002. That workshop was followed by a
23 Special Referee's report and a court hearing and court
24 order. Copy of that court order is on the back table
25 just for everybody's review, just to remind everybody

1 where we last left off with the Court on these issues.

2 The purpose of that workshop was to introduce the
3 interim plan to the Court. At the time, if you recall,
4 we weren't even complete with the interim plan. We were
5 still negotiating it. The monitoring plan still had yet
6 to get going. We were still talking about signing up for
7 the forbearance program, et cetera. And so the issues
8 that were discussed at that workshop were how
9 participation in the plan would work, whether monitoring
10 would work, and what was going to happen over the next
11 three years.

12 The Court in its order ordered a follow-up
13 workshop in order to monitor all of those issues and what
14 kind of progress we were making under those issues. In
15 the order that's on the back table, the Court set a date
16 for that workshop of July 2003.

17 Over the last couple years as the monitoring has
18 progressed, at every step we decided that it would be
19 helpful to have a little bit more information before a
20 workshop and a little bit more and a little bit more.
21 And I think finally the MZ1 technical committee got to
22 the point where they felt they had enough to present it
23 to the Court. And that's why we're here today, is to
24 have the workshop that the Court asked us to have back in
25 July of 2003.

1 The purpose of today's workshop, then, unlike that
2 first workshop where we were doing primarily a legal
3 introduction of the interim plan, the purpose of today's
4 workshop is primarily technical in nature to inform the
5 Referee and the court's technical advisor about the
6 progress of the monitoring, the things we've learned, and
7 what we see for the future.

8 Because of that, we are hoping that this
9 discussion will be technical in nature primarily. This
10 is a workshop. It's not a hearing. There's no decision
11 that the Court is going to make as an outcome of this
12 process today.

13 We will take a break at lunch, so about noon. So
14 we'll go for about an hour. Then we'll take breaks
15 periodically throughout the day after that. And I think
16 the Referee wanted to make some comments now, and then
17 after that, we'll go directly into the presentation.

18 SPECIAL REFEREE SCHNEIDER: Thank you. As Michael
19 indicated, the active order of the Court is the
20 October 17th, 2002, order that's on the back table.

21 That order directed Watermaster to implement the
22 interim plan that was before it, to continue the MZ1
23 technical committee work, and schedule a follow-up
24 workshop, that was, as Michael said, in July 2003. The
25 workshop today is that workshop.

1 To file reports on a quarterly basis, which pretty
2 much the Watermaster has done, advising the Court of the
3 activities going on under the interim plan.

4 And finally, the order requires that a long-term
5 plan be developed by fiscal year 2004-2005, which would
6 mean by July 1. That clearly is not going to happen. I
7 anticipate that Watermaster will go back to the Court to
8 have an amended order that would provide a new date for a
9 long-term management plan.

10 The purpose of this workshop is to describe the
11 substantial amount of work and study that has been done
12 since the interim plan began, if any conclusions have
13 been reached, what those conclusions are, describe the
14 activities that are being undertaken now, and describe
15 remaining work to be done, if any. And it is finished --
16 to our understanding, that a long-term management plan is
17 the goal for this process.

18 As Michael said, this is a workshop and not a
19 hearing. Andy Malone will make the main presentation, as
20 I understand it. Questions are welcome so long as we
21 don't bog down Mr. Malone's presentation. This is a
22 technical workshop in my view and not a legal one. So if
23 there are comments or questions, I would hope that they
24 would stay on technical issues. There also will be no
25 cross-examination of anyone. So the questions have to be

1 not in the nature of cross-examination or we'll just cut
2 them off, if necessary.

3 So I appreciate your being here. Due to our
4 flight schedule, I'd like to stop, wherever we are, if
5 possible, by 3:30 at the very latest. And with that, I'd
6 like to have you start. Thank you.

7 MR. FIFE: So again, please, if you have questions
8 come up to the microphone that's here for that purpose
9 and state your name clearly for the reporter. Thank you.

10 MR. MALONE: I would encourage a lot of us here
11 from the MZ1 technical committee are familiar with this
12 material, and if I happen to skip over a point that
13 someone else in the audience feels is an important point
14 to illustrate at this point in time, please speak up and
15 say so.

16 With that we'll start right in. This is the
17 outline of discussion for today. We'll start with some
18 brief topics on the basic concepts of aquifer mechanics.
19 We will talk a little bit about the background, the
20 hydrogeology of the Chino Basin, and the history of
21 subsidence and fissuring in the Chino Basin just to get
22 everyone up to speed. And then the bulk of the
23 presentation will be on our monitoring program.

24 We'll update you on the hypothesis that we started
25 with that was written in the OBMP and our methods that we

1 chose to test that hypothesis and then discussion of some
2 of our results and some of our conclusions that we've
3 come to today. And then a discussion on our ongoing and
4 recommended work for the future.

5 So we start out here with some of our basic
6 concepts. Before we get into those, though, I'd like to
7 mention that a lot of these concepts that we're talking
8 about are not new, that they've been documented and
9 studied. This process of aquitard drainage due to
10 groundwater withdrawal and associated land subsidence
11 that goes along with that aquitard drainage, it's been
12 documented in many places across this country.

13 What this map here shows in these areas here that
14 are highlighted or shaded are unconsolidated aquifers.
15 And each one of these lines here that indicate a certain
16 groundwater basin in these areas are areas where
17 groundwater withdrawal has been studied as the cause of
18 land subsidence, aquifer system compaction and land
19 subsidence.

20 In some of these areas like the San Joaquin
21 Valley, we have seen subsidence that's approached 30 feet
22 in magnitude. We're not seeing that same sort of
23 magnitude of subsidence here in Chino Basin, but we have
24 ground fissuring associated with our land subsidence
25 which makes it an issue. And in many of these places we

1 have ground fissuring that's associated with the land
2 subsidence as well.

3 This here is an InSAR image of the Las Vegas area.
4 And in these areas here we're seeing land subsidence
5 that's been attributed to groundwater withdrawal, and
6 these white lines here represent faults. This one right
7 here which is acting as a groundwater barrier and is
8 causing some differential subsidence to occur across that
9 fault. And there's ground fissuring that has been
10 documented to be associated with that subsidence. So in
11 areas like Las Vegas, very similar hydrogeology and a
12 similar history of subsidence and fissuring that we're
13 seeing in Chino.

14 This here is a photograph of a ground fissure.
15 It's fairly large. The ground fissures -- you're going
16 to see some photographs of our ground fissures that
17 occurred in the early '90s in Chino. Ours are not quite
18 of this magnitude here. But this is a ground fissure in
19 Arizona that was associated with land subsidence due to
20 groundwater withdrawal.

21 Again, something to point out here, these ground
22 fissures, the way they form, at the ground surface here,
23 you see it's an erosional feature. The fissure forms
24 that depth, and it's not quite this wide. But erosion,
25 rainfall events and erosion, which wash the sediment, the

1 surficial sediments down into that ground fissure at
2 depth manifest themselves as these large cracks that
3 appear in the ground surface.

4 So some of our basics of aquifer mechanics that
5 can lead to land subsidence in ground fissuring. I'm
6 going to go through these concepts one by one. The first
7 one is this concept of effective stress. And the way
8 this works is that at any point in a saturated aquifer
9 system, the overburden load, the sediments and the
10 saturated -- the saturated sediments that compose the
11 overburden load are supported by, in part, the pore fluid
12 pressure in those saturated sediments and in part by the
13 skeletal stress which is the grain-to-grain contacts in
14 the aquifer system.

15 So pore pressure, as we know, can change. When
16 the well turns on, the pore pressures decrease. And when
17 that happens, these skeletal stresses, those
18 grain-to-grain contacts, they increase. And the sediment
19 package will deform to become more stiff and support that
20 increased effective load. So that's why we call it
21 effective stress.

22 When pore pressures increase, the skeletal stress
23 can decrease, and the sediments can expand to their
24 original geometry. This can happen in an elastic
25 process. So that's the concept of effective stress.

1 MR. SCALMANINI: Andy, I'm flashing back about
2 40 years. Is there going to be a quiz on this at the end
3 of the day?

4 MR. MALONE: That is your textbook here.

5 So this skeletal stress in this deformation, that
6 brings us to this concept of compressibility of
7 sediments. All sediments are compressible, but it's a
8 material property, and it can vary from different types
9 of sediments. Aquifers are not as compressible. They're
10 composed of sand and gravel. They are not as
11 compressible as aquitards, which are composed of silt and
12 clay. They compress more.

13 And to give you an idea, the magnitude, the
14 compressibility of these aquitards can be anywhere from
15 4 to 8 times more compressible -- 8 to 4 -- 4 to 8 times
16 more compressible than aquifers. When the sediments
17 compress, they can yield water. So aquitards, when they
18 compress, yield more water than when the aquifers
19 compress.

20 Now, this sort of compression, like we mentioned
21 up here, can be an elastic process where they compress
22 and expand, or it can be an inelastic process where they
23 permanently compact. They compress and permanently
24 compact and will never achieve their original geometry,
25 no matter how high the water levels get back up or pore

1 pressures get back up.

2 Because of that, this inelastic process can yield
3 a lot more water than the elastic process to the aquifer
4 system. As Francis quotes, in some cases this inelastic
5 process can yield a hundred times more water than the
6 same amount of compression in an elastic process. And
7 this represents a one-time mining of the water from the
8 aquitards.

9 Did I state that correctly, Francis? You shook
10 your head.

11 MR. RILEY: You said the same amount of
12 compression. What you really mean is compression in
13 response to the same change in head or the same reduction
14 in pore pressure.

15 MR. MALONE: Yes. So what controls the difference
16 between the elastic and the inelastic processes that can
17 occur in these aquitards, what controls the transition
18 between those, that's this concept of preconsolidation
19 stress. What the preconsolidation stress is is the
20 maximum past skeletal stress that the aquifer system has
21 encountered in the past since those sediments were
22 deposited. And again that skeletal stress can change due
23 to pore fluid pressure changes. So as pore fluid
24 pressures decline and skeletal stress increases, if it
25 increases past the maximum past skeletal stress, then we

1 have a new preconsolidation stress. And that
2 preconsolidation stress is the threshold between the
3 elastic and the inelastic deformation that occurred in
4 these sediments -- that can occur in these sediments.

5 And the last concept, this is the concept of time
6 lag of aquitard drainage and deformation. As you're
7 probably aware, aquitards fine-grained sediments are not
8 very permeable sediments. It takes time for them to
9 drain and become equilibrated with lower heads in the
10 aquifers. This process can take weeks to months for the
11 elastic processes to come to completion, or they could
12 take decades or centuries for inelastic processes to come
13 to completion.

14 When we talk about coming to completion, that is
15 the time required for 93 percent of the ultimate
16 potential drainage to occur in these aquitards. And this
17 can be quantified if we know a little bit about the
18 materials that are being compressed and mathematically
19 what those terms are are the compressibility of the
20 sediments, the vertical hydraulic conductivity of the
21 sediments, and the thickness of the sediments. You can
22 see that the thickness is especially sensitive to the
23 time lag. It's to the power of 2.

24 So we have some graphics to illustrate this
25 process and some of these concepts. If these represent

1 our aquitards, our fine-grained silts and clays, and
2 these white areas represent our saturated aquifer
3 sediments, our sands and gravels, when a well turns on --
4 if this is where it's perforated, when a well turns on,
5 it's drawing water from the permeable coarse-grained
6 sediments, and lower heads are a result of this process
7 in the aquifers.

8 What occurs then is that these aquitards begin to
9 drain. They have higher heads in here than in the
10 aquifers, and water begins to drain out of these
11 aquitards. And so if you look at a point inside one of
12 these aquitards, your overburden pressure being partly
13 supported by the pore fluid pressure and the
14 intergranular stress here, when we have this aquitard
15 drainage, that pore fluid pressure will decline and the
16 grain-to-grain contact stress will increase. And then
17 when the well shuts off, we can have the pore fluid
18 pressures increase as water migrates back into these
19 aquitards.

20 We have this maximum past effective stress that is
21 one of these aquitards here. And we actually pump the
22 aquifer and decline heads in the aquifer so much that
23 water is draining out of these aquitards and the pore
24 fluid pressure in the aquitards exceeds the maximum past
25 effective stress, then this is when we can have the

1 permanent compaction in the aquitards which translates to
2 land subsidence at the surface.

3 Are there any questions on those concepts, those
4 basic concepts.

5 MR. SCALMANINI: Go ahead.

6 SPECIAL REFEREE SCHNEIDER: No.

7 MR. MALONE: Well, if we start talking now about
8 the background of subsidence and fissuring and some of
9 the hydrogeology of the Chino Basin here, we can go back
10 to virgin conditions near the turn of the century.

11 Basically what was happening in the Chino Basin at
12 that point in time is we have our four bay regions where
13 a lot of the recharge to the groundwater basin is
14 occurring, and we have groundwater flow from these four
15 bay regions down towards areas of discharge in the
16 southern part of Chino Basin.

17 And Mendenhall mapped an area right here, swampy
18 conditions, flowing artesian wells, in this general area
19 here in the southwest part of Chino Basin. Now, what
20 this indicates, these swampy flowing well regions, is
21 that we have fine-grained sediments that are acting to
22 confine the groundwater system. And that's what it
23 indicates.

24 So what we've also put on here is our area of
25 subsidence, our primary area of subsidence that we've

1 identified through our studies here. You can see that
2 there is some overlap here between these areas of
3 subsidence and the old flowing artesian zones.

4 What this also indicates, not only the existence
5 of fine-grained sediments in this area, but that water
6 levels were historically at or above the ground surface.
7 So we had a completely saturated column of sediments in
8 this area.

9 What occurred over the course of the Twentieth
10 Century is that a lot of wells were drilled in Chino
11 Basin and we pumped a lot of water out and we drew water
12 levels down significantly in some of these areas,
13 especially over here on the west side of Chino Basin. So
14 what this map here represents is that we had as much as
15 150 feet of drawdown in some of these parts of the
16 western side of Chino Basin. And it coincides with our
17 area here that we've indicated subsidence to have
18 occurred.

19 Now, this figure only shows the end result, 1933
20 to 2000. We look at a water level time history of some
21 wells over on the west side of Chino Basin, the ground
22 surface was about 690 for these wells. So you can see
23 that water levels in 19- -- in the late 1930s were really
24 close to the land surface in this area. This right here
25 is elevation of water level.

1 This gray line here represents the cumulative
2 departure from mean precipitation. And so this is a wet
3 period, and this represents dry period, a wet period, dry
4 period, and so forth.

5 So you can see that during this dry period we also
6 had a lot of wells come into the Chino Basin, and we had
7 a considerable amount of drawdown on the order of about,
8 let's say 650 to 550, so maybe 150 feet of drawdown in
9 this area here.

10 In the late 1970s, we had the adjudication of the
11 Basin and control of production. And we also had a
12 relatively wet period here. And so we have water levels
13 recovering about 50 feet in this area over that time
14 period.

15 When we look at the history of subsidence in Chino
16 Basin, we don't have much of a time history that goes
17 back past about the 1980s. But we do have good data that
18 starts in about the mid 1980s and goes forward to the
19 present.

20 What this graphic here is showing is two types of
21 data that we can use to monitor ground surface
22 deformation. The ground level survey data as outlined by
23 this green polygon. And this is an area where the City
24 of Chino has done repeat ground level surveys from about
25 1987 forward and has documented a maximum of about

1 2 1/2 feet of subsidence in this area.

2 The shaded area all right in here is InSAR data.
3 It's our remote sensing data. It's a relatively new
4 technology that came about in the early 1990's. And what
5 this is showing is this orange area right here is showing
6 about a maximum of 11 inches of subsidence over the 1993
7 to 1995 time period.

8 So you can see that both of these two methods of
9 measuring subsidence, these two independent methods, are
10 showing the subsidence has occurred over here on the west
11 side of Chino Basin. They're both documenting that.

12 One thing to note here is that in the southern
13 part of Chino Basin, this gray area represents areas
14 where the InSAR is not coherent and we don't have good
15 data down here. Agricultural areas don't normally return
16 very good data to the satellites that are collecting this
17 data. So we don't have very much good InSAR data here in
18 the southern part of the Chino basin, but we have very
19 good data where the landscape is composed of municipal
20 and industrial land uses.

21 If we zoom into this area right here, we have a
22 little time series of events that occurred since about
23 1987. So what we're looking at here is Central Avenue,
24 north-south alignment of Central Avenue here. This is
25 the southern part of the City of Chino proper. We have

1 Eucalyptus Avenue here, Edison, Schaefer, Chino, and
2 Riverside.

3 In the late '80s, early part of the 1990s, a
4 number of wells were drilled in this area that tapped the
5 deep confined aquifer system. After those wells were
6 drilled in the early 1990s starting in about 1991 and
7 going for a couple of years, some ground fissures began
8 to open up here on the city's -- I mean in the City of
9 Chino and on the property of CIM, the property of the
10 State. These fissures formed in this area first and
11 propagated to the north and to the south somewhat over
12 this couple-year period.

13 And here's some photographs of what some of those
14 ground fissures look like. This is on CIM property. And
15 this is just north of CIM property just near Edison
16 Avenue.

17 So when these fissures began to develop, the City
18 of Chino went out and performed again these repeat ground
19 level surveys from about 1987 to about 1999. And these
20 contours here are land subsidence contours in feet that
21 occurred over this time period. The data behind these
22 contours are those ground level surveys. And as you can
23 see, we have a north-south trending trough of subsidence,
24 a little over 2 feet of subsidence, that occurred over
25 this time period along Central Avenue here.

1 And another thing to note here is this very steep
2 eastern limb of the subsiding trough that coincides with
3 the fissuring zone which has led multiple authors in
4 investigations to associate this fissuring with this land
5 subsidence that's been documented.

6 Right here what we're doing is we're overlaying
7 that InSAR data on top of this and showing that these
8 areas -- again we're just looking at a short time period
9 from April to September 1993. A little over a half a
10 foot of subsidence occurred in this area, the maximum of
11 about .65 feet of subsidence occurred in this area.

12 Really the point of this slide is to show you that
13 these two methods of measuring subsidence, they're
14 turning out to be pretty comparable methods. Completely
15 independent of each other, but the distribution and the
16 magnitude of the subsidence that is being measured by
17 both these two methods are very similar.

18 And again in the InSAR data you can see here we
19 have some incoherence. These blank areas are where we
20 have incoherent data. You can see this steep grading of
21 subsidence along the same lineament as the ground
22 fissures. We will talk about that much more later.

23 So the OBMP -- when we constructed the Optimum
24 Basin Management Program, it addressed this phenomenon of
25 subsidence and fissuring in Chino Basin. What was said

1 in the OBMP is that we'll do these things. We will
2 attempt to minimize the subsidence and fissuring in the
3 short term. What we've done there is, that's the
4 forbearance agreement where we've agreed to reduce
5 production on an annual basis in this part of Chino Basin
6 by about 3,000 acrefeet a year. And then to initiate a
7 study to collect the information necessary to understand
8 the mechanisms, the extent, and the rate of subsidence
9 and fissuring in Chino basin. And that's our interim
10 monitoring program that we're going to be talking about.
11 And then to use that data that we collected there to
12 formulate a long-term management plan to minimize or
13 abate subsidence and fissuring in the future.

14 Another reason why this process is very important
15 to understand the best we can is that we have other
16 management programs in the Chino Basin where there may be
17 head declines associated with these management plans.
18 And especially in areas that are adjacent to our areas of
19 subsidence and fissuring where we may have head declines,
20 we want to really understand this process so that we
21 don't -- that we don't cause additional subsidence and
22 fissuring to occur.

23 One of those programs is, of course, the hydraulic
24 control monitoring program where these high capacity
25 desalter wells are reducing water levels in these

1 regions.

2 So to go into the monitoring program update.
3 We're going to take you through the scientific process
4 here where we first develop a hypothesis based on
5 existing data that we had back in about 1999, 2000. Then
6 we developed the methods, as the MZ1 technical group, to
7 test that hypothesis. And then we will review some of
8 the results and conclusions.

9 MR. SCALMANINI: Just before you launch into that,
10 Andy, it probably would be awkward to do it, but whether
11 you page back or not is academic. The hydrograph of what
12 I call the collection of wells as against the cumulative
13 departure curve. All shallow wells; right?

14 MR. MALONE: Yes.

15 MR. SCALMANINI: So from 1930-ish -- I don't
16 remember exactly, but does that sound right?

17 MR. MALONE: 1935.

18 MR. SCALMANINI: Forward, there's this pretty
19 massive decline in shallow groundwater levels. Before we
20 get to those dots, but while that's of interest, we're
21 not really going to talk today anymore about that and
22 subsidence. Is that fair to say?

23 MR. MALONE: We're not going to be focusing so
24 much on this, yeah, on this time period here.

25 MR. SCALMANINI: Right.

1 MR. MALONE: Is that what you're saying?

2 MR. SCALMANINI: As you look at the collection of
3 slides from about there to where we are now, you know,
4 it's like we -- this is of interest. We had this massive
5 decline of, let's say, at its peak prior to the judgment,
6 if you just kind of integrate the hydrographs, of water
7 levels that went from 670 plus or minus feet in elevation
8 to 520, -30, -40 somewhere in there. So there's a 150
9 foot decline, plus or minus. Okay?

10 MR. MALONE: Yes.

11 MR. SCALMANINI: Let's just call that of interest.
12 And then we put yellow dots and deep wells on the map in
13 the late '80s, early '90s, and then fissuring and then
14 surveying, InSAR, subsets of the survey period that are
15 pretty short in duration that consistently support the
16 cumulative subsidence in the area. But there's no tie
17 between that water level decline and the onset of
18 subsidence or anything like that. Is that as far as
19 we're going to go from here forward in this discussion?

20 MR. MALONE: We obviously know a lot more before
21 the 1990's than we do about this time period here in
22 terms of water levels, the production, and the subsidence
23 that occurred. So a lot of our focus is on what we know
24 most about. But this cannot be ignored. And in our
25 modeling efforts that we'll talk about later on in the

1 discussion, we do not ignore this.

2 MR. SCALMANINI: All right. So we will talk some
3 more about that.

4 MR. MALONE: Yeah.

5 MR. SCALMANINI: Okay. I'll ask this now just so
6 I don't forget later, and that is, can we ultimately get
7 like a more readable color set of these?

8 MR. MALONE: Yeah. That's no problem. We gave
9 you those so you can make notes, but we can provide you
10 with --

11 MR. SCALMANINI: Obviously some of these appear in
12 other places in a little more readable form than they are
13 right here. So that's fine.

14 The contours -- maybe you could page back just
15 about two or three -- the contours of equal
16 subsidence, so to speak, with that. Okay. Well, all the
17 contours up to the 2.2 feet in the center --

18 MR. MALONE: Yeah.

19 MR. SCALMANINI: -- are all derived over some time
20 period or from some time period?

21 MR. MALONE: Yes. It's the 1987 to about 1999.

22 MR. SCALMANINI: Okay. Thanks

23 MR. MALONE: So that's one of the issues. The
24 InSAR data, it's constrained in time.

25 MR. SCALMANINI: Yeah. It's chunks of time.

1 Right?

2 MR. MALONE: The survey data is constrained in
3 time when you took the surveys. In the past we don't
4 have a really good match between those time periods. But
5 qualitatively we can look at it and say, look, it looks
6 like the InSAR data looks like it's showing us the exact
7 same pattern of subsidence, and the magnitudes are
8 comparable.

9 MR. SCALMANINI: Yeah. Clear.

10 MR. WILDERMUTH: When Andy said they don't match
11 up on time periods, you understood what he meant?

12 MR. SCALMANINI: I think so.

13 MR. WILDERMUTH: Maybe you should explain just to
14 be sure. On the survey days, they weren't always in the
15 same point in the year.

16 MR. MALONE: The survey data goes from one year to
17 the next year, and the InSAR data might be offset from
18 that. It's the same concept. InSAR is the same concept,
19 data collection at certain time intervals and you compare
20 the two data collection periods.

21 MR. SCALMANINI: The data that allows the
22 development of the contours, that started in '87?

23 MR. MALONE: In '87.

24 MR. SCALMANINI: Did it just happen to have been
25 available, or was there surveying going on because of any

1 kind of subsidence-related concerns at that point in
2 time, '87.

3 MR. MALONE: The City of Chino might chime in on
4 this, but my understanding is that was data they went
5 back into the archives and pulled out after this
6 phenomenon appeared. They started doing surveys in about
7 1993. So the first time period goes -- is 1987 to 1993,
8 and we'll see some profiles that show that. So they went
9 back into the archives to find a ground level survey that
10 could compare to more recent data.

11 MR. SCALMANINI: There was, quote, some form of
12 baseline, which happened to be '87, against which they
13 could compare the 1993 survey --

14 MR. MALONE: Yes.

15 MR. SCALMANINI: -- that was done because of
16 concerns about subsidence.

17 MR. MALONE: Yes.

18 MR. SCALMANINI: Thanks. Sorry for the
19 interruption.

20 MR. MALONE: Is that generally your understanding
21 too, Dave?

22 DAVID CROSLEY: Yes.

23 SPECIAL REFEREE SCHNEIDER: Would you describe for
24 me why that gray shaded area has no data. That's the
25 state land.

1 MR. MALONE: Down in here?

2 SPECIAL REFEREE SCHNEIDER: Yeah.

3 MR. MALONE: The InSAR data is collected from a
4 radar satellite, and so it emits a signal at an angle to
5 the ground surface. And then what they need is a signal
6 to bounce back toward them. So they need some sort of
7 reflection that bounces back toward them, and then they
8 record that return.

9 In agricultural areas it's not as good of a
10 reflector as roofs would be where it's rough and hard and
11 it's consistent from year to year. When they take
12 another image, they have the same exact surface features
13 that come back to them. So the reflection is better in
14 these hardscape area than in these agricultural areas
15 where you can have cows walking on the field or they plow
16 the field or something like that.

17 SPECIAL REFEREE SCHNEIDER: When Chino collected
18 its data from 1987 on, it wasn't relying on InSAR
19 exclusively?

20 MR. MALONE: No. Yeah, these contours here are
21 from the ground level surveys that they were doing, the
22 conventional leveling surveys.

23 SPECIAL REFEREE SCHNEIDER: So whether from InSAR
24 incapability or just unavailable data, there are no data
25 that would complete this picture into that state

1 agricultural area?

2 MR. MALONE: The State did some of their own
3 investigations, and they did some surveying over this
4 time period too. But this data right here is showing us
5 only the data from the city of Chino surveys.

6 SPECIAL REFEREE SCHNEIDER: Were you given the
7 data that the State collected?

8 MR. MALONE: The State -- Craig, you may recollect
9 what the process that we went through here, but I'm not
10 sure that this data was completely comparable to the
11 state data.

12 MR. WILDERMUTH: They're not tied into the same
13 datum and things of that sort.

14 CRAIG STEWART: Craig Stewart. We have shared
15 data. They have the results of our work, and they know
16 what we did. But as you said, the surveys weren't tied
17 to the same reference elevations at that time. However,
18 I think I'm comfortable anyway that the data that the
19 State obtained and also interpreted for the areas beyond
20 the State's boundaries were generally consistent with
21 what Andy was showing.

22 MR. MALONE: And now our monitoring program, we
23 have monuments that we have brought into the state
24 property, and we're collecting that data.

25 SPECIAL REFEREE SCHNEIDER: That's what I was

1 getting at. So going forward, you'll be able to complete
2 more of that picture?

3 MR. MALONE: Yeah. In the past there is data down
4 here that, like Craig says, looks consistent with the
5 data that's been collected by the City of Chino. But
6 we're not showing it on the map.

7 MR. SCALMANINI: Andy, I don't want to put you on
8 the spot. Maybe I ought to ask Francis. In the
9 Las Vegas Valley, it looks like in what I'd generally
10 tend to classify as a not very urbanized area, they seem
11 to get pretty good InSAR response in some open-area
12 country out there. Is there some thought as to why that
13 was successful or more successful maybe? If you don't
14 know, let's not even waste time on it. It's just a
15 curiosity question.

16 MR. MALONE: I don't know exactly. In the areas
17 where you're plowing up the land, say, for instance, then
18 that can have an adverse effect on ability to compare
19 radar images.

20 MR. RILEY: Joe, in general the desert areas are
21 good radar reflectors. This is true in Las Vegas Valley
22 and Arizona and a number of places.

23 MR. SCALMANINI: Okay.

24 MR. MALONE: So when we go back to the OBMP and
25 look at our hypothesis that we started with, what we did

1 was reviewed the potential causes of subsidence, all the
2 laundry list of them, which included subsurface
3 withdrawal of fluids, hydrocompaction, oxidation of
4 organic soils, collapse of underground caverns, tectonic
5 causes, shrinkage of expansive soils, et cetera, here.

6 We reviewed all these, but what we zeroed in on
7 was this subsurface fluid withdrawal as our hypothesis.
8 That's what we identified as the most likely cause of the
9 subsidence that we had observed in the City of Chino.

10 MR. SCALMANINI: And more specifically, water as
11 contrasted to hydrocarbon fluids and things like that.

12 MR. MALONE: Right. So our hypothesis was that
13 the groundwater production caused land subsidence and
14 fissuring in Chino Basin. That was our hypothesis. And
15 the line of reasoning has that groundwater production
16 caused drawdown in our aquifers which caused the
17 aquitards to start to drain into the aquifers and deform
18 so we have compaction, aquifer system compaction; that
19 this aquifer system compaction resulted in differential
20 land subsidence across this zone of fissuring which
21 caused the fissuring.

22 So that was the hypothesis that we started with.
23 We also noted that it was likely, or that we were
24 hypothesizing that the production from the confined
25 aquifer system was the main cause of this recent episode

1 of subsidence and fissuring that was measured in the
2 early 1990s. So this is what we designed our monitoring
3 program to test, whether or not this hypothesis was
4 correct.

5 So we developed the internal monitoring program,
6 and this is a two-pronged effort. One is to monitor the
7 ground surface deformation itself. And again the way we
8 were going to do that is through conventional benchmark
9 surveying and this remote sensing method, this InSAR.

10 Then we were also going to do some fissure
11 monitoring with the conventional benchmark surveying
12 where we were going to do some horizontal distance
13 measuring between benchmarks to cross our zone of
14 fissuring to see if we could see any horizontal movement
15 that might be occurring.

16 Then along with that, we were going to monitor the
17 possible subsidence mechanisms, which would be the
18 aquifer system monitoring -- or the mechanisms would be
19 the aquifer system deformation. So we're going to
20 monitor the aquifer system, we're going to look at
21 groundwater production very closely. We're going to look
22 at piezometric levels, what the water levels are doing in
23 the area very closely. And then we're going to monitor
24 the aquifer system compaction or expansion that might be
25 occurring as a result of these piezometric levels

1 fluctuating.

2 If we look at each one of these methods
3 individually, the ground level surveying, again it
4 monitors the ground surface deformation. And what we did
5 there is we compiled all the historical data that we
6 could. Looking at City of Chino's data from 1987 to
7 2001. And the pre-1987 data, we made some attempts to
8 collect that, but actually we're having Associated
9 Engineers, a contractor that we have, do our ground level
10 surveying. We're having them go back and just try to
11 glean any information that they can from pre-1987 to give
12 us some idea of what happened subsidence-wise in the
13 Basin prior to 1987. That's in progress.

14 We then installed permanent benchmark monuments.
15 What we did is we took the City of Chino's existing
16 network and we augmented it. We filled in some spaces
17 with new monuments and we expanded the network.

18 And then what we've been doing is performing
19 annual survey events across this entire network. And
20 then we are also doing the semi-annual survey events in
21 the fall and then in the spring across the fissure zone
22 down here where these fissures appeared in the early
23 1990s.

24 So we have annual events across the entire network
25 and then these semi-annual events across the fissure zone

1 to see, if during the course of a pumping season, we can
2 see any sort of horizontal movement across the fissure
3 zone.

4 SPECIAL REFEREE SCHNEIDER: Do you have a slide
5 that shows what your whole network --

6 MR. MALONE: Yes. What you'll see, the way this
7 presentation is structured, Anne, I tell you in text
8 first of all what I'm going to show you with figures or
9 photographs or graphics. So I'll review it here, and
10 then we'll explain it again.

11 MR. SCALMANINI: Andy, on the pre-'87, it's for
12 the whole subsidence area?

13 MR. MALONE: Yeah.

14 MR. SCALMANINI: Or is it for the focused study
15 area?

16 MR. MALONE: We're trying to get, actually, across
17 the entire Chino Basin.

18 MR. SCALMANINI: Okay.

19 MR. MALONE: So this is your figure, Anne.

20 Again, this is our area of concern. And these red
21 lines represent the ground level survey network that
22 we're dealing with right now. If you recall, it was a
23 smaller area up here that the City of Chino was
24 monitoring.

25 So these are what some of our monuments look like.

1 This is the so-called Class V monument. It's a brass
2 disc that's glued to a curb. But then we've also
3 installed a number of very stable benchmark monuments
4 where we auger out a hole and then drive a steel rod to
5 refusal in that hole. And then put a grease-filled PVC
6 casing around it. So what we're doing is we're isolating
7 that monument from any shallow surface deformation that
8 might be going on due to wetting or drying of the soil.
9 So it's a very stable form of monument. And so we put a
10 number of these and spread them out amongst the network.

11 And here is Associated Engineers, a couple of
12 photographs showing them out in the field performing
13 their surveys. By the way, we're getting excellent data
14 from them. We're very pleased with their work.

15 For InSAR, again what InSAR stands for, the "In"
16 stands for Interferometry, and the "SAR" stands for
17 Synthetic Aperture Radar. Basically what you're doing is
18 you're collecting your radar image and then you're
19 comparing it to another radar image that was collected at
20 a second period of time. You're interfering those. The
21 difference between then is interpreted as a difference in
22 the ground surface elevation.

23 So what this is is remote sensing of ground
24 surface deformation. The key advantage of this compared
25 to the ground level surveys, as you can see by some of

1 those figures, is it's really an areally continuous
2 representation of the ground surface deformation. Where
3 surveys give us what's going on at certain points, but
4 the InSAR gives us a more or less continuous surface,
5 surficial representation of the land surface deformation.

6 We're constrained a little bit in time. We only
7 have data from 1992 to 2003. The satellites that were
8 collecting this data began to deteriorate. And they put
9 up some new satellites that have just begun to collect
10 additional data, so we're going to have a little bit of a
11 gap from about 2003 to 2005 where we're not going to have
12 very much usable InSAR data. But these new satellites
13 are up there now and collecting data. And we're actually
14 going to be using that data on an ongoing basis.

15 What we did was we created some time series, some
16 very detailed time series of ground surface deformation,
17 even more detailed than our ground level survey data over
18 the 1992 to 1995 period, and then another time series
19 from '96 to 2000. The data from 2000 forward is proving
20 to be a little bit problematic because satellites were
21 beginning to deteriorate. It's still a question whether
22 or not we're going to be able to have any post 2000 to
23 2005 data that we can use from InSAR. But our
24 subcontractor is looking into that right now. And then
25 again, the new satellites are collecting current data.

1 And this is just a graphic that shows the process.
2 The first pass of the radar satellite takes a radar
3 image. And then the second pass at some later date takes
4 another radar image, and the difference between the time
5 it takes for that radar wave to reflect off the ground
6 surface and come back to the satellite is interpreted as
7 the difference in the vertical deformation of the land
8 surface. So it's that measurement right there that the
9 interferogram is giving us.

10 So those were the two. Ground level surveys and
11 InSAR are two methods of measuring ground surface
12 deformation. Our aquifer system monitoring is trying to
13 explore the mechanisms behind the ground surface
14 deformation.

15 The key thing that we're trying to do here is
16 establish the relationships between the water level
17 changes that are happening in the aquifer and the aquifer
18 system deformation. Those are the relationships that
19 we're trying to establish. We think we've done a pretty
20 good job of it.

21 Again, the aquifer system monitoring is looking at
22 the production and its effect on piezometric levels and
23 piezometric level changes, their effects on the aquifer
24 system deformation.

25 And the centerpiece of our monitoring program is

1 the Ayala Park extensometer facility, which was
2 constructed in the summer of 2003. It consists of
3 multiple piezometers that are completed at different
4 depths within the aquifer system, and then the dual
5 extensometer which is measuring the aquifer system
6 compaction or expansion.

7 So this is our monitoring network. What we did
8 was we constructed the Ayala extensometer in this
9 location here. These yellow lines here again are ground
10 fissures. This is Central Avenue. As you recall, this
11 is our main area of subsidence here. So here's where we
12 constructed the extensometer. It consists of the
13 multi-piezometers and dual extensometer.

14 And then all these wells in red, the little red
15 dots here, we installed a water level transducer. We
16 collect water level data at these wells once every
17 15 minutes at all these red dots here. The green dots
18 represent a pumping well, and the beige dots represent a
19 non-pumping well. Either it's been abandoned or it's a
20 monitoring well.

21 So you can see that we've got a number of pumping
22 centers in this area, and we have water level transducers
23 in some of the pumping wells and in some of the
24 monitoring wells. And then we're monitoring water levels
25 pretty intensely here too.

1 Our extensometer -- this a graphic that shows what
2 our extensometer looks like. I think you've seen this
3 before, Anne, but just basically what it is is it's a
4 1400-foot bore hole here. And we pour a cement pad here
5 at the bottom of the bore hole, and then we case the bore
6 hole here and insert a 2-inch steel pipe that comes down
7 and rests on the bottom of the cement pad. This pipe
8 comes up and sticks out of the ground here at the ground
9 surface.

10 The next thing that we do is we install a very
11 stable ground surface datum here, these three piers that
12 go about 30 feet down into the ground surface and are
13 decoupled from the shallow soil by a PVC pipe. And they
14 support this bridge here in our extensometer facility
15 that represents the ground surface.

16 So as we have any sort of compaction that may
17 occur within this aquifer system, the ground surface will
18 come down and it will drag this datum down along with it.
19 But this pipe, being referenced at 1400 feet, it will
20 stay relatively stable. And we measure the displacement
21 between the ground surface datum and this pipe here. So
22 we have some monitoring equipment that measures that
23 displacement. We measure that displacement once every
24 15 minutes. And that's a very highly sensitive piece of
25 equipment where we can measure changes in the ground

1 surface on the order of one-thousandth of an inch. It's
2 highly sensitive. And again we're measuring displacement
3 once every 15 minutes, the same rate that we're measuring
4 water level changes out in the aquifer system.

5 Again we're trying to establish these
6 relationships between water level changes and then what's
7 happening mechanically here in the aquifer system.

8 So this deep extensometer, we call it, is
9 measuring the deformation that's occurring throughout the
10 entire thickness of the aquifer system.

11 We also have a shallow extensometer that comes
12 down to about 550 feet so it's doing the same thing here
13 in the shallow part of the system. We can subtract these
14 two records to get an idea of the deformation that's
15 occurring within the deep part of the system.

16 This is our extensometer in mid-construction.
17 Here's our piers and our ground surface datum, this
18 bridge that rests across the top of the triangle here.
19 And here's the extensometer. And it's hard to see, but
20 this steel pipe is coming up out of the extensometer.

21 The next figure I'm going to show you, we have
22 extended the steel pipe up and we've extended some
23 monitoring equipment down from this bridge here and we
24 measured the displacement between this bridge here, which
25 represents the ground surface, and this pipe, which

1 represents 1400 feet below ground surface.

2 This is what it looks like today. The pipe,
3 extensometer pipe, here. This is the bridge, our
4 monitoring equipment here. This is the linear
5 potentiometer which again is measuring displacement
6 between that bridge and that pipe once every 15 minutes.
7 And we are recording that at data loggers inside this
8 building.

9 What this lever arm does is that it's attached to
10 the pipe, and it's not pulling the pipe up off the bottom
11 but it's pulling about 80 -- 70 to 80 percent of the
12 weight of pipe off of itself. This is a steel pipe,
13 1400 feet of it. It's a lot of weight, and that weight
14 will cause it to bend under its own weight and rub up
15 against the side of the casing here, and that causes
16 friction. So what we're trying to do here is pull some
17 of the friction off and straighten out the pipe so it
18 would reduce the friction in this monitoring facility.

19 So as the ground surface goes up and down, this
20 pipe will seemingly come up and down out of the ground.
21 But really it's the ground surface coming up and down.
22 This lever arm will tilt up and tilt down over the course
23 of a pumping season. It's pretty impressive to go in
24 after a couple months and see the difference in the lever
25 arm. Sometimes we have to make adjustments to this lever

1 arm because it's going too far in either direction.

2 And this is what one of our piezometers looks like
3 here. Again, it's hard to see. We have a conductor
4 casing here and five different piezometers that are
5 completed at different depths within the aquifer system.
6 We have transducers in each one of these wells that are
7 linked to this data logger here, again measuring water
8 levels once every 15 minutes.

9 What we also propose to do is to run control
10 pumping tests -- to run control pumping tests to stress
11 the shallow part of the system separately from the deep
12 part of the system. And our objectives here to run these
13 tests were to determine the hydraulic and mechanical
14 parameters of both the deep and the shallow aquifer
15 system. If there were any groundwater barriers in the
16 area, we'd be able to characterize those groundwater
17 barriers by running these control pump tests. And the
18 main point here, we were attempting to transition the
19 aquifer system from elastic compression into inelastic
20 compaction. We're actually going to try to cause some
21 inelastic compaction to occur.

22 So what we would be doing there is identifying
23 that threshold where the deformation process transitions
24 from elastic to inelastic. By doing that, we'd be
25 defining the usable volume of the storage reservoir,

1 under what range of water levels can we operate where
2 we're not causing inelastic compaction. And that would
3 be a very key finding to any long-term management plan
4 that might develop out of this study.

5 So to go into some of the results. One of the
6 first results that came out of this is that we've
7 identified two very distinct aquifer systems, one shallow
8 system, which is unconfined to semi-confined that goes
9 from about 100 feet down to 300 feet below ground
10 surface. Water levels in this area are generally at
11 about 100 feet in the shallow system. So that's where
12 the shallow system exists.

13 We have a confining layer, a very tight confining
14 layer, from about 300 to 400 feet below ground surface.
15 And then below 400 feet we have a deep confined aquifer
16 system. And so we have some graphics to demonstrate
17 that.

18 MR. SCALMANINI: So you do. You have some
19 lithologic or cross-sectional type diagrams? Or --

20 MR. MALONE: We have that data, but we're not
21 showing it here in this presentation. But the lithologic
22 data supports the hydraulic data that we're going to be
23 showing here.

24 MR. SCALMANINI: At the site or spatially, or
25 both?

1 MR. MALONE: Spatially.

2 MR. SCALMANINI: Okay.

3 MR. MALONE: This is a hydrograph showing time
4 down here on the X axis and depth to water here on the
5 Y axis. We go from about 80 feet down to 280 feet here.
6 And this time period is going from, looks like, July of
7 '03 to about July of '04. So over the course of one
8 year. And this time history that you're seeing here of
9 water levels is from one of our piezometers that's
10 completed in the deep part of the aquifer system. We
11 call it PA-7. It's completed at about 438 to 448. So
12 it's in that deep part of the system, the very upper part
13 of that deep part of the system.

14 And what this water level is showing you here is
15 that we have some pretty substantial drawdowns and
16 recoveries that occur in this deep part of the system.
17 Up here at fully recovered water levels, we're near
18 100 feet below ground surface. But you can see during
19 the course of a pumping season, we can get down to about
20 250 or more feet below ground surface.

21 This is in response to wells -- some of those
22 wells that we showed you in some of the very first slides
23 that are completed in this deep part of the system. One
24 or two wells turn on and cause these water level
25 declines. When they turn off, they cause these water

1 level recoveries.

2 This represents a typical hydrograph for the deep
3 part of the aquifer system.

4 If we look at one of our piezometers that's
5 completed in the shallow part of the aquifer system --
6 this is our PA-10 piezometer which is completed at about
7 220 feet below ground surface. You can see that it also
8 fluctuates in water levels but not at the same magnitude
9 as the water levels fluctuate in the deep part of the
10 system. In fact, we have more groundwater production in
11 this area from the shallow part of the system than we do
12 from the deep part of the system, but not the same
13 magnitude of water level change.

14 One area to focus in on here to really show you
15 the distinction between the two systems. This was part
16 of our shallow system test back in the spring of '04.
17 And what we were doing was not pumping the deep part of
18 the system and allowing water levels to recover here, but
19 we were pumping starting here, the shallow part of the
20 system and we were getting some water level declines.
21 But it's not really showing up here in the deep part of
22 the system at all. We're seeing water level declines in
23 the shallow part of the system while the deep part of the
24 system is still recovering, illustrating the separation
25 between the shallow and the deep part of the system.

1 In addition to these two distinct aquifer systems,
2 we also identified a previously unknown groundwater
3 barrier in this area that is coincident with the historic
4 fissure zone. This groundwater barrier, it is turning
5 out, is a groundwater barrier in the deep part of the
6 system, but it doesn't seem to be a groundwater barrier
7 in the shallow part of the system. We have some graphics
8 to illustrate how we discovered this groundwater barrier.

9 We performed two deep system tests where we were
10 trying to hold water levels constant in the shallow part
11 of the system while turning on wells in the deep part of
12 the system and causing water level declines in the deep
13 part of the system. We did that here at Chino Hills Well
14 19, which is perforated from about 340 down to about a
15 thousand.

16 What I'm going to show you is the water level time
17 history in the pumping well. Then I'm going to show you
18 the water level time histories at three wells that are
19 also perforated in the deep part of the system. Then
20 I'll finish by showing you a water level time history of
21 this well that's also perforated in the deep part of the
22 system but is on the opposite side of the historic
23 fissure zone where we think our groundwater barrier
24 occurs.

25 So again, this is a hydrograph showing depth to

1 water on the Y axis and time on the X axis. And this
2 black line represents the water levels in the pumping
3 well. So the well is on here, turns off, turns on, turns
4 off, turns on, and so forth. And you can see our deep
5 piezometer here, PA-7 at Ayala Park, you can see it react
6 to the pumping that's going on at Chino Hills 19. And
7 you can see that it's reacting with significant magnitude
8 and almost immediately to the pumping episodes.

9 This next well here is Chino Well 7, and it's
10 showing you a similar water level response that we're
11 seeing at PA-7 that's being driven by the pumping at
12 Chino 19 -- Chino Hills 19.

13 And then this well here is quite a distance away,
14 Chino Hills 7-C, and it's also showing a similar water
15 level response. Not quite the same magnitude of water
16 level fluctuation, but it's a greater distance away.
17 This is the water level response that we see on the
18 opposite side of the ground -- the ground fissuring zone.
19 So this is why we think that we have a groundwater
20 barrier between Chino Hills 19 and Chino Hills 18.

21 MR. SCALMANINI: Andy, do you care to say anything
22 about the perforation interval in Chino Well No. 7?

23 MR. MALONE: Yeah. This is sort of a hybrid well,
24 but it actually, when we compare it to shallow -- other
25 shallow wells, it looks more like it's responding to the

1 deep system than the shallow system. But it is a hybrid
2 between the two systems.

3 Some other results here that, currently at the
4 extensometer, we are mainly measuring elastic deformation
5 within the aquifer system. We've got some charts to show
6 you that, that over the course of the pumping season, any
7 sort of aquifer system compaction that occurs, it
8 rebounds during the course of the recovery. So that's an
9 observation that we can demonstrate pretty clearly.

10 We're also establishing those relationships
11 between the aquifer head changes and the aquifer system
12 deformation. And we're being able to determine some
13 aquifer system parameters that are going to be used in
14 some of our numerical groundwater flow and subsidence
15 models that we're going to be developing over the course
16 of the next year. So through these pumping tests we've
17 collected a lot of very valuable data.

18 This is the graphic that you just saw here with a
19 deep piezometer responding to pumping in the deep system
20 and a shallow piezometer responding to pumping in the
21 shallow system.

22 This occurs over our entire -- almost our entire
23 time history since we installed the extensometer. It
24 goes from July of '03 to about April of '05. But not
25 only are we going to be charting here the water level

1 time histories, but over on this axis here, we're going
2 to be charting the extensometer time histories and
3 comparing them to the aquifer head time histories.

4 What we see here with this purple line is the deep
5 extensometer record, deformation that occurred throughout
6 the entire thickness of the aquifer system. The deep
7 extensometer again goes from the ground surface down to
8 about 1400 feet below ground surface. So you can see
9 here that it's tracking pretty closely the deformation --
10 the water level time history of the PA-7 piezometer in
11 the deep part of the system, that when we have drawdowns
12 in the deep part of the system, we have the compaction
13 that occurs, and when we have recovery in the deep part
14 of the system, we have expansion that occurs.

15 And again, you can see that a lot of this is
16 elastic in nature, that we have a great deal of
17 subsidence that occurs over this period of time, but as
18 the water levels begin to recover, a lot of that is
19 recovered, a lot of that compaction is recovered as
20 rebound.

21 I think you can even see in here little episodes
22 where the water level of a nearby pumping well is turned
23 back on and then turned off, and you can see this
24 extensometer responding even to those short-period
25 changes in water levels.

1 This here is the time history of the shallow
2 extensometer. And the shallow extensometer is completed
3 from about the ground surface down to about 550 feet so
4 it spans not only the shallow aquifer system -- again,
5 remember the shallow aquifer system goes down to about
6 300 feet -- it goes down into the upper part of the deep
7 part of the system too. So it's recording deformation
8 that's occurring in the shallow system and in the upper
9 part of the deep system. But again it's a lesser amount
10 of compaction that occurs there because it's simply
11 measuring a lesser amount of -- a lesser thickness of the
12 aquifer system. But it generally follows the same
13 patterns as the deep extensometer.

14 A notable exception is up in this area right here
15 where we're not -- this is the area again where the
16 shallow system is being stressed while the deep system is
17 recovering. And so what we're having here is the shallow
18 system is compacting while the deep system is staying
19 about -- just about the same -- I mean the deep
20 extensometer is not really recording anything. When we
21 subtract these two from each other, we get what's going
22 on in the deep system. So this blue line represents the
23 deformation that's occurring from about 550 feet down to
24 1400 feet.

25 You can see here that we're having the deep part

1 of the system continue to expand -- that blue line,
2 continuing to expand -- while the shallow part of the
3 system is compacting. So very interesting part of the
4 curve there where water levels in the deep system are
5 recovering and the deep part of the system is expanding,
6 water levels in the shallow system are drawing down and
7 the shallow part of the system is compacting. So again,
8 a very good illustration of the separation between the
9 two aquifer systems.

10 When we take this deep extensometer data, which is
11 the strain, the deformation that's occurring in the
12 aquifer system, and we plot it against the water level
13 data, which is the stress that's being a part of this
14 system, we come up with what's called a stress-strain
15 diagram.

16 So the stress, the water level changes are
17 being -- are on the Y axis, and actually drawdown is in
18 this direction so stress increases in this direction
19 here. The compaction being recorded by the deep
20 extensometer is increasing in this direction so the
21 strain in the system increases this way. So when we plot
22 these two things against each other, this is the
23 relationship that we're trying to achieve, the
24 relationship between water level changes and aquifer
25 system compaction.

1 Our period of record starts right here in July of
2 '03, and again during the summertime, we have pumpage in
3 the aquifer system and so we have drawdown that occurs in
4 this direction. But we also have compaction that occurs
5 in this direction. So we trend -- this is the trend line
6 that is the stress-strain diagram. This trend is an
7 elastic trend. What we've done is shown a little line
8 here, a little black line here, which represents the
9 elastic storativity of the aquifer system. If this line,
10 if this trend begins to bend over and become more
11 horizontal, this represents a transition into the
12 inelastic processes.

13 So as long as our line is trending along this
14 slope, we're in the elastic range. We can be fairly
15 confident we're in the elastic range of deformation.

16 SPECIAL REFEREE SCHNEIDER: Could you describe
17 where you would see inelastic, then. What would it look
18 like?

19 MR. MALONE: I'll get there.

20 This was the first pumping season, and then this
21 here in the red line is the continuation of that curve.
22 But this is the recovery season.

23 MR. SCALMANINI: Can you go back one slide just
24 for a second because I can't read the time scale on the
25 handout.

1 MR. MALONE: It's our entire record from about --

2 MR. SCALMANINI: That's from July of '03

3 through --

4 MR. MALONE: -- through April.

5 MR. SCALMANINI: That's this spring.

6 MR. MALONE: Yes.

7 MR. MANNING: July 28, '03, to -- that one's

8 March 19th, '05.

9 MR. SCALMANINI: It goes beyond March 19th,

10 though, so that's all right.

11 MR. MALONE: I've updated this slide here to

12 represent the current, most current data.

13 MR. SCALMANINI: That's this, right?

14 MR. MALONE: Yes. This one here, I have not

15 updated this graph. But we're pretty close. I mean,

16 what's happening, we're still having water levels recover

17 up towards their area right here, their level right here.

18 But I haven't updated this. This is April data. We're

19 missing about a month's worth of data here.

20 MR. SCALMANINI: If you put that, mentally

21 transpose this to the stress-strain diagram, then what

22 might be called the residual strain as of about January

23 of '05 -- I'm now picking on the blue curve right there.

24 MR. MALONE: Right here.

25 MR. SCALMANINI: We could go into here. Andy,

1 MR. SCALMANINI: Starting and stopping, yeah.

2 MR. MALONE: What this large difference between
3 this trend here and -- not the large difference but the
4 offset between this trend here during the drawdown season
5 and this trend here during the recovery season, what's
6 happening here is the wells turn off at this point in
7 time at the end of the pumping season, and we have -- we
8 immediately have recovery in the PA-7 piezometer. But it
9 takes a little bit of time for that water to start
10 migrating back into the aquitards and start to expand
11 those aquitards which would be recorded in the
12 extensometer data. So this represents the time lag
13 that's involved between -- the time lag that is involved
14 in the migration of water back into the aquitards.

15 If we look at the drawdown trend here for our
16 first year, it's trending at that slope. And then we
17 have the same sort of trend in the recovery limb of the
18 stress-strain diagram for the recovery in 2004. And then
19 in 2004 for the pumping season, we again have this
20 drawdown and compaction.

21 But at about 250 feet of drawdown, we start to see
22 this curve become more horizontal and deviate from the
23 elastic trend as represented by this black line here.
24 And if you compare the elastic trend at this water level
25 of about 280 feet to where it ended up here at the end of

1 that would be somewhere up in here (indicating)?

2 MR. MALONE: What happens --

3 MR. SCALMANINI: There's four-tenths of an inch or
4 something like that at that point.

5 MR. MALONE: So what that represents is this area
6 right here where this blue line --

7 MR. SCALMANINI: Is recovering?

8 MR. MALONE: -- comes down here. And then we
9 start -- we came back up here, a pumping well turned back
10 on, and we cycled through this zone. And now we're
11 recovering our water levels again. This is the end of
12 the time series which was yesterday right here.

13 MR. SCALMANINI: But reading the preceding graph,
14 that four-tenths of an inch, is that what it was, roughly
15 speaking?

16 MR. MALONE: Yeah.

17 MR. FIFE: So four-tenths of an inch divided by 12
18 is what? .03 feet? Is that right?

19 MS. ROJO: No. It would be an inch.

20 MR. SCALMANINI: I don't want to drag you through
21 it. I was just trying to get located off in these little
22 hysteretic loops. Okay. That's cool.

23 MR. MALONE: What these little loops represent are
24 the short periods of time that the well, in this case,
25 you know, shut off and then turned back on.

1 the pumping season, it looks like we had about
2 two one-hundredths of a foot of inelastic compaction that
3 may have occurred during this late stage of drawdown
4 during the pumping season.

5 We actually wanted -- we were trying to do this
6 with our pumping test. We turned on an additional well
7 here in the late stages and tried to draw down water
8 levels as far as we could draw them down and create a
9 tiny bit of inelastic compaction to try to identify that
10 threshold where we're transitioning the system from
11 elastic into inelastic compaction.

12 Now, we shut off the wells here in October of
13 2004, and the water levels have been recovering and the
14 system has -- the aquifer system has been expanding
15 mechanically. We had this episode where we had one of
16 the wells turned back on and turn off a couple of times,
17 and we had this hysteresis loop, this kind of shorter
18 period in time hysteresis loop that occurred here.

19 Since this point in time in March we've had some
20 good recovery. The wells turned off continuously, and
21 we've had some good recovery and we've got the recovery
22 trend coming back to its original trend in this
23 direction.

24 SPECIAL REFEREE SCHNEIDER: Would you expect, and
25 if so when, that that curve would go back down to that?

1 MR. MALONE: Down to these levels here?

2 SPECIAL REFEREE SCHNEIDER: Yeah.

3 MR. MALONE: We're thinking towards the end of
4 June, maybe some point in time in July, is what we're
5 predicting by looking at the recovery rate. So I'd say
6 to be safe --

7 MR. SCALMANINI: Couple months.

8 MR. MALONE: -- maybe two months, two more months.

9 MR. SCALMANINI: You're going to stay -- you -- is
10 pumping going to stay off?

11 MR. MALONE: We've had discussions with Chino
12 Hills, and they've assured us that they are committed to
13 letting water levels recover down to about 105 feet,
14 recover back to 105 feet below ground surface, which were
15 our prepumping test conditions here in the summer of '04.
16 So they've given us assurance that they'll keep their
17 deep system wells off to allow full water recovery.

18 What it's looking like is that if this continues
19 on this same trend here, it's looking like, if indeed
20 this curve ends up here, that it's looking like we could
21 have about two one-hundredths of a foot of permanent
22 compaction that occurred over the last pumping season.
23 And that would, if we go back here, that would match up
24 with what we thought occurred toward the later part of
25 the pumping season last year.

1 This is a pretty key point right here for you to
2 understand. So if you have any questions on this, now is
3 the time. Or we can talk about it in greater detail
4 later.

5 Another thing to note here -- another thing to
6 note here -- did you have a question right now?

7 MR. SCALMANINI: No. I'm going to look at
8 something. You can go ahead, please.

9 MR. MALONE: Another thing to note here is that
10 this short-term hysteresis loop where we had the well
11 turned on for about a month or so and we drew down water
12 wells to about 210 feet, well, its recovery trended in
13 this direction here and intersected the same point that
14 it started at. So what that's indicating is a purely
15 elastic process occurred over this short time period of
16 drawdown and recovery.

17 So we're clearly -- the stress-strain diagram is
18 clearly indicating that operating in this range right
19 here, at least for the pumping -- the location of the
20 pumping that occurred, that we're operating within the
21 elastic range of deformation.

22 But it appears that if this stress-strain diagram
23 comes down and stabilizes out in this area here, that
24 this is indicating that we operated in an inelastic
25 range. And what we're saying is that that inelastic

1 threshold was crossed at about 250 feet below ground
2 surface during the later part of the pumping season.

3 MR. SCALMANINI: Going back to quite a ways ago,
4 but that collection of hydrographs that was labeled
5 Figure 9 which was the shallow water level histories that
6 went back, whatever, six decades or thereabouts. Is
7 there a, I'll call it a comparable collection of
8 historical data in the deep aquifer available where you
9 could do hydrographs from what nominally late '80s, or
10 thereabouts, when this portion of the aquifer system was
11 first developed?

12 MR. MALONE: We don't have very much deep aquifer
13 system data in this area, water level data in this area.
14 We have some from Chino Well 7. We have some data that
15 dates back a ways. I'd have to look at that more closely
16 to tell what exactly that time history is there.

17 MR. SCALMANINI: So you could or couldn't classify
18 or speculate about 250 feet below ground surface being a,
19 quote, historic low?

20 MR. MALONE: Well, we have some water level data
21 in the 1990s from City of Chino Hills wells that show
22 water levels much greater than 250 feet below ground
23 surface.

24 MR. SCALMANINI: Really?

25 MR. MALONE: Yeah. And some pumping wells near

1 400 to 500 feet below ground surface for short periods of
2 time.

3 MR. SCALMANINI: Okay. That's a pumping water
4 level in a production well?

5 MR. MALONE: Yeah. Again, the quality of our data
6 doesn't approach this where we have 15 minute data from
7 transducers. It's monthly data that's gone out and
8 collected manually.

9 MR. FIFE: Andy, are you getting to a point where
10 you could break because lunch is here. And if this is a
11 good point, or you're near one. Okay. Then if we could,
12 we could go ahead and break for lunch. Dennis has got a
13 comment?

14 MR. WILLIAMS: Yes. Dennis Williams, Geoscience,
15 for Chino Hills. I just had some clarifications to
16 Mr. Scalmanini's questions a while ago.

17 There were some deep -- there were some deep wells
18 prior to 1990, albeit most of them were in the northern
19 area of what's called the area of subsidence concern.
20 But there was pumping prior to 1990 in the deep aquifer
21 system.

22 Also there was some benchmarks, USGS. Some of
23 them were approximate, but they showed like Pipeline and
24 forget the actual -- but most of the subsidence recorded
25 between '33 and '87, at least according to these

1 benchmarks, was northwest of the fissure zone. And this
2 is all in the report that I did in August of 2002.

3 Also there were some fissures. I don't remember
4 exactly where they were. But there were some fissures
5 recorded in the literature prior to 1990 also. And
6 primarily, I believe, they were over on the State's
7 property to the east. And also the water level changed
8 between the early 1900s and 1975, 150 feet, we believe is
9 one of the main results of this. But we just have to
10 wait and see. And Andy has said that, you know, in a
11 couple of months maybe we'll see what the trend is going
12 to be as far as that. Thank you.

13 MR. MANNING: This is a good spot to break, then
14 we'll go ahead and break for lunch.

15 (Recess in proceedings from 12:11 to 12:52 p.m.)

16 MR. MANNING: We should probably get started
17 again. If we can get everybody back, we will go ahead
18 and get started and we'll try and pick it up right where
19 we left off, Andy, with the famous stress-strain diagram.

20 MR. MALONE: We can move this black line around a
21 little bit further where this was an earlier trend in the
22 year. And we're not exactly sure what's happened here,
23 but we think that when this plays out to completion, that
24 we will be within this range here somewhere. That's what
25 it looks like to us that's going to occur.

1 Now, these stress-strain diagrams, and this is for
2 our area here, but in Francis's experience he's
3 constructed other extensometers and looked at similar
4 data in different parts of the state and the western
5 United States. And these are some, like here in
6 particular is a stress-strain diagram from another area.
7 And, Francis, I'd like you to explain this if you
8 wouldn't mind, since this is your data.

9 MR. RILEY: Okay. This basically covers the time
10 frame from about 1960 to, I think, probably the early
11 70's. I can't quite read the numbers on the graph there,
12 but it looks like it goes into, what it is, Andy? About
13 1975?

14 MR. MALONE: 1980.

15 MR. RILEY: 1980, okay.

16 MR. MALONE: 1960 to 1980.

17 MR. RILEY: The top graph is the head change in
18 the confined aquifer system, which as you can see,
19 declined relatively slowly year by year with a fairly
20 substantial seasonal fluctuation each year, until
21 additional water was brought in through aqueducts and the
22 production was diminished. And then we began to see a
23 period of water level recovery but still with essentially
24 the same amplitude of seasonal fluctuation.

25 The graph immediately below just translates those

1 water levels into effective stress values which are
2 virtually the same. And then below that, we see the
3 graph showing two things. The long slightly wavy curve
4 is the extensometer record for that time period. And the
5 little straight line segments that are connected together
6 in the earlier part of that history reflect successive
7 measurements on a nearby benchmark which obviously is
8 very closely tracking -- I should put it the other way.
9 The extensometer is very closely tracking the benchmark
10 elevation changes.

11 Now, at the bottom we have a stress-strain
12 diagram. And you'll say, well, that doesn't look
13 anything like what we were just looking at on the
14 previous slide.

15 MR. MALONE: Francis, you can back off from the
16 mike a little bit.

17 MR. RILEY: I'm sorry. I'm talking too loud. I'm
18 sorry.

19 In the early phases of this subsidence phenomenon,
20 as you can see from the basic data on the extensometer,
21 it was essentially a continuous downward movement of the
22 land surface. And although there were little seasonal
23 wiggles, they are never sufficient to overcome that
24 downward trend. As a result, the stress-strain plot
25 never reverses itself, and it's always showing ongoing

1 subsidence year by year by year. Each one of those
2 little humps is one year's worth of data on the
3 extensometer.

4 But as you can see, as time goes along, the amount
5 of subsidence that's occurring, each compaction that's
6 occurring each year gets smaller and smaller and smaller.
7 And eventually over here, we begin to see a little bit of
8 elastic rebound here, not really evident here, but
9 definitely evident here. And then we're getting into
10 something which looks very much like what we are now
11 seeing in our Chino installation.

12 So in a sense you could say it's very likely that
13 what we were looking at now at Ayala Park is this phase
14 of something, which if we'd had extensometers in there
15 for the last 30 years, might look quite a bit like this.

16 MR. SCALMANINI: You know where that is?

17 MR. RILEY: I beg your pardon?

18 MR. SCALMANINI: Where is that?

19 MR. RILEY: Santa Clara Valley in the City of
20 San Jose.

21 MR. MALONE: So what we're showing is just a
22 different record, same concept as the stress-strain
23 diagram but a more complete record here of a lot of
24 inelastic subsidence transitioning into elastic
25 deformation.

1 So if you recall we --

2 SPECIAL REFEREE SCHNEIDER: Excuse me, Andy. Is
3 the work that the Associated Engineers are doing trying
4 to figure out if there is that kind of a history?

5 MR. MALONE: Yeah. Of course, we won't have a
6 continuous history like that. But exactly. We're trying
7 to get the total subsidence history dating back into the
8 1930s if we can back that far before we had significant
9 head decline in the basin. We want to have some idea
10 what the land surface was doing over that same period of
11 time. That's going to help us calibrate our models that
12 we will be talking about shortly.

13 So if you recall, we performed these deep system
14 tests. We did one in 2003 which we weren't successful in
15 transitioning the system into inelastic compaction to our
16 satisfaction. We could only get water levels down to
17 approximately 250 feet.

18 The City of Chino Hills had some production
19 problems, mechanical problems with one of their wells
20 that had to be shut down and I believe is still being
21 repaired. So that ended our test prematurely back in
22 2003. We ran another test in 2004 where we were able to
23 draw water levels down further down to about 280 feet.

24 And some of our preliminary conclusions from that
25 test is that we were able to transition the system from

1 elastic to inelastic like you saw on our stress-strain
2 diagram there. It occurred when the water level exceeded
3 250 feet in our PA-7 piezometer. And again, this
4 conclusion is pending confirmation. It's a preliminary
5 conclusion right now. But we're looking for fully
6 recovered water levels before we can draw this
7 conclusion.

8 The groundwater barrier aligned with the fissure
9 zone. We confirmed its existence through these pumping
10 tests. And it looks like by close analysis of this data
11 from both deep tests and shallow system tests, that the
12 groundwater barrier is a competent groundwater barrier
13 below about 250 feet but is not competent above 250 feet,
14 meaning that head changes can propagate across the
15 fissure zone above about 250 feet.

16 And because we were able to identify the
17 preconsolidation stress, the current preconsolidation
18 stress in the system through our pumping test, we think
19 we have enough data now to proceed with the modeling.

20 So that ends our discussion of our results with
21 our aquifer system monitoring. But again remember, we're
22 also doing performing ground level surveys and InSAR data
23 as well. So some of the results of our ground level
24 surveys -- and we drew this conclusion prior to our study
25 by looking at some of the historical data -- that we had

1 nearly 2 1/2 feet of permanent subsidence near Ayala Park
2 over the 1987 to 2004 time period. That we recognized
3 the very steep gradient of subsidence across the fissure
4 zone which suggested that the probable mechanism for the
5 fissuring was the subsidence. And we also recognized
6 that the rate of subsidence has declined over time. Now,
7 again, these are statements, and I'm going to illustrate
8 some of this with some graphics.

9 This is a figure from earlier on today. What
10 we're going to be looking at are three transects,
11 profiles of ground level survey data, over this time
12 period here. First of all, we're going to be looking
13 at -- actually not over this time period, but this first
14 one will be.

15 We're going to be looking at a profile along
16 Schaefer Avenue through this maximum area of subsidence
17 here along Central Avenue. And that's what this is here.
18 So this is west, this is east. And on this axis here,
19 we're measuring the vertical deformation or the vertical
20 displacement of our benchmarks. And our benchmarks are
21 represented by these little points here. We have a
22 benchmark here at Pipeline Avenue and a benchmark here at
23 Monte Vista Avenue, at Central Avenue, at Benson, and
24 then at Magnolia. And this line here represents our
25 baseline in 1987. So that was the first survey.

1 Our next survey is this line right here, which is
2 a June 1993 survey. And so you can see here along
3 Central Avenue that this monument subsided about one foot
4 over that period of time from 1987 to 1993. Then from
5 1993 to 1995, this benchmark subsided a little more than
6 a foot again. And then from 1995 to 1999, we had a
7 fraction of a foot, looks like about three or four inches
8 of subsidence. From 1999 to 2000, another couple of
9 inches. And then since 2000, we haven't measured too
10 much permanent subsidence at all in this area.

11 So from looking at this, you can see that most of
12 the subsidence occurred from 1987 to 1999. That's what
13 the ground level survey data is showing us. It's slowed
14 down progressively now. We're not having much permanent
15 subsidence occur at all.

16 SPECIAL REFEREE SCHNEIDER: Where would the
17 groundwater barrier be?

18 MR. MALONE: This is a cartoon of the location of
19 the historic fissure zone. And so the groundwater
20 barrier would be right approximately in this area. What
21 we've also projected onto this profile are the nearby
22 pumping wells. We have Chino 6 and Chino 4, which are
23 shallow wells, right here projected onto the profile.
24 And then Chino Hills 17 and Chino Hills 19 located right
25 here.

1 So by looking at some of our current data, we know
2 that pumping from these wells causes a lot of drawdown in
3 this area. But at least in the deep zone, that drawdown
4 does not propagate east of this fissure zone. And so --

5 SPECIAL REFEREE SCHNEIDER: So where your graphic
6 shows the fissure zone, that's approximately the location
7 of your barrier?

8 MR. MALONE: Yes. So the fissure zone and barrier
9 seem to be coincident.

10 MR. SCALMANINI: So there really shouldn't be any
11 significance attached to the straight lines between the
12 points east and west of the barrier?

13 MR. MALONE: Over here?

14 MR. SCALMANINI: No. The next two points. From
15 immediately east of the barrier to, I'll say, quote,
16 immediately west. The straight line that goes from there
17 down to the left over to there.

18 MR. MALONE: Over here?

19 MR. SCALMANINI: Yeah.

20 MR. MALONE: What do you mean there is no
21 significance?

22 MR. SCALMANINI: If one went out and measured
23 vertical displacement -- well, let's just say east of the
24 barrier and west of -- is that Benson Avenue?

25 MR. MALONE: This is Benson Avenue here.

1 MR. SCALMANINI: So pick a point on that line.
2 That line is now diagonally going down to the left.
3 Would one expect to have that much vertical displacement
4 on the east side of the barrier?

5 MR. MALONE: Right. I mean what we're doing here
6 is we're just connecting the dots between two points.

7 MR. SCALMANINI: That's what I'm saying. So
8 they're just connected dots. They are not -- the
9 significance means, or the lack of significance means one
10 should not expect that there is a linear relationship.

11 MR. MALONE: Right, right, exactly. I see what
12 you're getting at.

13 The reason why we draw this here is to demonstrate
14 that the gradient of subsidence on this side of the
15 trough is steeper than the gradient of subsidence on this
16 side of the trough.

17 MR. SCALMANINI: And arguably, it could be even
18 steeper.

19 MR. MALONE: It could be if we had data points
20 that were closer on the east side of the fissure zone and
21 data points that were closer on the west side of the
22 fissure zone. And I think that when you look at some of
23 our InSAR data, which again is a continuous
24 representation of the ground surface, that you'll see an
25 even steeper gradient of subsidence than indicated by the

1 ground level survey data.

2 So that was the historical data that we were
3 looking at there. If we -- did you have another
4 question?

5 If we look at some of the current data that we've
6 been collecting, this seasonal data in this area that
7 we've been collecting along Edison Avenue here and along
8 Eucalyptus Avenue here across the fissure zone --
9 remember, we're doing both vertical and horizontal test
10 distance measuring between monuments down in this area.
11 And we're doing this on a spring to fall and a fall to
12 spring interval. So we're looking at seasonal changes.

13 We know that we don't have much permanent
14 compaction and subsidence at the current time. But we
15 have also noticed that we have quite a bit of elastic
16 deformation that occurs. So we're going to be looking at
17 some of that elastic deformation in these next two
18 profiles along Edison Avenue and along Eucalyptus Avenue
19 here.

20 So this is along Edison Avenue. Again, we've got
21 Monte Vista Avenue here, Central Avenue here, which has
22 historically been our area of greatest subsidence, and
23 Benson Avenue and Magnolia Avenue. And here again is the
24 projection of our fissure zone. And we've projected on
25 locations of some of the pumping wells near Edison

1 Avenue.

2 This is over a time period from April to November
3 of 2004. This is a time period where we have pumping
4 that's going on in this area. The forbearance agreement
5 allows for it. And what you're seeing here is the April
6 benchmark, our baseline for April. And then what we have
7 here in red is the mainly elastic deformation that
8 occurred over this time period from April to November in
9 2004.

10 When we go from November to the spring of 2005,
11 these benchmarks rebound back to almost their same
12 position. What you see here is also some horizontal
13 displacement. We're not only recording vertical but
14 we're recording horizontal displacement of these
15 benchmarks as well.

16 So it's interesting to see how these benchmarks
17 are displaced not only vertically but also displaced
18 towards the center, the centers of pumping where we have
19 our greatest drawdowns. So it makes a lot of sense.

20 You can also see the same sort of pattern that we
21 saw with the permanent subsidence, you're seeing it with
22 the elastic subsidence over this short time period where
23 we're having more deformation that occurs on the west
24 side of the fault where we have water level decline,
25 significant water level declines, that don't propagate to

1 any great extent across the fissure zone to the east
2 where we don't have as much deformation occurring.

3 So looks a lot like the same pattern of subsidence
4 that we saw with the longer time history of permanent
5 subsidence, but this is elastic over a shorter period of
6 time.

7 MR. WILDERMUTH: Andy, can I ask a question. Is
8 that all right?

9 MR. SCALMANINI: Yeah, it's all right. Who's
10 working for whom here.

11 MR. WILDERMUTH: What is the significance of the
12 direction of these horizontal displacements?

13 MR. MALONE: This is Chino Hills 19, and again,
14 remember, when we looked at the hydrographs, this is the
15 main pumping well in this area. When we look at the
16 hydrographs, this is the well where we have the largest
17 cone of depression in the area. So this is where we'd
18 have the greatest drawdowns. And it's showing us here
19 that the land is moving towards this area of drawdown.
20 So the aquifer is compacting or compressing elastically
21 more in this area here where Chino Hills 19 is pumping
22 from than the areas on the other side of the fissure zone
23 or further to the west.

24 MR. WILDERMUTH: The same question relative to the
25 fissure zone?

1 MR. MALONE: Say that again.

2 MR. WILDERMUTH: Same question relative to the
3 fissure zone?

4 MR. MALONE: Same question?

5 MR. WILDERMUTH: What is the significance of the
6 fact that the horizontal displacements are going now in
7 opposite directions.

8 MR. MALONE: Are going in opposite directions
9 here? We don't have a real good explanation. This is a
10 fairly small movement of displacement that's occurring
11 there. But we have a pumping well over here, CIM Well
12 No. 3, which doesn't produce a great amount of water, but
13 it is producing water. And we have other wells that are
14 further off to the east too.

15 But again we don't see -- we have monitoring -- we
16 have water level transducers in many wells that are out
17 here, and we don't see the magnitude of drawdown in this
18 area as we see in this area.

19 MR. WILDERMUTH: Relatively speaking or exactly,
20 if you can, how much horizontal displacement are we
21 talking about in feet or inches?

22 MR. MALONE: We made the scale to be as similar as
23 possible. So this is half a foot here so this is a --

24 MR. WILDERMUTH: Tenth of a foot.

25 MR. MALONE: Tenth of a foot. So this is close to

1 45 degrees so it's probably a little less than a tenth of
2 a foot. But it's significant.

3 And we see the same pattern down on Eucalyptus
4 Avenue where we've again projected some of the main
5 pumping wells in the area onto our profile. And again we
6 see this similar pattern where we have greater subsidence
7 on the west side of the fissure zone than we do on the
8 east side of the fissure zone.

9 We also again are recording -- we're doing our
10 ground level surveys not only in this area in the south,
11 but we're also -- we've also extended these lines of
12 surveying up into the central portions of MZ1. And what
13 we've seen, we only have one good year of data behind us
14 so far. But what we're seeing is that in the central
15 regions of MZ1, that we are having some measurable
16 subsidence that's occurring. It's on the order of about
17 an inch that occurred from the April 2003 to April 2004.
18 But it's an inch. And down in the southern area we're
19 not recording any significant subsidence at all. So
20 that's one finding that we've noticed.

21 When we are asking --

22 MR. SCALMANINI: Andy, when you say central, could
23 you put some geography around that.

24 MR. MALONE: We will here with a map.

25 When asked to characterize this subsidence in this

1 central portion of MZ1 as either elastic or inelastic, we
2 don't have enough data to make that characterization yet.
3 We have not analyzed the pumping and water level data to
4 the same degree as we are analyzing it in the southern
5 portions of MZ1. But we plan on doing that in the
6 future, and we'll talk about that shortly too.

7 So this is going to illustrate the concept that I
8 just talked about. What we're doing with this graphic
9 here is we're showing two different sets of land
10 subsidence data. In the dots, these big red dots, that
11 get smaller as we move to the south and actually turn
12 into green dots down here, these are benchmark monuments
13 that recorded subsidence or rebound from April 2003 to
14 April 2004. And again, our maximum subsidence during
15 this time period occurred up here north of the
16 60 freeway along Philadelphia Street. And again about a
17 maximum of an inch of subsidence occurred up here. While
18 down here near the Ayala Park extensometer, we have
19 virtually no subsidence at all recorded by our ground
20 level surveys.

21 The InSAR data here is from the September '93 to
22 December '95 so we're going back in history into those
23 early '90s where we know from the ground level survey and
24 the InSAR data we actually had over a foot of subsidence
25 that occurred over this time period down in these areas

1 here.

2 So the point of this illustration is that
3 currently we're not showing much permanent subsidence
4 occurring down here in the southern part of the MZ1.
5 Back in the early '90s we had subsidence occurring up in
6 this region as well. But in today's world, we're still
7 having some subsidence occur up here as indicated by the
8 ground level surveys. So that's -- the distribution of
9 subsidence has changed over time, is the main point of
10 this slide. We can illustrate that with some other
11 graphics later on too, especially with the InSAR.

12 So transitioning into the results of the InSAR,
13 what we can say about the InSAR data that we've analyzed
14 to date is that it's generally consistent with the survey
15 data both in its areal extent and its magnitude. We've
16 made that point.

17 That the steep gradient of subsidence across the
18 fissure zone is extending to the north, all the way up to
19 about Francis Street. We will show a graphic of that.

20 And that the InSAR data is displaying this steeper
21 gradient of subsidence across the fissure zone than the
22 survey data, going back to your point, Joe.

23 The InSAR data also supports the existence of the
24 groundwater barrier that's aligned with the fissure zone.
25 The rate of subsidence has declined over time. We can

1 show that with the InSAR data. That near Ayala Park it's
2 primarily elastic compaction and expansion that's
3 occurring.

4 But these central areas are now displaying greater
5 rates of subsidence than near Ayala Park. But again the
6 pumping and water level data has not yet been analyzed so
7 it's difficult for us to characterize the nature of that
8 subsidence as elastic or inelastic.

9 So what we're going to do now is take you through
10 two of our time series of the InSAR data. And the maps
11 as I page through them, the maps will show you what time
12 period is of interest that's being displayed on the map.
13 And these maps are cumulative in their series. So as we
14 go from September '92 to October '93 and we move on to
15 the next image, it's a cumulative map where we now go
16 from September '92 to December '95.

17 So we're sort of adding on subsidence as we move
18 through these time series. So that's what you're going
19 to see.

20 If we look here for the September '92 to October
21 '93, you can see our main area of subsidence and that
22 there is more subsidence occurring down here near Ayala
23 Park than up to the north. But we still do have in these
24 central regions some subsidence that's occurring.

25 The scale here of the subsidence is a maximum of

1 50 centimeters of subsidence, and that will occur at the
2 end of the time series in 1995. And then in these green
3 dots, the bigger the dot, the greater the production over
4 this time period here. So this time period is the water
5 year of 1993. And this data comes from Watermaster's
6 production database.

7 MR. FORDHAM: Eric Fordham. I might want to point
8 out, Andy, also, that there is a mixture of both deep
9 wells and shallow wells shown on this graph for
10 production. And in kind of the location where the
11 shallow wells are versus some of the deeper wells.

12 MR. MALONE: Yeah. Here's our Ayala Park
13 extensometer. We have shallow wells and deep wells
14 located right next to each other in this region and in
15 this region here. Here these are some shallow wells.
16 This is a deep well, and this is a deep well here.

17 Then as we move into the December '95 period, you
18 can see that again we have a great deal of subsidence
19 that has been occurring down in this region. We lose
20 some coherence in this area, but you can see from the
21 pattern that the reddest areas are down in this region.

22 But we do have this area of significant subsidence
23 that is occurring here in the central regions of MZ1.
24 You can see generally over this entire area here we have
25 some low level, persistent subsidence that's occurring.

1 If we put contours to this, we have about
2 50 centimeters of subsidence down in this region, about
3 30 centimeters in this northern region, maximum of about
4 30 centimeters. And everything outside of this
5 10-centimeter contour is less than 10 centimeters out in
6 these regions over this time period.

7 And remember, from our ground level survey data
8 that the rate of subsidence slows down considerably after
9 1995. The next series of slides will show us the '96 to
10 2000 time period.

11 This slide here again shows the same InSAR data
12 but we've added well ownership. These pink wells are the
13 City of Pomona, the green wells are the City of Chino.
14 And CIM, some of their production wells down in this
15 region. And these are wells owned by City of Chino Hills
16 out here. Monte Vista Water district has some wells in
17 this region here. These are city of Ontario.

18 So if we look at the second series, this is a very
19 interesting series. Again, it's a more detailed series,
20 and you can see the last series from '92 to '95 we only
21 had two interferograms to add up. But in here we have
22 more like 20 interferograms that we're going to go
23 through. They span shorter time periods, and you're
24 actually going to be able to see some of the rebound of
25 the land surface, not just the subsidence but actually

1 some of the rebound which will show up as the blue
2 values, as blue areas here.

3 I caution you that it's going to look a lot redder
4 in this area, but we changed -- we've changed our scale
5 here of displacement from 50 centimeters to
6 15 centimeters. And at the very end of this time series
7 we'll compare the first time series to the second time
8 series so you can see that comparison.

9 But as you can see here from our January to April
10 1996 time period, we have very little subsidence or
11 rebound occurring throughout the Basin. But down here in
12 this region, we are seeing a lot of elastic rebound.

13 As we move through the pumping season of 1996 to
14 September '96, you can see now that that rebound has been
15 replaced with subsidence. And here is the distribution
16 of production in 1996.

17 As we move into January 1997, we see some
18 subsidence that occurred over this time period in the
19 central regions, but down here near Ayala Park it
20 hasn't -- we haven't seen much subsidence at all. In
21 fact a little bit of rebound down in these areas.

22 We move into February '97 and now into April '97,
23 still in the non-pumping season or not quite into the
24 pumping season yet. And you can see even more rebound
25 occurring in this area.

1 We're into May '97 here, into July '97 so we're
2 entering the pumping season of 1997. September 1997.
3 And here is the production from 1997. Generally what
4 we're just trying to do here, we haven't done a great
5 deal of analysis, but just looking at the distribution
6 and looking for patterns, production patterns, versus the
7 subsidence patterns.

8 So now this is two full years of the time history,
9 and again these northern regions showing some subsidence
10 over this time period. Down here in the south not quite
11 as much, if any.

12 April '98. We're moving into the pumping season
13 of 1998. And the subsiding trough is really starting to
14 develop here. And this is the production patterns for
15 1998.

16 So now this is three full years. We're into
17 January 1999. We're into May '99 coming into the pumping
18 season of '99. Now we're in October '99. I think what
19 you can really see is this north-south lineament that is
20 aligned with the fissure zone, you can start to see that
21 steep gradient of subsidence. And the development of
22 this trough of subsidence up in the central regions is
23 showing up quite well. Here again is our production
24 patterns.

25 Now we're moving into the year 2000 towards the

1 end of our time series, into March and April. And while
2 you can see that some subsidence occurred over this time
3 period down here in the southern regions, it's not quite
4 as much as what occurred up here in the northern regions.

5 Here is the production patterns for the year 2000,
6 water year 2000. And these are the production patterns
7 for the entire time series from '96 to 2000, so
8 cumulative production over that time period.

9 One very interesting thing to note here is that
10 while in these areas of subsidence down here we have
11 wells that are centered on the areas of maximum
12 subsidence, we don't really have that up in these regions
13 here. Speculate on some of those causes, but that's what
14 it would be is speculation at this point.

15 But again, note the very little amount of
16 subsidence that occurred directly to the east of the
17 fissure zone. But we have significant subsidence that's
18 occurring just directly to the west again, the steep
19 gradients of subsidence on the eastern limb of the
20 subsiding trough.

21 So here we're giving you some values of
22 subsidence, over 12 centimeters of subsidence over this
23 time period, '96 to 2000, 12 down in here, a little less
24 than 12 down in these regions.

25 Our well ownership again. Now, if we compare

1 these two, again this is the first series '93 to '95.
2 And this is the second series '96 to 2000. But again
3 look at the contours, and you can see that in this area
4 right here in '92, 95, we still had over 30 centimeters
5 of subsidence whereas we had some, you know, a good
6 amount of subsidence occur during this later time period
7 but less than before. Go back and forth and compare
8 these two images to each other.

9 Are there any questions about the subsidence
10 diagrams, or does anyone want to add any clarification to
11 that? Maybe Francis, you in particular?

12 MR. RILEY: No. No, no, no.

13 SPECIAL REFEREE SCHNEIDER: So there is no
14 fissuring further to the north, but you're seeing as much
15 subsidence there as in the Ayala Park area?

16 MR. MALONE: We have not -- we don't have any
17 indication that it's occurred there. We haven't
18 documented anything. But it certainly looks very similar
19 in its pattern to an area where we had fissuring in the
20 past. So it concerns us that it's a possibility.

21 SPECIAL REFEREE SCHNEIDER: How far north does
22 your barrier extend, as far as you know?

23 MR. MALONE: Well, we haven't done any hydraulic
24 testing in this area, but the InSAR here is suggesting
25 that this barrier extends to at least up into this

1 region. That's what the InSAR is suggesting something
2 about that, the extension of that barrier. But again we
3 haven't done any hydraulic testing in this area to
4 confirm that.

5 SPECIAL REFEREE SCHNEIDER: I don't recall how far
6 north Chino's work in looking at subsidence went from
7 '87.

8 MR. MALONE: It went down to about this area. It
9 was in this area right here.

10 SPECIAL REFEREE SCHNEIDER: So has no one studied
11 subsidence historically above that point?

12 MR. MALONE: Up in that area, not a study like
13 we're performing here. I'm not aware of any specific
14 subsidence investigations that's occurred up in this area
15 here.

16 What this is also suggesting -- Anne, we have a
17 later slide in here where we talk about this -- that the
18 InSAR can reveal certain things about the subsurface
19 geology. In this case we think it's revealing the
20 existence of this barrier or the extension of this
21 barrier to the north.

22 Also, you can't have permanent subsidence
23 occurring where you don't have compressible sediments.
24 So these aquitards that we're talking about down in this
25 region compacting and causing permanent subsidence at the

1 land surface, this InSAR is suggesting the existence of
2 those fine-grained sediments to the north too.

3 SPECIAL REFEREE SCHNEIDER: Can you show the
4 distribution of deep pumping in the central area again.

5 MR. MALONE: Okay. If we go to deep pumping here,
6 I think the well ownership, in this area here, I know
7 that these wells here are some deep wells. In here, and
8 then we've got a deep -- we've got two deep wells down
9 here.

10 SPECIAL REFEREE SCHNEIDER: I mean up in the
11 central.

12 MR. MALONE: This area here we don't have any
13 wells to speak of in this area at all. But as -- forgot
14 who mentioned it earlier, Dennis -- that a lot of these
15 wells up here in this region are perforated deep. The
16 water levels -- the depth to water is much greater up in
17 these regions here. It can be 400 to maybe even 500 feet
18 to groundwater in some instances. So as a result a lot
19 of these wells are drilled and completed in deeper
20 portions of the aquifer.

21 ERIC FORDHAM: Andy, maybe you can talk a little
22 bit about how the geology, as you understand it from
23 looking at well logs, varies from the southern portion of
24 the zone that we talked about up in this northern area.
25 You know, the water levels drop. And as you go further

1 to the north, as you just said, how does the geology, the
2 character of the geology change?

3 MR. MALONE: Off the top of my head, I can't tell
4 you exactly how far some of these confining layers extend
5 to the north. I know that the geology is fairly similar,
6 though, as you go to the north, that we do -- looking at
7 some of the well logs, that we do have fine-grained
8 compressible units up in this area.

9 But as far as extending some of our detailed
10 knowledge down here to the north, we haven't done that
11 work in detail yet. But we plan on doing it.

12 MR. HILL: Can you comment on the depth of the
13 well to the east of this fissure zone down to the south,
14 as well as up here?

15 MR. MALONE: We don't know the well construction
16 of every single one of these wells. But what we have
17 obtained, we've obtained from Geomatrix that works for
18 the State here on some of the well construction. They're
19 generally shallower.

20 MR. HILL: Up further.

21 MR. MALONE: Up further up here?

22 MR. HILL: Down there, the 12 down there too.

23 MR. MALONE: Near the 12 here?

24 MR. HILL: On the 12 down there on the east side
25 of this --

1 MR. MALONE: This well over here is a deep well,
2 but it doesn't pump. It's constructed similarly to these
3 other wells. These wells don't pump down here. They're
4 old ag wells that are fairly shallow, maybe 200 feet in
5 depth. But they've been preserved as monitoring wells so
6 we have water level transducers in them. But they're
7 basically providing us with shallow system data.

8 MR. HILL: What about up there?

9 MR. MALONE: Up in this region here I can't tell
10 you off the top of my head, but I know generally as we
11 move to the north, the wells become deeper in their
12 construction. But I can't tell you specifically for each
13 well up here.

14 But our plans are to come up here and do the same
15 sort of investigation that we did down here up here by
16 dropping in water level transducers in some of these
17 wells, start to understand -- trying to understand the
18 relationship between groundwater production and water
19 level declines and the hydrogeology better in this
20 region. Those are our plans.

21 So those are our results, and now we're going to
22 talk about some of our conclusions to date.

23 What we're stating here is that under the current
24 mode of aquifer system utilization, meaning that we have
25 the forbearance agreement that we're operating under, and

1 under the current distribution of pumpage both in
2 location and depth, Chino Hills is limited somewhat by
3 water quality issues like arsenic in their wells. And
4 like I stated earlier, some of the -- one of their wells
5 in particular is having mechanical problems.

6 But under what we've seen the past few years,
7 under that mode of aquifer system utilization, the
8 permanent compaction is minimal in these southern parts
9 of MZ1. We're mainly seeing elastic deformation.

10 Anne, I think you had a question about this as far
11 as the forbearance agreement and the impact of the
12 forbearance agreement.

13 SPECIAL REFEREE SCHNEIDER: One of my questions
14 has been whether you just happened to hit the right
15 number with 3,000 acrefeet or not. But my question, is
16 the main importance of what you've been looking at with
17 the forbearance agreements in place and the forbearance
18 going on, that the key may be that you don't go below a
19 certain depth for more than a certain amount of time in
20 order to ensure that you have elastic conditions versus
21 any particular amount of water being pumped or not pumped
22 under a forbearance agreement. What are the key factors
23 that seem to make the most difference to be able in your
24 stress-strain diagrams to come back and stay elastic in
25 the changes you get?

1 MR. MALONE: So what you're asking -- so the
2 forbearance agreement pertains to groundwater production.

3 SPECIAL REFEREE SCHNEIDER: Right.

4 MR. MALONE: What we've been --

5 MR. SCALMANINI: What it really pertains to is an
6 amount of reduced groundwater production.

7 MR. MALONE: Right. And the relationships we've
8 been establishing so far are between groundwater levels
9 and aquifer system compaction.

10 Now, the next obvious link is, how does production
11 affect groundwater levels. And that's really the next
12 step in our investigation is to create groundwater models
13 to simulate the groundwater production's effects on
14 groundwater levels. And so at that point in time we will
15 be in a better position to say what the effect
16 forbearance has on groundwater levels in this area.

17 But we have not done any specific work to date on,
18 has forbearance helped in mitigating subsidence. It was
19 a mitigation measure that we took in the beginning, but
20 we haven't done the work to quantify its effect.

21 MR. SCALMANINI: The number 3,000 acrefeet had --
22 I'll try it as a statement and you correct me if I'm
23 wrong -- had nothing to do with, I'll call it, science.
24 In other words, 3,000 wasn't calculated. It was an
25 amount of available water that could be brought in as a

1 substitute water supply if I remember correctly. Right?

2 MR. MALONE: I'm going to defer to Mark on some of
3 this. You can chime in when you want to on the
4 forbearance aspects of it. Maybe Mike will take it.

5 MR. WILDERMUTH: Let Michael take it.

6 MR. FIFE: I think that is a fair statement, and
7 it kind of depends on where the discussion goes.

8 MR. SCALMANINI: It's not intended to go anywhere.
9 It was an amount of water that people could agree to
10 because it was an amount of water that could substitute
11 for a reduction in pumpage while this work that's gone on
12 for the last three years went on.

13 MR. KINSEY: Joe, it was originally a
14 pipeline-convenient capacity, surplus capacity in --

15 MR. SCALMANINI: Yeah, that was -- had to do with
16 hydraulics of the system also, I remember.

17 MR. BUNN: Say your name, Mark.

18 MARK KINSEY: Mark Kinsey, Monte Vista Water
19 District.

20 SPECIAL REFEREE SCHNEIDER: And there was only
21 capacity in that line in the non-summer season.

22 MARK KINSEY: Right. Restrictions were non-peak
23 periods and surplus capacity.

24 SPECIAL REFEREE SCHNEIDER: I just wanted to see
25 if there was something you could say about whether the

1 ultimate program, the long-term program will be looking
2 at constraints that are related more to the depth to
3 which water can be lowered and the duration of time for
4 which those lower depths can be allowed, more than not
5 pumping a certain amount during a certain period of time
6 or even pumping limitations in general.

7 So, you know, what little I understand about pore
8 pressure and skeleton things, it would make sense to me
9 that not allowing water levels to be lowered for long
10 periods of time would be a good idea in terms of staying
11 away from inelastic responses. Is that true?

12 MR. MALONE: I think that we have some empirical
13 evidence that suggests that that's true, that when we
14 operate in the forbearance agreement where we pump during
15 the pumping season, but we allow the system to recover
16 during the wintertime months, that we've demonstrated
17 that we're operating generally in an elastic range.

18 And so to how far we can step out of that same
19 pumping pattern and still operate within the elastic
20 range, we have not determined that yet. But the models
21 hold a promise of determining that.

22 Francis, would you say that that's --

23 MR. RILEY: Yeah. I would agree with that.

24 MR. SCALMANINI: Andy, I will ask a question about
25 the very last one -- I don't know if it's the very last

1 one. Yeah.

2 The distribution of pumpage location and depth.
3 In light of the fact that the aquifer responds to what
4 you do as compared to what you don't do, then if we
5 wanted to somehow assemble a description of the spatial
6 distribution and the depth distribution and volumes and
7 rates and those kinds of things of what actually took
8 place during this forbearance period, that could be done?

9 MR. MALONE: Uh-huh.

10 SPECIAL REFEREE SCHNEIDER: So you indicated yes?

11 MR. MALONE: Yes.

12 What we're seeing here is that looking at
13 historical and current production from the deep system,
14 that we believe that it has caused the greatest increases
15 in stress. We showed many hydrographs showing that
16 production from the deep system causes these great
17 drawdowns in the deep part of the system in comparison to
18 the drawdowns that we see in the shallow part of the
19 system. And not only that, we're looking at maybe
20 175 feet of maximum drawdown in the deep system during
21 our last pumping test and a maximum drawdown of about
22 15 feet that we were able to achieve in the shallow part
23 of the system during the shallow tests.

24 Not only that in magnitude but we also see in
25 lateral extent when production in the deep system occurs,

1 we see this lateral propagation at significant magnitude
2 of drawdown. So it's not only in magnitude, but it's
3 also in lateral extent that we see the greatest stresses
4 imposed upon the system.

5 MR. SCALMANINI: Lateral but constrained to the
6 east.

7 MR. MALONE: But constrained to the east by the
8 fissure zone. When we see wells located, deep wells
9 located at significant distances to the west, we see that
10 lateral propagation and head decline to significant
11 degrees.

12 And again with our stress-strain diagram, this
13 last bullet pertains to our stress-strain diagram where
14 we're seeing that these head declines can induce
15 permanent compaction. But again this is a preliminary
16 conclusion because it is still pending fully recovered
17 water levels. We're waiting for those water levels to be
18 fully recovered to see if any inelastic compaction did
19 occur over the last pumping season.

20 With regard to the groundwater barrier that we
21 believe it exists in the deep system and that it has the
22 potential to create differential subsidence and
23 fissuring. Because it's a ground water barrier and does
24 not allow these head declines to propagate to the east,
25 that we set up a situation where we can have differential

1 subsidence across the fissure zone as long as pumpage is
2 concentrated on one side of the fissure zone.

3 MR. SCALMANINI: Andy, it's been a while since I
4 looked at the cross sections that are in -- I forgot
5 Initial State of the Basin Report and maybe other places,
6 is there an equivalent, quote, deep system on the east
7 side of this barrier?

8 MR. MALONE: What I can tell you is that we don't
9 have a great deal of data.

10 MR. SCALMANINI: I didn't think so.

11 MR. MALONE: It's Chino Hills 18 that exists over
12 there, and what it seems like is as we move towards the
13 east, the fine-grained layers become more interbedded in
14 the coarse-grained layers. And so it doesn't --

15 MR. SCALMANINI: Does not the basement dip up as
16 you go to the east also?

17 MR. MALONE: To the south. It actually, you know,
18 extends off to the north central part of Chino Basin.
19 The deepest parts of the Basin are in the City of
20 Ontario.

21 MR. WILDERMUTH: Eventually it comes out.

22 MR. MALONE: Eventually it comes out.

23 MR. SCALMANINI: Eventually it comes out.

24 MR. MALONE: If you move towards the Jurupa Hills,
25 that's bed rock surfacing there.

1 I believe this is our last conclusion is that the
2 central portions of Management Zone 1 require further
3 study. I think by looking at some of that InSAR data,
4 it's fairly obvious that it requires further study. That
5 this InSAR data, like I stated earlier, is suggesting
6 that something about the hydrogeology, the existence of
7 these fine-grained sediments, and the possible extension
8 of the groundwater barrier to the north, but that the
9 source and magnitude of the drawdown and the material
10 properties such as the compressibility of the sediments
11 and the threshold for inelastic compaction, the so-called
12 preconsolidation stress, those are all unknown in that
13 northern part of the Basin. Where we think in the
14 southern parts, where we've been studying it, where we've
15 been studying it quite intensely, that we think we have a
16 handle on a lot of this now, but not in the central
17 regions of MZ1. And that the InSAR data is also showing
18 us that we have this differential subsidence in these
19 central parts of the MZ1 too which suggests the potential
20 for fissuring.

21 So that brings us to our ongoing and recommended
22 work. Continued monitoring. We're going to continue.
23 Our monitoring program is almost on auto pilot in that a
24 lot of it's automated. We have these transducers that
25 are out there just continually collecting data at the

1 extensometer and surrounding wells. We plan on
2 continuing that.

3 For the ground level surveying, we're going to
4 increase the frequency of ground level surveying. We're
5 going to go twice a year across the entire network to get
6 the seasonal fluctuations across the entire network, as
7 well as the annual and ongoing subsidence and rebound
8 that may be occurring.

9 We're also going to extend some of our horizontal
10 monitoring further to the north. We have only been doing
11 it at Edison and Eucalyptus Avenues. We're going to
12 extend that distance measuring across the historic
13 fissure zone up to Schaefer Avenue.

14 For the InSAR, again we're investigating the
15 possibility of creating a similar time series that you
16 saw here previously for the 2000 to 2005 time period.
17 That would help us with some of the calibration of our
18 models that we intend on developing. And what we're
19 going to do is we're going to try to match our InSAR data
20 with the data collection frequency that we're doing of
21 ground level surveys. We're going to go spring-fall,
22 spring-fall for the next two years with the InSAR data to
23 match the ground level survey data. In that way, we're
24 going to be able to compare the two technologies and see
25 if we can't modify our long-term monitoring program to

1 include a less -- maybe less frequent ground level
2 surveying which is the more expensive method of surveying
3 but it's tried and true. This down here is a little more
4 experimental but there's many attractive features to it.

5 If we can show that the InSAR data is replicating
6 what we get with ground level surveys, maybe we can back
7 off on some of the ground level surveying and depend more
8 on our InSAR data for our monitoring, our long-term
9 monitoring.

10 Then these numerical models that we've been
11 discussing, there's two of them. One is this
12 one-dimensional compaction modeling that we're
13 performing. And what we're trying to do there is come up
14 with some estimates of the aquitard properties, these
15 vertical hydraulic conductivities and these
16 compressibilities of the sediments. And we're doing this
17 modeling at Ayala Park using the data coming from Ayala
18 Park. And then we hope to be able to extrapolate these
19 properties into our three-dimensional groundwater flow
20 and subsidence model that we'll be developing next year.

21 And what that model will be doing is it will be
22 linking the areal and vertical distribution of pumpage to
23 water level fluctuations and then the ultimate
24 deformation that occurs in the aquifer system.

25 So again, we've been working mostly on this link

1 between water level fluctuation and deformation. The
2 model will, then, now take us from that to include
3 pumpage, how it affects water level fluctuations, and
4 then how the water level fluctuations affect deformation.
5 And it will be a spatial three-dimensional model.

6 MR. FORDHAM: Question on the modeling. Eric
7 Fordham. Will it also consider the time factor such as
8 how long it would be for these aquitards to undergo the
9 inelastic deformation once a certain withdrawal took
10 place, so that there's time factors that will also be
11 considered there?

12 MR. MALONE: Yeah. Francis is a little more
13 familiar with the details of the model. Do you want to
14 comment on that, Francis?

15 MR. RILEY: In general, yes, the modeling should
16 allow us to predict what you might expect if pumpage were
17 continued beyond the relatively short summer pumping
18 periods that we have seen in the last two years during
19 which we have been collecting detailed data.

20 But what little we've seen so far doesn't seem to
21 suggest that there would be a dramatic change and the
22 response is just over a longer period of time.

23 However, if we were to exceed the threshold of
24 inelastic compaction, of course, you would extend your
25 time delaying factor by whatever the multiplying factor

1 on the compressibility is, which might be on the order of
2 50 or something of that sort.

3 Does that address your question?

4 MR. FORDHAM: Right. So essentially it does
5 incorporate, then, what that factor would be?

6 MR. RILEY: Yes, right.

7 MR. FORDHAM: If it does exceed it, then you would
8 know that this may continue to occur over a period of
9 years following that exceedance of the threshold, if you
10 will, or whatever the time factor would be.

11 MR. WILDERMUTH: In other words, you're saying if
12 the change in the pressure inside the aquitard is
13 dropped, we're going to see this over some period of
14 time. Is that what you're saying?

15 MR. FORDHAM: That's what I'm asking, if the model
16 would be able to accommodate that.

17 MR. RILEY: Yes, it would.

18 MR. MALONE: As far as future work goes, we plan
19 on expanding our monitoring to the central regions of
20 MZ1. And the first thing that we do, first, least
21 expensive, and most bang for our buck would be to install
22 these water level transducers in existing wells up there.
23 Our experience with learning a lot about the aquifer
24 system and how it works and how different pumping wells
25 affect water levels in the region, we gained a lot of

1 very valuable experience with this in the southern part
2 of MZ1. So it's the obvious thing to do right away is to
3 install water level transducers in existing wells.

4 And then what we're doing here is really
5 speculating about what our group might want to consider
6 in the future. And that would be to construct a new
7 monitoring facility or facilities up in the central
8 regions where we have our greatest amount of subsidence
9 as indicated by InSAR and ground level surveys. And that
10 new monitoring facility might include a multi-piezometer
11 and/or an extensometer.

12 MR. SCALMANINI: Emphasis on the word "might."
13 That's to be determined?

14 MR. MALONE: That would be to be determined. I
15 think that what we want to do is continue to collect
16 ground level survey data and InSAR data and water level
17 data up in this area before we came to a conclusion as a
18 group as to exactly what this monitoring facility should
19 be.

20 But we're speculating right now that it would be
21 at least piezometers, multiple piezometers that we could
22 get some good geologic data up in this area that doesn't
23 really exist. We don't really have any wells up in that
24 area.

25 MR. SCALMANINI: That's where I was going to go

1 next.

2 MR. MALONE: Hydrologic -- or the hydraulic data
3 as well.

4 MR. SCALMANINI: Okay.

5 MR. MALONE: And then the development of the
6 long-term management plan itself. The statement that
7 were making here is that all this data that we've been
8 collecting and the results and conclusions we've been
9 coming to are providing what we call the technical
10 foundation for the development of the management plan,
11 the long-term management plan. It's not the long-term
12 management plan itself. But it provides the foundation
13 for the development of that plan.

14 That these groundwater flow and subsidence models
15 will assist in the evaluation of any plans that we might
16 develop. And the effectiveness of this plan can be
17 continually evaluated based on a data collection and
18 analysis and model verification.

19 As far as the schedule for this, over the next
20 fiscal year, we plan on expanding our monitoring network
21 to these central regions of MZ1 in the summer of this
22 year. We have a piezometer replacement project that
23 we're doing at Ayala Park. I think you're familiar with
24 the piezometer issues that we've been having in some of
25 our deep piezometers. We've come to the conclusion that

1 we'd like to replace that piezometer with a new one.

2 MR. SCALMANINI: Okay.

3 MR. MALONE: And that is tentatively scheduled for
4 the fall of '05. Ground level surveys again --

5 MR. SCALMANINI: Comment in passing, you're going
6 to tear up all that landscaping and everything all over
7 again? Might start working on the fence now. Just a
8 little walk down memory lane.

9 MR. MALONE: Yeah.

10 Our surveys and InSAR again will both be fall '05
11 to spring '06 surveys. And modeling, we anticipate to be
12 complete with our modeling in the spring of '06. And the
13 final reports -- that would be the modeling report and
14 the completion reports for our extensometer building and
15 those types of reports -- we plan on being complete with
16 those in summer of '06. So that's what our tentative
17 schedule is right now that we hope to achieve.

18 MR. SCALMANINI: But that has no new piezometers
19 in the --

20 MR. MALONE: No.

21 MR. FIFE: No new extensometer in it, none of
22 that?

23 MR. MALONE: That's not put in the budget here
24 either for the new facility. It's again that the new
25 facility is something that we're speculating about right

1 here that the group might recommend in the future. But
2 we're not there yet.

3 MR. WILDERMUTH: The work we're doing right now in
4 the southern part of the subsidence area was really as a
5 result of a controversy that came up during the
6 development of the OBMP. And going north would be --
7 what Andy calls the central area -- would be sort of a
8 desire of this group to continue this work up there or
9 not. I'm not sure this is necessary to meet the purposes
10 of the OBMP yet, but that has to be determined. I mean,
11 it's like Andy says, subsidence is like the weather. It
12 may not be an issue up there or it may be, as Andy
13 suggests, a potential for fissuring which should have
14 everybody worried. That just sort of has to be
15 articulated by the stakeholders.

16 SPECIAL REFEREE SCHNEIDER: I've been wondering
17 how it would be determined that there is a problem of
18 significance in the central area to the north. I mean,
19 it's clearly of significance that there has been
20 subsidence because there's been fissuring and impact to
21 infrastructure where you have been studying. How does
22 one determine significance before deciding to go into a
23 lot more study and analysis and modeling and --

24 MR. WILDERMUTH: I don't have an answer to that
25 question, but I understand your question.

1 SPECIAL REFEREE SCHNEIDER: Is that part of what
2 the technical advisory group is looking at?

3 MR. WILDERMUTH: I think they are going to have to
4 consider it at subsequent meetings.

5 MR. MALONE: A lot of what we've learned here with
6 the InSAR data is brand-new to the group, that we've just
7 recently got this data which has showed us in a lot
8 greater detail the history of subsidence in the 1990s in
9 this part of Chino Basin. So it's a relatively new
10 concept that we're discussing in the group.

11 SPECIAL REFEREE SCHNEIDER: I have to observe, I
12 guess, that I had expected that there would be sort of a
13 new generation of working hypotheses that had come out of
14 the work so far. As I understand it, you had a working
15 hypothesis going into this work that seems to have been
16 your conclusion that the deep pumping has had an effect
17 and this somehow correlates to the subsidence and the
18 fissuring historically. What working hypotheses do you
19 have going forward here?

20 MR. MALONE: In these central regions?

21 SPECIAL REFEREE SCHNEIDER: Is there further work
22 to do in the area that has been of concern? Are there
23 questions you're specifically going to be trying to
24 answer for that area as well as more work to the north
25 and the central area?

1 MR. MALONE: We don't have any plans to do further
2 testing in this region, testing being a method to answer
3 a certain question. We feel like we're one with that.
4 We feel like if the stress-strain diagram goes to where
5 it seems to be going, that we've identified this
6 threshold of preconsolidation stress that is the
7 transition between inelastic and elastic compaction.

8 So we -- to answer your question, I don't think we
9 have any further questions that we're trying to answer in
10 this southern part of Management Zone 1. We're going to
11 be developing the models that will help us provide that
12 linkage between groundwater production and groundwater
13 levels which would provide a tool to evaluate any
14 management plan that might come out of this.

15 SPECIAL REFEREE SCHNEIDER: So one thing the model
16 would do ultimately will tell you if everyone in concert
17 does not pump more than X so that water levels don't go
18 below Y for longer than Z amount of time, then you will
19 stay in an area that will be elastic. Is that true?

20 MR. MALONE: Yes. I think that's generally
21 accurate, yes.

22 SPECIAL REFEREE SCHNEIDER: Is that what the
23 technical advisory group is waiting to find out? I'm
24 concerned that there is nothing on your schedule as to
25 when a long-term plan is going to be created. So the

1 question is, does the model have to be developed and then
2 applied in order to answer the question I just posed?
3 And when that question is answered, is that when you
4 would be able to develop a long-term plan, "you" being
5 the technical advisory group.

6 MR. MALONE: If we were to develop a long-term
7 management plan that said, you know, production should be
8 limited to this or that, this type of pumping
9 distribution for this period of time, what would the
10 effects be in terms of inelastic subsidence. And what
11 we're trying to do is get to a point where we have tools
12 to evaluate what the effects would be.

13 MR. WILDERMUTH: Anne, I would tell you that where
14 we're headed is kind of where the OBMP was headed at one
15 time where the technical documents were done and then
16 some institutional work probably has to be done.

17 SPECIAL REFEREE SCHNEIDER: Is that what you refer
18 to as deal making?

19 MR. WILDERMUTH: That wouldn't be exactly how I
20 would say it, but it would be about that, yes. I think
21 we will come up with the technical basis from which a
22 long-term plan can be developed. It could run a range
23 from just being, here, here's the guidance information.
24 You go. You go, "you" meaning the local pumpers, you go
25 make this work. Just don't cross these thresholds,

1 whatever they may be.

2 Another way to do it would be to be strong-arming.
3 But that is the exact implementation, how you use this
4 information, is something that is going to have to be
5 done not by Watermaster staff and consultants, but it's
6 going to have to bring in a broader group.

7 SPECIAL REFEREE SCHNEIDER: This is deja vu all
8 over again, 'cause the transcript from the workshop a
9 couple years ago, the same question is posed, when can
10 you get to a long-term plan. The answer was five or six
11 years of technical work and then a year to reach an
12 agreement.

13 It sounds to me -- I pose this as a question. Is
14 that still a fairly logical projection? So a few more
15 years of studies and model development and analysis
16 followed by 12 months to reach an agreement.

17 MR. WILDERMUTH: That's probably very reasonable.
18 The 12 months on reaching the agreement is less certain
19 than the technical part.

20 MR. SCALMANINI: This is not to argue. In the
21 OBMP, did we not write language that said the objective
22 of the MZ1 part of the overall OBMP was to eliminate
23 subsidence or reduce it to an acceptable or manageable
24 level or words to that effect. I think that's what it
25 says. And again I'm not arguing with the need for a

1 model. With the knowledge today, could that be, say,
2 quasi-technically done, meaning stop short of a model
3 because a model is going to allow you to analyze
4 scenarios that would achieve some water level objective,
5 the kinds of things that Anne said in terms of X, Y, and
6 Z. An amount of pumping distributed a certain way over a
7 certain amount of time.

8 And so the model will allow you to ask, so what
9 will happen if I do this distribution over this period of
10 time, et cetera, et cetera, et cetera. Ultimately all
11 put in the context of the water demands of the affected
12 parties are yet some other letter, A, and the pumping
13 will supply a certain amount of that water supply, and
14 then the rest of it has to come from somewhere else.

15 So that has to be sort of factored into it too
16 ultimately, I guess, the deal part of this. But if the
17 goal was as stated in the OBMP, to reduce subsidence, to
18 eliminate it, or in some acceptable or manageable level,
19 could in light of where you are with conclusions today,
20 that be described short of analyzing scenario A, B, and C
21 as to how to effectively implement it if it could be
22 defined.

23 MR. WILDERMUTH: I'll take a crack at it. I'd say
24 we're close to coming up with that kind of number. And
25 from a management perspective, what the models do, and

1 they're just models. I always make that --

2 MR. SCALMANINI: Recognize that, Mark, yes.

3 MR. WILDERMUTH: Put the word quote, closing
4 quote, on the "just" part. They will give us some
5 guidance, perhaps, on how to apply the criteria. So
6 that's just another step of sophistication in trying to
7 provide some results.

8 But saying that, once you got those model results,
9 they're just model results. They have some accuracy.
10 And what you'd have to do is you'd have to continue with
11 the monitoring and come back to that. You'd still be
12 coming back to those target levels that we're talking
13 about or thresholds, management thresholds. You'd still
14 be monitoring for that. And you would hope that the
15 models would give you good information to help you get
16 there.

17 But it's going to come back to a point where
18 you're going to agree on something so you don't cross the
19 thresholds and you have to monitor very carefully to make
20 sure you don't.

21 MR. SCALMANINI: I don't want to, you know, jump
22 to conclusions but for a collection of reasons that have
23 to do with everything from arsenic to available, called
24 substitute water supply, the interim plan has resulted in
25 some conclusions that -- I should look up the word to

1 use -- but it's minimal or basically no new inelastic
2 subsidence in the focused study area to date. Right?

3 So one could possibly conclude you could go
4 forward. A long-term plan to achieve OBMP objectives as
5 stated, was it five years -- I'm losing track of time --
6 five or six years ago now, we kind of know now what it
7 takes to do that.

8 MR. WILDERMUTH: In an empirical way, if you look
9 at our pumping over the last few years, you could say if
10 we read the data over again, you might not have -- it
11 could be a low-cost way to do it. At least to provide
12 them information.

13 MR. SCALMANINI: And the alternative, complexly,
14 is to spend another million dollars or the better part of
15 it subject -- I mean if the central portion of the Basin
16 becomes more focused, wouldn't that piezometer
17 installation cost \$300,000? Extensometer costs a similar
18 amount of money? So a million and a half dollars by the
19 time the smoke clears if that gets added to this. And
20 wouldn't you just extract three to five more years?

21 MR. WILDERMUTH: If you bring in the northern
22 portion, this will go on more than what we talked about a
23 moment ago, the central portion.

24 SPECIAL REFEREE SCHNEIDER: This may be just the
25 world's most stupid question, but I've having a hard time

1 understanding the connection between whatever is
2 happening to the north and the problems that were the
3 focus of the work so far, in the Ayala Park area. Can
4 you help explain why it's logical that you need to go
5 study further to the north? Does it have anything to
6 with the problem so far? Or is there a perception that
7 there might be a problem?

8 MR. WILDERMUTH: I'm going to give you my opinion.
9 Francis and Andy may have a different opinion. I think
10 that the interest to the north, to me, or I have a
11 concern as a professional is the extension of that deep
12 barrier and the likelihood of perhaps fissuring in the
13 future, going up there and all the attendant issues of
14 that. Whether or not we need to solve that problem in
15 the north to come up with a solution to the south, I
16 think we could probably bifurcate that. I think we can.
17 I'm not a hundred percent sure. And from what I now
18 know, I think it's possible.

19 SPECIAL REFEREE SCHNEIDER: Is it your sense that
20 whatever the cause of the problem to the north is, it's
21 more likely to be coming from the north than from the
22 south?

23 MR. WILDERMUTH: I can't answer that question with
24 certainty.

25 MR. SCALMANINI: I'm trying to decide whether to

1 stop biting my tongue. I'm reluctant to bring it up, but
2 I'm going to anyway. That given the stuff that we've
3 just been talking about, which is that it seems like
4 physically for at least part of the area and the part
5 that's been focused on, going back to objectives to
6 reduce or eliminate subsidence, that you're kind of
7 there. And empirically, you know, or otherwise there's
8 some level of detail that could be developed to say
9 here's how to get there and stay there.

10 The issue that seems to me to be overarching is
11 what all the liability pieces that go. You can stop it,
12 but you still don't answer the question with definition
13 as to, okay, so what about all the liability associated
14 with fissuring, et cetera, in the past. We can stop it
15 from getting worse or from advancing at all. But then
16 you still have all that hanging out there.

17 I guess ultimately, it seems to me, like that's
18 what will be fought over more than the physical solution
19 to, quote, minimize or stop the advancement. It's kind
20 of there now. I don't know how easily it would be to
21 perpetuate something like this 3,000 acrefeet of
22 substitute water supply to allow pumping to be in and
23 about the range it's been, or words to that effect, or
24 what other water supplies would be needed to meet
25 projected increases in water demand, so that groundwater

1 doesn't meet that.

2 But assuming that's a solvable problem, that then
3 there's still all this overarching question of, then,
4 what about all the liability things that seem to have
5 prompted this process that we're in right now beyond the
6 OBMP.

7 Is there anything in all of what's planned for
8 additional work in the next -- what's the date, Andy? --
9 year, two years, spring of '06, summer of '06 for
10 reports. Will that go in a direction of helping answer,
11 I'll call it the question or the issue that I just added
12 to the technical side?

13 MR. WILDERMUTH: Will the report address liability
14 issues?

15 MR. SCALMANINI: Not so much address them but
16 allow them to be addressed, I guess is maybe a better way
17 to put it, Mark.

18 MR. WILDERMUTH: I'm not going there.

19 MR. FIFE: That's the right thing to do.

20 I think all those issues are potentially,
21 potentially, wrapped up in the long-term plan and that's
22 the -- I just go back to where we started today. This is
23 a technical workshop, and we have not even addressed
24 those issues. We've not approached those issues, and I
25 think it would be premature to even address them in this

1 workshop.

2 MR. SCALMANINI: With one qualifier I'll agree
3 with you, Michael. The qualifier is that if the
4 addressing or resolution of those is going to be
5 technically based, we better be sure we're doing the
6 technical work that's required to do that.

7 MR. FIFE: And this, I think if we look at a
8 couple slides back that the future work they are
9 proposing is geared toward providing the technical basis
10 for addressing those issues.

11 MR. SCALMANINI: Okay. Well, then at the risk of
12 being further argumentative, let me try a couple things.
13 Let's go back to whatever slide it was, Andy, that listed
14 all the potential mechanisms, you know, three years ago.
15 It's on page 11 of the handout. There's -- what? --
16 three per, so it's 33.

17 MR. MALONE: Can you escape, and then go to
18 slide 33.

19 MR. SCALMANINI: On this, if you take the first
20 sub-bullet, subsurface fluid withdrawal, and subdivide it
21 to where one of it's subdivisions is groundwater
22 extraction, then there's been, going back to the -- when
23 that list was first posed three years ago, that that's
24 been the focus of the investigation.

25 And so it seems like to ultimately get there --

1 and again, Michael, I agree with you about, you know,
2 we're not going to talk about solving the issue, but if
3 we're going to talk about technical considerations that
4 can affect the resolution of those, then it seems to me
5 that to come in with the level of detailed focus,
6 thorough, well-done and all those kinds of words that
7 would apply to the work that's gone on for the last three
8 years, unless you can say I have an absolute
9 cause-and-effect relationship between ground water
10 extraction and subsidence that unilaterally eliminates
11 all the rest of these, then you have the potential for
12 the debate to go on about, well, could some of the
13 historical problem be the result of hydrocompaction or
14 desiccation of soils.

15 Now, on its face or their faces, there's a handful
16 of those, if not all of them, they're almost dismissable
17 out of hand, but there hasn't been any work to dismiss
18 them out of hand. But it seems like on the punch list of
19 things, between now and, say, the summer of '06 or
20 whatever, that there ought to be some effort to say that
21 we've dismissed these. We didn't just pick one and study
22 the heck out of it. We picked it for a collection of
23 reasons, some of which were that these others don't have
24 foundation in this location. And/or whatever other
25 reason that can be dismissed. That's one thought that

1 comes to mind as far as the list of things to go on from
2 here.

3 You've been there. Maybe not as much as I have
4 yet, but you've got a couple more years to go. The point
5 is people can bring up things from a list like that. So
6 how do you know it's not the collapsed underground
7 caverns. I don't know who laughed. It's not. But, you
8 know, the answer "I just know" usually doesn't work.
9 Might for Francis.

10 So that's one thing that comes to mind, you know,
11 to make sure that if we created this list of
12 possibilities once, that we then paid some attention to
13 them so they go away.

14 The other is -- and maybe it's embedded, Andy. I
15 just don't flip memorywise fast enough. But the efforts
16 that you have commissioned to the surveyors to try to
17 extract what they can from what's available in history,
18 will produce something, something ranging from nothing to
19 hopefully a lot. Then is there -- well, I guess, (a),
20 it's a function of what comes back. But let's assume
21 that there's something. Then is there some intent to,
22 I'll call it expand the focus of -- I'll stick with
23 groundwater related causes, but that might go beyond just
24 the deep aquifer or the deep portion of the aquifer
25 system.

1 A thought that comes to mind, for example, in
2 passing is that if I remember your classification of the
3 lithology and broad bullets, there was an aquifer from
4 100 to 300, a fine-grained layer from 300 to 400 roughly
5 speaking, and a deep aquifer system from 400 to, what,
6 1200 or more. I forget the depth, the bottom number.

7 If Mendenhall mapped flowing conditions and swampy
8 conditions a hundred years ago, then that interval from
9 zero to a hundred which wasn't classified as an aquifer
10 is -- and I think you classified it as semi-confined,
11 unconfined to semi-confined, maybe, or words to that
12 effect -- then it seems like there's some suggestion that
13 there was some relationship between that significant
14 water level decline that goes back to, if Mendenhall
15 started with a below-ground-surface of zero, or something
16 very close to that, or maybe a positive head at that
17 point, and then we come forward to today, a water level
18 that's a hundred feet below the ground, then we've taken
19 all that head off the shallowest formation. And so
20 depending on what's available surveywise, it seems like
21 some of the focus in this go-forward work might
22 worthwhile be focused there.

23 MR. MALONE: Yeah. Again, Francis, you can help
24 with some of the explanations of what the time period of
25 the model will simulate, but we were aiming to have the

1 model go back to these 1930s, hopefully, if we have
2 water --

3 MR. SCALMANINI: That's to calibrate against water
4 level data; right?

5 MR. MALONE: Calibrate against water level data.
6 And simulate compaction through the entire system, not
7 just the deep system but the entire system.

8 MR. SCALMANINI: Oh, okay. If you said that or
9 implied it, I just missed that.

10 MR. MALONE: We didn't say that, but that's our --

11 MR. SCALMANINI: The reason I bring it up -- and I
12 know Francis does some work up in what I call my neck of
13 the woods. You look at parts of the Sacramento Valley
14 where the head change has been pretty darn small and yet
15 we do have some inelastic subsidence that sort of boggles
16 the mind when you think of even numbers that are
17 comparable to this, 2 or 3 feet in localized places; yet
18 the static water level today is at 50 feet, you know, and
19 used to be at 20 feet. It's not like it's been huge or
20 anything dramatic like some other places like here --
21 meaning "here," the area we're talking about -- but it
22 nonetheless has occurred. So one has to wonder if you
23 can have that kind of thing in a setting like that. You
24 know, what's happened historically here when you had the
25 dramatic kind of water level change in the aggregate, not

1 just since 1989 or -- I heard what Dennis said about
2 maybe there being some deeper wells earlier. But
3 whatever the head change has been vertically distributed
4 over time.

5 Those are, I don't know, some, I guess you could
6 say thoughts or reactions to the go-forward.

7 MR. MALONE: There is some historical information
8 to indicate that some subsidence was occurring prior to
9 1990, that there was some fissuring that occurred located
10 a little bit further to the east than where the current
11 fissures are. But there were some fissures noted in the
12 early 1970s. But then we had this focused event that
13 occurred in the 1990s. So I know that occurs on a
14 backdrop of a long history of water level declines and
15 subsidence in Chino Basin.

16 MR. FORDHAM: If I can make a comment, please.

17 MR. FIFE: Before we go on, the reporter has been
18 going on for two hours. If there -- if we're going to
19 have a lot more discussion, maybe we could give her a
20 break. We are done with slides. Do you want to take
21 five minutes just to give the reporter a break?

22 MR. SCALMANINI: I have one other question.

23 SPECIAL REFEREE SCHNEIDER: I have some, so sure.

24 MR. FIFE: Let's take five minutes.

25 (Recess in proceedings from 2:28 to 2:58 p.m.)

1 MR. MALONE: Just a little clarifier here, that
2 this is again 2000 data. We don't have much -- we don't
3 have any recent InSAR data, at least, to indicate that
4 this is still going on. We do have some ground level
5 survey data in this area that indicates that in 2003,
6 2004 we have about an inch of subsidence in this area.
7 But I was reminded that we also have since 2000 some new
8 recharge programs that are going on up in this area that
9 may manifest themselves and have an effect in this area
10 at some point in time in the future if not already. So I
11 think maybe the additional InSAR and ground level survey
12 data that we collect in the future might show that.

13 SPECIAL REFEREE SCHNEIDER: Have you checked in
14 the area to the north that you're calling the central
15 part of the MZ1 for fissuring or any other problems
16 connected to subsidence?

17 MR. MALONE: Francis, you can probably talk a
18 little bit about this. We have just driven around a
19 little bit. Nothing beyond just some reconnaissance
20 driving around on the streets and looking.

21 SPECIAL REFEREE SCHNEIDER: No reports of
22 problems?

23 MR. MALONE: No reports that I'm aware of.

24 MR. RILEY: At the machine shop that's pretty well
25 established. That's, what, 200 or 300 feet north of

1 Schaefer Avenue.

2 MR. MALONE: That's down in this region here we
3 have some --

4 SPECIAL REFEREE SCHNEIDER: No. I meant in the
5 upper 12.

6 MR. RILEY: No. Up in there, no.

7 MR. MALONE: We've just sort of driven around and
8 not really recognized anything. And there's been no
9 reports.

10 MR. SCALMANINI: At the machine shop, that's where
11 they put their waste fluids, though, in that fissure?

12 SPECIAL REFEREE SCHNEIDER: The key reason for
13 this workshop was to check on work in progress and to
14 figure out what the status was of the efforts to deal
15 with the subsidence issues that were at hand in MZ1. And
16 I need to report back to the Court in a report of referee
17 which will be much briefer than the last one on this
18 issue as to how the work is going.

19 I think one of the things that will need to be
20 addressed by Watermaster probably in a motion to get a
21 revised order is when a long-term plan would be
22 completed. And I guess I'd just like to suggest that it
23 would be worth thinking about what that schedule might
24 look at. And I pose the question on whether it would
25 make sense to try to phase the work in MZ1 potentially to

1 come up with a workable pumping regime in the lower area
2 that has been the focus of this effort, with potential
3 phases with separate schedules for areas to the north.

4 I don't know how much you could address or Mark
5 could address, but it would be interesting to see how
6 this comes together in terms of when you get to a
7 long-term plan. That's what the Court was hoping to hear
8 about, and it's not on the schedule here. My sense is it
9 hasn't been given a whole lot of attention.

10 MR. MALONE: Do you want to take that, Mark, or do
11 you want me to --

12 MR. WILDERMUTH: When you say given a lot of
13 attention, you're referring to the actual plan?

14 SPECIAL REFEREE SCHNEIDER: I'm referring to the
15 need to get to a long-term plan as being what the Court
16 was interested in in the order he signed in 2000; that he
17 had hoped there would be a long-term plan by July of this
18 year. There isn't. But when will there be? And is
19 there some merit in thinking about phasing the future
20 work so that perhaps you can get to a long-term plan,
21 which, of course, could be changed over time, but still
22 it would be a long-term plan with a pumping regime of
23 some sort to address the issues that have been the focus
24 of the work, and then in subsequent phases go to the
25 north. Is that a conceivable way of looking at it?

1 MR. WILDERMUTH: In my professional opinion, yes.
2 And I think to be clear, we haven't felt until very
3 recently, last maybe six or eight months, that we were at
4 a point where we were getting close to coming up with
5 conclusions from which we could build a plan on, pull the
6 parties together and talk about their deal making to
7 implement a plan.

8 So I think we have been thinking about it, but
9 we've just been postponing the deal portion of it, the
10 actual how you put it together, until after we get enough
11 technical information that the group would -- that we
12 could buy in. So I would suggest that what you're saying
13 makes a lot of sense, that we break it into maybe a
14 southern portion and central portion, try to get the
15 southern portion going, and then based on the interests
16 of the stakeholders, do something in the central area.

17 SPECIAL REFEREE SCHNEIDER: Thanks. Does anyone
18 else have questions or brief comments that they would
19 like to make? Mr. Bunn.

20 MR. BUNN: Could I just make a comment on the last
21 point. I'm Tom Bunn. Many of us in the room are seeing
22 this information presented in this format for the first
23 time at the same time that you are. And it is my feeling
24 that what I at least as an attorney have got today
25 significantly advances what I know about this situation

1 here. And I think that this is a milestone of sorts that
2 we now can do some sitting down and figuring out whether
3 we're in a position to start formulating a long-term plan
4 now, whether we want to await the results of the model in
5 spring '06 to formulate the plan and so forth. So you
6 might have some better information on that within just a
7 few weeks.

8 SPECIAL REFEREE SCHNEIDER: Thank you. Is there
9 anyone else?

10 MR. HENSLEY: Mark Hensley, Chino Hills. I agree
11 to some extent, and Dr. Williams couldn't stay this
12 afternoon, which is unfortunate. But he still has a
13 number of questions with regard to a number of the
14 questions that Mr. Scalmanini raised about the historical
15 pumping. And there's a lot of information about how much
16 has been taken out of the ground over the course of the
17 last 70 years and subsidence that occurred prior to 1990
18 and those kinds of issues. I think -- and if that's
19 important for purposes of coming up with a long-term
20 plan, I think that those issues are probably going to
21 slow down that long-term plan. How much I don't know.
22 How much agreement there will ever be amongst the
23 parties, I don't know the answer to that either. And I
24 think those are pretty significant issues.

25 There's been a focus on a very small period of

1 time with regard to what's occurred when you've got a
2 basin that's been operating for 70, 80 years. I'm not as
3 confident that we're going to move as quickly as perhaps
4 others. Not that I don't want to, candidly. This is a
5 slow and tortuous process generally. And I think it
6 moves too slowly. I'd like to see it improve. I don't
7 know how to do that. But Chino Hills will continue to
8 cooperate in trying to come up with solutions.

9 But I know when all of the parties get together
10 and try to work out the solutions, again it's a very
11 painful process. I don't have as much history as some
12 others do, but at least the seven or eight years I've
13 been participating, it takes two or three years just to
14 agree generally on relatively minor issues.

15 SPECIAL REFEREE SCHNEIDER: So you'd agree it
16 makes sense to push for some sort of a schedule, though;
17 right?

18 MR. HENSLEY: I think so. Yeah, I think there
19 should be some schedule. I'm not quite certain when you
20 talk about a long-term plan what that means. I think
21 there's not going to be a willingness on the majority of
22 the parties to address those solutions.

23 It's one thing to say, well, don't pump more than
24 X amount. I'm not a technical person. I'm sure that
25 comes right through. But it's easy to say you can only

1 pump up to X amount from a portion of the basin. Well,
2 then what? Where do you take the water from? Where do
3 we get the replacement water from? Simply moving to
4 another area of the basin may not be a good answer if
5 there's starting to be subsidence in some other areas of
6 the basin. It's moving our problems from one area to
7 another. That may not be a good long-term solution.

8 SPECIAL REFEREE SCHNEIDER: I think your comment
9 goes to the question of how difficult coming up with an
10 agreement will be. I was concerned more on focusing on
11 how to characterize what the technical work will be going
12 forward, whether there is some discrete amount of
13 technical work that, when completed, would allow that
14 agreement process to proceed, maybe before a whole lot
15 more work were to occur to the north. And that's just a
16 question I leave for the technical advisory group to
17 consider.

18 I think we're through on a technical basis here.
19 I think you did a great job, Andy. Very long and
20 complicated presentation.

21 MR. MALONE: Thanks. I want to make one comment
22 on the cooperation comment that Mark just had. We got
23 incredible cooperation from all the pumping parties down
24 in this part of the Basin, the State and Chino and Chino
25 Hills, all the way along in terms of installing the

1 transducers and controlling the pumping. And all this
2 work couldn't have been done without the help of their
3 staff from the field level, you know, up into Mike and
4 Dave at Dave's level at these agencies. So we really got
5 a lot of cooperation, and they all seemed to us to be
6 genuinely interested in the scientific study that we've
7 been pursuing here. Just want to make that statement.
8 It's been a while since you've been here. I don't think
9 that we've ever expressed that.

10 SPECIAL REFEREE SCHNEIDER: That's good news.

11 MR. SCALMANINI: I would certainly second that.

12 Although I have been here for a couple of technical
13 committee meetings on occasion, and I've seen the ongoing
14 work a little more frequently. But I sure second that
15 and salute others, as you do, for their cooperation.

16 MR. FIFE: Thank you. And that's the workshop.

17 (TIME NOTED: 3:10 p.m.)

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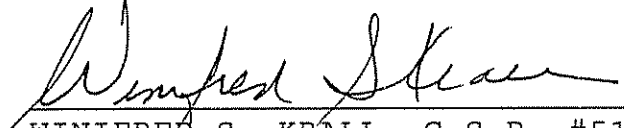
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