STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

APPLICATION OF AMERADA HESS)
CORPORATION FOR A WATERFLOOD) CASE NO. 10252
PROJECT, LEA COUNTY, NEW MEXICO.)
)

REPORTER'S TRANSCRIPT OF PROCEEDINGS
EXAMINER HEARING

BEFORE: DAVID R. CATANACH, Hearing Examiner
September 19, 1991
10:45 a.m.
Santa Fe, New Mexico

This matter came for hearing before the Oil Conservation Division on September 19, 1991, at 10:45 a.m. at the State Land Office Building, 310 Old Santa Fe Trail, Santa Fe, New Mexico, before Linda Bumkens, CCR, Certified Court Reporter No. 3008, in and for the County of Bernalillo, State of New Mexico.

FOR: OIL CONSERVATION DIVISION

BY: LINDA BUMKENS CCR
Certified Court Reporter
CCR NO. 3008

I N D E X

September 19, 1991
Examiner Hearing
CASE NO. 10252

E X H I B I T S

A P P E A R A N C E S

FOR THE DIVISION:	ROBERT G. STOVALL, ESQ. General counsel Oil Conservation Commission 310 Old Santa Fe Trail Santa Fe, New Mexico 87501
FOR AMERADA HESS CORPORATION:	CAMPBELL, CARR, BERG & SHERIDAN P.A. BY: MR. WILLIAM F. CARR, ESQ. 110 North Guadalupe Santa Fe, New Mexico
FOR MERIDIAN OIL INC:	KELLAHIN, KELLAHIN & AUBREY BY: MR. TOM KELLAHIN, ESQ. 117 N. Guadalupe Santa Fe, New Mexico 87504

EXAMINER CATANACH: Call the hearing back to order at this time. Case 10252.

MR. STOVALL: The application of Amerada Hess Corporation for a waterflood project, Lea County, New Mexico.

EXAMINER CATANACH: Are there appearances in this case?

MR. CARR: May it please the Examiner, my name is William F. Carr with the law firm Campbell, Carr, Berge & Sheridan of Santa Fe. I represent Amerada Hess Corporation and I have four witnesses.

EXAMINER CATANACH: Other appearances?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin, Kellahin & Aubrey appearing today on behalf of the Meridan Oil Inc. I do not have any witnesses to be sworn.

EXAMINER CATANACH: Will the witness please stand to be sworn in?

(At which time were sworn.)

WILLIAM S. HOLDER,

the Witness herein, being duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CARR:

Q. Will you state your name for the record,

please?

A. My name is Bill S. Holder.

Q. And where do you reside?

A. I reside in Tulsa, Oklahoma.

Q. By whom are you employed?

A. Amerada Hess Corporation.

Q. And in what capacity?

A. As a petroleum land man.

Q. Have you previously testified before the New Mexico Oil Conservation Division?

A. No, I have not.

Q. Would you briefly summarize your educational background and then review your work experience for Mr. Catanach?

A. I received my bachelor of arts degree in 1980 from Westminister College. I have been a petroleum land man since 1982 when I was first employed by Bremmer Oil Company subsequently employed by Irish Petroleum and Kaiman Resources, and now Amerada Hess.

Q. In all those capacities you've worked as a petroleum land man?

A. Yes, that's correct.

Q. Are you familiar with the application filed in the case?

A. Yes, I am.

Q. And are you familiar with the status of the lands involved in the proposed north Monument Grayburg/San Andres Unit in this area?

A. Yes, I am.

MR. CARR: We tender Mr. Holder as an expert witness in petroleum land matters.

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Carr) Would you briefly state what Amerada Hess Corporation seeks in this case?

A. We seek approval of a waterflood project for the North Monument Grayburg/San Andres Unit.

Q. And this unit area was previously approved for statutory unitization by the Division Order R-9494?

A. That's correct.

Q. Are you the individual who has been responsible for obtaining ratifications of that order from the working interest owners and the royalty interest owners in the unit area?

A. Yes, I am.

Q. Has Amerada reviewed the unit agreement and received final approval from the Bureau of Land Management?

A. Yes, we have.

Q. Could you identify what has been marked as Amerada Hess Exhibit Number 1, please?

A. That is a certification determination from the BLM.

Q. And this is their final approval?

A. Showing their final approval of the unit subject to the OCD's approval.

Q. Has this -- and it is subject to receiving authorization for the waterflood project from this Division?

A. That's correct.

Q. Has this application been reviewed -- the unit application -- with the Commissioner of public lands?

A. Yes. We have received preliminary approval and we seek final approval tomorrow. We have a meeting tomorrow at 9:00 a.m.

Q. What percentage of working interest owners in the unit area have at this time ratified the division unitization order?

A. We have a little bit in excess of 91 percent.

Q. Could you identify what has been marked as Amerada Hess Exhibit Number 2, please?

A. Yes. This is a report that shows the

percentage ratified on a per-tract basis and totaled on a unit basis.

Q. And this exhibit addresses the working interest ownership?

A. That's correct.

Q. Could you identify what has been marked as Amerada Hess Exhibit Number 3?

A. This is a similar report that covers the royalty owner ratifications showing that we have in excess of 81 percent ratification.

Q. So at this time you have received sufficient ratifications to cause this unit to be statutorily unitized?

A. That's correct.

Q. In your opinion, has Amerada Hess made a good faith effort to locate and secure voluntary participation of all the interest owners in the area?

A. Yes.

Q. And have you attempted to identify and provide notice of this application for approval of a waterflood project giving all those parties again notice of the application and hearing?

A. Yes.

Q. Could you identify what has been marked as

Amerada Hess Exhibit Number 4, please?

A. Yes. This is an affidavit of notice and there are two parts to it. Actually, the second part here was sent out prior to our April 4th hearing, which we originally anticipated having our C-108 hearing, and the second part, which is the top affidavit, represents a second attempt to reach those people that we couldn't reach the first time around.

Q. So what we have here is the notice that was provided when the case was originally called last April, and in the top portion of this is a separate affidavit with individuals who you have either identified or were unable to reach during the first effort to provide notice?

A. That's correct.

Q. In your opinion, has notice been provided to all parties to whom notice has been required to be given by the rules of this Division?

A. Yes.

Q. Were Exhibits 1 through 4 prepared by you or compiled under your direction?

A. Yes, they were.

MR. CARR: At this time, Mr. Catanach, we would move the admission of Amerada Hess Exhibits 1

through 4.

EXAMINER CATANACH: Exhibits 1 through 4 will be admitted as evidence.

(Amerada Hess exhibits 1 through 4 were admitted in evidence.)

MR. CARR: That concludes my examination of Mr. Holder.

EXAMINATION

BY MR. CATANACH:

Q. Mr. Holder, the subsequently notified parties, why were not those parties -- why were you not able to notify those parties?

A. Well, when we did our initial check for the surface owners that were under the injection wells and all the operators surrounding the injection wells, we came up with addresses that we didn't receive a return receipt card on, and we went back and checked -- did a little further checking -- and found a couple more, or, I think, about ten more.

Q. So these parties represent surface owners?

A. Right. And we obtained some information from -- we reviewed the county clerk records, the tax assessor's records, and checked the phone books, city directories, and first time around some of the addresses with -- that are of record -- were bad

addresses, and so we reviewed them again. Some of them had changed and we mailed that to the new addresses.

Q. Are any of these mineral interest owners?

A. No. Well, they could be mineral interest owners. Some of them could be.

EXAMINER CATANACH: I have no further questions. Mr. Kellahin, do you have any questions?

MR. KELLAHIN: No questions.

MR. CARR: At this time we will call Mr. Kline.

GARY L. KLINE,

the Witness herein, being previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CARR:

Q. For the record, will you state your name and place of residence?

A. Gary L. Kline, Tulsa, Oklahoma.

Q. By whom are you employed and in what capacity?

A. I'm employed by Amerada Hess Corporation as a professional geologist.

Q. Were you the expert geological witness who

testified in the statutory unitization case last April?

A. Yes, I was.

Q. And your qualifications as an expert in the field of geology were accepted and made a matter of record at that time?

A. Yes, they were.

Q. Are you familiar with the application filed in this case?

A. Yes.

Q. Have you made a study of the portion of the Unit Monument pool that is involved in this particular waterflood application?

A. Yes, I have.

MR. CARR: Are the witness's qualifications acceptable?

EXAMINER CATANACH: They are.

Q. (By Mr. Carr) Have you prepared certain material for presentation here today?

A. Yes, I have.

Q. Mr. Kline, would you review for the Examiner how the proposed injection interval is actually defined?

A. The interval is defined from the top of the Grayburg formation to the base of the San Andres

formation, and the reference-type well is the Abo Unit Number 1 in the southwestern portion of the unit.

Q. Could you refer to the material behind tab Roman numeral VIII in the form C-108, which is our Exhibit Number 6, and using this briefly describe for Mr. Catanach the formation that is involved in this application?

A. The geological information is provided in Section 8, and this preliminary pertains to Grayburg formation and the San Andres Unit. The Grayburg is the formation of interest for the waterflood, and the San Andres will be the source of injection water for that waterflood.

The Grayburg primarily is a heterogeneous sequence of interbedded dolomitized mud stones, wackestone, packstones, and grainstones with some additional silty and sandy dolomite.

The Grayburg Unit itself varies from 350 to approximately 400 feet with an average thickness of 375 feet, and the top of the Grayburg will be encountered at a depth from between 3250 to 4,000 feet depending upon the structural -- depending upon the position of the well relative to the structure of the formation and also the surface elevation of

the well.

The Grayburg itself is divided into four units, each with distinctive lithologic and textural differences which effect the distribution and nature of porosity and permeability development perfect.

The better quality reservoir occurs at the lower most part of the Grayburg, and poorest reservoir quality occurs in the upper most part of the Grayburg. Vertical continuity of flow units within the Grayburg decreases upwards within the section, and lateral continuity of the flow units is best developed in the lower portion of the Grayburg where the flood would be conducted. And the stratigraphic continuity of flow units as we go up in the section becomes more segregated at linticular and discontinuous.

The San Andres formation is primarily a mass of thick dolomite with some interbedded sands and silts, and the upper most part of the San Andres may contribute some oil, but lower in the section is where we plan to source our injection water.

The top of the San Andres will occur at approximate depths of 3620 to 4220 feet, and for the most part, the San Andres is approximately 1,000 feet thick. Based upon information available, there

are no known faults that cut the San Andres and Grayburg Units that may act at conduits for gas or oil or brine fluids from depths into fresh water aquifers near the surface.

Q. Now, there are fresh water zones in the area?

A. Yes, there are.

Q. Could you identify those, please?

A. In the proposed North Monument Grayburg/San Andres Unit, which is about ten miles southwest of Hobbs, we have primary fresh water zones in the Quaternary alluvium, the Pliocene Ogallala formation and also other fresh water zones are likely to be present in the Triassic red bed zones of the Chinle and Santa Rosa formations.

The Quaternary aquifers present in the area are recent unconsolidated to semi-consolidated fine to medium-grain sandstones which are primarily localized extent. They consist primarily of dune sands and channel fill and lake deposits. For the most part, these occur in the southern part of the unit. They will likely be 100 feet thick, and they lie unconfirmably upon some of the Ogallala formation, and they will vary in thickness from 5 to 80 feet thick.

The Pliocene Ogallala aquifer on the other hand, is a heterogeneous complex of terrestrial sediments consisting of calcareous, unconsolidated sand with interbedded clays, silts and gravels, and these will exhibit some rather rapid facies changes.

For the most part, the Ogallala varies from 0 to 300 feet thick, and the Ogallala is exposed at the surface in the northern part of the unit. There is some evidence that due to the erosional nonconfirmity that has been removed in the southern part of the unit, but were present in the northern part, we anticipate the thickness to vary between 50 and 150 feet, and this will be due to erosional nonconfirmity bounding the units.

Within the Quaternary and the Ogallala deposits within the unit area, the aquifer's first water table is likely to vary from a depth of 5 to 55 feet.

Now, additional fresh water aquifers can be anticipated in the Triassic red beds in the Chinle and Santa Rosa, and there is some evidence that these may occur very near the surface depending upon the nature of the erosion, and they are likely to be anticipated anywhere from approximately 5 to 150 feet below the surface.

The Chinle formation is primarily a red and green clay stone with some minor sands that primary aquifers in the red beds are going to occur in the Santa Rosa formation where you have primarily medium to fine-grained sand with interbedded clay and silt stones.

Now, the red beds overlie the Permian, Rustler and anhydrite of the unit, which is considered the effective base of the red beds, and so the base of the red beds will occur anywhere between 970 and approximately 1,470 feet. The reservoir anhydrite is considered an impermeable barrier, and it will vary approximately about 65 feet, and it will provide a barrier to the contamination of fresh water zones higher up in the section, and is likely to prohibit the movement of brines and oil or gas from below.

No known fresh water zones occur below the Rustler anhydrite. Consequently, in all new wells protection for fresh water zones will be a procedure. Cement will be circulated to the surface around casing on these wells to protect the fresh water zones.

Q. Based on your review of the geology and the plans of Amerada Hess for this waterflood project,

do you have an opinion as to whether or not the proposed waterflood poses any threat to any underground source of drinking water?

A. Not to my knowledge.

Q. Were these portions of the material that you've just reviewed, which are included behind tab 8 and our Exhibit 6, were they prepared by you?

A. Yes.

MR. CARR: Mr. Catanach, I will move the admission of that portion. Later I will move the admission of all of Exhibit C-108, which is our Exhibit 6. I will not do that at this time, however. And that concludes my direct examination of Mr. Kline.

EXAMINER CATANACH: Okay. So you didn't want to enter anything at this time?

MR. CARR: I don't think so. It is part of Exhibit 6 and the remainder of the exhibit will be testified to later.

EXAMINER CATANACH: Okay.

EXAMINATION

BY MR. CATANACH:

Q. Mr. Kline, is it Amerada's intent to waterflood only the Grayburg formation?

A. The waterflood may occur in some of the San

Andres. The boundary between the San Andres and the Grayburg is not always well defined, and on the crest of the structure we do have oil in the upper part of San Andres.

Q. Is it the intent to flood each of the four units that you've described in the Grayburg formation?

A. The oil is contained primarily in the lower most part of the Grayburg, primarily in zone 3C and lower part of 3, and this will be the primary target of our waterflood. The upper portion of the unit is highly stratified, vertical continuity is poor. It is likely that any flooding of this unit will be very, very difficult.

Q. At this point you only intend to flood Zones 3 and 3C?

A. That will be the primary target, yes, sir.

Q. Okay.

MR. CATANACH: I believe that's all I have. Mr. Kellahin, do you have anything?

MR. KELLAHIN: Point of clarification, Mr. Examiner. Mr. Kline has sponsored only this portion of the presentation that deals with geologic data insofar as it defines and locates the fresh water.

MR. CARR: That is correct.

MR. KELLAHIN: Do you have another geologic witness?

MR. CARR: No, we do not.

MR. KELLAHIN: Let me ask Mr. Kline a few questions about the geology. Mr. Carr, do you intend Mr. Kline to sponsor Exhibit Number 7?

MR. CARR: No, we have an engineering witness who will sponsor the cross section.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Let me ask you a few questions about the geology, Mr. Kline. When we look at the distributions of hydrocarbons within the unit boundaries and the relationship of those hydrocarbons to the potential water, is there a water component geologically as you investigate through the top of the Grayburg down through the base of the San Andres?

A. Are you talking about fresh water or the brine water of the formation?

Q. Any kind of water.

A. Primarily the water that we see here is formation water. It's brine water natural to the formation which has been a part of the influx due to

production.

Q. Okay. That water component of production, can you as a geologist define where the top of that water is?

A. This will be part of our data acquisition to define this. We will be using various lugging techniques to define where this water is at occurring times.

Q. Is there a separation of the hydrocarbons so that at some point in this Grayburg interval you find predominantly gas production as opposed to oil production?

A. Well, it all depends on where you are within the unit, and we do have gas. We have a gas-oil contact at approximately a subsea depth of minus 150, and there is gas production within the unit.

Q. Is there a geological explanation for the points in the unit in which gas is accumulated in the reservoir? Is there a structural component to the reservoir?

A. Yes. I'd like to say that this is a north trending anticlinal feature, and that the structure of the -- of the unit is primarily in the center of the proposed unit.

Q. The gas wells that occur within the unit boundary are found then on the highest point in the structure?

A. I would like to defer that to the subsequent testimony, if I may.

Q. That is not something that you were involved in analyzing?

A. No.

Q. Did you participate in the preparation of Exhibit Number 7 that's part of the presentation?

A. No, no.

MR. KELLAHIN: I have no further questions. Thank you.

EXAMINER CATANACH: The witness may be excused.

MR. CARR: At this time we call Jim Almrud.

JIM ALMRUD,

the Witness herein, being duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CARR:

Q. Will you state your name for the record, please?

A. James Almrud.

Q. Where do you reside?

A. In Seminole Texas.

Q. By whom are you employed?

A. Amareda Hess Corporation.

Q. And what is your current position with Amerada Hess?

A. I'm the manager of technical services for the southwest region office, which area of responsibility includes the Monument area.

Q. Have you previously testified before the New Mexico Oil Conservation Division?

A. No, I have not.

Q. Could you briefly review for Mr. Catanach your educational background?

A. I have a bachelor of science degree from the University of Wyoming in 1969.

Q. And since graduation for whom have you worked?

A. I have worked for Husky Oil Company for two years, and in 1971 I joined Amerada Hess Corporation and have been employed with them since in various engineering and managerial positions.

Q. Are you familiar with the waterflood application that has been filed on Amerada Hess's behalf in this particular case?

A. Yes, I am.

Q. And are you familiar with the proposed North Monument Grayburg/San Andres Unit and the lands and wells that are located within the unit area?

A. Yes.

MR. CARR: We would tender Mr. Almrud as an expert witness in petroleum engineering.

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Carr) Are you the person in Amerada Hess who's been responsible for preparation of the waterflood application for this unit?

A. Yes, I have.

Q. Could you review for the Examiner what work has been done on this proposed project? And I think initially what I'd like you to do is focus on what has been done since the April 4th hearing when the case was originally scheduled.

A. The original development plan for the unit was based on very limited information on the reservoir, primarily on core data obtained from one well big the Monument Abo Unit Number 1. It's the only modern logs and the only core available in the whole field. So since the April hearing we have gathered additional information, primarily bottomhole pressure information for the purposes of

evaluating the need for infield drilling during the flood process.

We've also reviewed the operations and results of two surrounding waterflood in the Grayburg, and we are in the process of modifying our development plan for this unit area.

Q. Generally speaking, what sort of modifications are you talking about?

A. We're talking about adding one year to the development plan primarily for the purposes of gathering data so that we can optimize our flood plan for the development of the field. This one year period -- or during this one year period we hope to -- or we plan on -- drilling ten wells directly for the purposes of obtaining modern core and modern log information which will be further analyzed and which we think will have a major impact on the plan and development of the field.

Q. Is Amerada Hess Exhibit Number 5 a copy of the current plan for development for this project?

A. Yes, it is.

Q. And has copies of this been provided to both the Bureau of Land Management and to the State Land Office?

A. To the Bureau of Land Management, yes. To

the State Land Office tomorrow morning.

Q. Okay. Can you identify what has been marked as Amerada Hess Exhibit Number 6?

A. Exhibit Number 6 is a completed C-108 application. It contains the information requested on the C-108 form itself and is organized and separated by tabs. These tabs are numbered Roman numerally compatible with the C-108 form itself.

Q. And the first document in the beginning of the exhibit is the form C-108?

A. Yes. And it's behind the tab marked C-108.

Q. And let's go to the material behind the tab marked Roman numeral III, and I'd ask you to identify that, please, and review it.

A. The information behind the tab marked Roman Numeral III is that information requested on the form under Roman numeral. The first part of this is a plat and a table showing the proposed well numbering scheme for the unit. The tabular data gives the proposed block and well number for each well that will be contained within the unit boundary. It has the lease and well number, API number, location of each well by unit, section, township and range, and the current operator of each of those leases.

Following that is the information requested in part three about the proposed injection wells. Once again, the first portion of this information is in tabular form, and we have the proposed block and well number, the leased name and well number, the API number, the location by unit, section, township and range, the operator, the status, and also the location by footage for each of these proposed injection wells.

Following this are wellbore schematics which were prepared on each of the existing wellbores which will be converted to injection. These wellbore schematics give information on total depth, the Kelly bushing elevation, the date drilled, information on casing, cementing details, open hole portion of the wellbore, perforations, information on stimulations, squeezes, tubular data, information on packers, bridge plugs, cement plugs. I think that pretty well covers it.

Q. Everything required by form C-108?

A. Yes, sir.

Q. And behind that in this exhibit, the next yellow tab, what is the information?

A. This is information that we included on typical injection well conversions. It's behind the

yellow tab marked typical injection well schematics.

The first schematic is a typical well before conversion, which is one of the wells that we took at random and used as an example. Following that is a typical completion of a well with two strings of casing showing tubing, packer, and perforations.

The next is a typical completion on a well with three strings of casing showing the same information. This is followed by schematics of wells with three strings of casing and open hole, and three strings of casing with open hole and casing perforations.

Following that is a typical drawing for a proposed newly drilled injection well. On all of these typical wellbore drawings is also the information requested by the form regarding such things as the injection formation, the field and pool name, whether or not the well was drilled or will be converted for injection, any other perforations existing in the wellbore, and information on the overlying and underlying producing zones.

Q. Does this also show information on the cementing that will be used in the extent of cement

circulation?

A. Yes, it does. Yes.

Q. All right. At full development, how many injection wells do you anticipate having in this unit area?

A. There will be 108 full waterflood patterns containing 108 injection wells. Nine of these wellbores will definitely have to be redrilled. We have identified that they do not exist today. There are also 16 temporarily abandoned wellbores which we will anticipate on converting, and we are anticipating that we may have to redrill as many as 50 percent of these, and that's just the number that is based on experience, and we don't have any firm idea at this time.

Q. You haven't identified any particular well?

A. No, we haven't at this time.

Q. Will the annular space in the injection will be filled with insert fluid, and will the injection wells be, in all respects, be operated in accordance with the requirements of the Federal Underground Injection Program?

A. Yes, they definitely will be.

Q. Let's go to the material behind tab Roman numeral V in this exhibit, and I'd ask you to

identify that and review it for Mr. Catanach?

A. The information contained behind tab five is a two-part plat showing the area of review. It is identical to the area of review map on the wall. This map, or plat, shows all the currently proposed injection wells within the unit boundary. It identifies the unit boundary itself. It shows the lease ownership within two miles of the unit boundary, and also identifies all the wells in ownership within the half mile area of review surrounding each injection well.

Q. What plans do you have for injection in wells along the outer edge of the unit area?

A. There are two wells along the outer edge, particularly in the southwest corner. Wells proposed to be numbered 1813 and 1815, which directly offset the units Monuments to unit expansion area B. We propose to negotiate a lease line injection agreement with Chevron in the very near future.

Q. And you may have already testified to this, but what sort of an injection pattern are you proposing to utilize?

A. This will be an 80-acre five spot pattern.

Q. Let's go to the information behind tab

Roman numeral VI. I'd ask you to identify and review that.

A. The information behind Roman numeral VI is broken into four parts divided by yellow tabs. The first of these is information on the unit area producers. Part six of the C-108 requests information on all wellbores which penetrate the injection zone.

The information behind that first tab is in two forms. Firstly, tabular information -- tabled information -- on the proposed well numbers, the lease name, API number, location by unit, section, township, range, operator and status followed by schematic drawings on each of the wellbores which penetrate the zone of interest and will be producing from the unitized interval.

Following this is a tab marked other wells in the area of review. This is information on other wellbores which penetrate the unitized interval, but will not be used to produce from either because they're producing from deeper horizons or they're outside the unit area.

Q. So these will be nonunit wells?

A. They will be nonunit wells. Following that is information on plugged and abandoned wells both

inside and outside the unit boundary as the tabs indicate, and it's also contained in tabular and schematic form.

Q. And did the schematics for these plugged and abandoned wells show all plugging data?

A. They show all of the wellbore abandonment plugs that we were able to identify from the records of the companies and the records of the OCD Division in Hobbs.

Q. How many plugged and abandoned wells are there in the areas of review?

A. We have identified 50 wellbores. There's 28 inside the unit area, 22 outside the unit area.

Q. And have you reviewed all the data on each of these plugged and abandoned wells?

A. Yes, we have reviewed it, and we've also reviewed it with Jerry Sexton of the Hobbs division office. In doing so we have identified 23 wellbores which may have to be reenter and have remedial work done on them because of their abandonment techniques used at the time.

Q. Do you intend to do this work before you get into an injection phase?

A. Yes, we do.

Q. What is the source of the water that

Amerada Hess proposes to inject?

A. We are proposing to use water from two sources. The first is produced water from the Grayburg producing well. Additional volumes required will be taken from make up wells, water supply wells, which will be drilled to the lower Andres. We're proposing possibly as many as four of these wells. Two of them are being proposed to be drilled in 1992 as far as the data acquisition program that we talked about earlier.

Q. Are the locations of these first four proposed water supply wells indicated on the plats in Exhibit Number 5, which is the plan for development?

A. Yes, they are identified there.

Q. What is going to be the maximum daily injection rate per well?

A. The maximum rate anticipated at this time is 1,000 barrels per day initially, and probably closer to 750 barrels a day at Phillip.

Q. And will this be an open or closed injection system?

A. This will be a closed system.

Q. Will you be initiating by gravity or under pressure?

A. We will be injecting initially with gravity -- just on the gravity system, but as we approach fill up, we'll be injecting under pressure.

Q. At this time what is the maximum injection pressure you anticipate needing to use?

A. 710 PSI is the number we used.

Q. Will a pressure limitation of 2/10ths pound per foot of depth to the top of the injection interval be satisfactory for your purposes?

A. Yes.

Q. Do you request authority to increase the injection pressure without the necessity of further hearings if it can be demonstrated to the division that a higher injection pressure would not cause the injection fluids to escape from the injection interval?

A. Correct.

Q. Could you refer to the water analyses for the injection fluids that are located behind tab Roman numeral VII in this exhibit?

A. The information behind tab in the second page is information on water capability tests which were run by an independent laboratory on waters obtained from Grayburg producing wells mixed with water obtained from water supply wells in the Eunice

Monument South Unit. Waters were mixed in various proportions and the report shows that the waters are compatible.

Q. Let's go now to the material behind tab 9, and I'd ask you to identify and review that.

A. The information behind tab 9 is proposed stimulation information on typical injection well. It states that wells with cased hole completions will be treated with upwards of 3,000 gallons of 15 percent hydrochloric acid, and wells with open hole completion will be completed with upwards of 3 to 5,000 gallons of 15 percent hydrochloric acid.

Q. Are logs of all the proposed injection wells on file with the Division?

A. Copies of all the logs that exist are on file with the Division. We did identify four wellbores, which are listed behind tab Roman numeral X, which do not have logs available on them. We are proposing that we will log these wells upon first entry, and file those logs with the Division prior to conversion to injection.

Q. Let's go now to tab 11. Would you refer to the material behind that and review the water analyses on the fresh water wells with Mr. Catanach?

A. Behind tab 11 is a plat showing the locations of four fresh water wells which were sampled, and behind that are the laboratory analysis by an independent lab showing the analysis of the water. It all indicates that this is fresh water, I think, from the Ogallala formation.

Q. Are you aware of similar applications that have been granted for enhanced recovery by waterflooding in the same general area as the subject unit and water -- proposed waterflood project?

A. Yes. We have identified several. One is the Eunice Monument South Expansion Area B, which directly offsets our unit. It's identified by the blue-colored area on this area of review map.

There's also the Eunice Monument Grayburg Unit operated by Green Hill Petroleum, as well as the Skaggs Grayburg Unit operated by Green Hill, and Conoco has a volunteer unit. It's called the Southeast Monument Unit in the area.

Q. Does Amerada Hess request an administrative whereby additional wells can be converted to injection without the necessity of additional hearings?

A. Yes, we do.

Q. In your opinion, will approval of this application for waterflooding result in the recovery of oil that otherwise would not be recovered?

A. Yes, that's right.

Q. Have you reviewed the available engineering data on the area in question?

A. Yes, I have.

Q. As a result of that review and examination, have you found evidence of any open faults or other hydrologic connections between the injection zone and any underground source of drinking water?

A. No, we have not.

Q. In your opinion, will approval of this application impair the correlative rights of any other interest owner in the area?

A. No, it will not.

Q. Will Amerada Hess call a witness to review particular questions concerning potential harm to offsetting nonunit producing wells?

A. Yes, we will.

Q. Were Exhibits 5 and 6 prepared by you, or compiled under your direction?

A. Yes, they were.

MR. CARR: At this time, Mr. Catanach, I would move the admission of Amerada Hess Exhibits 5 and 6.

MR. CATANACH: Exhibits 5 and 6 will be admitted as evidence.

(Amerada Hess Exhibits 5 and 6 were admitted in evidence.)

MR. CARR: That concludes my direct examination of Mr. Almrud.

EXAMINER CATANACH: Mr. Kellahin.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Almrud, for point of reference, it might be easiest to have you look at the display following Exhibit 3 -- Exhibit tab 3. There's a well numbering system shown on a map. Do we have the same book?

A. Yes, we do. Mine is a larger scale than yours is.

Q. I'd like to focus your attention on what is identified on this display as Block Number 21. Do you find that?

A. Yes.

Q. My understanding is that Meridian has a gas well in the Grayburg which would be located within Section 5, a portion of which is identified as Block 21, and it is more particularly located in the northwest of southeast of Section 5. Do you see the

gas well symbol?

A. I see the gas well symbol.

Q. Okay. When we look at Block 21, did you identify with Mr. Sexton whether or not you have any wells within Block 21 that will require any remedial action?

A. I don't recall off hand. I'd have to look at the specific information.

Q. Okay. Do you have a tabulation or a submittal to the Examiner of what Mr. Sexton has characterized as problem wells, or wells that require remedial action within the project?

A. I don't have it prepared in a format to submit, but I do have it here.

MR. KELLAHIN: May we ask post hearing that we obtain that information from him?

MR. CARR: Yes.

MR. KELLAHIN: Thank you.

Q. (By Mr. Kellahin) The plan of development, you've asked for the flexibility of being able to administratively alter injection wells. When we look at Block 21, the current plan shows two injectors?

A. That is correct.

Q. Do you foresee a need to alter the

injection pattern in Block 21?

A. I do not at this point in time based on that that is along the edge of the formation. It is getting higher structurally, and the target is thinning in that location.

Q. At this point in Block 21, do you foresee a future need for any additional injectors to complete a flood pattern in Block 21?

A. I do not at this point in time, no.

Q. The plan of operation -- well, let me say -- In Block 21 there are some temporarily abandoned well symbols within that block?

A. That is correct.

Q. Are those temporarily abandoned wells to be converted to producing wells?

A. All temporarily abandoned wells which directly offset injection wells will be converted to production as part of our plan of development if they are joined to the direct offset location. They may or may not. It was kind of left to the option of the people operating the unit at the time.

Q. Okay. When I look at Block 21 and see injector Number 3, 2103?

A. Correct.

Q. Looking to the south of that producer 2107,

that will be, in fact, a producer?

A. Yes, it will be.

Q. To the west of that is a temporarily abandoned well Number 6. Is that to be converted to production?

A. Yes, it is.

Q. Okay. Because it's a direct offset to that injector?

A. Yes.

MR. KELLAHIN: I believe that's all the questions I have. Thank you.

EXAMINATION

BY MR. CATANACH:

Q. Mr. Almrud, is it my understanding that you may at a later time propose to alter the injection wells? Change which wells are going to be injection wells?

A. I guess, as I stated earlier, it was our plan to gather data from these ten wells which we propose to drill early next year, evaluate the data, and that information could effect our ultimate development plan. It is possible that that would lead us to propose to our partners that we infield drill this field which would take the number of injection wells from 108 to significantly more than

that.

I do not anticipate at this point in time that we would change the injection pattern in that shifting it one way or another, I think, would be of any great advantage or disadvantage.

Q. Okay. It is further my understanding that you're not going to place any wells on injection for about a year; is that correct, while you do some further evaluation?

A. That is correct. Our existing thinking at this point in time is that we would probably not -- well, let me back off that. I'm sorry. We do plan on doing some injectivity tests in 1992 upwards of a four-well test for purposes of defining injection pressures, volumes, responses sort of thing, gathering as much information as we can early on. Injectivity prior to finalizing our full development plans, but we had not planned on putting a given section or portion of the field on total injection during 1992.

Q. Okay. Have you reviewed the completions of your proposed injection wells with Jerry Sexton?

A. No. I do not -- No. We did not specifically talk about the completion techniques on the injection wells.

Q. Okay. What you have talked with Jerry about are area of review wells?

A. We looked at all plugged and abandoned wellbores within the area of review, and looked for problems which he could identify as possible areas where the -- what they call a salt section was not definitely -- what do I want to say? -- isolated.

Q. And he's identified 23 wells that may need corrective action?

A. That is correct.

Q. 23 plugged wells?

A. These are plugged and abandoned wells, yes.

Q. Has an agreement been reached with Jerry as to -- is Amerada going to reenter all 23 of those wells, or is there still some talking going on between you and Jerry?

A. We left it that I would take that back to our management and we would review it, but we are going to endeavor to -- We'll make the formation, properly isolate it, and protect the upper horizons from any injection fluids, and it's our intent to do what is required to do that.

I guess -- you know, we will definitely review these, and if we find problems that we think possibly aren't quite as critical as Jerry did, I'm

sure we'll go back and review them with him with the hopes that some things might be negotiable, but we will endeavor to do exactly what is required.

Q. The proposed injection wells, or the schematics that you've presented as evidence, do those reflect the actual perforated and open hole intervals that you'll be injecting into, or his that -- is it too preliminary at this point to actually final?

A. It's too preliminary. We've only identified that in the typicals.

Q. That's just how --

A. That's how we propose to do them. These injection wells drawings are as the wells exist today.

Q. I see. So these in no way reflect what actual interval you'll be injecting into?

A. No. They do not, no.

Q. Okay. Have you had any discussions with Jerry concerning the producing wells within the area of review?

A. No. I showed him the information that we have in the C-108 here, and I guess we left it at that. It was Amerada Hess's responsibility to identify any problems with isolating the zone of

interest and, of course, we have direct interest in being sure that the injection interval is isolated in all of our producing wells and in all of our injection wells, and we have gone through the records and checked for correct amount of cement above shoe and above perforations, and there are very few wellbores that do not have the mandated -- I guess you might call it that -- volume from the regulations.

Q. You have identified those wells?

A. Yes. And some of -- I guess some of our future plans are hinged on dual completion wellbores that maybe don't have enough cement above the Grayburg at this point in time, but after the current operator goes in and squeezes off perforations in the Queen, the well would then qualify and then have the adequate amount of cement. So there are some that might not meet the requirements today, but they will meet the requirements before injection begins.

Q. Approximately how many producing wells, or any other type of wells besides plugged wells, are in the area of review?

A. Wells which we will have direct use of and contact with, injection wells and producing wells,

amount to at least 293.

Q. But I'm talking about the total number of wells within -- whether in or out of the unit that are out of the review wells.

A. In the area of review? In excess of 500.

Q. 500. Two things I'd like to get from you. A list of the 23 wells that Jerry has identified as problem wells as far as PNA?

A. We can supply that to you today.

Q. A list of other wells which you've identified as not having the adequate amount of cement behind the casing.

A. We can supply that to you today as well.

Q. And you may want to note on those that they will be squeezed by the current operator, or something like that if you know that that's going to occur?

A. The other complicating factor here is that the wellbores within the unit that were producing roughly a year ago, were put on a demand list, and we will demand that wellbore from each operator prior to unit -- or at the time of unitization, and each well operator has the choice of either submitting the wellbore or not submitting it.

If they choose not to submit, of course,

they'll be squeezing off the Grayburg zone and possibly converting the well into a Queen well or something like this, and our obligation has disappeared or is no longer there.

So I just offer that as a reason. It might sound like I was hedging a little bit, but I really wasn't. We don't know exactly which wellbores we're going to be dealing with in the future.

Q. I understand.

EXAMINER CATANACH: I believe that's all I have of the witness. You may be excused.

MR. CARR: At this time we call Mr. Hermann

JEFFERY B. HERMANN,

the Witness herein, being previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CARR:

Q. Will you state your name for the record, please?

A. Jeffery Bruce Hermann.

Q. Mr. Hermann, where do you reside?

A. Tulsa, Oklahoma.

Q. By whom are you employed?

A. Amerada Hess Corporation.

Q. And in what capacity?

A. I'm a petroleum professional engineer in a reservoir engineering group.

Q. Did you testify in April at the hearing when the statutory unitization application came before the Division?

A. Yes.

Q. And at that time were your credentials as a petroleum engineer accepted and made a matter of record?

A. Yes.

Q. Are you familiar with the application filed in this case seeking approval of a waterflood project for the North Monument Grayburg/San Unit?

A. Yes, I am.

MR. CARR: Are the witness's qualifications acceptable?

EXAMINER CATANACH: They are.

Q. (By Mr. Carr) Mr. Hermann, have you reviewed the proposed unit operations to determine if they will have an adverse effect on offsetting nonunit producing wells?

A. Yes. We have our review or proposed unit operations. In particular in the vicinity of Meridian's Number 1R Laughlin gas well which is located in the northeast quarter -- the southeast

quarter of Section 5, Township 20 South, Range 37 East. We did that in part because Meridian had previously asked us to exclude that 40-acre parcel from the unit, and that particular situation was discussed at our hearing in last April.

Q. Have you prepared an exhibit for presentation here today?

A. Yes.

Q. Is that what has been marked as Amerada Hess Exhibit Number 7?

A. Yes, it is.

Q. Would you identify this and review it for Mr. Catanach?

A. We have prepared a structural cross-section to include Meridian's gas well. There's a little location map in the lower left-hand corner of this exhibit that shows where this cross-section is located. It starts at unit producer 1606 on the left-hand side of the exhibit, runs due south to Meridian's gas well, and then due east to unit producer 2216.

In all, it shows 6 proposed unit producing wells, four proposed unit injection wells, the original well on Meridian's tract which is now plugged and abandoned, and that well was abandoned

back in the'70s, and their current gas completion, the Number 1R well.

We have highlighted in red Meridian's current gas completion interval. It is from minus 23 feet to minus 77 feet, and what we've identified as lower Grayburg Zone 2 and Upper Grayburg Zone 3.

In contrast, our target waterflood interval will be confined largely to Grayburg Zones 3 and 3C between the original gas/oil contact of minus 150 and the original water/oil contact of minus 350. We have highlighted that area in green on this particular exhibit, and you can see there is significant vertical separation between the gas completion interval and our target waterflood interval.

In addition, our geologist has previously stated that as a whole, the Upper Grayburg and particular Zones 1, 2, and 3 are highly stratified, the porous and permeable intervals are commonly thin, lateral is discontinuous, and there is little evidence of vertical communication between zones, and, again, that just further emphasizes the vertical segregation between this gas completion and our target waterflood interval.

I also point out that there's considerable

distance between our nearest injection well and Meridian's gas well. Our unit injector 2103, which is located on this cross-section, is approximately 2100 feet north of Meridian's gas well. We will be confining our injection of that well as indicated by the blue line to Lower Grayburg Zone 3 and Grayburg Zone 3C, so it's not even the same stratigraphical interval as Meridian's gas completion.

In addition, there will be a unit producer, well Number 2106, between this injection well and Meridian's gas well. That well will be a producing well, and it will act as -- not only allow us to monitor performance, but it will also be drawing production from these wells.

There will be other wells injecting into the Upper Grayburg Zone 3. The closest or nearest injector that will actually be injecting in the Grayburg Zone 3 will be approximately 3100 feet away from Meridian's gas well. It's not shown on this particular diagram, but, again, there will be wells -- producing wells -- between that injector and Meridian's gas wells.

The remainder of the injection wells injecting into Zones 3 will be on the order of a mile or more away, and, again, there will be

multiple producing wells between those injectors and Meridian's gas well. So we have concluded that based on the vertical separation and segregation of the zones, the distances involved, and the fact there will be producing wells between any of our injectors in this gas well, that that gas well will not be harmed by unit operation.

Q. Mr. Hermann, will the proposed waterflood project have an adverse impact on other nonunit producing wells?

A. No. When we set up -- or selected the unit boundary -- we selected it to be sure that there would be -- at least each unit injector -- would be at least two locations from any nonunit Grayburg/San Andres producing well. The only exceptions would be injectors 1813 and 1815 that were described previously by Jim Almrud that would be part of a negotiated lease line injection agreement with Chevron. Next adjacent to their unit is the Monument South Unit Expansion Area B.

Q. In your opinion, will water injection have an adverse impact on nearby Grayburg gas wells?

A. No. We will be designing, operating and monitoring the flood in such a manner as to minimize out of zone losses and injected fluid, and also to

prevent oil from moving outside the unit boundary.

Q. In your opinion, will the proposed waterflood project cause the premature watering out of any offsetting wells or otherwise damage any neighboring properties?

A. No.

Q. Was Exhibit Number 7 prepared by you?

A. Yes, it was.

MR. CARR: At this time, Mr. Catanach, I move the admission of Amerada Hess Exhibit Number 7.

MR. CATANACH: Exhibit Number 7 will be admitted as evidence.

(Amerada Hess Exhibit 7 was admitted as evidence.)

MR. CARR: That concludes my direct examination of Mr. Hermann.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Hermann, let me direct your attention back to Exhibit Number 7. There is some nomenclature on the display. The bottom indicates an original water/oil contact. How is that determined?

A. Yes. Just a review of past performance and records that were on file both in the State and with

our own company and other companies based on production tests.

Q. And based upon those tests then, you have estimated what the original location of the water was in this portion of the reservoir?

A. Yes. That's our best estimate at this time.

Q. Okay. What period of time represents the data on which this point was made? Original means when in point of time in terms of --

A. Did we make that assessment?

Q. Yes, sir.

A. Well, the assessment was made in the early 1980s based on review of data that went all the way back to the initial discoveries way back in the mid-1930s.

Q. Can you approximate for us what is the current oil/water contact in this particular portion of the reservoir?

A. The oil/water contact varies substantially throughout the reservoir. We have seen instances of water encroachment vertically from the San Andres into the lower most Grayburg. We have seen that encroachment as high as Grayburg Zone 3C, but we have not seen any instances where water is

encroached higher than Grayburg Zone 3C.

Q. Within the specific area of this Block 21, as generally shown on this display, can you approximate for us based upon your evaluation of these wells, where you think the current oil/water contact is?

A. I cannot do that with the data I have here. One of the things we'll be doing too is -- that's one of the reasons why we are concentrating initially on the data acquisition program, so we can better identify where that water encroachment has incurred and how far it has incurred throughout the study area.

Q. Do you know whether or not the producing wells that are still producing within Block 21 are producing water?

A. I'm sure there are some wells that are producing water, but I cannot say at the present time how much.

Q. Okay. When we look now at the original gas/oil contact, was that original contact developed in the same way by examining the data available to you?

A. Right.

Q. What is your estimate now of the current

gas/oil contact in this portion of the reservoir?

A. In this portion of the field we still feel the gas/oil contact is at approximately minus 150 feet.

Q. Why has that not changed over time?

A. We just have not seen encroachment of water in this particular area into the gas cap. The only area we've seen any measurable encroachment of water into the gas cap is in the white area on that map south of our unit where we had Zones 3C in the gas cap.

In certain area we have seen encroachment of fluid, both oil and water, into that gas cap area, but we have not seen any evidence anywhere that water encroachment has gotten up into Zone 3.

Q. In terms of the gas/oil contact, has that not changed over time in this specific period?

A. It is possible that gas/oil contact has moved slightly one way or the other, but there's not enough evidence to pin down any movement.

Q. Okay. Geologically, when we look at the vertical separation between the gradient perforations and their gas well, and the perforations lower down in the Grayburg 3C, there's no geologic barriers that would preclude water from

moving up structure within that formation, are there?

A. Well, if you're talking about water moving from Zone 3C into Zone 3, yes, I think there are geological barriers out there. Again, we've seen the natural water influx stop within Zone 3C at various points throughout the reservoir due to apparently the barrier to vertical flow, and, again, as you get into the Upper most Grayburg, there are many more dense streaks in those Zones that will, again, act as barriers to flow.

Q. There is nothing that satisfies you as a reservoir engineer that that barrier system is complete to fully isolate 3C from 3 in this site specific area, is there?

A. We see no evidence to indicate that there are no -- All the evidence we have looked at seems to support that there are barriers between the gas producing intervals in the Upper Grayburg and our target water flow particularly in Zone 3C.

Q. For an example, if we pick injector 2103, which is two to the left of the gas well, and look at that first injector, the injection interval is to be the open hole interval?

A. The injection interval will be outlined in

blue which will include lower most Zone 3 and Grayburg Zone 3C.

Q. When we look at the corresponding producer that is between the gas well in this injector, where will its perforations be?

A. I think that will be determined at a later date. I would assume it would be Grayburg Zone 3C, and in all probability, a portion of the Lower most Grayburg Zone 3.

Q. So when we look at producer 2106, it's your belief that those perforations would be adequate not only to recover additional oil that's being moved by the injector well towards that producing well, but it will serve as a safety net, if you will, by which you can protect the gas well that's farther away?

A. That's correct.

Q. And geologically you believe the reservoir will operate in such a way that the water injected is going to move laterally to horizontally --

A. Particularly --

Q. -- and not move vertically?

A. Particularly when you get into the Upper Grayburg Zone. There's enough stratification there that we believe the water will move laterally not vertically.

Q. Thank you.

MR. KELLAHIN: No further questions.

EXAMINER CATANACH: I believe I don't have anything for this witness. However, I would like to ask Mr. Almrud one more question.

JIM ALMRUD

the Witness herein, being previously duly sworn, was examined and testified as follows:

REEXAMINATION

BY MR. CATANACH:

Q. I believe we might have gone over this slightly at the unit case, but I would like for you to explain. The map on the wall shows the proposed injection wells. You've got an area in the center of the unit that does not have any injection occurring into it. Can you explain that?

A. Yes. That area -- I don't know what the best explanation is -- is an area that we feel is receiving influence from the aquifer down below directly, and that there are fewer barriers in there to vertical flow, and a lot of the wellbores are still top allowable wells, and as such we feel that they were not a prime waterflood target in that they were already receiving some effects from the aquifer.

So we've targeted the tighter areas around the edge of that area which we feel have not recovered probably any oil due to water activity, but primarily due to solution gas drive, and therefore, the prime target for the waterflood.

Q. Will the producing wells in that area receive any benefit from waterflood operation?

A. They could well in that the, you know, there's injection wells along the edge of it and they could very well receive some benefit one row into the center area. And that area is also a prime tertiary target and has an ideal situation for tertiary recovery in the future.

Q. And you said there still are some top allowable wells in that area?

A. Yes, there are.

Q. Excluding that area, do you know what the average production rate within the unit is?

A. I would guess around 20 barrels a day.

EXAMINER CATANACH: I believe that's all I have.

MR. CARR: There was one other point that we --

THE WITNESS: Yes. We weren't sure about your concern about the integrity of wellbores. As part

of our unit agreement with our partner -- unit operating agreement -- we will be entering every unitized wellbore within the first year, or at least we have an obligation to within the first two years of operation for purposes of doing casing integrity tests and also braidenhead tests to make sure A, the casing is in adequate condition to contain the flood and also that there is no flow of fluids of any kind, liquid or gas, up from behind any surface pipe or intermediate strings.

EXAMINER CATANACH: That's all producing unit wells?

THE WITNESS: That all the producing unit wells; that is correct.

EXAMINER CATANACH: I think our concern is that, and we want to make sure that any area of review well has adequate cement behind the casing to isolate injected fluids is basically our concern.

THE WITNESS: Okay. We have reviewed them. We've had several people go through the drawings and try to identify problems. If other people, you know, feel that they have identified problems, we sure want to look at them and review it.

EXAMINER CATANACH: Well, I probably get to go through these 500 wells and check them myself. Are

there any other questions of this witness?

MR. CARR: Nothing further.

EXAMINER CATANACH: Anything further in this case?

MR. KELLAHIN: Nothing further.

EXAMINER CATANACH: There being nothing further, Case Number 10252 will be taken under advisement.

(The foregoing case was concluded at the approximate hour of 12:00 p.m.)

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 10252, heard by me on September 19 1991.

David R. Catanach, Examiner
Oil Conservation Division

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

REPORTER'S CERTIFICATE

BE IT KNOWN that the foregoing transcript of the proceedings were taken by me, that I was then and there a Certified Shorthand Reporter and Notary Public in and for the County of Bernalillo, State of New Mexico, and by virtue thereof, authorized to administer an oath; that the witness before testifying was duly sworn to testify to the whole truth and nothing but the truth; that the questions propounded by counsel and the answers of the witness thereto were taken down by me, and that the foregoing pages of typewritten matter contain a true and accurate transcript as requested by counsel of the proceedings and testimony had and adduced upon the taking of said deposition, all to the best of my skill and ability.

I FURTHER CERTIFY that I am not related to nor employed by any of the parties hereto, and have no interest in the outcome hereof.

DATED at Bernalillo, New Mexico, this day November 12, 1991.

My commission expires
April 24, 1994

LINDA BUMKENS
CCR No. 3008
Notary Public