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

APPLICATION OF COG OPERATING LLC FOR SPECIAL RULES AND REGULATIONS FOR THE ARTESIA GLORIETA-YESO POOL *ET AL.*, AND CANCELLATION OF OVERPRODUCTION, LEA AND EDDY COUNTIES, NEW MEXICO	**Case No. 14613**
and	**CONSOLIDATED**
APPLICATION OF BURNETT OIL CO., INC. AND HUDSON OIL COMPANY OF TEXAS FOR CONSOLIDATION AND EXPANSION OF AND ADOPTION OF SPECIAL POOL RULES FOR CETAIN YESO POOLS, INCLUDING CEDAR LAKE GLORIETA-YESO POOL *ET AL.* IN LEA AND EDDY COUNTIES, NEW MEXICO	**Case No. 14647**

CLOSING STATEMENT OF BURNETT OIL CO., INC. AND HUDSON OIL COMPANY OF TEXAS

TO THE HONORABLE HEARING EXAMINERS RICHARD EZEANYIM AND DAVID BROOKS:

COME NOW **BURNETT OIL CO., INC.** ("Burnett") and **HUDSON OIL COMPANY OF TEXAS** ("Hudson") and present this their written closing argument on the hearing in the captioned matter held May 16 and 17, 2011.

I. SUMMARY.

This hearing occupied two long days, with several witnesses and many exhibits offered by four parties. In the end, the case boils down to two principal contested issues:

First, what is the proper density for development – 10 acres per well or 20 acres per well? The credible evidence, including testimony, the engineering calculations of well drainage areas, and well interference between 10 acre wells, all demonstrate quite clearly that most Yeso wells are capable of effectively and efficiently draining 20 or more acres. Certainly the vast majority are capable of draining more than 15 acres, which is the mid-point between the competing 10 and 20 acre density rules. Twenty acre density is also shown to be the proper initial density by the rules in many Texas Yeso equivalent Clearfork reservoirs, and reservoir modeling studies offered in this record as Burnett/Hudson Exhibits 56 and 28.[1]

The second principal contested issue is whether a GOR restriction is necessary to prevent waste. While the nominal oil allowable was also contested, with Burnett/Hudson advocating 187[2] barrels of oil per day ("BOD") per 40 acre spacing unit, and the other parties advocating 300 BOD, the evidence showed that 187 BOD was sufficient to allow new wells to produce their initial, "flush" production without restriction, when applied with the one year "balancing rule" for over and underproduction advocated by Burnett/Hudson and later adopted by the other parties. More importantly, since most units are not capable of producing a full oil allowable, the maximum oil allowable is most important for the gas limit it creates with a GOR Rule, since as the oil allowable rises, so does the gas limit. Burnett/Hudson urge the Examiners to retain the Statewide GOR Rule

[1] The Burnett/Hudson proposal allows two Paddock and two Blinebry completions per 40 acre proration unit. Operators may use up to four wellbores for this purpose because many wells were originally drilled only through the Paddock. Burnett/Hudson's proposed Orders accommodates this possibility.

[2] Burnett/Hudson revise this recommendation to 107 BOD in this Closing Statement, for the reason stated below.

of 2000:1 because the evidence shows that increasing gas production prematurely depletes reservoir pressure and energy and thereby reduces ultimate recoverable oil and causes waste. Because of the results of Burnett/Hudson's reservoir modeling work discussed below, which strongly confirm this relationship between restricting gas production to enhance oil production, Burnett/Hudson now revise their proposed allowable to 107 BOD with a 2000:1 GOR. The necessity for a 2000:1 GOR is also shown dramatically by the fact that the COG wells have an average cumulative GOR in excess of 4000:1, and average estimated ultimate recoveries of 66,000 barrels of oil per well; while in contrast, the Burnett wells have produced at an average GOR of approximately 2300:1 and have average EURs from 115,000 barrels per well up to over 300,000 barrels of oil per well, with their newly designed "slick water fracs" with combined Paddock and Blinebry production. (Burnett/Hudson Exhibits 42 and 28I).

In response to Examiner Ezeanyim's question at the end of the hearing, Burnett and Hudson commissioned the highly respected Dallas petroleum engineering consulting firm of William M. Cobb & Associates, Inc., to construct a reservoir model of the Paddock member of the Yeso formation and run model results for estimated oil and gas recoveries with several various potential allowables, with and without a 2000:1 GOR Rule (sometime hereafter called the "New Cobb Study"). The full New Cobb Study is a 91 page report, and its results are summarized in Burnett/Hudson Exhibits 59 and 60 tendered with this Closing Statement. This modeling work demonstrates that the lower gas limits produced by lower oil allowables with a 2000:1 GOR do indeed enhance the ultimate oil and gas recovery from the field. In fact, this evidence shows that with a field

allowable of 107 BOD, a 2000:1 GOR, and 20 acre density, each 40 acre unit will produce 14,200 barrels more oil from the Paddock than will be produced with COG's proposed 300 BOD and no GOR allowable and four wells per spacing unit (186.5 MBO vs. 172.3 MBO under COG's proposal). Because the model included only the Paddock member of the Yeso, when the Blinebry is included, each 40 acres will produce double this amount, or 28,400 barrels more oil per 40 acres than with COG's proposed rules. Over the many undeveloped sections in the Eastern part of the Consolidated Area, Burnett/Hudson's proposed rules will result in millions of barrels of additional oil production.

Because the oil recovery is greater with lower oil allowables which create lower gas allowables under the GOR, Burnett/Hudson now modifies its proposed rules to ask the Division to adopt a 107 barrel a day oil allowable, with a 2000:1 GOR for the entire Consolidated Area. This rule is already in effect for the pools in the Eastern part of the Consolidated Area, since the Yeso is deeper and lower structurally there, and falls in the depth bracket with a 107 barrel a day allowable already.

Considering all of the evidence, and weighing the credibility of the witnesses and the studies and calculations they presented, Burnett/Hudson urge the Examiners to adopt one of their two alternate proposals: first, consolidation of 6 pools and the unassigned surrounding areas, with 20 acre well density (but providing "grandfathered" status for existing 10 acre wells), and an oil allowable of 107 BOD per 40 acre unit, a producing GOR of 2000:1 and a 1 year "balancing rule" for over and underproduction on a 40 acre unit basis. Alternatively, in recognition of the large areas in the Western portion of

Burnett/Hudson's proposed Consolidated Area that are already developed to 10 acre density, Burnett/Hudson request that their proposed Consolidated Area be divided in two parts, with the dividing line being the boundary between T17S R30E and T17S R31E. The East Consolidated Area (T17S R31E and Eastward) would be named the Mar Loco, East Yeso Pool, and have 20 acre density, while the West Consolidated Area would retain the current 10 acre density rule and would be named the Mar Loco, West Yeso Pool. Both the East and West portions of the Consolidated Area would include the same Burnett/Hudson allowable and GOR Rules. This alternative proposal would allow operators to continue 10 acre development in the Western area if they believe it is necessary either to produce their properties efficiently, or to protect their properties from uncompensated drainage from offsetting properties developed on 10 acres, while allowing the original development of the large undeveloped portions of the East area to proceed on 20 acre density in this much less developed portion of the Consolidated Area.

II. BURNETT/HUDSON'S RESPONSE TO HEARING EXAMINER EZEANYIM'S QUESTION AT THE CLOSE OF THE HEARING; THE NEW COBB STUDY SUPPLIES A DEFINITE ANSWER.

At the close of the May 17, 2011 Hearing, Examiner Ezeanyim posed the following question:

> **E Ezeanyim**: "I want anybody that will dispute to come out and say so, because all these are being recorded. So it's a solution gas drive that is tight, low porosity, low permeability. **In a solution gas reservoir, this is the position I make. In a solution gas reservoir, especially when it's producing below the bubble point, rate of withdrawal does not damage the reservoir.** I'm going to do it carefully, because this is the crux of the matter, because **my decision will be based on what I just said last**. I said, in solution gas drive reservoirs, rate of withdrawal, especially if it's producing below the bubble point, does not harm or damage the reservoir".

Trans., May 17, 2011 at 383-84.

In response to this question, as mentioned in the summary above, Burnett and Hudson commissioned the New Cobb Study to determine if there were verifiable directional or qualitative trends in estimated ultimate recovery from the Yeso with oil allowables at different rates, and with or without a GOR Rule. The results of those model runs are included in the several pages of Burnett/Hudson Exhibit 60, tendered herewith. The results show quite clearly that (1) the Yeso is rate sensitive with lower allowables producing higher EURs; (2) that a GOR Rule to reduce gas production results in higher oil and gas EURs; and (3) that 20 acre density will effectively and efficiently drain the reservoir. On closer examination, as shown by the comparison runs with and without a GOR Rule, the enhanced oil production with lower allowables appears principally to be a product of the restricted gas production that occurs with lower oil allowables and a 2000:1 GOR. This confirms Burnett/Hudson's position at the hearing, that excessively dense development on 10 acres and unrestricted, high GOR producing rates by COG, in violation of the Division's current allowable rules, causes both economic and physical waste.

Not only does the New Cobb Study prove that the ultimate recoveries from the reservoir are sensitive to the rate of gas production, but also it proves that the amount of incremental oil saved from waste by keeping the allowable at 107 barrels of oil per day with a 2000:1 GOR is very substantial. Because the model was constructed to mimic only the Paddock portion of the reservoir, the values shown on Exhibit 60 must be

doubled to include the additional increased EURs from the Blinebry portion of the Yeso. The model study shows that the ultimate oil recovery at an allowable of 107 BOD and a 2000:1 GOR is 10.39% of the original oil in place, which declines to 9.60% under COG's proposed rules of 300 barrels per day and no GOR. The additional recovery under Burnett/Hudson's proposed rules amounts to 14,200 barrels per 40 acres for the Paddock member only. Thus, the additional recovery is 28,400 barrels for the Paddock and Blinebry per 40 acres. This additional recovery amounts to 454,400 barrels per section! Considering the many undrilled sections in the Eastern part of the Consolidated Area, application of Burnett/Hudson's proposed rules in only the Eastern portion of the field will save several million barrels of Yeso oil from being wasted by COG's excessive drilling and production rates.

The New Cobb Study also shows very clearly that the Yeso formation can be effectively and efficiently drained with 20 acre density, with 10 acre wells adding, at most, only *de minimis* additional recoveries of around three thousand barrels for each of the 3rd and 4th wells when keeping the oil allowable and GOR constant, which additional recovery from the 10 acre infill wells is plainly uneconomic. And, even these minimal additional recoveries diminish at higher allowable rates and actually disappear at COG's proposed 300 BOD allowable, because of the high 600 MCFD gas allowable it creates. Most important, the EUR is actually **higher** with Burnett/Hudson's proposed allowable and 20 acre density than with COG's proposed allowable with 10 acre density and no GOR(186.5 MBO per 40 acres for Burnett/Hudson vs. 172.3 MBO per 40 acres for COG). The New Cobb Study confirms Burnett/Hudson's hearing evidence which

demonstrated that Burnett's 20 acre wells produce substantially more oil, at substantially lower GORs than COG's 10 acre well program. Based upon both the record evidence and the model studies, Burnett/Hudson believes the evidence shows that this reservoir, even though it is now producing below the bubble point, is materially sensitive to the rate of gas production. Consequently, Burnett/Hudson modifies its recommendation and requests that the Division establish an allowable of 107 barrels of oil per day per 40 acre spacing unit, with a limiting gas/oil ratio of 2000:1, and 20 acre density.

III. ISSUES FOR DECISION.

A. UNCONTESTED ISSUES.

All parties agreed upon two of the proposals in the Burnett/Hudson application: Consolidation of five fields and adoption of a one year balancing rule for over/underproduction. Consequently, Burnett/Hudson will not address these issues in its Closing Statement. They are included in Burnett/Hudson's Proposed Orders implementing either their original proposal, or the alternate proposal described above. Note that, for ease of administration and accommodation of new well's hyperbolic original production declines, Burnett/Hudson have provided that the initial partial year for a unit with a new well be combined with the following full year for balancing production and allowable.

B. CONTESTED ISSUES.

The issues contested by the parties on which the Examiners must render a decision include:

(1) A well density rule of 20 acres per well as proposed by Burnett/Hudson, or 10 acres as proposed by the other parties;

(2) The oil allowable for a 40 acre unit;

(3) Whether the GOR Rule of 2000:1 should be retained, as proposed by Burnett/Hudson, or abolished, as proposed by COG, Apache and Premier; and

(4) Whether the sixth field, the Maljamar, Yeso, West should also be consolidated.

The evidence and arguments on each of these issues is discussed below, and demonstrates that the Division should adopt a 20 acre density rule, establish an oil allowable of 107 barrels of oil per day, retain the GOR Rule of 2000:1, and consolidate all six fields and the adjacent unassigned areas, as requested by Burnett/Hudson. Alternatively, the Consolidated Area could be split in two parts at the boundary of T17S R30E and R31E, with the East part having 20 acre density and the West retaining 10 acre density.

IV. THE RECORD EVIDENCE AND THE NEW COBB STUDY CONFIRM THAT WELL DENSITY SHOULD BE 20 ACRES, NOT 10 ACRES.

Four main areas of evidence on this issue demonstrate that 20 acres is the proper basic density rule for effective and efficient drainage of the Yeso Formation within the proposed Consolidated Area. First, the drainage area calculations sponsored by Burnett/Hudson prove, using correct and fully disclosed data and factors in the engineering calculations, that most of the existing wells will drain in excess of 20 acres and that the vast majority of wells drain in excess of 15 acres, which is the mid point

between a 10 and 20 acre density pattern. Second, there are multiple instances of proof of interference between wells drilled on a 10 acre pattern proving that 10 acre wells compete with each other for production. Third, long production histories in Yeso equivalent Clearfork reservoirs in the Texas portion of the Permian Basin show that these fields were developed initially on 40 acre density, then many years later permitted infill development on 20 acres per well, and only very recently have operators begun 10 acre infill drilling in parts of some fields where engineering evaluations indicated this was warranted. Finally, The New Cobb Study shows that 20 acre density under Burnett/Hudson's proposed rules will produce substantially more oil recovery than COG's proposed rules. All of this evidence, considered separately, and as a whole, overwhelmingly supports the conclusion that the basic density rule for effective and efficient drainage should be 20 acres per well with 10 acre development reserved for exceptional areas where engineering studies show that it is warranted.

A. THE DRAINAGE AREA EVIDENCE AND CALCULATIONS FOR BOTH THE PADDOCK AND BLINEBRY PROVE THAT 20 ACRE DENSITY PROVIDES FOR EFFECTIVE AND EFFICIENT DRAINAGE OF THE YESO.

The Burnett/Hudson drainage area evidence and calculations are detailed, complete, honor the actual field data, and convincingly show that wells can drain 20 acres effectively and efficiently in virtually all instances. (See Burnett/Hudson Exhibits 24, 24A, 25, 26, 27, 28 and 28A). On the other hand, COG's drainage area exhibit (COG Exhibit 38) was conclusory, not supported by disclosed or proper data and unconvincing.

Perhaps the only aspect of this issue on which the parties agreed was that the universally accepted reservoir engineering drainage area equation (see Burnett/Hudson

Exhibit 21 and Tr. Vol. 1 p. 231-239) should be used for the calculation. The data used by Burnett/Hudson and COG for several of the critical factors in the equation account for the differences between Burnett/Hudson's calculated drainage areas supporting 20 acre density (Burnett/Hudson Exhibits 24-28A) and Concho's unsupported conclusion that 10 acre density is proper (Concho Exhibit 38). The factors in the equation on which the parties either utilized different values or for which COG refused to disclose the value it used in its "calculation" include well EURs, the primary recovery factor, porosity, net pay feet, and the grain density used to calculate porosity. As shown below, in each instance, Burnett/Hudson studied, located, used and disclosed the proper data in the equation, while COG used assumed values, or did not disclose its values in its secret "statistical model" and in every instance selected incorrect data with the intent and purpose to have a smaller drainage area be calculated from the equation to support its aggressive 10 acre drilling program.

With respect to the EUR factor, Burnett/Hudson displayed in their Exhibit 25 for Blinebry wells, and Exhibits 27 and 28 for Paddock wells, the calculated oil EUR for each well for which it made a drainage area calculation. Burnett/Hudson also provided samples of well decline curves it used to establish its EURs for Blinebry and Paddock wells (Burnett/Hudson Exhibits 25A and 28A.) In contrast, COG's Exhibit 38 shows that it did not disclose the EURs it used for its drainage area calculations, and that its undisclosed EURs were based upon the unfounded and over-optimistic assumption of a 15% recovery factor of its undisclosed estimated original oil in place on a lease average basis. In conclusion on this point, the Burnett EURs were derived from real data on a

well-by-well basis, based upon established decline curve analysis utilizing proper reservoir engineering techniques; in contrast, COG's values were undisclosed and based upon invalid assumptions.

With respect to the porosity factor, the evidence shows that Burnett/Hudson's calculation of porosity was done on a well by well basis, and utilized correct log readings and data. COG, however, used the wrong log data and an incorrect grain density to calculate porosity, both of which errors overstated their porosity values. As shown on Burnett/Hudson's Exhibit 23, and in Mr. Gore's testimony (at Tr. Vol. 2 p. 176), Burnett/Hudson used the bulk density log reading for its porosity value, rather than the cross plot porosity curve, because Burnett/Hudson's analysis of its core data proved that the neutron porosity curve overstated porosity, and therefore the cross plot of neutron vs. density porosity also overstated porosity. Although COG also had obtained core data from the reservoir, the evidence failed to show that COG used the core data to correlate log porosity readings to core porosity as Burnett/Hudson has done.

Secondly, the evidence showed that Burnett/Hudson used core data to establish a precise grain density of 2.84g/cc for the reservoir rock from analysis of 100 core samples (Burnett/Hudson Exhibit 28D), whereas COG used an assumed grain density factor of 2.87g/cc from industry data. COG's slight overstatement of the actual grain density in the reservoir winds up creating an overstatement of porosity ranging from 0.9% up to 1.74% (Burnett/Hudson Exhibit 28E). In a reservoir in which both parties used a very low 3% porosity cutoff for net pay, overstating porosity by 1-1.7% incorrectly creates much more "net pay" in COG's calculations, which creates a greater "H" factor. Thus,

COG's faulty and overstated porosity created excessive values for both the porosity and height factors, overstating Phi-H in two ways, thus greatly increasing the "net pay" used in its Exhibit 38, which thereby caused the calculated drainage areas to be significantly understated. (See Burnett/Hudson Exhibits 28B and C and related testimony at Tr. Vol. 2 p. 172-188).

Thirdly, and finally, Burnett/Hudson used a 10% primary recovery factor, which is supported by the reservoir data and recognized industry literature on limestone/dolomite reservoirs, whereas COG assumed a recovery factor of 15%, which is extremely high for these reservoirs and again causes smaller calculated drainage areas as a result. Burnett/Hudson's use of a 10% recovery factor is supported by several aspects of the evidence. First, Mr. Gore testified regarding the research he did to find the established range of primary recovery factors in reservoirs of these type rocks, and that 10% was a reasonable average. (Tr. Vol. 2 p. 151-154). In addition, the authoritative Craft and Hawkins textbook on Petroleum Reservoir Engineering shows that average primary recovery factors in reservoirs with these rock types and parameters vary from 2.5 to 11.8%, depending upon the oil gravity and solution GOR. (A copy of this table from Craft and Hawkins is filed herewith as Burnett/Hudson's Exhibit 56.) Additionally, SPE Paper 84282 admitted as COG Exhibit 45 in its rebuttal case also supports Burnett/Hudson's 10% recovery factor by stating that the average primary recovery factors in Texas Clearfork (Yeso equivalent) reservoirs range from 8 to 12%. Thus, Burnett/Hudson's use of 10% is precisely at the mid-point of this range, whereas COG's

assumed 15% recovery factor is outside the reasonable range and clearly excessive based upon all of the evidence and industry literature.

The evidence on all of these factors in the drainage equation shows that Burnett/Hudson's calculated drainage areas for wells in this reservoir are supported by actual reservoir data and recognized industry standards and literature. In stark contrast, COG's "calculations" are based upon faulty assumptions, incorrect data where known, and undisclosed data from its "statistical model" in other instances. COG's small drainage areas are simply unreliable, incorrect and plainly understated. Accordingly, the record evidence on drainage area calculations clearly supports Burnett/Hudson's proposed 20 acre density rule, and condemns COG's 10 acre density recommendation as unsupported, excessive and wasteful.

B. THE EVIDENCE ON WELL PERFORMANCE AND INTERFERENCE PROVES THAT 10 ACRE DENSITY IS EXCESSIVE.

In addition to the engineering calculations discussed in Part A., above, Burnett/Hudson offered numerous instances of proven interference between wells on 10 acre spacing, thus providing confirming proof from reservoir performance that 10 acre density is excessive and 20 acre density should be adopted for these fields.

The evidence of well interference on 10 acre development falls into two groups. The first group is demonstrated on Burnett/Hudson Exhibits 31-36 which cover three separate COG 40 acre units where the EURs calculated from the production declines at the time when the units had only two wells were greater than the actual ultimate recovery after 4 wells were drilled. These exhibits also show that the addition of the 3rd and 4th

wells substantially increased the GORs from these units, showing excessive localized drainage and dissipation of solution gas drive energy. Although each of these examples turned out to be in or near the area of COG's failed pilot water flood, the production and GOR trends on the units before they depleted support the conclusion that adding the 3rd and 4th wells steepened the decline rates and increased the GORs because the wells then interfered with each other's drainage pattern, thereby creating localized pressure drops, which adversely affected ultimate recoveries from these units.

The second group of exhibits evidencing well interference with 10 acre development includes Burnett/Hudson Exhibits 41C, D, and E, each of which is an example showing that the production decline rates from COG units steepened when the 3rd and 4th wells were drilled, indicating between well interference and lower ultimate recoveries.

Other record evidence also establishes the existence of well communication or interference between 10 acre locations. Most dramatically, Burnett/Hudson Exhibit 54 shows that the Burnett Gissler B Well 45 was knocked off production by water and sand from the fracing of COG Caddo-Federal Well No. 7, a direct 10 acre offset to the South.

Additionally, Burnett/Hudson's study of the "Harvard Federal" area where COG operates a 160 acre block which it has developed on 10 acre spacing within and surrounded by Burnett properties drilled on 20 acre spacing, also supports the existence of interference among the 10 acre locations drilled on the COG Lease. (Burnett/Hudson Exhibits 18-20 and testimony of Mr. Jacoby at Tr. Vol. 2 p. 61-79.) The Burnett/Hudson evidence shows that the reservoir quality across this area on the Burnett and COG

properties is quite similar (See cross-section X – X' in Burnett/Hudson Exhibit 20), as would be expected from wells drilled in close proximity to each other. Despite producing from very similar portions of the reservoir, the 9 Burnett wells used for comparison produce at a substantially higher oil rate (26,400 barrels of oil per month for the 9 Burnett wells vs. 8,900 barrels per month for the 9 COG wells), and at substantially lower GORs (2500:1 for the 9 Burnett wells vs. 7100:1 for the 9 COG wells). This six months of comparative production history from nearby wells drilled on 20 acres in Burnett's case, and 10 acres in COG's case, demonstrates that 10 acre locations are competing for reserves with each other, thereby resulting in lower production rates, higher GORs, and lower EURs for the COG wells.

In summary on this point, actual reservoir performance supports and compliments Burnett/Hudson's calculated drainage areas showing that 20 acres, not 10 acres, is the appropriate density pattern for the reservoir.

C. EXTENSIVE INDUSTRY HISTORY AND LITERATURE, AND COMMON SENSE, SUPPORT 20 ACRES AS THE PROPER DENSITY AT THIS TIME IN THE PRODUCTION HISTORY OF THE FIELD.

In addition to the engineering calculations of drainage areas and the demonstrated interference between wells drilled on 10 acre locations, common sense and industry experience in analogous reservoirs also support 20 acres as the correct basic density rule for these reservoirs. Prudence and common sense dictate that development should begin on a wider spacing pattern, leaving later infill drilling to occur if and when demonstrated reservoir performance and engineering studies support infill drilling. If well performance and later field studies demonstrate that infill wells can be drilled on an economic basis,

the reserves are still there to support the drilling. If, however, the field is developed initially on 10 acre density in a competitive response to an aggressive well funded operator, uneconomic 10 acre wells can never be "undrilled", and hundreds of millions of dollars will be wasted. All the costs associated with twice as many wells and their associated facilities will be incurred. With twice the number of wells, twice the costs should be expected, resulting in a huge reduction of program economics.

This well established principle of prudent development is also demonstrated by the history of the Clearfork reservoirs that are the subject of the two SPE papers offered in evidence by COG at the end of the hearing as its Exhibits 44 and 45. Exhibit 44, concerning the Fullerton Clearfork Unit in Andrews County, Texas, shows that the field was initially developed on 40 acre density from discovery in 1942 until 1973 when the field rules were changed to allow infill drilling on 20 acre spacing; a pilot 10 acre infill program was adopted in 1983. Likewise, Concho Exhibit 45 concerning the TXL South Unit in Ector County, Texas, shows that this Clearfork reservoir was discovered in 1946, and initially developed on 40 acre spacing, with most wells being drilled in the 1950s; it was unitized in 1967 for a pilot water flood project and continued on 40 acre development until the mid-1990s when a 20 acre infill drilling program was begun, "primarily in the eastern half of the field". Only in the last few years has the unit operator begun experimenting with a 10 acre infill drilling program, again in the Eastern half of the field, where the reservoir quality is better.

Both of these examples in Clearfork analogous fields, from evidence offered into this record by COG, demonstrate that prudent operations begin with wider spacing and

only progress to denser infill development after many years of production. COG's very aggressive and rapid march to develop the field on 10 acre density as fast as possible is not prudent, and appears motivated by a desire to report to the investment community that it has a very large drilling program, with the highest possible number of "undrilled locations", and quarter-to-quarter ever increasing oil production, in an effort to enhance its stock price. This course of action simply is not prudent and should not be adopted by the Division since it will inevitably compel other operators who have more prudent long term development plans to defend their properties from lease line drainage with 10 acre locations when they are shown to be unnecessary and uneconomic.

Burnett/Hudson's Exhibit 57 filed with the Closing Statement further emphasizes industry experience that supports 20 acre density. Exhibit 57 is a compilation of the current density rules adopted in 45 Texas Clearfork fields in Railroad Commission District 8A. These fields remain predominately on 40 acre density, with 4 fields having optional 20 acre infill wells permitted. No field has 10 acre density. In its rebuttal case, COG urged the Examiner to consider Texas Clearfork fields as analogous reservoirs for the issues in this hearing. (COG Exhibits 44 and 45). COG apparently did not recognize that this evidence from the Texas Clearfork experience overwhelmingly, indeed unanimously, condemns COG's proposed 10 acre density.

D. THE NEW COBB STUDY CONFIRMS THAT 20 ACRE DENSITY WILL EFFECTIVELY AND EFFICIENTLY DRAIN THE YESO AND IS NECESSARY TO PREVENT ECONOMIC AND PHYSICAL WASTE.

Finally, the reservoir modeling work tendered into the record by Burnett/Hudson with this Closing Statement as Burnett/Hudson Exhibits 59 and 60 demonstrates not only

that drilling on 20 acre density vs. 10 acre density does not cause waste – it shows essentially no incremental recovery with 10 acre density – but also that the combination of 20 acre density and the reduced allowables and GOR proposed by Burnett/Hudson actually results in a higher ultimate oil recovery per 40 acre drilling unit than COG's proposed 10 acre density and unlimited gas allowable. As discussed in Part II., above, the Burnett/Hudson proposed rules will result in millions of barrels of additional oil production compared with the COG proposal. And, as discussed further in the next Section V. on the GOR Rule issue, this incremental production from the Burnett/Hudson proposal is due both to 10 acre development causing the reservoir to develop higher gas saturations in the upper strata and to the higher gas production and resulting dissipation of reservoir energy from the unlimited gas production allowed by the COG proposal for no GOR Rule. Accordingly, adoption of the Burnett/Hudson proposal will not only prevent the enormous economic waste of drilling many unnecessary and wasteful 10 acre wells, but prevent also the physical waste of millions of barrels of producible oil.

Burnett/Hudson's evidence (Burnett/Hudson Exhibits 28H and I) also showed that Burnett's current drilling and completion practices, employing selective perforations and large slick water frac jobs, have created wells capable of producing almost twice the oil per well as the wells drilled by COG in its rapid march to 10 acre development with a preset "one size fits all" perforation and completion program. Well density should be based upon current best practices, not COG's inefficient practices.

E. The COG and Apache evidence claiming incremental recovery with 10 acre infill development was proven to be unpersuasive.

COG offered four decline curves (COG Exhibits 23, 24, 31 and 32) and Apache offered one decline curve (Apache Exhibit 6) which they claimed supported their contention that 10 acre infill development created enhanced oil recoveries on 40 acre units. Burnett/Hudson's witness Gore demonstrated in Burnett/Hudson's rebuttal case (Tr. Vol. 2 p. 215-223) and with his modifications of these COG and Apache Exhibits (Burnett/Hudson Exhibits 41B – 41F) that the claimed incremental oil production was illusory because COG's extrapolations of two well and four well oil production declines and EURs were done incorrectly, and that Apache's claimed enhanced recovery was likely due to much larger slick water frac completions on the third and fourth wells than Apache used on the first and second wells. This evidence provides no reliable basis for the Division to conclude that 10 acre development will result in material or economic enhanced oil recovery as compared with 20 acre density.

V. A GOR LIMIT OF 2000:1 IS NECESSARY TO PREVENT WASTE.

The evidence shows that COG's wells, on a cumulative basis, have produced at an average GOR of 4051:1, while Burnett's have produced at a substantially lower cumulative GOR of 2334:1. (Burnett/Hudson's Exhibit 42). In addition, this Exhibit shows dramatically, by its color coding, that areas where wells have been drilled on 10 acre density produce at much higher GORs than areas, such as Burnett's properties, that are drilled on 20 acre density or less. While COG made a point in rebuttal that its current GOR from all wells is trending down closer to 2500:1, this is the result of its massive

drilling program in new areas, which includes many new wells that are early in their productive life when they have their highest oil production and reservoir pressure and lowest GOR. Burnett/Hudson has filed with this Closing Statement their Exhibits 58A and B, which display the GOR data of all wells drilled by COG (and its predecessors) since Burnett commenced drilling wells in September 1998 through January 2008. This ten year time span eliminates both the older wells COG inherited from its purchase of Mack and Marbob, which now produce even higher GORs, and as the most recent wells, completed after January 2008, which produce at lower GORs. This constitutes a subset of the data included in Burnett/Hudson's Exhibit 42, and demonstrates that Burnett's wells of this vintage, on a GOR vs. time basis, now produce at an average GOR of approximately 3000:1, while COG's wells produce at an average GOR or around 5500:1. This dramatic difference is caused by COG's large areas of 10 acre development, which more rapidly depletes pressure and reservoir energy in localized areas, thereby resulting in higher rates of gas production relative to oil production. Burnett/Hudson Exhibit 58B is a GOR vs. cumulative production graph for these same wells and again shows that COG wells produce at GORs nearly double that of Burnett even when normalized for comparison on cumulative production rather than time.

As discussed in Parts II and IV.D., above, the New Cobb Study also confirms that the combination of 10 acre density and an unlimited gas allowable, as recommended by COG, will result in higher GORs and the waste of millions of barrels of producible oil from the undrilled areas of the Consolidated Area.

All of this evidence supports the basic principle that premature dissipation reservoir pressure by excessive gas production from high GOR wells prematurely dissipates reservoir pressure and energy and thereby reduces the ultimate recovery of oil. Accordingly, continuation of the existing GOR limit of 2000:1 is necessary to prevent waste. It is also consistent with virtually all of the other Yeso Pool Rules in the area, as all of the 12 fields included in the Concho application have a GOR limit, except one, the Maljamar, Yeso, West, where special field rules were established in the early 1950s to eliminate the GOR, for unknown reasons. Burnett and Hudson's request to retain the GOR Rule of 2000:1 for the Consolidated Area should be granted to prevent waste.

VI. AN OIL ALLOWABLE OF 107 BARRELS PER 40 ACRE SPACING UNIT IS NECESSARY TO PREVENT WASTE.

The rate of oil production, by itself, is not shown from the evidence to have an adverse effect on the ultimate oil recovery from the field. However, because the GOR sets the maximum gas allowable from the maximum oil allowable, restricting the maximum oil allowable to only that which is necessary to allow the better units to produce without material restriction, under the agreed one year balancing rule, is necessary to prevent waste by keeping the gas allowable as low as possible. While the virtually unlimited production over the last several years has shown that only a very few units can produce up to 300 barrels a day for their first month or two of production, the wells decline in a hyperbolic fashion in their early phase, so a one year balancing period for over and underproduction makes having an allowable equal to the maximum initial producing rate unnecessary. Burnett/Hudson's modified proposed oil allowable of 107

BOD (which is derived from the New Mexico Statutory Depth Bracket Allowable, and already applicable to the deeper East part of the Consolidated Area), will provide a sufficient allowable for most units to produce oil at capacity over a one year balancing period.

As the New Cobb Study (Exhibits 59 and 60) proves, the important point is to keep the oil allowable no higher than necessary to keep the resulting gas allowable as low as possible, because it is the production of excessive amounts of gas, at high GORs, that dissipates reservoir energy and pressure and lowers ultimate oil recoveries. (See Parts II and IV.D., above). Burnett/Hudson's reservoir modeling studies, Burnett's much higher EURs (Burnett/Hudson Exhibit 28I), and COG's much higher producing GORs (Burnett/Hudson Exhibits 42 and 58A & B), all combine to show that the Burnett/Hudson proposal of 107 barrels of oil and a 2000:1 GOR will maximize ultimate oil recovery from the field and prevent the physical waste of millions of barrels of oil.

VII. PAST OVERPRODUCTION MUST BE CALCULATED CORRECTLY.

All operators have produced their properties essentially at capacity for the last several years. This has resulted in all operators accumulating large amounts of overproduction under the current allowable of 80 barrels of oil per 40 acre spacing unit. While the issue of the exact amount of overproduction was not an issue to be determined in this hearing, the hearing evidence did demonstrate that COG, Apache and perhaps other operators are not calculating overproduction as required by New Mexico law. New Mexico law (Section 19.15.20.13A & B(1)) requires that a proration unit that has a gas/oil ratio that exceeds the GOR rule for the field, and has the capacity to produce

above the top allowable, shall have its oil allowable reduced by multiplying the unit oil allowable by a fraction, the numerator of which is the GOR for the pool, and the denominator of which is the unit's current actual producing GOR. Thus, with a GOR Rule of 2000:1, a unit that actually produces at a GOR of 4000:1 would have its oil allowable reduced by half. COG plainly has not calculated its past overproduction by following the statute.

Burnett/Hudson included exhibits displaying this proper allowable and overproduction calculation method in their Exhibits 43 and 44, which follows and incorporates New Mexico law. Burnett and Hudson urge the Examiner to require each operator to calculate its actual past overproduction in this way, under the allowable rules for the Consolidated Pool adopted in the Final Order, retroactive to first production, and furnish those calculations to the other operators and the Examiners. Burnett/Hudson's proposed Orders contained provisions requiring operators to do so.

VIII. THE SIXTH POOL - MALJAMAR; YESO, WEST - SHOULD ALSO BE CONSOLIDATED.

COG agreed to the consolidation of five of the six pools for which Burnett/Hudson seeks consolidation. They objected to the consolidation of the sixth pool, the Maljamar; Yeso, West Pool, solely on the basis that it "already has no GOR Rule". There is no record evidence to establish that any technical basis supported elimination of the GOR Rule in this pool in the early 1950s hearing. Because the evidence in this hearing conclusively proves that a GOR Rule of 2000:1 is necessary to prevent waste of millions

of barrels of oil, this sixth pool should be consolidated along with the other five pools and the adjoining unassigned acreage, as requested by Burnett/Hudson.

IX. THE RESPECTIVE HISTORIES AND OPERATING PRINCIPLES OF THESE PARTIES ARE DRAMATICALLY DIFFERENT AND THESE DIFFERENCES ARE REFLECTED IN THE QUALITY AND CREDIBILITY OF THE PARTIES' EVIDENCE IN THIS CASE.

Evidence presented at the Hearing confirms that the history and operating principles of the parties in this proceeding are drastically different.

Burnett operates 85 wells in the five pools subject to its application. (Tr. Vol. 1 at 18.) It has operated in these pools for over 13 years, through closely-held family companies. Burnett's family predecessor has operated shallow production on these leases for over fifty years. Burnett's current owner is Anne Burnett Windfohr Marion, a substantial and contributing part-time citizen of Santa Fe County. (*Id.* at 28). Burnett's operating principles are premised on attention to detail, expert examination of individual well data, and reasoned action based on hard evidence. Similarly, Hudson Oil Company of Texas is a family-owned company that has operated in the Permian Basin of Southeast New Mexico for over 60 years. Hudson family entities own working and royalty interests in over 70,000 acres of Lea and Eddy Counties. Together, Burnett/Hudson own mineral interests in 11 sections of the pools at issue in this proceeding -- 20% of the total acreage at issue. (Burnett/Hudson Exhibit 2.) They have long-term goals of maximizing production from these important reservoirs to prevent waste and protect correlative rights.

On the other hand, COG is a recently-formed public company whose operating principles are premised on "drill quick, drill everything, raise reported production, and

sell the company." Its management has been successful with this business plan twice before with companies known in the industry as "Concho 1" and "Concho 2". It is not surprising that COG itself admits – in a classic understatement – that it has "tended to expedite things." *Id.* (Tr. Vol. 1 p. 247). A disinterested observer (Premier's Mr. Jones) confirms that COG is "*very aggressive, [t]hey go after everything they can.*" (Tr. Vol. 1 p. 346.)

Such an operating mindset has resulted in COG's reliance on – and, more importantly, *COG's argument that the Division rely on* – what it characterizes as its "statistical model." (Tr. Vol. 1 p. 146-47.) What, precisely, is COG's "statistical model?" After two full days of testimony, it remains a "mystery." The mystery of COG's "statistical model" – on which it bases its entire case -- is revealed in the following exchange between Technical Examiner Ezeanyim and COG's principle witness Prentice:

> **Q: What do you mean by "statistical"? Empirical? What are you talking about?**
>
> A: Well, if – if one – if one point is zero PHI-H, there's nothing to drain, is there?
>
> Q: No.
>
> A: No. So – but you know you've cum'd, say 100,000 barrels. But you don't produce 100,000 barrels from no PHI-H. So you've got to expand your – your statistical sampling to include wells that have got porosity in them. You can't just use one or two points. The more points that you have the more reliable your drainage calculations become, in our view.
>
> Q: **Yeah. I see your point.** ***But you see my point? I wanted to see how you got your numbers. You know, I want to be comfortable with that?***

A: The numbers come right off the log data. We put them through a geophysical model that tries to incorporate core data, log data, *everything else that we can possibly figure out.* And – and that's how we develop our PHI-H numbers. It is a – it is developed off a model.

You indicated last week that you would like very much to sit down with a set of logs and figure out PHI-H and try to match it to ours.

I'm going to submit to you that ours is such a statistical basis that would be *a very difficult task for you or anybody else to do.* We run it through a model and that model, based on a lot of correlations, determines our PHI-H numbers.

(Tr. Vol. 1 p. 262, emphasis added.)

So, in substance, the evidence supporting COG's Application boils down to this: "trust us; the underlying facts are too difficult for you to understand; just trust us." The Division cannot grant COG's Application based on the indecipherable "black-box" it has presented.

In complete contrast, Burnett/Hudson presented all the data they used in their engineering calculations, and the source of the data. Burnett/Hudson's evidence is transparent, verifiable, complete and accurate. Consequently, Burnett/Hudson's conclusions and opinions are reliable, and should be the basis of the Division's decision in this case.

X. CONCLUSION AND PRAYER.

This consolidated proceeding is the first time the Division must take a hard technical look at the intersection between decades-old statewide rules permitting 10-acre spacing of oil wells and modern, sophisticated fracing technologies which have

transformed oil production from tight reservoirs in southeastern New Mexico. This is an important proceeding.

COG asks the Division to maintain the historic 10-acre spacing rule, to almost quadruple the historic allowable and, importantly, to eliminate the historic 2000:1 gas-oil ratio (GOR) in the pools at issue. COG's request for elimination of any GOR coupled with the much higher allowable in the pools at issue that presents the most serious and provable threat to the prevention of waste and the protection of correlative rights in the affected area. *See* Point II, Response to Examiner Ezeanyin's Inquiry, *infra.*

COG began the hearing by referring the Division to two "similar applications," stating that COG "agrees with the findings and conclusions" in those cases, and would itself be "reiterating to a large degree the same geologic and engineering testimony" in this proceeding. TR. Vol. 1 at 22. But in one of those proceeding, Devon *withdrew its request* to increase GOR to 4000:1 (*see* OCD Case No. 13185; Order No. R-12199; COG Exhibit 35) and in the other, Mewborne *did not even apply* to increase GOR from 2000:1. *See* OCD Case No. 14554; Order No. 13350. These cases supply no precedent to grant COG's Application, and Burnett/Hudson urge the Division to reject COG's suggestion that "you've done this before." The Division has not done this before.

The testimony and evidence COG presented does not come close to sustaining the far-reaching relief it seeks. Throughout the Hearing, COG repeatedly directed the Division and Burnett/Hudson to COG's "sophisticated statistical analysis" (TR. Vol. 1 at 22), to these pools being a "statistical play" (*id.* at 70) based on "statistical information." *Id.* at 86. But COG refused to place in evidence any of the facts and data underlying its

"statistical analysis." It refused to place in evidence its input and calculations on PHI-H (*id.* at 146-147), the grain density it utilized to calculate its porosity and conclusory drainage areas (*id.* at 108), its EUR calculations (*id.* at 193); the input or output data supporting its production forecasting (*id.* at 183-185); and the range of drainage areas in its "average drainage areas." (*Id.* at 156-7.)

On the other hand, Burnett/Hudson have proven with full data disclosure that by employing modern completion practices two wells (not four) can effectively drain a 40-acre proration unit; that two such wells result in a *greater* oil producing rate than COG's four wells; and that such results occur while maintaining a GOR near the historic limit of 2000:1, thus preserving reservoir energy. Burnett/Hudson's Application, not COG's, is supported by credible evidence that implementation of its proposed rules will prevent waste and protect correlative rights for all operators in the area.

COG's overarching theme in this proceeding has been "live and let live," i.e. that each operator should be allowed to drill as each sees fit, that COG should not be "forced" to drill on 20s, and that grant of its Application does not deprive Burnett/Hudson of its right to drill on 20s. This theme is a fable, for two different reasons. First, the evidence in this proceeding overwhelming confirms that two wells (not four) effectively drain a forty-acre proration unit if the historic GOR is maintained, while drilling on 10 acres causes excessive gas production, premature loss of reservoir energy, and waste of millions of barrels of oil. In such circumstances, *conservation principles* – not coercion – require an up-spacing result.

Second, COG's feigned "live and let live" proposal is just that – a ploy. COG has no intention of allowing Burnett/Hudson, or any other operator, to drill at a prudent development pace on 20-acre spacing. Twice since this dispute began, COG has demanded that Burnett/Hudson consent to COG's oppressive – indeed confiscatory – 10-acre drilling program in the Maljamar area where Burnett/Hudson own a majority interest. Earlier this year, before filing its application for this hearing, COG sent Burnett/Hudson AFEs to drill a total of 47 wells on 40-acre spacing, but with the intention of drilling each down to 10 acre density, on tracts where Burnett/Hudson owns the majority interest, at an aggregate cost of $77,738,000.00. On May 25, 2011, COG switched gears and proposed AFEs to drill six triple lateral wells, costing $11.5 million each (total over $68 million). COG also admitted that they have never drilled such a complex well in the Yeso, and indeed that no operator has either.[3] COG has no intention of permitting Burnett/Hudson to drill its majority-owned acreage employing prudent operating procedures on 20-acre spacing. COG appears intent on seizing Burnett/Hudson's mineral interests via a massive, fiscally-imprudent 10-acre drilling program in Burnett/Hudson's area of majority interest.

The Burnett and Hudson case and proposed rules for the Consolidated Area are supported by disclosed, correct and verifiable data; proper engineering calculations; observed and demonstrated reservoir response and performance; industry standards, customs and practices in analogous reservoirs and literature; and, the comprehensive

[3] These actions by COG were proven in Division proceedings in Cases Nos. 14640, 14641, 14649 and 14650 (Consolidated), heard on May 26, 2011, with Mrs. Brooks sitting as legal examiner. Burnett/Hudson ask the Examiners to take official notice of these facts from the record of those cases.

reservoir engineering modeling work of the New Cobb Study. The contrast between the clear, comprehensive and convincing evidence presented by Burnett/Hudson, and the bare conclusions and erroneous data and calculations offered by COG and Apache, could not be sharper. The Burnett and Hudson proposals for a 20 acre density rule, a 107 BOD oil allowable with a 2000:1 GOR, and a one year balancing rule, will prevent the physical waste of millions of barrels of producible oil, the waste of hundreds of millions of dollars by drilling unnecessary and uneconomic wells, and provide the operators sufficient oil allowable to produce the vast majority of their units without restriction utilizing the one year balancing rule.

Burnett and Hudson respectfully request that the Division adopt one of its two proposed orders which consolidate either the entire Consolidated Area proposed by Burnett and Hudson in its application as a single consolidated pool; or, alternatively, divide the Consolidated Area into two pools, with the West pool having 10 acre density and the East pool 20 acre density, with both pools having an allowable of 107 BOD, a 2000:1 GOR, and the one year balancing rule for over and underproduction. Proposed Orders for the Division are filed with this Closing Statement.

RESPECTFULLY SUBMITTED,

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CERTIFICATE OF SERVICE

I certify that on the 10th day of June, 2011, I served a copy of this document to the following persons by e-mail:

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