STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:

APPLICATION OF MERIDIAN OIL, INC.

CASE NO. 11,067

11984

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: DAVID R. CATANACH, Hearing Examiner

August 18, 1994

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Division on Thursday, August 18, 1994, at Morgan Hall, State Land Office Building, 310 Old Santa Fe Trail, Santa Fe, New Mexico, before Steven T. Brenner, Certified Court Reporter No. 7 for the State of New Mexico.

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CO2 project

STATE OF NEW MEXICO
ENERGY, MINERALS, AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:

CASE NO. 11067
Order No. R-10202

APPLICATION OF MERIDIAN OIL INC. FOR A CO2 INJECTION PILOT PROJECT, SAN JUAN COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 8:15 a.m. on August 18, 1994, at Santa Fe, New Mexico, before Examiner David R. Catanach.

NOW, on this 29th day of September, 1994, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS THAT:

(1) Due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) The applicant, Meridian Oil Inc., seeks authority to initiate a pilot carbon dioxide injection project in the Basin-Fruitland Coal Gas Pool within a portion of its Allison Unit in Township 32 North, Ranges 6 and 7 West, NMPM, San Juan County, New Mexico, by the injection of carbon dioxide into the coal seams through four proposed injection wells shown on Exhibit "A" attached hereto.

(3) The pilot project area is proposed to comprise the following described area:

TOWNSHIP 32 NORTH, RANGE 6 WEST, NMPM
Section 19: All
Section 30: N/2

TOWNSHIP 32 NORTH, RANGE 7 WEST, NMPM
Section 24: E/2
Section 25: NE/4

(4) The Allison Unit is a Federal exploratory unit initially comprising some 11,705 acres in New Mexico and some 2,069 acres in Colorado. Within New Mexico, the unit comprises portions of Township 32 North, Ranges 6 and 7 West, NMPM, San Juan County. The unit was formed in 1950 and is currently operated by Meridian Oil Inc.

(5) Further land testimony by the applicant indicates that the Basin-Fruitland Coal Participating Area (BFCPA) covers the entire Allison Unit area. The evidence further indicates that the interest ownership within the pilot project area is common.

(6) According to applicant's evidence and testimony, laboratory research and computer modeling have indicated that injection of carbon dioxide into coal formations may aid in the methane desorption process which may result in the recovery of a significantly greater amount of gas from the Basin-Fruitland Coal Gas Pool than would normally be recovered by pressure depletion.

(7) According to applicant's engineering evidence and testimony, the proposed carbon dioxide pilot injection project is an attempt to test the effectiveness of carbon dioxide as a displacing agent as described above.

(8) Applicant's testimony indicates that the injection of carbon dioxide into the coal seams may result in the recovery of an additional 1.1 BCF of gas from the pilot project area which may otherwise not be recovered, thereby preventing waste.

(9) The applicant proposes to inject into three distinct coal seam intervals located within the gross interval from approximately 3,058 feet to 3,376 feet.

(10) Applicant further proposes to inject approximately 2.5 MMCFG per day at an average surface injection pressure of approximately 1500 psi.

(11) The applicant's plan of operation for the pilot project area includes a period of six month continuous injection during which time no production will occur, followed by six months of continuous production during which time no injection will occur.

(12) The applicant proposes to utilize the following described wells as producing wells within the pilot project area:

WELL NAME & NUMBER	WELL LOCATION
Allison Unit No. 113	Unit M, Section 19
Allison Unit No. 114	Unit I, Section 19
Allison Unit No. 120	Unit A, Section 30
Allison Unit No. 130	Unit G, Section 24
Allison Unit No. 132	Unit H, Section 25

(13) Applicant's proposed pilot project, according to its testimony, should be completed within approximately four years.

(14) No offset operator and/or interest owner appeared at the hearing in opposition to the application.

(15) Approval of the proposed pilot carbon dioxide injection project will allow the applicant the opportunity to test a new process and technology which may ultimately result in the recovery of otherwise unrecoverable gas from the Basin-Fruitland Coal Gas Pool, thereby preventing waste, and will not violate correlative rights.

(16) The applicant should take all steps necessary to ensure that the injected carbon dioxide enters only the coal seam intervals and is not permitted to escape to other formations or onto the surface from injection, production, or plugged and abandoned wells.

(17) At the hearing the applicant requested that it be granted an exception to the requirement that the tubing in its injection wells be plastic-lined. To support its request, the applicant testified that the injected carbon dioxide gas will be dehydrated prior to being injected.

(18) The applicant did not present sufficient evidence to indicate that the injected fluid does not have corrosive properties.

(19) The applicant's Division Form C-108, presented as evidence in this case, indicates that the tubing in the proposed injection wells will be cement lined.

(20) The injection of carbon dioxide into the wells shown on Exhibit "A" should be accomplished through 2 7/8-inch cement or plastic lined tubing installed in a packer set within 100 feet of the uppermost injection perforation; an approved leak detection device should be attached to the annulus in order to determine leakage in the casing, tubing or packer.

(21) Prior to commencing injection operations into the wells shown on Exhibit "A", the casing in each well should be pressure tested throughout the interval from the surface down to the proposed packer setting depth, to assure the integrity of such casing.

(22) The injection well or pressurization system should be initially equipped with a pressure control device or acceptable substitute which will limit the surface injection pressure to no more than 2000 psi.

(23) The Division Director should have the authority to administratively authorize a pressure limitation in excess of the pressure limitation described in Finding No. (22) above upon a showing by the operator that such higher pressure will not result in the fracturing of the injection formation or confining strata.

(24) The operator should give advance notification to the supervisor of the Aztec District Office of the Division of the date and time of the installation of injection equipment and of the mechanical integrity pressure tests in order that the same may be witnessed.

(25) The proposed carbon dioxide injection pilot project should be approved and the project should be governed by the provisions of Rule Nos. 701 through 708 of the Oil Conservation Division Rules and Regulations.

(26) Expansion of the pilot project should be approved only after notice and hearing.

IT IS THEREFORE ORDERED THAT:

(1) The applicant, Meridian Oil Inc., is hereby authorized to initiate a pilot carbon dioxide injection project in the Basin-Fruitland Coal Gas Pool underlying a portion of its Allison Unit in **Township 32 North, Ranges 6 and 7 West, NMPM, San Juan County, New Mexico, by the injection of carbon dioxide into the coal seams through four injection wells shown on Exhibit "A" attached hereto.**

(2) The pilot project area shall comprise the following described area:

TOWNSHIP 32 NORTH, RANGE 6 WEST, NMPM
Section 19: All
Section 30: N/2

TOWNSHIP 32 NORTH, RANGE 7 WEST, NMPM
Section 24: E/2
Section 25: NE/4

(3) The applicant shall take all steps necessary to ensure that the injected carbon dioxide enters only the proposed injection interval and is not permitted to escape to other formations or onto the surface from injection, production, or plugged and abandoned wells.

(4) Injection into the wells shown on Exhibit "A" shall be accomplished through 2 7/8-inch cement or plastic lined tubing installed in a packer set approximately within 100 feet of the uppermost injection perforation; an approved leak detection device shall be attached to the annulus in order to determine leakage in the casing, tubing or packer.

(5) The injection well or pressurization system shall be equipped with a pressure control device or acceptable substitute which will limit the surface injection pressure to no more than 2000 psi.

(6) The Division Director shall have the authority to administratively authorize a pressure limitation in excess of the above upon a showing by the operator that such higher pressure will not result in the fracturing of the injection formation or confining strata.

(7) Prior to commencing injection operations into the wells shown on Exhibit "A", the casing in each well shall be pressure-tested throughout the interval from the surface down to the proposed packer setting depth, to assure the integrity of such casing.

(8) The operator shall give advance notification to the supervisor of the Aztec District Office of the Division of the date and time of the installation of injection equipment and of the mechanical integrity pressure tests in order that the same may be witnessed.

(9) The applicant shall immediately notify the supervisor of the Aztec District Office of the Division of the failure of the tubing, casing or packer in any injection well, the leakage of gas from or around any producing well, or the leakage of gas from any plugged and abandoned well within the project area, and shall take such steps as may be timely and necessary to correct such failure or leakage.

(10) The subject project is hereby designated the Allison Basin Fruitland Carbon Dioxide Pilot Project, and the applicant shall conduct injection operations in accordance with Division Rule Nos. 701 through 708 and shall submit monthly progress reports in accordance with Division Rule Nos. 706 and 1115.

(11) Expansion of the pilot project shall be approved only after notice and hearing.

(12) Jurisdiction of this cause is retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

WILLIAM J. LeMAY
Director

EXHIBIT "A"

DIVISION ORDER NO. R-10202
ALLISON BASIN FRUITLAND CO2 PILOT PROJECT
APPROVED INJECTION WELLS

Well Name	Location	Unit	S-T-R	Injection Perforations	Packer Depth	Tubing Size
Allison Unit No. 140	600' FSL & 785' FEL	P	19-32N-6W	3109' - 3376'	3059'	2 7/8"
Allison Unit No. 141	1070' FSL & 800' FEL	P	24-32N-7W	3067' - 3366'	3017'	2 7/8"
Allison Unit No. 142	1920' FNL & 850' FWL	E	19-32N-6W	3059' - 3326'	3009'	2 7/8"
Allison Unit No. 143	1205' FNL & 1880' FWL	C	30-32N-6W	3058' - 3315'	3008'	2 7/8"

I N D E X

August 18, 1994
Examiner Hearing
CASE NO. 11,067

* * *

E X H I B I T S

	Identified	Admitted
Exhibit 1	6	13, 46
Exhibit 2	6	-
Exhibit 3	6	13
Exhibit 4	7	13
Exhibit 5	7	25
Exhibit 6	7	46
Exhibit 7	7	25

* * *

A P P E A R A N C E S

FOR THE APPLICANT:

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Santa Fe, New Mexico 87504-2265
By: W. THOMAS KELLAHIN

FOR AMOCO:

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P.O. Box 2208
Santa Fe, New Mexico 87504-2208
By: WILLIAM F. CARR

* * *

WHEREUPON, the following proceedings were had at 1:08 p.m.:

EXAMINER CATANACH: At this time we'll call Case 11,067, which is the Application of Meridian Oil, Inc., for a CO_2 injection pilot project, San Juan County, New Mexico.

Are there appearances in this case?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin, appearing on behalf of the Applicant, and I have three witnesses to be sworn.

EXAMINER CATANACH: Additional appearances?

Will the three witnesses please stand to be sworn in at this time?

MR. HAWKINS: Excuse me, Mr. Examiner --

EXAMINER CATANACH: Sorry?

MR. HAWKINS: Bill Hawkins with Amoco. Our attorney is not here right now, but we'd like to enter our appearance in the case as well.

EXAMINER CATANACH: Is your attorney Bill Carr?

MR. HAWKINS: Yes, he is.

EXAMINER CATANACH: Where is he?

MR. HAWKINS: I don't know.

EXAMINER CATANACH: Okay.

Could I get the witnesses to stand and be sworn in at this time?

(Thereupon, the witnesses were sworn.)

ALAN ALEXANDER,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Alexander, would you please state your name and occupation?

A. My name is Alan Alexander. I'm currently employed as a senior land advisor for Meridian Oil, Inc., in their Farmington, New Mexico, office.

Q. As part of your duties as landman, have you been involved as part of the Meridian area team to study the facts and circumstances surrounding this Application?

A. Yes, sir, I have.

Q. Are you knowledgeable about the ownership and the leasehold configurations within the area that we've identified for this CO_2 injection pilot project?

A. Yes, sir, I am.

Q. It's a portion of what's identified as the Allison unit, is it not?

A. That's correct.

Q. And are you familiar with the contract documents that are involved in that unit process?

A. Yes, sir.

MR. KELLAHIN: We tender Mr. Alexander as an expert landman.

EXAMINER CATANACH: Mr. Alexander is so qualified.

Q. (By Mr. Kellahin) Mr. Alexander, let's have you summarize for us how you've organized the hearing book so that as we go through it the Examiner will know the sequence of presentation.

A. Yes, behind Exhibit Number 1 we have included for the Examiner a copy of our Application.

And attached to the Application is the C-108 form that we mailed out as part of our notice requirements and sent to the Division.

Q. Now, the original C-108 that was mailed out to the parties and filed with the Division is behind Exhibit Tab 1?

A. Yes, sir.

Q. There have been some subsequent revisions and supplements to that C-108?

A. That's correct.

Q. And where would we find those changes?

A. We have included those changes behind Exhibit Tab Number 2 in the book.

Q. All right, sir. What then do we find?

A. Behind Exhibit Tab Number 3 we have provided land

plats, and they cover the project area.

And also we'll speak to the fact that there are some freshwater wells in this injection area that we would like to talk about.

Behind Exhibit Tab Number 4 we have included the working interest ownership for the Allison unit, and those are the parties --

EXAMINER CATANACH: Excuse me, Mr. Kellahin, I'm still on your commingling case.

Sorry.

THE WITNESS: That's fine.

Behind Exhibit Tab Number 4, besides the list of working interest owners, we have also included copies of our certified receipts, indicating the notices that we did send out in this project for this hearing.

Behind Exhibit Tab Number 5, we are going to show and talk about the geologic discussion for the project area.

Behind Exhibit Tab Number 6 we have included the reservoir engineering presentation for this afternoon's hearing.

And behind Exhibit Tab Number 7, we have included a cross-section that covers the project area.

Q. (By Mr. Kellahin) Let's turn to the display that's shown behind Exhibit Tab Number 3, first display,

it's a partial foldout.

Are you familiar with the Division's desire to have a map of the project area under the C-108 processing whereby within a two-mile radius of any injection well they can locate and find any well that has been drilled?

A. Yes, sir.

Q. And have you accomplished that on this display?

A. Yes, sir, we have indicated the two-mile radius from each of the injection wells. Those radiuses are color-coded to match the injection wells so that you can easily locate all of the wells that were within each respective two-mile radius.

We've also included a radius for a half-mile investigation around the wellbore.

And the other thing to be noted on this land plat is the location of the freshwater wells in proximity to the injection wells.

Q. There's a color code on the right margin that shows the water well in a rectangle with a blue "W"?

A. That's correct.

Q. And then below that are the conventional symbols that Meridian utilizes to identify the producing interval of the various hydrocarbon wells?

A. That is correct.

Q. Let's focus on your efforts and Meridian's

efforts to identify and locate freshwater sources.

A. Yes, when we initially filed the Application, we were using the USGS database for registered water wells. We did not find any in this area, and we so stated in the Application.

However, upon sending out notices to all the people involved, we became aware through their correspondence back to us that in fact there were some water wells out in this area that were more than likely unregistered water wells.

At that time I went ahead and contacted the State Engineering Office here in Santa Fe to confirm whether he had any registered water wells on file. They do not, so I sent out a survey team into the area of our switchers to survey the area and find any and all water wells that they could.

As a result of that survey and some correspondence that came back to us from the surface owners who we sent certified letters to, we have located four water wells that are in the area of these injector wells.

Q. Do we have any of those freshwater wells located within the area of review for any injection well?

A. Yes, three of the water wells fall within the half-mile radius of two of the injector wells, and you can see that on this land plat.

Q. All right. Where do we find those wells?

A. If you will notice up in Section 19 of 32 North, 6 West, up in the northwest quarter of the northwest quarter, there are two water wells in very close proximity to each other.

Q. That's in the area of review for the injection well, 142?

A. Yes, sir, that's correct.

Q. And then when we look at injection well 141 to the south and west of the first well --

A. Yes, sir.

Q. -- do you see 141? There is a freshwater well there just to the west?

A. That is correct, in Section 24.

Q. As a result of that investigation, what is the deepest total depth of any freshwater well within a half-mile radius of investigation?

A. Within that radius, the deepest depth that we were able to ascertain -- And again, this information was provided by the land owners; there are no official records of the depths of these wells. They indicated that those wells -- the deepest one, which is located in Section 24 of 32 North, 7 West, is 245 feet deep.

Q. Despite the fact that we're going to be injecting CO_2, have you advised your engineering personnel within

your team of the deepest known freshwater sources, and have they correspondingly adjusted the casing -- surface casing program for their injection wells?

A. Yes, we have.

Q. So in each instance our surface casing string for an injection well is substantially below the deepest known freshwater source?

A. That's correct.

Q. What's the status of any objections or concerns by any of the parties notified of your request?

A. We have not had any objections to the hearing. I think that was clarified. One initial letter from one of the surface owners could have been interpreted as an objection, but he followed up with another letter making it very clear that he did not object to the Application as long as we did the appropriate water testing, which we are doing.

Q. All right. You're referring to Mr. and Mrs. Lawrence Kelly?

A. That is correct.

Q. As of today, are you aware of any objection from anyone with regards to the approval of this Application?

A. No, sir, I am not.

Q. Let's turn to the next display, past the locator map within this same tab section. What's the next display?

A. That display is also a map, and we have obtained a survey from one of the survey people that we use in the field to ascertain the exact locations of those water wells for our own records, since they are not documented anywhere else, and this map represents an adequately -- represents the distance from each of our injector wells to each of these water wells that are in this area.

Q. The carbon dioxide injection project, would that be considered an enhanced or a secondary recovery project procedure?

A. We consider it to be an enhanced recovery procedure.

Q. And would that be conducted pursuant to the existing documents and agreements in the Allison unit?

A. Yes, sir, it would be.

Q. Within that unit concept, have you notified the interest owners within the unit that would participate in this production?

A. Yes, we have.

Q. And have you received any objection from those interest owners?

A. None so far.

Q. Is there a portion of the display book where we can find a summary of the ownership?

A. Yes, sir, behind Exhibit Tab Number 4 I have

included a listing of the Allison unit working interest owners for the Fruitland Coal participating area at this point in time.

Q. Behind that summary, what is next contained in the exhibit book?

A. We have included Xerox copies of our certified mailing cards for each of the parties that we did contact, and that also includes the surface owners that were contacted.

Q. Okay, the certificate that contains my signature is a notification of the surface owners at each injection well location?

A. That is correct.

Q. And plus any operator within a half-mile radius?

A. Yes, that's correct.

Q. Except that would be Meridian, I guess.

A. That is Meridian.

Q. All right. So there's no other operator to notify?

A. There are no other operators.

MR. KELLAHIN: That concludes my examination of Mr. Alexander.

We move the introduction of the exhibits behind Exhibit Tab 1, 3 and 4.

EXAMINER CATANACH: Exhibits 1, 3 and 4 will be

admitted as evidence.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Alexander, what do you actually -- In your opinion, what is the project area for this project?

A. The project area for this project, we will describe to you in some later testimony.

If you wanted to take just a very quick look, and it will be covered again in more detail behind Exhibit Tab Number 6, and it's the second page behind Exhibit 6, gives a very good locator map for you, and that locator map shows the Allison unit. This project is fully located within the boundaries of the Allison unit.

And then if you would also go back four or five pages till you get back to an exhibit that says, Allison Unit Injection Project Area, that will further delineate the project area for you. It's in the green rectangle, and that is our project area.

Q. Approximately two sections, a little bit more than two sections?

A. Yes, sir, approximately.

Q. Okay. Mr. Alexander, within that project area, is that all included in the Fruitland Coal participating area?

A. Yes, sir, within the Allison unit, correct.

Q. That parties that are listed behind Tab Exhibit Number 4, those are the working interest owners within the Fruitland Coal PA?

A. Yes, sir, that's correct.

Q. That's not necessarily just in the project area, that's in the whole Allison unit?

A. It's in the whole participating area, and that is exactly also the same interest that would be in the project area. The Fruitland Coal participating area extends and covers all acreage within the Allison unit.

Q. The Fruitland Coal PA?

A. Yes, sir.

Q. So in essence, everything within the project area is commonly owned?

A. Yes, sir.

Q. Is that federal acreage?

A. The acreage that the project area covers?

Q. Right.

A. I believe that it is. I have a map with me which I could verify that for you. I don't have it up here.

Q. I'm not sure that's entirely important. I was just curious.

Have you submitted to your various working interest owners a participation plan in the project?

A. Yes, sir, we have. That was mailed out on July

10th to each of the working interest owners.

Q. Is everybody participating, or --

A. We're still receiving elections at this point to participate or not.

Q. But no objections?

A. No objections to this point.

EXAMINER CATANACH: Okay. I have nothing further of this witness, Mr. Kellahin.

MR. KELLAHIN: Call at this time Mr. Greg Jennings.

GREG JENNINGS,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Jennings, would you please state your name and occupation?

A. Yes, my name is Greg Jennings. I'm currently employed as a senior geologist for Meridian Oil, Inc., and located in Farmington, New Mexico.

Q. Mr. Jennings, on prior occasions have you testified as an expert witness before the Division?

A. Yes, I have.

Q. Describe for us your involvement in this project as a geologist.

A. Well, as you've heard in previous testimony, we're divided into geographical areas. We have teams assigned to those geographical areas, and I'm the geologist that's responsible for the area that includes the Allison unit and, as such, have been actively involved with this project.

Q. As part of that responsibility, have you made yourself informed on the geology available concerning the coal gas seams within the project area?

A. Yes, I have.

Q. And have you taken that information and reduced it to some geologic illustrations for the Examiner?

A. Yes.

Q. Let me have you turn to the information behind Exhibit Tab Number 5 and ask you if this represents your work product.

A. Yes, it does.

Q. In addition, there is a cross-section that's contained in the back of the exhibit booklet. Is that also your work product?

A. That's correct.

Q. And based upon that work product, do you have now geologic conclusions and opinions concerning the feasibility geologically of this injection project?

A. Yes, I do.

MR. KELLAHIN: We tender Mr. Jennings as an expert geologist.

EXAMINER CATANACH: Mr. Jennings is so qualified.

Q. (By Mr. Kellahin) Let's take the isopach, which is the first display behind Exhibit Tab 5.

A. Right.

Q. Tell us what you're mapping when we look at that isopach.

A. This is an isopach of the total net coal or total Fruitland Coal over the area depicted.

The basic purpose of the map is to show a very uniform amount of coal. You might notice the injection wells are spotted on this map. They're depicted as red triangles right in the center, 140 through 143, and in the project area the coal thickness ranges from approximately 40 feet to approximately 50 feet. One of the reasons that this area was picked for this project is that the coal reservoir is very continuous.

Q. Within the proposed injection project area, do you have an opinion about the continuity of that coal and the coal characteristics, to whether or not it is reasonably uniform?

A. Yes, I do. The coal is -- it will -- When we look at the cross-section exhibit momentarily, we'll see this in a little better detail, but the coal is divided

into three basic coal seams, and those coal seams are continuous across the project area and have only minor variations in thickness, and it does act as one continuous reservoir.

Q. Geologically, why is that of significance to you when you and the engineers are trying to construct a pilot project for CO_2 injection into the coal gas?

A. Well, the significance is that we have complete confidence that the CO_2 gas, when it's injected into the coal, will stay in the coal.

Q. Let's turn to the structure map. The structure map is identified as being on the "base of middle coal zone". What does that mean?

A. Well, as I mentioned previously, we've identified three major coal packages or three major coal seams that were added together to come up with the total coal thickness. Those are the zones which we will be injecting into. Those are the main producing zones in -- really the primary and only producing zones in the Allison unit. And we simply picked the base of the middle coal zone to draw a structure map.

Q. Having drawn the structure map, is there a geologic conclusion concerning structure that's of significance to us when we look at approving this pilot project?

A. Yes, the important thing to note is that we have a relatively uncomplicated structural setting. Once again, the injection wells are located on the map for reference as red triangles, and what you see is just monoclinal dip to the northeast, no major structural complications, no indications of any faulting or anything which would cause a separation of the reservoir.

Q. Do you see any faulting or other geologic event that would provide a conduit or an opportunity for the CO_2 injected into the coal then to leave the coal reservoir?

A. No, definitely not.

Q. Let's turn to the cross-section.

A. The cross-section is back behind Exhibit 7, which is now unfolded before you.

Q. Any particular significance of the selection of the wells in the cross-section and the orientation of the cross-section from northeast to southwest?

A. Well, we've constructed many cross-sections through this project area, and we have selected this cross-section to show at this hearing for a couple reasons.

One, once again, looking at the map, you can see that it runs right through the center of the project area, and it is very representative of the coal stratigraphy in the project area.

Q. When we look at the existing coal gas wells in

the project area, how many do we have?

A. I'd need to flip back to the -- Are you talking about the number of producing wells?

Q. Yes, sir.

A. I need to flip back to the exhibit that shows the project area just to make sure I don't give you a wrong well count.

As we've already discussed, we have four injection wells and five wells which will be producing wells inside the project area.

Q. When we look at those five producing wells that are currently in the project area and compare it to the cross-section, in what particular coal members are those wells perforated?

A. Yes, that's the other important aspect that we wanted to draw out of this cross-section.

As you can see, the main coal package can be subdivided into three coal seams, and those are confined to an interval approximately 100 feet total thickness, and you can really see that all the way across the cross-section.

Those three coal seams are the zones which we're going to inject into, which we're going to perforate and inject carbon dioxide into.

Q. Are they currently perforated in the existing producing coal gas wells in the project area?

A. Yes, those are the same coal zones that are open and completed and producing in the wells in the project area.

Q. So the Examiner will have a marker point, if you will, find a well on your cross-section that is typical and give us a footage that would represent the approximate top and bottom of the injection interval.

A. Well, let's just go to the Allison Number 132, which is located right in the center of your cross-section. It's a little short log, and it's located in the northeast of Section 25, 32 North, 7 West. You can also see it on the map. It is in the project area. It is one of the wells that will be affected by the injection project, and the top of the coal is at approximately 3120, and the base of the coal is at approximately 3170.

You might just note while you're looking at the cross-section, if you look to the left of that well, you'll see that there are a couple of small, very thin coal stringers way down deep in the section. Those are very insignificant coal stringers in the Allison unit area. They are not producing in the coal wells in the project area, and they will not be injected into.

Q. Apart from the engineering reasons that support the conclusion that the CO_2 will be confined within those three main coal seams, are there geologic boundaries,

vertical boundaries on the top of the coal and on -- below the coal, that will confine the CO_2?

A. Yes.

Q. Describe or illustrate what those are.

A. I think the easiest way to understand what I'll be telling you is just to look at the Burnt Mesa Number 1, which is right to the left of the Allison 132 on the cross-section, and you essentially have shaley members above and below the coal seams.

Occasionally you will find a little bit of sandstone in some of those intervals. Those sandstones and those shales are very tight, very low permeability. It's a drastic contrast to the permeability of the coal. There are definite vertical barriers, and that will result in the CO_2 remaining in the coal reservoir.

Q. Is there any Fruitland sand gas production or Pictured Cliffs sand gas production within the immediate proximity of the coal seam within the project area?

A. No, there is no Fruitland sand production or Pictured Cliffs production in the entire Allison unit.

Q. Is there a reason for that?

A. It's because the reservoir is so tight and has such low permeability.

Q. So when we're looking for that kind of relationship between the coal and the PC sand and the

Fruitland sand, that exists in other parts of the Basin but is not present in the Allison unit?

A. That's correct.

Q. In addition to this specific work, did you also assist the engineering members of your area team in the formulating of geologic interpretations for their reservoir modeling for the project area?

A. Yes.

Q. And --

A. This project has actually been worked on by myself and one other geologist.

Q. When Mr. McCracken starts describing his engineering work, we're going to see some geologic interpretations. Do those represent conclusions for which you agree?

A. Definitely.

Q. And that work is either your work or the work of others that you have reviewed?

A. That's correct.

MR. KELLAHIN: That concludes my examination of Mr. Jennings.

We move the introduction of his geologic exhibits contained within Exhibit 5.

EXAMINER CATANACH: Exhibit 5 will be admitted as evidence.

THE WITNESS: We need 5 and --

MR. KELLAHIN: Five and 7, Mr. Examiner.

EXAMINER CATANACH: Five and 7 will be admitted as evidence.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Jennings, these are the only coal-seam intervals within the unit; is that correct? I mean, the three that you've described here, those are the main intervals?

A. Right. And as you can see on the cross-section, there is an occasional thin, two-to-three-foot stringer that might be present 100 or 200 feet below, or perhaps 100 feet above, but they are not completed in the producing coal wells and will not be injected into.

Q. Okay. Did you say the producing wells within the project area are all completed in all three of these intervals?

A. Yes, they are all completed open-hole -- excuse me, I should say naturally with a pre-perforated liner, which we commonly refer to as Open-a-Hole.

Q. Is there a -- Have you seen any evidence of a dominant producing zone, or do you have any knowledge of that?

A. I might defer to Mr. McCracken. He's going to

get into a little bit of his reservoir modeling to address that.

Q. Okay. Are these coals fractured in any way upon completion; do you know?

A. Well, the -- There are really two types of permeability that exist in the coal, as you know: the cleats that are formed during coalification -- and those are the primary permeability -- source of permeability for the coal.

Natural fracturing does occur to a minor degree.

Q. Is the cleat permeability, is that oriented in any particular direction?

A. Yes, it is, and Craig will elaborate on this some more, but we have found a primary permeability direction that trends more in a northwesterly orientation, and Craig has some very specific information that will give you some good detail on that.

Q. You testified that there's shaley members above and below the coal intervals in this -- Is that present throughout the project area?

A. Yes. It varies. There are sandstones that exist within the Fruitland formation, and sometimes they're present close to the coal.

But we have evaluated those reservoirs, tested them in other parts of the Basin and have found them and

are confident in this area that they are very low permeability. In fact, they're such low permeability that we have not even pursued them as a target reservoir for production in this area.

And once again, the difference in permeability between the coal reservoir and any sandstone or shale above or below, the difference is very strong. The coal is where the permeability lies.

Q. You're confident that these shale barriers will confine the CO_2 to the coal interval?

A. Yes, and that is for a couple reasons.

One, the fact that the higher permeability is in the coal reservoir.

And two -- and I hate to keep saying this; Craig will elaborate on this more -- the coal has a natural adsorptive capacity for carbon dioxide. So given its choice, the carbon dioxide will naturally stay in the coal reservoir.

Q. In terms of the net coal thickness, is this one of the thicker areas within the unit?

A. Not really. It's fairly representative of the unit.

You know, we may find parts of the unit that are ten feet thinner, but it's not an extremely thick area.

Q. Was there a geologic consideration why this was

placed in -- the project was placed where it was?

A. Yes, there were a variety of reasons for picking the location, and one is that this area has exhibited a little better production characteristics and therefore a little more dewatering, which will allow the project to better success.

Q. Does structure really have any bearing on the injection project?

A. No, it doesn't.

Q. Is there any particular coal interval that you'll be focusing on in terms of the project, or is it just all three of them?

A. We will be perforating and injecting into all three.

We will -- We have two pressure-monitoring wells in the area, and in one of the wells the coals do separate a little bit, and we will actually be setting a packer in between those two coal -- in that interval that separates the two coals, and monitoring the pressure in both upper and lower interval to see if there are any differences.

But we will be injecting into all three zones, all three coal zones, simultaneously.

EXAMINER CATANACH: I have nothing further.

MR. KELLAHIN: Mr. Examiner, next witness is Craig McCracken.

CRAIG McCRACKEN,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. McCracken, for the record please state your name and occupation.

A. My name is Craig McCracken. I'm a petroleum engineer employed by Meridian Oil, Incorporated, in Farmington, New Mexico.

Q. On prior occasions have you testified before the Division?

A. Yes, I have.

Q. Give us a quick summary of your involvement as an engineer in this project.

A. For almost a year now I've been involved in a detailed modeling study of the area in question, both to attempt to characterize the reservoir and, along those same lines, to try to determine how those characteristics might affect a carbon dioxide flood.

Q. Apart from that involvement in the project, have you also been responsible for preparing and completing what is called the Division Form C-108?

A. Yes, I have.

Q. Based upon your work, do you now have engineering

conclusions about the feasibility of this pilot project?

A. I do.

Q. Do you have an opinion as to whether or not the institution of this pilot project will create the probability of improving ultimate recovery from the coal gas reservoir?

A. I believe that this project will increase the recovery from the coal bed reservoir.

MR. KELLAHIN: We tender Mr. McCracken as an expert engineer.

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Kellahin) Let's come back to the C-108 later.

A. Okay.

Q. Let's look at the information behind Exhibit Number 8, I believe it is.

A. I believe it's 6.

Q. Six, all right, back to 6.

When we look at the documents behind Exhibit 6, does that represent your work product?

A. Yes, it does.

Q. You've given us a summary on the first page. Give us the project overview. What are your major engineering conclusions?

A. We feel that drilling four injector wells in the

configuration that's been shown before and which we'll go over again, and obtaining approval for a maximum injection rate of 2.5 million cubic feet per day per well of carbon dioxide and a maximum surface injection pressure of 2000 pounds is the optimum configuration for flooding the coal in this area.

We feel that the best way to go about this is by cycling the injection, injecting for half a year and then producing for half a year within the project area.

We feel that the recovery that we expect from this area over the time period covered by this project from conventional recovery methods is a little bit over 19 BCF. We expect to recover an additional BCF through this technique over a four-year period of project life.

Q. Let's turn to the next page and have you locate for us the Allison unit in relation to the size and shape of the Basin Fruitland Coal Gas Pool.

A. The Allison unit straddles the New Mexico-Colorado border. All of the project that we propose will be in New Mexico. It's located in the north central part of the Basin, if you judge the borders of the Basin by the Fruitland Coal outcrop, which is outlined in red in that map.

There are some other locations on there, such as the City of Farmington and some of the other numbered units

in the basin to help orient the position of the unit.

Q. Can you give us a summary of the engineering hypothesis that you're testing here with the pilot project?

A. If you'll turn to the next exhibit following the locator map, we feel that there are two main mechanisms that can be used to enhance the recovery of methane from coal by the injection of carbon dioxide. I've termed the first one selective sorption.

This simplified representation that you see on this page illustrates the idea that coal is more adsorptive of carbon dioxide than it is methane.

We have some laboratory tests, which I'll elaborate on a little bit later, that show that in the presence of carbon dioxide, methane will be released from the coal and carbon dioxide will be adsorbed.

The following page illustrates the concept that introducing another gas -- and this gas doesn't necessarily have to be carbon dioxide -- into the cleat system in the coal will reduce the concentration of methane in the cleat system. And since differential concentration is the mechanism behind diffusion, we'll accelerate the diffusion of methane out of the coal matrix and into the coal cleats.

Q. Does this pilot project represent Meridian's first effort in the field to test the laboratory results?

A. Yes, it does.

Q. Do you have an illustration to show us the advantage that you think exists by the use of CO_2 as an injection medium?

A. On the following page, there's a comparison of isotherms of three different gases, nitrogen, methane and carbon dioxide.

On the Y axis of this graph is the adsorbed gas content in standard cubic feet per ton, and on the X axis is the pressure in pounds per square inch, absolute.

As you expose the coal to each of these gases at higher and higher pressures, they're capable of adsorbing more and more of each gas. But what you can see on this graph is the increasing adsorptive capability of the coal for carbon dioxide over methane, over nitrogen. And that has a lot to do, theoretically, with the polarity of each of the molecules. Carbon dioxide is by far the more polar molecule of the three.

Q. Your next display is captioned "Methane Displacement".

A. This particular graph represents a test that we did to try to demonstrate particularly the selective sorption mechanism on a coal sample from the Allison unit.

This is from the Allison unit Number 132, which Greg detailed in on his cross-section. It is in the project area.

The nature of this test -- The blue line on this isotherm up to 1625 p.s.i. represents the introduction of methane only into this core sample. What we did from that point on was inject carbon dioxide to try to see what would happen, particularly at higher test pressures.

And what you see there is that in the pressure range from 1625 to roughly 1850, this particular sample adsorbed 400 standard cubic feet per ton of carbon dioxide, while releasing roughly 260 standard cubic feet per ton of methane, or about half of the methane that was in the coal at 1625 p.s.i.

Q. What is your engineering opinion concerning the maximum initial injection pressure in order to achieve effective response from CO_2 injection?

A. Based on several simulation studies, we feel that 2000 p.s.i. would be the maximum injection pressure that would be necessary to sweep the reservoir the most efficiently and expose the reservoir to the optimum amount of carbon dioxide.

Q. And that's a surface pressure?

A. That's correct.

Q. All right. Let's deal with this topic now. The Division uses as a guideline a water gradient, of you will, of .2 p.s.i. per foot of depth. When we deal with saltwater disposal wells or water injection wells, the

Division requires -- or limits surface injection pressures for that fluid, so that at the surface you have no more than .2 p.s.i. per foot of depth to the top perforation. All right.

When we're dealing with CO_2, help us make the conversion so that we know the significance of 2000 p.s.i. at the surface when you're injecting CO_2.

A. The gradient of a column of water should be roughly .43 p.s.i. per foot. So for every thousand feet of water that you're dealing with, you're going to be dealing with around 430 p.s.i.

The gradient for carbon dioxide varies a little bit due to the compressibility of carbon dioxide, however it's going to be on the order of .03 p.s.i. per foot. So where the -- a column of water in a 3300-foot well, such as we're dealing with in Allison, would probably be around 1300 p.s.i. and would probably be less than 100 p.s.i. if the column were CO_2 instead of water.

The one thing that I could point out here, if we could flip back to the first page of this exhibit, I've attempted to show what the gradient of a 2000-p.s.i. injection pressure would be here, and it's .62.

I've also researched three wells that were fracture-treated in the Allison unit and looked at some data on those actual fracture treatments and some

calculations that were made by the service companies who did those treatments initially, and they show a .75 or greater frac gradient.

So this would be well underneath the frac gradient, and the additional pressure exerted by the column of carbon dioxide would only change that .62 p.s.i. per foot by a few hundredths.

Q. If the Examiner approves an initial maximum injection surface pressure for CO_2 of 2000 p.s.i., will that allow you the opportunity to inject CO_2 into the coal reservoir, but not be so great as to cause that gas to migrate out of the coal reservoir?

A. It should be well under the pressure that would cause something like that to happen.

Q. Have you reviewed the order Amoco received for their nitrogen injection project?

A. Yes, I have.

Q. And what are they using as a maximum surface limitation for nitrogen in that project?

A. I believe that it was 2000 p.s.i.

Q. Do you see any problem in setting that initial rate at 2000?

A. No.

Q. Let's turn to the next display. It says Allison Unit Injection Project Area. Mr. Jennings described it a

while ago, but let me have you do it again.

The black outline represents what, sir?

A. The outline of the Allison unit.

Q. And then the green box is the injection project area that you want to initiate?

A. That is correct.

Q. Why this particular location?

A. The five wells inside the green box in this page are the five best producers.

Greg alluded during his testimony to the fact that these wells had dewatered this area. Something that's fairly important in trying to displace methane through these producing wells is the relative permeability, and the lower the water saturation is within the reservoir, the higher the relative permeability of the gas is going to be. And this is an area where our simulations indicate that we've seen significant dewatering, and therefore significant decreases in the relative permeability, and we'll see the greatest effect from injecting carbon dioxide.

Q. Let's turn to the next display and have you identify for the Examiner the study area which is the model area that you've inputted into your simulator.

A. The modeling study area is outlined in the red. It's roughly 3.5 miles by 3.9 miles and includes 18

producing wells.

And what we have attempted to do is pinpoint the characteristics of the reservoir that we felt we had evidence on and sensitize our study for some of the other parameters to try to get a match on the production that's actually come out of those 18 wells over the four years from the summer of 1989 to the summer of 1993.

Q. What does the red rectangle represent?

A. That is the outline of the modeling study area. That's the area that a detailed geological analysis was done, and that analysis was input into a numerical simulator, and that's where we attempted to get the match on the 18 producing wells.

Q. Okay, let's look at the next display.

A. The next display represents the same display outline overlain on an individual zone isopach of what we are calling the middle main coal.

The reason that that's there is to try to show the 3-D representation of the reservoir which is shown on the next page.

Q. Okay, let's turn to that.

A. And then what this is --

Q. You're looking at the colored display that's got the three layers of coal?

A. That's correct.

Q. All right.

A. And what that represents is a -- if you were to drop vertical planes down through each boundary of the modeling area, down through the coals and lift them up to the surface, this is our interpretation, both geologically and according to the numerical model, of what they would look like.

And what I've done is, in the pink I've spotted the producing wells that are in the project area, and in the white I've spotted the four proposed injection wells.

Q. What's your engineering basis for locating the four injectors as you've proposed to locate them?

A. It has to do, to a very large extent, with a question that was again alluded to earlier about the direction of predominant permeability.

From doing some paleomagnetic studies and doing some oriented-core studies we've determined that the direction of predominant permeability is 25 degrees north of west.

And what we attempted to do was to orient our injector wells along the predominant direction of permeability. The simulation study sensitized the values of two to one, four to one, and eight to one for the magnitude of directional permeability in the X direction to permeability in the Y direction.

And we found that four to one fit the pressure distributions that we actually saw within this grid much better than either two to one or eight to one.

We feel by orienting injector wells along the direction of predominant permeability we will put more coal in contact with the carbon dioxide, rather than flowing it directly to the producing wells.

Q. Do you have a display that shows your history match on existing production within the project area?

A. The last display in this section illustrates in the solid red line the actual production from these 18 wells over that four-year period.

The solid blue line represents the water production from those same wells.

The boxes -- again, respectively, gas in red, water in blue -- represent actual output points from the simulator and show that we feel we had an excellent match on the history and therefore an excellent characterization of this reservoir before we began doing the study that produced the results in our summary.

Q. When we go back to the project overview and look at the conclusions, describe for us how you came to the conclusion that the additional incremental recovery of methane attributed to the injection project was going to be 1.1 BCF.

A. When the simulator was allowed to run four years into the future to try to model the project life with no injection, no additional enhancement, the result was the 19.4 BCF that's illustrated here as the study-area base recovery.

When four injector wells were put into the model and allowed to inject carbon at the rates and pressures that are specified above, 1.1 BCF of additional methane was recovered from the model.

I should probably point out at this point that there were several sensitivities done on the positioning and the rates and the pressures of these wells, and this was the optimum scenario.

Q. Take us through a summary of the operational sequence or plan that you propose to initiate in the project if the Examiner approves it. What's the process?

A. First of all would be the drilling of the four injector wells in the areas as we've outlined them in this Application.

Q. Then what happens?

A. We would then complete them by perforating, acidizing and breaking down.

And then the carbon dioxide would be delivered through the wells, through a unit distribution system, and would be treated for water and heated at the surface

location to reservoir pressure and then injected into the wells at the rates and pressure specified.

Q. You mentioned a cyclic injection procedure.

A. Yes.

Q. Describe that to us.

A. The four injection wells would be operated for a six-month period with the producing wells in the project area shut in. Following that six-month period, the injector wells would be shut in and the producing wells would be opened up and allowed to flow.

This particular procedure is the result not only of the simulator indicating that this is the best way to go about doing this injection process, but also a patent that's held by Conoco that in fact expires within the next week, which details this process as being an optimum means of injecting carbon dioxide to remove methane from coal mines, to avoid mine explosions.

Q. Describe for us whether or not you have an engineering conclusion about confining the CO_2 vertically, if you will, to the coal gas seams.

Q. Well, in addition to the geologic reasons that Greg gave why the carbon dioxide is not going to migrate outside the coal, I think if you look at the adsorptive capacity of coal for carbon dioxide, you'll see that the coal -- excuse me, the carbon dioxide would much rather

stay in the coal than go anywhere else.

A lot of it is going to adsorb very large quantities. When you think about 400 standard cubic feet per ton and how much coal is in this area, very large quantities are going to adsorb before there's going to be enough carbon dioxide adsorbed for it to want to try to leave the formation.

Q. When you look in a horizontal extent about how far the coal -- the CO_2 is going into the coal seams, are you going to have the ability to monitor and test where that CO_2 is going?

A. We have not only the producing wells in the area that we'll be monitoring the composition and the pressure and rates on, to try to determine things exactly like that, but we will also be taking those results from those wells and going back into our model and trying to refine the model and see if the conclusions that we made can be modified by the results that we're seeing from the flood.

So we intend on continually monitoring this, not only from a compositional, pressure and rate standpoint, but also by attempting to match the results of the flood on the simulator.

Q. In addition to the Allison unit wells that Meridian operates in the coal gas, do you also operate the coal gas wells immediately to the south of the unit and the

project area?

A. Yes, we do.

Q. Will you have the opportunity to utilize those wells to monitor for the migration of CO_2?

A. Yes. Yes, we do, and we will.

Q. Let's turn now to the C-108 procedure. We mentioned initially that after the C-108 was filed, there were some modifications made as a result of further investigation as to the depth and the location of freshwater sources. Let's start at that point, then, and let's look behind Exhibit Tab Number 2.

A. The first four pages behind that exhibit tab represent modifications to the wellbore schematics originally submitted with the C-108.

Q. In what way were they modified?

A. The surface casing, if you'll reference the original C-108, was set at 200 feet. This was before we had the knowledge that there were water wells as deep as -- I believe 250 feet was the deepest, roughly, was the deepest water well that was found from the field study.

We modified these wellbore schematics, and the same data in tabular form, which is the last page in this particular exhibit, to reflect a 350-foot surface casing setting down.

Q. Behind the four schematics within the same

exhibit section, what is the summary sheet?

A. That is a tabular representation of roughly the same data that appears on the schematics, as required by the C-108.

Another difference between this tabulation and the one that appears in the C-108 is the recalculated cement volume for the surface casing being 150 feet deeper.

Q. Within the area of review for each of the injection wells, did you tabulate for the Examiner the location and mechanical integrity information for any producing well?

A. Yes, I did. What I tabulated in -- Let me try to locate this for you. It's behind -- The fourth page behind the type log, the pull-out type log of the Allison POW Number 2, is a tabulation of the wells that are in the review area, and what I have here is the well name and number, the location, the formation that the well was completed in, date drilled, depth and the type of completion.

What I have done for these wells, as well as the wells in the two-mile area specified by the C-108, is examined the cementing records of each one of those wells. And what I found from that was, there's at least 200 feet of cement over the top Fruitland Coal interval in each of these wells.

Q. Did you find any plugged and abandoned wellbores within any area of review for any of the four injection wells?

A. No, I did not.

Q. What's your conclusion about the mechanical integrity of all the wells within the area of review for any injection well?

A. All of these wells are sound with respect to the Fruitland Coal.

Q. Do these wells pose any risk to freshwater sources?

A. No.

MR. KELLAHIN: That concludes my examination of Mr. McCracken.

We move the introduction of his engineering displays behind Exhibits Number -- What was it? Six?

THE WITNESS: Six.

MR. KELLAHIN: Six. And then he's verified the C-108, which is contained behind Exhibit Tab Number 1.

EXAMINER CATANACH: Exhibit Numbers 1 and 6 will be admitted into evidence.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. McCracken, where did you have your area-of-review wells listed?

A. They're in Exhibit 1 -- Oh, I'm sorry, are you talking about the tabulation?

Q. Right.

A. Oh, that's -- If you'll go to the type log of the Allison POW Number 2, it's the fourth page behind that.

Q. Where is the type log at?

A. It's the fifth page of Exhibit 1.

Q. Okay.

A. That's it.

Q. Okay, got it.

Is this the only information you have on the area-of-reviews?

A. Yes, it is. Except for the map.

Q. Okay. Can I get you to submit some more data on these wells showing the casing and cementing data on those wells --

A. Certainly.

Q. -- as well as cement tops, if those were calculated. I assume you calculated those tops?

A. The great majority of them were from temperature surveys or cement bond logs. There were two -- and I believe it's the Burnt Mesa Number 1 and the Allison Unit 18 -- which were calculated, but they were calculated disregarding the standard hundred percent excess.

Q. Okay. If you would submit that additional

information --

A. Okay.

Q. -- I would appreciate it.

What's the source of your CO_2?

A. Meridian Oil Gathering Incorporated's Valverde plant.

Q. Mr. McCracken, do you have any -- You mentioned that you had some data with regards to the fracture gradient of these wells on initial treatment?

A. Yes.

Q. Do you have any of that data with you?

A. No, I do not.

There were only three wells that were ever fracture-treated in the coal in the Allison unit. None of them are within the project area. Two of them are fairly close.

Q. Okay. Can I get you to submit that additional information as well?

A. Certainly.

Q. Okay. The recovery you've got listed here, study-area base recovery, 19.4 BCF, is that ultimate recovery, or is that just in the four-year period?

A. That's over a roughly ten-year period that encompasses the six years of history to date, plus the four years of the project.

Q. Okay.

A. Actually, that's six years of history as of 1-1-95, when we hope to institute the project.

Q. Okay. That doesn't include the 1.1 additional incremental?

A. That's correct. That simulator run produced a recovery over that same period of time, or over an equivalent period of time, of 20.5.

Q. Okay. What's the significance of the four-year project life?

A. We feel that if this project is successful and turns out to be the type of project that we think that it could be, we will probably come back before the Division within that period of time with either an expansion or a continuation.

We feel that the four years gives us sufficient time to evaluate what we've got and the kind of response that we're getting.

Q. As I understand it, you propose to inject in all four wells continually for a six-month period?

A. That's correct.

Q. And then during that time will you be producing the --

A. Not from the wells in the project area, they'll be shut in.

Q. They will be shut in for a --

A. Yes.

Q. -- six-month period?

And the second six months, you will strictly be producing from the wells in the project area?

A. Yes.

Q. Will your production stream change as a result of the CO_2 injection?

A. Yes, it will.

Q. And what changes will that be?

A. We expect it to be roughly two and a half times what it was without the enhancement, so that on an annual basis we'll be producing about one and a quarter times as much methane as we would just from primary production.

Q. Will the composition of the produced gas change?

A. Yes, it will.

Q. That will --

A. We expect compositions of produced gas to be in the 10-to-12-percent range when we initially turn some of the producing wells back on, and then it will decline back to normal levels for the unit, which are in the 5-to-6-percent range from there.

Q. Are you confident the area-of-review wells are cemented and cased adequately to prevent any gas from going up the annulus?

A. Yes, I am. The minimum depth that I found between the top of cement and the top of the top injection zone is 200 feet.

Q. You don't think that any microannulus will be a problem in any of those wells?

A. There was none indicated on any of the cement bond logs I examined.

Q. What kind of tubulars do you intend to use in the injection wells?

A. Since the carbon dioxide is going to be delivered to the wells at very low water content, it's going to be dehydrated at the compressor station, we're going to use regular tubulars, the same kind of tubulars we'd use in any well.

We don't expect corrosion problems because we're not going to be putting the carbon dioxide in contact with significant quantities of water.

Q. So you don't plan on lining the tubing with anything?

A. No. That's another reason for picking a dewatered area to inject into.

EXAMINER CATANACH: I think that's all I have of the witness, Mr. Kellahin.

MR. KELLAHIN: That concludes our presentation, Mr. Examiner.

EXAMINER CATANACH: Okay. If you can get me that additional information, we'll go ahead and process the Application.

Is there anything further in this case?

MR. KELLAHIN: No, sir.

EXAMINER CATANACH: Okay. There being nothing further, Case 11,067 will be taken under advisement.

(Thereupon, these proceedings were concluded at 2:24 p.m.)

* * *

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 11067, heard ~~by~~ me on August 18 1994.

David R. Catanach, Examiner
Oil Conservation Division

CERTIFICATE OF REPORTER

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I, Steven T. Brenner, Certified Court Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Division was reported by me; that I transcribed my notes; and that the foregoing is a true and accurate record of the proceedings.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL September 21, 1994.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 1994