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of the Applicant. I would like to suggest that perhaps this case could be consolidated for the purpose of hearing only with Case No. 2473, which is the next case on the docket, involving a proposed waterflood operation in this unitized area. Some of the exhibits, one of the principal exhibits is to be used in both cases, and I thought perhaps it might save time to combine them for the purpose of the hearing only.

MR. NUTTER: Is there objection to the consolidation-- We will have to call it first. We will call next 2473.

MR. MORRIS: Application of Newmont Oil Company for expansion of its Loco Hills Waterflood Project, Eddy County, New Mexico.

MR. NUTTER: Is there objection to the consolidation, for the purpose of taking the testimony of Cases 2472 and 2473? The cases will be consolidated for hearing purposes.

MR. CAMPBELL: Mr. Examiner, I have one witness, Mr. Darden, in these cases. This will be Exhibit 1.

(Whereupon, Applicant's Exhibit No. 1 was marked for identification.)

MR. MORRIS: Mr. Darden, would you stand and be sworn?

(Witness sworn.)

FRANK DARDEN

called as a witness, having been first duly sworn, testified as follows:



DIRECT EXAMINATIONBY MR. CAMPBELL:

Q Will you state your name, please?

A Frank Darden.

Q Where do you live, Mr. Darden?

A Fort Worth, Texas.

Q By whom are you employed and in what capacity?

A I am manager of operations for Newmont Oil Company.

Q What is your profession?

A Petroleum engineer.

Q Have you testified previously before the Commission or its Examiners in your professional capacity?

A I have.

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

MR. NUTTER: Yes, sir. In view of the fact that we advised people that this case would not be heard before 11:00 o'clock, I want to point out it's two minutes before 11:00. We advised them it would be approximately 11:00 o'clock. It is approximately 11:00 o'clock, if you wish to proceed.

Q (By Mr. Campbell) Are you familiar with the applications which are involved in this case?

A I am.

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Q I refer you to what has been identified as Applicant's Exhibit 1, which is on the wall there, and ask you if you'll please step up to that exhibit. Now, Mr. Darden, referring first to the application for approval of the unit, will you point out on Exhibit No. 1 the area that is involved in the proposed unit and identifying it by the nature of the markings which appear on Exhibit No. 1?

A Yes, the proposed West Loco Hills unit is outlined in heavy red line as shown here on Exhibit 1.

Q Will you point out in general the location of the presently operating Newmont Oil Company Loco Hills waterflood in relation to this proposed unit area?

A The Newmont Oil Company project is directly offsetting the unit on the North and on the East, and the active injection wells in the Newmont project are designated by red circles surrounding the injection wells.

Q Referring first to the Unit Agreement and the unit area, have there been a series of operators' meetings held in connection with the formation of this proposed unit?

A Yes, sir, there have.

Q Have copies of minutes of these meetings been furnished to the United States Geological Survey and to the office of the Commissioner of Public Lands?



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A They have.

Q Are the working interest owners in this area in substantial agreement as to the unit area and the Unit Agreement?

A They are.

Q Can you state what percentage of the operators and working interest owners have indicated their approval affirmatively?

A Approximately 89.33%.

Q Now, as to the balance, has there been any objection voiced to your knowledge?

A There has been no objection.

Q The 89.33% are those who have attended the operators' meetings, is that correct?

A That is correct.

Q And have all owners of working interest in this area been advised of these operators' meetings?

A They have.

MR. CAMPBELL: Will you mark this Exhibit No. 2, please?

(Whereupon, Applicant's Exhibit No. 2 was marked for identification.)

Q Mr. Darden, I refer you to what has been identified as Applicant's Exhibit No. 2 in this case and ask you to state what that is.

A This is the Unit Agreement for the development operation



of the West Loco Hills Grayburg No. 4 Sand Unit area.

Q There appears to be some portions of this exhibit, some changes in the identification of the exhibit numbers. Are you aware of that?

A I am.

Q There are two exhibits which will be introduced here to be attached to this Unit Agreement, Exhibits A and B, are there not?

A That's correct.

Q And the corrections have been made here only to change the identification of the exhibits to conform to the exhibits actually attached, is that correct?

A That's right.

Q I believe there is an interlineation in ink appearing in the agreement. Is it your understanding that this is for the purpose of clarifying the language and including some omitted language in the mimeographed form?

A That is my understanding.

Q That they do not change the substance of the agreement?

A No.

Q Those have been shown in the draft that has been provided here as Exhibit No. 2, is that correct?

A That's correct.

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MR. CAMPBELL: Will you mark this 2-A, please?

(Whereupon, Applicant's Exhibit 2-A was marked for identification.)

Q Now, Mr. Darden, I hand you what has been identified as Applicant's Exhibit 2-A and ask you to state what that is, please.

A This is a map outlining the unit limits and designating the participating and non-participating acreage which would be encompassed by the unit.

Q Does this exhibit number the various tracts that are involved in this proposed unit?

A It does.

Q And this is the Exhibit A which is referred to and will be attached to the Unit Agreement, is that correct?

A That's correct.

MR. CAMPBELL: Will you mark this 2-B?

(Whereupon, Applicant's Exhibit 2-B was marked for identification.)

Q I now refer you to what has been identified as Applicant's Exhibit 2-B and ask you to state what that is, please.

A This is a table which presents the description by tract number with the amount of acreage and the cumulative production to December 1st, 1960. It also presents the tract participation percentage in the unit. It also shows the total unit participation by each working interest owner.

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Q Mr. Darden, has the formation of the unit and the method of allocating the production from the unit been discussed with both the United States Geological Survey and the office of the Commissioner of Public Lands informally?

A It has.

Q Are you aware of any present objection to the formation of the unit?

A No.

Q Has an application been filed with the United States Geological Survey for the designation of the unit area?

A It has.

Q What is the proposed basis for the allocation of production from this particular unit?

A The participation formula is based 100% upon cumulative primary production from Zone 4 of the Loco Hills or the Grayburg, commonly called the Loco Hills Sand cumulative production to 12-1, 1960.

Q Have those consenting operators to which you have referred also agreed to this method of allocating the production?

A They have.

Q Will you state in general terms, Mr. Darden, how and why you arrived at this cumulative primary as the sole factor in the allocation of production from this proposed unit?



A This is an old field, and when the wells were originally drilled, very little reservoir data such as core analyses or radioactive or electric logs were taken. Therefore, there's not any tangible reservoir data which could be used, and it is the consensus of the operators that cumulative primary production from the Loco Hills Sand is the most representative basis for unitization.

Q In your opinion, Mr. Darden, will the approval of this Unit Agreement for secondary recovery purposes be in the best interest of conservation?

A Decidedly so.

Q If the unit is established, who will be the unit operator?

A Newmont Oil Company.

Q Newmont Oil Company, as I understood you, is now operating the waterflood project immediately to the East and North of the proposed unit area, is that correct?

A That's right.

Q If the unit is approved, do you intend to initiate additional waterflooding efforts in the unitized area?

A As soon as possible, yes.

Q Would you return to Exhibit No. 1 there, please? Will you point out to the Examiner, as you see fit, the present

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operation and what is proposed to be done with regard to adding injection wells, and proceeding with the development of secondary recovery in the proposed unit area?

A As I said before, the active injection wells in the Newmont project are circled in red. Also on Exhibit 1 we have underlined in orange the producing wells in the Newmont project which have responded to injection. As you will note, there are wells that directly offset the unit that have responded to Newmont's injection. So it is our plan to put injection wells on offsetting the Newmont project which will adequately protect correlative rights both to Newmont and to the participants in the unit in the manner which is portrayed on this Exhibit 1.

I would like to point out that this is only a tentative development plan and that there will necessarily be changes in some of the injection wells as the project is developed. However, we will at all times keep the pattern consistent with the best interest of conservation.

Q Do you believe, Mr. Darden, that the formation of this unit and the development of the unit acreage is in the best interest of conservation?

A I certainly do.

Q Do you believe that this is the best method of adequately protecting the correlative rights of the owners of property

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in this area insofar as secondary recovery is concerned?

A I certainly do.

Q Do you consider this unitized area and the operations therein to be a reasonable extension of the presently existing waterflood project which Newmont Oil Company now operates?

A I do.

Q Mr. Darden, have you made any projection of the additional production that may be expected from the Newmont area and any projection as to the anticipated production from the unitized area insofar as peak production is concerned?

A I have. We have prepared this exhibit, which will be Exhibit No. 3. It gives an estimate of the production rate which Newmont expects of its present project, and which it expects by development of the West Loco Hills Unit on the basis which we have proposed.

(Whereupon, Applicant's Exhibit No. 3 was marked for identification.)

Q Now, referring to Exhibit 3, will you state the basis upon which these calculations are made and explain to the Examiner what, in general, it indicates?

A Well, we relied very heavily upon the performance of Newmont's present project in estimating what the individual wells in the unit will do as far as response and performance. We also have projected Newmont's production rate to the best of our

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engineering ability, and both of these things are portrayed there.

The Newmont project future production is in the dark dotted line and the West Loco Hills unit production is in the lighter dotted line.

Q Does this indicate that the production from the unitized area here to the West will be increasing at the time that the presently producing wells are declining?

A Yes. We estimate that the present Newmont project will peak hit its highest production rate in 1962, and thereafter will commence to decline as shown on Exhibit No. 3. We estimate that the West Loco Hills project will hit its peak production in the latter part of 1964, and will hold that peak for approximately two years and then will commence declining in a manner similar to the present Newmont project.

Q And that the peak of this unit area would be around 13,000 barrels in the latter part of 1964 based on your present projections, is that correct?

A I don't know this 13,000 figure.

Q Here.

A That's 130,000 barrels per month.

Q 130,000 barrels per month, yes.

A Yes.

Q Have you made any comparative calculations between the

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allowable production which would be in existence under the development of this project as an extension of the existing flood and the development of the project with a unit allowable where permission was granted to make transfers of the allowable?

A Yes, I have. There are presently 92 active wells in the proposed unit, and when fully developed we expect to have a total of 128 wells, including injection wells. There will be 110 40-acre proration units within the unit, and based upon 42 barrels per 40-acre tract plus one-third of 42 barrels for each additional well within a 40, the total unit allowable would be 4872 barrels per day.

Q Have you made any calculations as to what the production would actually be, assuming that you proceeded under the same operation as you are conducting in the Newmont Loco Hills flood to the East?

A Yes, we estimate that the project will peak at approximately 4300 barrels per day.

Q So that the amount of the allowable under a unit allowable with transfers would be greater than the production you estimate under the extension of the presently existing flood, is that correct?

A That is correct.

Q Why is that?



A Well, that is due primarily to the system of control on rate of expansion. The Commission requires evidence of response of producing wells before the next row of injection wells can be put on. We have found in the Newmont project that that has very effectively limited the peak at which our project could hit.

We had originally estimated in our engineering before the flood was started that if it were a successful flood it would peak, I'm speaking now of the Newmont project, it would peak at around 5200 barrels per day. Well, it now appears that we will not peak at over approximately 3500 barrels, but, of course, in our original engineering we had expected to go to full development as soon as we had a successful pilot. And for that reason we believe that expanding on the same basis in the West Loco Hills Unit will achieve approximately the same sort of results.

Q Where do you anticipate obtaining the water for the development of this area?

A From the Yucca Water Company.

Q Is that the same source of water that's being used in the present Newmont flood?

A It is.

Q A few questions about the present flood and what you contemplate in connection with the unit area. Would you state for the record what you are doing in connection with the

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injection of water relative to injecting it through the casing or injecting it through the tubing in the injection wells?

A We have a standard procedure of testing each injection well to the plant injection pressure testing the casing in the well. If we find that the casing is in good condition and will hold that pressure with no evidence of any type of leakage, then we inject down the casing. In the event that there is any evidence either on that test or in subsequent injection that the water is not going into the desired sand, we then run tubing and set it on a packer and inject through tubing.

Q Do you believe, Mr. Darden, that if this project is approved as an extension of the existing Newmont flood, that it will be in the interest of conservation insofar as ultimate recovery of oil is concerned?

A I definitely do.

Q Do you believe that the Unit Agreement, coupled with the development of the unit area on the same basis as you have presently developed the Newmont flood, will protect correlative rights?

A I do.

Q Do you believe that the development of this area on this basis will better protect correlative rights than the development of the area on an individual lease basis would do?

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A I certainly do.

MR. CAMPBELL: I would like to offer Applicant's Exhibits 1, 2 and 3 in evidence, Mr. Examiner.

MR. NUTTER: Applicant's Exhibits 1, 2 and 3 will be entered in evidence.

MR. CAMPBELL: That's all the questions I have at this time.

MR. NUTTER: Are there any questions of Mr. Darden?

MR. MORRIS: Yes, sir.

MR. NUTTER: Mr. Morris.

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Darden, your original pilot waterflood project in the Loco Hills area was authorized, I believe, by Order No. R-1267, Case No. 1511. The order was dated on October 25, 1958, is that correct?

A I'm not certain of the number, but I assume that is correct. It was approximately that time.

Q Right. Could you tell me what the original pilot area was in this project?

A Yes. We had six injection wells located in Section No. 1, Township 29 East, 18 South, and Section No. 6, Township 30 East, Range 18 South. The wells were the Ballard No. 5-B,



the Yates A No. 2, the Yates A No. 11, the Yates No. 2, the Yates No. 3, and the Yates No. 5.

Q Yes. So five of those injection wells were in Section 6 and one was over in Section 1?

A That is correct.

Q How many producing wells did you have in the original pilot area?

A Well, there were two wells that were completely closed, Yates No. 8-A and Yates No. 9-A. There was one producing well which had what we call a three-way push. It was open on one side and that was the Yates No. 6.

Q So the six injection wells and the three producing wells constituted the entire pilot area?

A That's correct.

Q Then after the approval of that pilot area you expanded that particular project, did you not?

A Yes.

Q And in which direction did you first expand the project?

A I believe that our first expansion was with the drilling of our No. 13-A. Now, I would have to check the records to be certain, but we did expand it towards the East, and about the same time we re-entered Well No. 7 and put that well on injection. We put No. 12-A on to give some backup for No. 4, a producing well.

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We then put the Carper No. 2 Well on, we moved in this direction and put the Ballard --

MR. CAMPBELL: Which direction?

A To the West. On to the Ballard lease, and put the Ballard 4-B on, we drilled the Ballard 6-B to give a more efficient pattern. We have recently put the Brigham No. 1-A on, which is located in Section 31, Township 17 South, Range 30 East. We have drilled Brigham No. 4 on that same lease, an injection well, we have drilled Carper Talmadge No. 4 as an injection well in Section 32, so we have moved in both East and West directions as response dictated.

Q I see. How many injection wells do you have in the project at the present time?

A Well, I had better count them -- fifteen.

Q Fifteen injection wells at the present time, and the exhibit will reflect how many producing wells you have at the present time?

A Yes.

Q Would you say, Mr. Darden, that the project then has gone definitely beyond the stage of a pilot waterflood?

A Yes, sir.

Q And your most recent expansion of the pilot waterflood has been in the easterly direction?

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A That's true.

Q Mr. Darden, I believe we're all familiar with the present Rule 701 under which the Commission now operates. Was the pilot waterflood project authorized before present Rule 701 was promulgated by this Commission?

A Yes, it was.

Q I believe the records of the Commission will show that the present Rule 701, concerning waterflood projects, was promulgated by Order 1525, dated November 9th, 1959 following an extended hearing held in Roswell. If I might interrupt the cross examination for just one moment, I would like to read into the record a particular provision of the order promulgating our present Rule 701, for the purposes of discussion.

I'm reading now from Order R-1525, after the findings, the order reads as follows: "It is therefore ordered Paragraph 1 that Rule 701 of the Commission rules and regulations be, and the same is hereby revised to read in its entirety as hereinafter set forth, provided, however, that the allowable provisions contained in revised Rule 701 shall not apply to waterflood projects heretofore authorized by the Commission or to legitimate expansions thereof."

Are you familiar with that particular working of the rule?

A Yes, sir.

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Q Now, Mr. Darden, what was the allowable of this particular pilot project area when it was first authorized. Was it operating under any restrictions?

A There were no restrictions on the producing rates.

Q What is your proposal concerning the allowables to be assigned to your proposed extension of the project area?

A We propose that the unit will be operated under the same rule and basis as our present project as a logical expansion of that project.

Q Now, referring to the language that I just read in Order No. R-1525, the allowable provisions of our present Rule 701 would not apply to this project if it were considered a legitimate expansion of the old project, is that correct?

A I didn't understand it that way. Maybe you had better rephrase the question.

Q All right, I'll rephrase it.

A Or just repeat it, possibly, would be all right.

Q The only reason that your present extension, your proposed extension here of your waterflood project would not be governed by the allowable provisions of our present Rule 701 is because of the language that I just read which, in effect, states that the allowable provisions of Rule 701 will not apply to legitimate expansions of a waterflood project authorized before

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the promulgation of this rule?

A That's true.

Q So far as the allowable issue in this hearing is concerned, it depends upon what we mean by a legitimate expansion of a flood, does it not?

A Well, that's the Commission -- yes, I suppose it is.

Q That's the issue as far as the allowables are concerned?

A I would say probably so. However, I would emphasize that we do consider this to be an expansion of an existing flood. It's in the same reservoir, there is no evidence of any separation, so consequently for us it is an expansion of an existing project.

Q Now, I believe that the order refers to the word "legitimate" expansion, and I'm not sure any of us know what legitimate means. What factors do you think the Commission should take into consideration in determining whether or not an expansion of a flood is a legitimate expansion? Do you have any thoughts on that subject?

A No.

MR. CAMPBELL: May I answer that?

MR. MORRIS: I'll be happy to have you do that.

MR. CAMPBELL: I think it's almost a legal question if you are defining the term legitimate. I think we would take the position that the Commission should consider whether it is in the

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same reservoir, whether the projects are geographically adjacent to each other, whether there is a risk of the abuse of correlative rights in the event there is a change in method of operation of the adjacent waterflood properties.

I believe the findings in the order establishing Rule 701 make some reference to the fact, or to the Commission's conclusion that there is a question at least, a possibility as I recall the word, that to change rates of injection in a waterflood project might result in waste, and I think this is a factor that the Commission should consider. There are probably others, but certainly I think those are important factors in determining whether it is a logical expansion, and it is difficult for me to see how within the same reservoir, from the point of view of efficient operation of the flood and the protection of correlative rights of producers or owners in that field, you can alter the method of allocation of allowables once a project is approved.

MR. MORRIS: Mr. Campbell, since the word legitimate expansion was used in the order promulgating Rule 701, it might be a reasonable inference to make that expansions were contemplated that might be illegitimate.

MR. CAMPBELL: I'm unable and was unable at the time to construe what the Commission had in mind when it made that differentiation between legitimate and illegitimate expansions. I

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think that the Commission, as in other cases, simply must reach a conclusion as to whether or not it is in the interest of the prevention of waste by way of efficiency of the operation of the project, and whether it's in the interest of protection of correlative rights that the same procedures be followed in immediately adjacent properties in the same common reservoir.

I think that's the basic question. If that means that's the definition of legitimate or illegitimate, well, that would be the way I would construe it. I don't think it alters the basic responsibility of the Commission.

MR. MORRIS: Do you think that a difference in ownership between the two areas would be the factor to consider in determining whether particular expansion of a project were legitimate?

MR. CAMPBELL: I do not think so from the point of view of the Commission, and the Commission has in the past apparently considered who the operator is as a factor. Though I have never fully agreed with that, but in this instance, of course, the operator is the same. There might be some justification where the operator isn't the same, on the assumption that the project would not be operated in exactly the same fashion.

Therefore, there might be some doubt as to whether correlative rights would be protected the same by different operators, but



I don't think that who owns the property is the basic question in this determination as far as, certainly as far as efficient operation and prevention of waste is concerned. It perhaps would have a bearing to some extent on the protection of correlative rights.

MR. MORRIS: Do you feel that one factor that might be considered would be the direction in which the flood was moving at the time the extension to the flood was projected?

A Well --

MR. CAMPBELL: Well, I certainly think it has to, because obviously as you approach an area over which you have no control or no line agreement or no unitized area, your correlative rights begin to be affected, and I think that is a consideration. I think if somebody just blindly moved off in a direction which made it necessary to expand the flood without consideration of efficiency factors in the method of development, that might be a question that they were simply trying to get more allowable, that could be a consideration I suppose, though I don't think that exists here. As long as I'm testifying, I might as well throw that in.

A I might mention, Mr. Morris, that in my description of how this project was expanded, I did not mean to infer that that was the most sound engineering basis for expansion, but we had other considerations; since we did not have lease line cooperation

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we did not have offsetting injection wells on other properties which would have protected correlative rights, we were forced to keep our expansion within our own property.

Q Mr. Darden, do you have an active flood front at the present time in the Northeast Quarter and the North Half of the Southeast Quarter of Section 1?

A Well, by a flood front, if you mean do we have oil moving as a result of our water injection, we do have. Of course, in a pattern waterflood you have a flood front in each five spot, or each pattern, and, of course, since our patterns are not closed up here or over here, we have, you might call it, a flood front, although we wouldn't think of it exactly that way.

We are moving oil as indicated by the response of this well here, Ballard 3-B, and by the response of Ballard 2-B.

Q Mr. Darden, if you drill your injection wells as proposed here, I'm referring specifically to your Well No. 1-B in Section 1, your Well No. 1, Well No. 4-A and Well No. 2 just coming right down your line in Section 1, if you drill those injection wells or convert them to injection wells and begin injecting water into those wells, do you feel that you would have to produce your next row of producing wells immediately to the West of those injection wells at a rate greater than the allowable which you would receive under our present Rule 701?

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A If we could produce them at no more than 84 barrels per day, for example, if there was one injection and one producing well?

Q Right.

A I would say that very definitely we're going to have to produce them at higher rates than that in order to recover the oil, because your production rate is a definite function of your injection rate. If you are putting the water in at a certain rate, and you don't withdraw the fluids that come into the producing well at approximately the same rate, then you are going to have oil driven by that producer and trapped in the formation, and it probably will never be recovered.

Q You are assuming there that you are going to have to inject water in the injection wells mentioned at a rate so high that you would have to produce the wells at a higher rate than 84 barrels a day?

A I'm assuming that because experience in Newmont's project has given us definite proof that injection at rates and pressures below the maximum which we can achieve below the formation's breakdown pressure do not force water into all of the productive sands, so consequently at lower injection rates and lower pressures we are bypassing a considerable volume of oil which will never be recovered.

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Q Moving westward, if you come to the next general tier of injection wells, would you have to inject water into those wells at the same rate you would have to into the tier of injection wells closer to the present project?

A Yes, we would have to, and there are several reasons for it. First is the reason which I have mentioned, that in order to get maximum recovery by waterflooding in this field we know that we have to put the maximum volume at the maximum pressure that we can in each injection well, and that doesn't apply just to one side because if you just put it in say this side so you get efficient flooding on this side well, what are you doing over here? Are you going to be happy with only flooding half the sand on this side simply by reducing your injection rates?

Secondly, without some sort of balance in a pattern flood, you have premature water breakthrough. You have additional waste and loss of the oil in that respect.

Q It's your feeling, I take it, Mr. Darden, that the reservoir characteristics of this particular formation lends itself only to a capacity type flood?

A That's correct.

Q Then, if I may presuppose answers from you, you would not feel that any buffer zone that might be established in this

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area between the present project and the proposed extension would be feasible?

A You are correct. We have looked into that idea and have tried to see where it might be workable, and from a recovery standpoint we don't believe that a buffer zone in this field is workable. In other words, we believe that the use of a buffer zone would cause loss of ultimate recovery.

Q Mr. Darden, generally do you remember when your Wells 4-B and 6-B in Section 1 were put on injection?

A It will have to be very generally.

Q That's all right.

A I don't have the data with me on that. I would say they've been on injection approximately a year.

Q Approximately a year?

A Now one other thing I might point out while we are discussing this Newmont performance, we have had the injection rate cut back on these wells for this 4-B and 6-B Ballard for more than six months. By cutback, I mean we have restricted the injection rates to roughly half of what those wells would take, simply because we had evidence that the producing wells offsetting them were responding, and we have hoped that we would be able to accomplish some type of lease line cooperation before we drove any oil off our property. We know this is not the most efficient

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way to flood this, but we have an obligation to protect the correlative rights of our royalty owners, and our own company's oil, so we have had to restrict our injection rates in 5-B, 4-B and 6-B from the Ballard to prevent migration of oil off our property.

That is one additional reason why we are so positive that the formation of this unit and the immediate waterflood development of the unit is necessary to protect correlative rights and from a conservation standpoint.

Q Mr. Darden, is the formation of the unit in any way contingent upon the allowable provisions that are included in the order as a result of the hearing on your waterflood project?

A I would say no. I feel that Newmont, as well as the other operators in the field, recognize that the unit formation is necessary for the most efficient development of the property for the protection of correlative rights, as I've mentioned. I would say that we feel there will definitely be a loss of ultimate recovery if the Commission rules in such a way that we have to artificially restrict injection rates and producing rates.

Q But the formation of the unit itself is not contingent upon the outcome of the waterflood case?

A Well, of course, I don't know.

Q There's nothing in the Unit Agreement to that effect?



MR. CAMPBELL: No.

A No.

MR. CAMPBELL: No one has signed it yet either.

A No, the Unit Agreement is not signed.

MR. MORRIS: I have no further questions.

MR. NUTTER: Does anyone else have any questions of Mr. Darden?

MR. CAMPBELL: No, I have no more questions.

CROSS EXAMINATION

BY MR. NUTTER:

Q What did this 89.33% of working interest actually represent again?

A That represents the working interest owners within the unit area that have given their tentative approval to the proposal of the unit and of the participation factor.

Q These are the operators that attended the operators' meetings and gave their consent at those meetings?

A Well, that isn't exactly true. There was one operator who was not there who has since given his firm approval. There was one operator who was represented there but who has not had authority from his top management, and we have not heard anything from them one way or the other. So the 89.33% is of the operators that have given positive indication of their approval.

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Q How about royalty ownership in this area, is it all either Federal or state land?

A Yes.

Q Or is there any fee land?

A It's all state or Federal. As a matter of fact, the state owns 40.7% of the acreage in the unit.

Q As to the participation formula, I presume these 89.33% of working interest owners have approved this participation formula based on cumulative primary production up to 12-1-60?

A Yes.

Q Has the regional supervisor of the United States Geological Survey given his consent to the participation formula?

A Yes.

Q Has the Commissioner of Public Lands given his tentative consent to the participation formula?

A He has.

Q The participation formula is the tract percentage formula in direct proportion to the cumulative production in the next column to the left?

A Yes.

Q How was the estimated recovery for the two undrilled tracts determined, Mr. Darden?

A It was determined by the preparation of an isocumulative



map based on the cumulative production from the Loco Hills Sand, and those two 40-acre tracts which are to be developed in the immediate development pattern, were given a psuedo cumulative credit based upon the menterium of the contours of the isocumulative map.

Q So, in effect, the offsetting wells were the ones that contributed the figures for the isocumulative map and, in effect, determined how much credit these 40's would get, I presume?

A That's correct.

Q You have actually, in this particular case, requested authority to convert three wells to injection, have you not?

A I believe that's correct.

Q And are each of those three wells direct or diagonal offsets to wells which do offset current injection wells, or wells which have responded to the water injection program?

A Yes, sir, they do.

Q So the three wells for which you have requested authority to convert to water injection are the Ballard B No. 1 in the Southeast Northwest Quarter of 1, 18, 29?

A That's right.

Q The Dixon-Yates Federal No. 2, Southeast Southeast 1, 18, 29 and the Newmont Canfield 1-A in the Northwest Northwest of 7, 18, 30?

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A That's right.

Q And presumably any additional wells which would be converted to water injection, you would request administrative approval for those after the response features of Rule 701 have been met?

A Yes.

Q Now, Mr. Darden, you stated that under Rule 701, with the 110 40-acre proration units and the proration units for which additional credit would be given for second or third well on the 40, you would have how much allowable when the thing was fully converted?

A 4872 barrels per day.

Q And your estimated peak, according to Exhibit No. 3, is 4300 barrels per day?

A That's right.

Q You are going to purchase water from Yucca Water Company, will Yucca Water Company have sufficient water available in this area to complete the waterflood project?

A Yes.

Q That's the source of water for your adjoining flood also, is it not?

A That's correct.

Q Now, the Commission recently authorized three additional



waterfloods just North of this area. Do you know whether the source of water for those projects will be Yucca Water Company or not?

A No, I don't. We have talked with those operators, and it's my understanding that one of the operators has made a contract with another company for water. We have not heard what the other operators are going to do.

Q Has any of those three floods been commenced as yet?

A No, sir.

Q But Yucca does assure there will be sufficient water to carry your flood to its conclusion?

A Yes, sir.

Q Mr. Darden, referring to the three factors which Mr. Campbell mentioned as being important considerations in determining whether a project was a legitimate or logical expansion, he mentioned that the first would be the same reservoir. This is in the same reservoir, I presume?

A Yes, it is.

Q His second consideration was the geographic adjacency of the projects. Are they geographically adjacent?

A Yes, and Exhibit 1 shows that.

Q The third factor he mentioned was the risk of correlative rights being damaged. Do you consider that a factor?

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A I consider that probably the most single important factor in this hearing.

Q Since we're referring to No. R-1525 in this hearing, I'd ask you if you are acquainted with finding No. 9 of that order which reads as follows: "That the establishment of buffer zones between waterflood projects may be necessary when offsetting waterflood projects have varying allowable provision." Rule 701 should, therefore, include a provision for the assignment of special allowables in such buffer zones where it is established at a hearing that correlative rights can not adequately be protected otherwise.

I take it from your previous testimony with regard to the buffer zones that you feel that a buffer zone could not be established which would adequately protect correlative rights?

A That's correct.

Q Or is it that you feel that a buffer zone couldn't be established that wouldn't result in waste?

A Well, I think they're the same problem. If your property within the buffer zone is flooded effectively and there's no waste created, however, if the next stepover where injection rates are reduced, as I understand the buffer zone idea, then you aren't flooding efficiently based on our experience in this field, then consequently you are not only damaging correlative rights for the

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people in the zone or in the area that does not have full injection rates, but you are also creating waste at the same time by not effectively flooding their property.

Q Would you agree that it would be possible to establish a barrier between two projects in which sufficient water was placed into the ground to prevent a pressure differential from one side of the barrier to the other?

A That has been done in some fields, not for that purpose, but, as I understand it, to prevent water from migrating or oil migrating into a gas cap, or something like that. It's possible. I don't see that it would serve any useful purpose here.

Q You do know of water barriers being established between particular areas in pools, though, do you not?

A I have read of some, yes.

MR. NUTTER: Are there any other questions of Mr. Darden?

MR. MORRIS: I have one further question.

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Darden, you have testified that the daily expected peak in the waterflood project, when all wells are converted to the project, will be some 572 barrels per day less than the peak that you would be entitled to receive if the project were operated



under the allowable provisions of Rule 701. With that in mind, would you explain why Rule 701 would not be, and its allowable provisions would not be satisfactory to you in this case?

A Well, frankly, I'm not well enough versed in the ramifications of Rule 701, since we have no projects that operate under it, to know how that would affect us. I would say if we were given a unit allowable with sufficient latitude and transfer of allowables so that we could be assured of not artificially restricting injection rates or producing rates in the portion of the unit which was under development at that time, it probably would not hurt the flood.

MR. MORRIS: No further questions.

MR. NUTTER: Are there any further questions?

REDIRECT EXAMINATION

BY MR. CAMPBELL:

Q The response to the last question will have to be predicated upon the operation of this unit with a unit allowable, would it not?

A Yes.

MR. CAMPBELL: No further questions at this time.

MR. NUTTER: Are there any other questions? Mr. Darden may be excused.

(Witness excused.)

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MR. NUTTER: Do you have anything further, Mr. Campbell?

MR. CAMPBELL: No, not unless I want to respond to some statements.

MR. NUTTER: Does anyone have anything they wish to offer in Case 2472 or Case 2473?

MR. MORRIS: I have a telegram.

MR. NUTTER: Mr. Morris.

MR. MORRIS; I have a telegram from Graridge Corporation which I will make part of the record in this case, generally concurring with the application of Newmont in this case.

"Graridge Corporation, as a working interest owner in the proposed West Loco Hills Grayburg 4 sand unit, supports Newmont Oil Company's application for approval of this unit for the purpose of conducting secondary recovery operations. Newmont's current secondary recovery project in the Loco Hills Field in the Grayburg 4 sand has demonstrated water flooding to be a sound conservation measure in recovering oil which otherwise would remain in the Grayburg reservoir. Graridge further supports Newmont's application to develop the subject unit as a logical expansion to its Loco Hills waterflood project and that operation of the unit should be conducted in accordance with the same sound engineering practices and program that have resulted in success in this field. We respectfully request that the Oil Conservation Commission grant

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approval of the applications made by Newmont through Cases 2472 and 2473 on Docket No. 1-62."

MR. MURPHY: Mr. Chairman, I would like to enter an appearance for Caprock Water Company, Inc. as their interest appears in this case, and state that they operate under Franchise 178 from the Public Service Commission, and they wanted me to state for them that they are ready, willing and able to furnish water to this project at the posted price.

MR. NUTTER: Would you identify yourself?

MR. MURPHY: Yes, I am Bert Murphy, I am a consulting engineer from Fort Worth, Texas representing Caprock Water Company.

MR. BRATTON: Howard Bratton on behalf of Humble Oil and Refining Company. Capacity allowables were reviewed in detail in Case 1787 in October of 1959. It is requested that the testimony in that case be considered and made a part of this Case 2473, if Newmont Oil Company's application for expansion of its Loco Hills waterflood project to include the proposed West Loco Hills Grayburg No. 4 sand unit is approved by the Commission, it is recommended that the expansion area be made subject to statewide Rule 701, and if considered appropriate, a buffer zone of reasonable size be established between the existing Loco Hills waterflood project and the proposed area.

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MR. NUTTER: Mr. Bratton, did I understand you to say that you wanted certain testimony in the other case incorporated in the record in this case?

MR. CAMPBELL: We object to that if they want the whole record.

MR. BRATTON: We would ask that if Mr. Campbell objects that the evidence of Humble in that case as to the basic question of the necessity of capacity allowables to prevent waste, that that evidence be considered and be made a part of this record.

MR. MORRIS: If the Examiner please, if Mr. Campbell has no objection, I certainly have no objection to the inclusion of the record of that case being incorporated into this case. However, this case was not advertised for a whole new consideration of the problem of capacity versus restricted allowables.

MR. CAMPBELL: I might say further, if that is done, then it would be incumbent on the Applicant here to present considerable additional evidence with regard to the operation in this particular field. We have not in this case made any attempt to attack the original order, we are seeking authority under the order, testimony is in the record as to the witness's opinion on this particular field, and we certainly would not like to see one side of the testimony in a case involving a particular application, incidentally, and not a general hearing, as I recall it,

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included in this particular case. I think it will make the record unnecessarily large, and in the event that there was an appeal, we certainly would want to have an opportunity to present additional evidence.

MR. NUTTER: Would there be any objection to the Examiner or the Commission taking administrative notice of Case No. 1787?

MR. CAMPBELL: I have no objection. I am reasonably confident they will anyway.

MR. NUTTER: Is that satisfactory with you, Mr. Bratton?

MR. BRATTON: If the Commission please, yes, that's perfectly satisfactory.

MR. NUTTER: Mr. Kellahin.

MR. KELLAHIN: Kellahin, appearing on behalf of Amerada Petroleum Corporation. Amerada Petroleum Corporation certainly has no objection to the formation of this unit, nor the water-flood project as such, but it does object to the allowable features which would be incorporated as a result of this expansion, and urges that the project be placed under the provision of Rule 701.

This, in its essence, amounts to the expansion of a project which consists of something in the vicinity of three sections to something between 11 and 12 sections of land. It appears to be a

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situation of the tail wagging the dog in order to extend the allowable provisions of a going project.

On that basis we don't feel it complies with the provisions of Order No. R-1525, as a legitimate expansion of an existing flood. We second the statement which was made in behalf of Humble Oil and Refining that the project be placed under Rule 701 with a buffer zone provision, if that appears appropriate and necessary. In essence, the testimony of the witness presented on behalf of Newmont is solely to the effect that in his opinion the formation lends itself only to a capacity type flood, a matter which we feel was settled by the Commission when it adopted its Order R-1525.

MR. NUTTER: Anything further?

MR. CAMPBELL: I would like to make a statement in that regard.

MR. NUTTER: Mr. Campbell.

MR. CAMPBELL: This question was, in my judgment, not settled as to each reservoir in that case definitely, and the Commission recognized this in making provision in several respects for exceptions under the rule, or for different treatment under certain conditions, and I think the examination of the evidence offered in this case, the percentage of ownership of Newmont, the operator of the present flood, will definitely

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reveal that they do not own a majority interest in this unit area.

It has been my impression that the Commission has consistently encouraged the formation of units, particularly for secondary recovery, rather than facing a situation where constant lease line agreements had to be initiated and entered into to expand these waterfloods, and I would like to state again that it is the position of the applicant here that this is, in effect, a legitimate and not an illegitimate expansion of the existing waterflood.

MR. NUTTER: Thank you. Anyone else? We'll take these cases under advisement and recess the hearing until 1:30.

(Whereupon, a recess was taken until 1:30 P.M.)

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STATE OF NEW MEXICO)
) SS
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 5th day of January, 1962.

Ada Dearnley

Notary Public-Court Reporter

My commission expires:

June 19, 1963.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2472-2473 heard by me on 1-4, 1962.

[Signature], Examiner
New Mexico Oil Conservation Commission

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DOCKET: EXAMINER HEARING - THURSDAY - JANUARY 4, 1962

9 A.M. - OIL CONSERVATION COMMISSION CONFERENCE ROOM
STATE LAND OFFICE BUILDING - SANTA FE, NEW MEXICO

The following cases will be heard before Daniel S. Nutter, Examiner, or Elvis A. Utz, as alternate examiner:

CASE 2448: (Continued)

Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project on its C. J. Holder, State Holder Oil Unit, State "CA", State Oil Unit and Gallegos Canyon Unit Leases, San Juan County, New Mexico, in the Cha Cha-Gallup Oil Pool with water injection initially to be through five wells located in Sections 8 and 16, Township 28 North, Range 13 West, and Section 23, Township 28 North, Range 12 West, and requests adoption of special rules to govern the operation of said project.

CASE 2449: (Continued)

Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project on its Navajo Tribal "H" and Gallegos Canyon Unit Leases, San Juan County, New Mexico, in the Totah-Gallup Oil Pool with water injection initially to be through five wells located in Section 35, Township 29 North, Range 13 West, Section 12, Township 28 North, Range 13 West, and Sections 13 and 24, Township 29 North, Range 14 West, and requests adoption of special rules to govern the operation of said project.

CASE 2429: (Continued)

Application of Standard Oil Company of Texas for approval of the Jurnegan Point Unit Agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of the Jurnegan Point Unit Agreement embracing 10,240.84 acres, more or less, of State and fee lands in Township 24 South, Ranges 24 and 25 East, Eddy County, New Mexico.

CASE 2452: (Continued)

Application of Southwest Production Company for an order pooling all mineral interests in the Basin-Dakota Gas Pool in the W/2 of Section 7, Township 30 North, Range 11 West, San Juan County, New Mexico. Interested parties include Maleta Y. Brimhall, Phoenix, Arizona, and Barbara Brimhall Burnham, Aztec, New Mexico.

CASE 2463:

Application of Amerada Petroleum Corporation for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its L. M. Lambert Well No. 2, located in Unit G of Section 6, Township 20 South, Range 37 East, Lea County, New Mexico, as a dual completion (conventional) in the Grayburg and McKee zones in the Monument Field, with the production of gas from the Grayburg zone to be through a string of 1 1/2-inch tubing and the production of gas from the McKee zone to be through a parallel string of 2 3/8-inch tubing.

CASE 2464:

Application of Amerada Petroleum Corporation for a triple completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its State NJ "A" Well No. 1, located in Unit A of Section 2, Township 25 South, Range 37 East, Lea County, New Mexico, as a triple completion (combination) in the McKee, Fusselman and Ellenburger zones in the North Justis Field, with the production of oil from the Fusselman and Ellenburger zones to be through tubing installed within parallel strings of 3 1/2-inch casing and the production of oil from the McKee zone to be through a parallel string of 2 7/8-inch casing, all of said casing strings to be cemented in a common well bore.

CASE 2465:

Application of Skelly Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Hobbs "N" Well No. 1, located in Unit D of Section 8, Township 18 South, Range 35 East, Lea County, New Mexico, as a dual completion (conventional) in the Vacuum-Abo Pool and in an undesignated Drinkard pool, with the production of oil from both zones to be through parallel strings of 2 1/16-inch tubing.

CASE 2466:

Application of Shell Oil Company for a 320-acre non-standard gas proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to establish a

320-acre non-standard gas proration unit in the Eumont Gas Pool, comprising the S/2 of Section 22, Township 21 South, Range 37 East, Lea County, New Mexico, said unit to be dedicated to the Turner Well No. 7, located at an unorthodox location 1650 feet from the South line and 330 feet from the West line of said Section 22.

CASE 2467: Application of Shell Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Livingston Well No. 12, located 4620 feet from the South line and 660 feet from the East line of Section 4, Township 21 South, Range 37 East, Lea County, New Mexico, as a dual completion (tubingless) in the Drinkard and Blinebry Oil Pools, with the production of oil from both zones to be through parallel strings of 2 7/8-inch casing cemented in a common well bore.

CASE 2468: Application of Shell Oil Company for a triple completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Livingston Well No. 11, located 3300 feet from the South line and 660 feet from the West line of Section 3, Township 21 South, Range 37 East, Lea County, New Mexico, as a triple completion (tubingless) in the Drinkard Oil, Tubb Gas and Blinebry Oil Pools, with the production of oil from the Drinkard and Blinebry zones and the production of gas from the Tubb zone to be through parallel strings of 2 7/8-inch casing cemented in a common well bore.

CASE 2469: Application of El Paso Natural Gas Company for an order establishing special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order establishing special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico, including provisions for 160-acre proration units and a limiting gas-oil ratio of 4000 to 1.

CASE 2470: Application of J. R. Cone for a 40-acre non-standard gas proration unit and for an exception to Order No. R-1670, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the establishment of a 40-acre non-standard gas proration unit in the Blinebry Gas Pool comprising the NE/4 SE/4 of Section 21, Township 21 South, Range 37 East, Lea

County, New Mexico, said unit to be dedicated to the Anderson Well No. 2, located 1650 feet from the South line and 330 feet from the East line of said Section 21. Applicant further seeks an exception to Rule 34 (A) of the special rules and regulations for the Blinebry Gas Pool as contained in Order No. R-1670, to permit the gas produced from said Anderson Well No. 2 to be produced into a low-pressure separator only.

CASE 2471: Application of Leonard Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Federal Ginsberg Well No. 8, located in Unit M of Section 31, Township 25 South, Range 38 East, Lea County, New Mexico, as a dual completion (conventional) in the Langlie-Mattix and Justis-Blinebry Pools, with the production of oil from both zones to be through parallel strings of 2 3/8-inch tubing, separation of the zones to be by a liner re-entry shoe seal assembly.

CASE 2472: Application of Newmont Oil Company for approval of a unit agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of the West Loco Hills Grayburg No. 4 Sand Unit Agreement, covering 5320 acres, more or less, in Townships 17 and 18 South, Ranges 29 and 30 East, Eddy County, New Mexico.

CASE 2473: Application of Newmont Oil Company for expansion of its Loco Hills Waterflood Project, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks permission to expand its Loco Hills Waterflood Project to include the proposed West Loco Hills Grayburg No. 4 Sand Unit Area, comprising 5320 acres, more or less, in Townships 17 and 18 South, Ranges 29 and 30 East, Eddy County, New Mexico.