

**OIL AND GAS DOCKET NO. 03-0236417**

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**THE APPLICATION OF CROWN PETROLEUM CORP. FOR FIELD RULES AND PRODUCTIVE ACREAGE DETERMINATION, SOUR LAKE, E. (PRICE) FIELD, HARDIN COUNTY, TEXAS**

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**OIL AND GAS DOCKET NO. 03-0238718**

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**COMMISSION CALLED HEARING ON THE COMPLAINT OF CROWN PETROLEUM CORPORATION CONCERNING PROPER FIELD DESIGNATION OF HANSON PRODUCTION COMPANY'S T.P. RANCH LEASE, WELL NOL 1-L, SOUR LAKE, E. (PRICE) FIELD, HARDIN COUNTY, TEXAS**

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**Heard by:** Margaret Allen, Technical Hearings Examiner  
Mark Helmueller, Hearings Examiner

**Procedural history**

Application received: September 23, 2003  
Hearing held: April 20, May 24-27 and June 17-18, 2004  
Proposal for decision issued: October 19, 2004

**Appearances**

Applicant

Philip F. Patman  
Todd Reynolds  
Rick Johnston  
Brent Edwards

Representing

Crown Petroleum Corp.

Protestants

Mike McElroy  
Neil Hanson  
Terry Payne  
George E. Jochetz  
Dave Cook

Hanson Production Company

Interveners

Glenn Johnson  
Matthew Scott

Samson Lone Star, L.P.  
Texas General Land Office

Observers

George C. Neale

Black Stone Minerals Company, L.P.

**EXAMINERS' REPORT AND PROPOSAL FOR DECISION**

**STATEMENT OF THE CASE**

Crown Petroleum Corporation ("Crown") is seeking permanent field rules, including a determination of production acreage, for the Sour Lake, E. (Price) Field, Hardin County. The proposed field rules are summarized as follows:

1. Designated interval between 11,098' MD and 11,218' MD as shown on the log of the Crown Black Stone Minerals Oil Unit No. 3, Well No. 3;
2. 467-1200' well spacing;
3. oil proration units of varying sizes as selected by the operator and limited to productive acres; or, in the alternative, 160 acre oil proration units, with optional 40 acre units, limited to productive acres; and
4. allowable of 4.1 barrels of oil per day times the number of productive acres, subject to the following limits:

Black Stone Gas Unit	139.3 acres
T.P. Ranch Lease	46.1 acres
Cecil Gas Unit	35.6 acres.

Crown is also requesting that the field be balanced as of the date of the final order, which would result in the cancellation of nearly 18,000 barrels of overproduction.

Additionally, Crown has filed a complaint requesting that Hanson Production Company's T.P. Ranch Lease, Well No. 1-L, be re-assigned from the Sour Lake, E. (Yegua #4) Field to the Sour Lake, E. (Price) Field. This complaint was assigned Docket No. 03-0238718, and the complaint hearing was consolidated with this field rule hearing.

Hanson Production Company ("Hanson") believes the Statewide Rules currently governing the Sour Lake, E. (Price) Field are adequate and is protesting the requested field rules. Hanson believes its T.P. Ranch No. 1-L is properly assigned to the Sour Lake, E. (Yegua #4) Field. At the hearing, Hanson also presented evidence on its requested drilling permit (Rule 37 Case No. 0236368) for the T.P. Ranch Lease Well No. 2ST, in the Sour Lake, E. (Price); Sour Lake, E. (Yegua #4); Sour Lake, E. (Yegua DF-9); and Wildcat Fields, which is the subject of a separate Proposal for Decision.

A representative of the Texas General Land Office appeared as an intervener. Samson Lone Star, L.P. ("Samson"), the operator of a well that may have penetrated the Sour Lake, E. (Price) Field, also participated in the hearings. A representative of Black Stone Minerals Company, L.P. appeared at the hearing as an interested party.

### **DISCUSSION OF THE EVIDENCE**

The Sour Lake, E. (Price) Field (“Price field”) was discovered in May 1999, with the completion of Hanson’s (originally Adobe Energy’s) T.P. Ranch Lease, Well No. 1 (“Ranch No. 1). In 2000, Crown’s Black Stone “A” Lease, Well No. 1R (“A” No. 1R) was drilled downdip. The third well in the field was Crown’s Black Stone Gas Unit Lease, Well No. 3 (“Black Stone No. 3), which began producing May 2003 as the highest well on the structure.

The field is located in a structural trap downthrown from a major fault to the northwest. The location of this boundary fault is known from 3d seismic and fault cuts in various area wells. The field’s other boundaries are downdip oil/water contacts. The producing Yegua sandstone is called the Price sand and both Crown and Hanson agree it is separated into two members by a thin shale. The discovery well, the Ranch No. 1, has produced 507,000 BO from perforations in the upper member only. The “A” No. 1R has produced only 50,000 BO and is essentially depleted. The Black Stone No. 3 has already produced 63,000 BO and 48 MMCF of gas.

Crown and Hanson contested most of the issues raised in the field rules proposed for the Sour Lake, E. (Price) Field. A summary of each issue, the party’s positions, and supporting evidence is set forth below.

#### **Designated Interval**

The top of the upper member is at a sub-sea elevation of -10,830<sup>1</sup> in the Black Stone No. 3, while the upper member is 22’ lower structurally in the Ranch No. 1. The top of the lower member is at an elevation of -10,862’ in the Black Stone No. 3 and -10,891 in the Ranch No. 1. The two members had different original oil/water contacts indicating they were separate reservoirs before the discovery well was drilled.

The discovery well (Ranch No. 1) was perforated only in the upper member, between elevations of -10,849’ and -10,859’. The operator’s application for a new field designation indicated the top and bottom of the reservoir as the top and bottom perforation in the Ranch No. 1. This definition of the reservoir did not include either the base of the upper member or the lower member. The “A” No. 1R was also perforated only in the upper member.

Crown’s Black Stone No. 3 was the first well to perforate both members of the Price sand. Initially Crown perforated only the lower member of the Price sand and it considered requesting a new field designation for the lower member only. Crown decided that it was not practical to keep production from the two members isolated and subsequently added perforations in the upper member of the Black Stone No. 3. Crown is proposing a field rule to designate the correlative interval for the field between elevations of -11,040’ and -11,160’ (11,098’ MD and 11,218’ MD) on the log of the

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<sup>1</sup> Almost all the wells were drilled directionally. Different methods can be used to convert depths measured below the surface in a directional wellbore to true vertical depth. The calculated true vertical depth can vary by a foot or two depending on the method used to calculate it. Elevations below sea level are used throughout this proposal for decision for consistency.

Black No. 3, an interval that includes both members.

Crown believes the two members of the Price sand were accidentally put in communication during the completion of the Ranch No. 1 before the first oil was ever produced from this field. Crown based this opinion on 1) the movement of oil/water contacts, 2) pressure history, and 3) the bond log of the Ranch No. 1. If the two members were already in communication behind the casing of the Ranch No. 1, then the well has already produced oil from both members and the reservoirs cannot be resealed.

Hanson asserts that the discovery well was perforated only in the upper member and has produced oil only from the upper member. Before the hearing, Hanson wanted the lower member to be produced as a separate field from the upper member, making the proposed designated interval inappropriate. At the end of the hearing, Hanson conceded that it would not be practical to produce the two members separately in the future.

#### Movement of the oil/water contacts

Crown believes the oil/water contacts in both members rose in response to depletion before its Black Stone No. 3 became the first well actually perforated in the lower member. According to Crown, the upper member's original oil/water contact at -10,880' has now moved up to -10,865' as oil has been withdrawn. Crown maps the original oil/water contact in the lower member at -10,905', and believes it has moved up to -10,895'. The Ranch No. 1 produced almost all of the oil from the field prior to 2003, and the 10' rise in the oil/water contact of the lower member proves to Crown that the Ranch No. 1 has been producing oil from both members.

Hanson believes the original oil/water contact in the upper member was at -10,890'. According to Hanson, the reservoir volume in the upper member is large enough to account for the cumulative production from its well and the "A" No. 1R. Both Hanson and Crown introduced exhibits which show that neither party has been consistent in its interpretations of the oil/water contacts over the last two years.

#### Bottom-hole pressure history

When the Black Stone No. 3 was completed in 2003, it encountered depleted pressure in the lower member. According to Crown, this depleted pressure could only be due to communication between the two members behind the casing of the Ranch No. 1. Crown believes the field's pressure history shows the two members were placed in communication early in the life of the reservoir.

Hanson's Exhibit 14 shows the initial reservoir pressure of both members was about 6220 psi<sup>2</sup>. By the time the Ranch No. 1 had produced almost 200,000 barrels from upper member perforations, the reservoir pressure had dropped to 5750 psi in the lower member and 5395 psi in the upper member. After the production of 590,000 barrels of total fluid (largely from the Ranch No. 1), the reservoir pressure in the lower member had declined to 5119 psi as measured in the Black Stone No.

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<sup>2</sup> All reported pressures have been corrected to a common datum of -10,875'.

3 on June 26, 2003. In January, 2004, Hanson reported the reservoir pressure in the upper member in the Ranch No. 1 had declined to 4789 psi.

Hanson measured pressures in the upper and lower members separately in the Ranch No. 1 during March, 2004. The surface pressure and shut-in bottomhole pressures of the upper and lower members were very similar in the Ranch No. 1. However, when the upper member was producing and the lower member shut-in, their pressures measured at the surface were very different. When both members were producing, the flowing pressure gradient surveys also show different gradients with depth in the two members. The flowing bottomhole pressure was 2700 psi in the lower member and 4600 psi in the upper member. Hanson believes that if these two members were in communication behind pipe, the two members should have experienced similar pressure drops during production.

### Bond log

The cement bond log of the Ranch No. 1 shows a four-foot interval with no cement behind the pipe, according to Crown. This four-foot interval corresponds with the thin shale bed between the upper and lower members. The cement bond log indicates free pipe (less than 50% bond) between -10,978' and -10,982' in the Ranch No. 1. Hanson claims this bond log does not prove that there was communication between the two members because cement can form an effective hydraulic seal even without 100% bond. Hanson also claims that the shale is typically ten feet thick rather than four feet and thus can prevent communication between the two members.

### Spacing and Density Rules

Crown asserts that one well on top of the structure could drain all of the oil in the Sour Lake, E. (Price) Field because there is a both water drive and depletion drive. Crown suggests that wells be assigned the amount of productive acreage on their respective leases. In the alternative, Crown proposes that wells be assigned proration units of 160 acres with optional 40-acre units as long as only productive acreage was included. Well spacing of 467' from lease lines is standard for 40 acre optional units.

According to Hanson, there is no need to adopt special field rules: Statewide Rules provide for 40 acre drilling units and 467-1200' well spacing. Crown's evidence shows it will recover 60% to 70% of the remaining reserves even if the Commission does not adopt field rules. Hanson pointed out that if Crown wants to accelerate the rate of recovery of its reserves it should drill a second well under Statewide Rules rather than assign more acres to the Black Stone No. 3.

### Allocation Formula

Crown requests an allowable of 4.1 BOPD (barrels of oil per day) per productive acre. Under this proposal, the allowable of the Black Stone No. 3 would be 570 BOPD because Crown believes this well has 139 productive acres. Crown points out that 4.1 BOPD per acre is not unusual for allowable purposes. Under Statewide Rule 45(a)(2), the yardstick allowable for fields at this depth on 80-acre density of 329 barrels per day (equal to 4.1 BO per acre), and on 160 acre density is 562

BOPD (equal to 3.5 BO per acre). If 160-acre density is adopted for the Sour Lake, E. (Price) Field, Crown would be able to assign 139 productive acres to the Black Stone No. 3 and the well's allowable would be 3.5 BO per acre or 488 BOPD.

The discovery allowable for this field was 510 BOPD. The Ranch No. 1 produced up to this rate without damaging the reservoir, according to Crown. Crown characterized this reservoir as a good quality Yegua sandstone whose water cut and gas/oil ratio are not sensitive to the daily rate of production. After the discovery allowable expired, the operator of the Ranch well requested an MER hearing to allow the well to continue to produce at high rates. Both Crown and Hanson agreed the tests submitted as part of the MER application showed the Ranch No. 1 was not rate-sensitive.

According to Hanson, the daily producing rates show that Crown's Black Stone No. 3 is rate-sensitive and that it may cause waste to produce at the rates Crown is requesting. Daily production reports show that when daily production from the Black Stone No. 3 was increased to 330-335 barrels, the well began to produce water along with the oil. When production was choked back to less than 300 BOPD, the well ceased to produce water. Crown believes that the 10 to 15 barrels of water produced per day, less than 5% of the fluid recovery, was insignificant in a water drive reservoir. In fact, according to Crown, it may be advantageous to produce the oil quickly and 'out-run' the water drive. Crown conceded that it would not consider an allowable of 2 BOPD per productive acre to be an adverse recommendation.

Crown is requesting that the field be balanced which would cancel the overproduction of the Black Stone No. 3. Hanson points out that Crown protested Hanson's earlier request to produce the Ranch No. 1 under an MER of 250 BOPD because evidence did not prove the MER would prevent waste. The MER requested for the Ranch No. 1 was denied after hearing, as was Hanson's request to cancel the overproduction of the Ranch No. 1 at that time. Hanson therefore objects to the cancellation of the nearly 18,000 barrels of overproduction accrued by the Black Stone No. 3. Hanson believes the current allowable protects correlative rights.

### **Productive Acreage**

Crown recommends acreage assignments based on the number of acres originally productive in the upper member since the upper member covered a larger area than the lower member. It presented detailed seismic and geologic analysis supporting maps of the productive acreage in the upper and lower members. The original and current productive acres from Crown's exhibits are shown below.

<b>Operator</b>	<b>Original Productive Acres</b>	<b>Current Productive Acres</b>
Crown	139.3	108.9
Hanson	46.1	29.6
Samson	35.6	22.5

Over the last two years, Crown and Hanson have each made several maps in this field, and both parties changed interpretations several times. Hanson's position is that there is too much uncertainty to draw a map of the field limits and it did not present a geologic analysis of the productive acreage in the Sour Lake, E. (Price) Field. If the Commission insists on adopting special field rules, Hanson believes the examiners should draw their own productive acreage map.

Crown also argues that its isopach maps allow it to compare a volumetric estimate of reservoir size with the amount of oil recovered to date. The volumetric change in the reservoir, due to the rise in oil/water contact as estimated from Crown's evidence, is 672,000 barrels. Cumulative production has been 635,000 barrels of oil which Crown believes confirms its reservoir mapping.

Crown planimetered an isopach map that Hanson had prepared in September 2003. The reservoir volume from Hanson's map is similar to that from Crown's exhibits. Hanson's map showed 63% of the net acre/feet were under Crown's leases and 37% under the Ranch lease, with no productive acreage under the Cecil lease. This map showed the Ranch lease had 45.5 productive acres in the upper member and 40.2 in the lower member.

Crown's interpretation of the number of productive acres in the upper member at original conditions is based on its interpretation of 1) the original oil/water contact, 2) a 'bulk shift' necessary to correct the log of the Black Stone Lease Well No. 1-A, and 3) bottomhole pressure in the Cecil No. 3.

#### Original oil/water contact

Crown bases its map of the productive limits of the upper member on an average initial oil/water contact at -10,880'. This interpretation is supported by logs from several wells, particularly Hanson's T.P. Ranch No. 2, which tested the Price sand before any production from the field. Crown presented a map, prepared by Hanson before the hearing, showing the oil/water contact in this particular well at -10,878'. According to Crown, this shows that Hanson at that time agreed with Crown's interpretation of the oil/water contact. Crown also believes the oil/water contact in the upper member has risen 15', from an average elevation of -10,880' to -10,665'.

Hanson agrees that several different estimates have been made of the oil/water contact in this field. Various people have mapped the contact differently, possibly due to the different methods used to correct directional wellbores or to the use of different resistivity cutoffs. Hanson believes the variability in water contact interpretations shows Crown's productive acreage determination is unreliable. Hanson's current interpretation places the original water contact in the upper member at -10,990', based primarily on the log of the Crown Black Stone Lease Well No. 1-A. This was a non-productive well on the western edge of the field, drilled at about the same time as the Ranch Lease Well No. 2.

One reason Hanson believes that the original oil/water contact could not have been as shallow as -10,880', is that this is approximately the same depth as the base of the upper member in the Ranch No. 1. According to Hanson, the Ranch No. 1 would not have produced 200,000 BO, at rates up to 400-500 barrels per day with no water, if the oil/water contact were just at the base of the sandstone in the Ranch No. 1.

If the oil/water contact is 10' lower than Crown has mapped it, then Crown's estimate of the reservoir volume is incorrect. According to Hanson, moving the contact down to -10,890' increases the reservoir volume of the upper member enough to account for all of the oil produced from wells in the upper member. Hanson believes this confirms that its Ranch well has been producing oil from only the upper member. A deeper contact (at -10,890') also increases the productive area on the southern side of the field, including the productive acreage on Hanson's Ranch Lease.

Crown recalculated the productive acreage on its maps, using the elevation of -10,890' as Hanson proposes for the water contact. Crown argues that even if the original oil/water contact were 10' lower, the proportion of productive acreage under each lease would not change significantly. For example, Hanson's share of the original productive acreage only increased from 20.9% to 21.8%.

### Bulk shift

Crown agrees that the log of the Black Stone Lease Well No. 1-A does not support its interpretation of the oil/water contact. This well tested some oil along with large amounts of saltwater in the upper member, indicating it was just at or below the oil/water contact. The elevation of the water contact shown at -10,990' on the log of this well, is not consistent with Crown's interpretation, based on other wells, that the original water contact was at -10,880'.

To reconcile this evidence, Crown shifted the log of the Black Stone Lease Well No. 1-A by 15', putting the water contact of the Price sand at -10,865'. Crown's seismic evidence also indicated that the log of the Black Stone Well No. 1-A needs to be shifted. If this "bulk shift" is made, the seismic velocity at the location of Well No. 1-A is consistent with the seismic velocity seen at the location of in the "A" No. 1R well. These two wells shared the same surface location and, according to Crown, should exhibit the same seismic velocity.

Hanson believes that the oil/water contact is obviously at -10,890' in the Black Stone A-1 and there is no need for a bulk shift of 15'. According to Hanson, this log value is inconvenient to Crown's interpretation and Crown therefor created an excuse to discard the data. If the bulk shift is based on seismic evidence it violates Crown's testimony that actual log data should take precedence over seismic interpretations. Hanson claims that Crown postulated a 15' bulk shift in the log only to fit Crown's oil/water contact interpretation of -10,980'.

### Cecil Unit #3

Samson drilled its Cecil Unit Well No. 3 ("Cecil No. 3) on the east side of the field and tested oil in the upper member of the Price Sand on January 17, 2004. The lower member is water-bearing. Samson did not present evidence but contends the Cecil lease is outside the Sour Lake, E. (Price) Field. Samson believes the Price sand in its Cecil well is on a separate structural high from the wells in the Sour Lake, E. (Price) Field. If there is no communication between hydrocarbons in the Sour Lake, E. (Price) wells and Cecil No. 3, then production from the Cecil well would not affect the existing wells and vice versa.

The measured bottomhole pressure in the Cecil No. 3 was 5255 psi in 2004 while the original pressure in the upper member of the Price sand was 6220 psi. Crown believes the pressure depletion in the Cecil No. 3 was due to the production of 600,000 barrels of fluid from the field before 2004.

Before the Cecil No. 3 was drilled, the maps of both Crown and Hanson showed the Cecil Lease was outside the field. According to Samson, Crown changed its interpretation to show the Cecil well in the same accumulation to prove the field extends to the east and thus include more of Crown's acreage. Crown's seismic interpretation shows a saddle in the Price between the Cecil No. 3 and Black Stone No. 3. Crown now believes the pressure depletion in the Cecil No. 3 shows that oil underneath this saddle connected the upper members of the Cecil and Black Stone wells, at least initially.

Crown believes the Black Stone and Cecil wells were in communication before the field was discovered but admits that the oil/water contact may have risen enough to separate the wells. Hanson believes the saddle between the Black Stone and Cecil wells was deep enough to separate these two wells even under original conditions. Samson disputes any communication but claims that even if there was communication at one time, the rise in the oil/water contact has separated them.

Samson ultimately completed the Cecil No. 3 in another field and has not perforated either member of the Price sand. Samson particularly objects to any allowable limit which might be placed on the Cecil acreage based on Crown's interpretation should a Cecil well ever be completed in the Price sand.

### **Proper Field Designation**

Both Crown and Hanson claim that the recent performance of the Ranch No. 1 proves their cases. By early 2004, this well had produced 507,000 barrels and 294 MMCF of gas from perforations in the upper member of the Price sand. During March 2004, Hanson reworked the Ranch No. 1 and installed two strings of tubing. It installed a packer between the two members and, for the first time, perforated the lower member of the Ranch well -10,890' to -10,894' (from 11,054' MD to 11,058' MD). The flowing pressures that Hanson encountered afterward in the upper member (4591 psi corrected to -10,850') were significantly different from those in the lower member (2703 psi corrected). Hanson believes these flowing pressures prove that the upper and lower members have never been connected behind casing.

Hanson seeks to have the lower-member perforations treated as a separate completion in the Sour Lake, E. (Yegua #4) Field under the name of T.P. Ranch Lease Well No. 1L. Crown believes the Ranch No. 1 has been producing oil from both members since the beginning, and objects to treating the two sets of perforations as different completions. Crown also pointed out the discovery well of the Sour Lake, E. (Yegua#4) Field is separated from the T.P. Ranch Lease by faulting. Hanson insists however, that the lower member is a separate reservoir from the upper member and thus belongs either in another field from the Sour Lake, E. (Price) Field or in a new field.

Hanson cites the different producing characteristics of the upper and lower sets of perforations in its Ranch No. 1 after the workover as evidence the two members are not in communication behind pipe. Early in January 2004, before the workover, the Ranch No. 1 was producing about 250 barrels of fluid per day at a water cut of 23%. After the workover, production from both sets of perforations has been erratic, but total percent of water to oil produced from the two strings of tubing has been

significantly different, according to Hanson. In general, total production from the Ranch well since the workover has not been as good as before the workover.

According to Crown, total fluid production from the Ranch well after the workover is little changed from total fluid production before the workover. Crown believes the workover, involving the installation of a packer and two strings of tubing, may have damaged the producing characteristics of the formation. The original perforations (upper member) had to be placed on gas lift after the workover complicating comparisons of fluid production before and after the workover. However, after the gas lift was installed, production from the upper member increased while production from the lower member decreased. Crown believes this shows the two members were connected behind pipe, both before and after the workover.

### **EXAMINERS' OPINION**

The examiners agree that one well would be able to drain this entire reservoir. None of the leases has more than 160 productive acres, and Commission rules permit wells to assign only acreage reasonably productive of hydrocarbons. Field rules allowing 160 acre proration units with 40 acre optional units would allow each well to assign the appropriate amount of productive acres. Well spacing of 467' from lease lines and 1200' between wells is standard for 40 acre optional units. There is conflicting evidence on the original oil/water contact but the preponderance of the evidence supports Crown's interpretation. Crown's leases have 139 productive acres in the Sour Lake, E. (Price) Field and Hanson's leases have 46 productive acres.

The depleted pressure in Samson's Cecil No. 3 is persuasive evidence that this well was initially in communication with the Sour Lake, E. (Price) wells. However, the Cecil No. 3 has not been perforated in the subject field. It appears that the oil/water contact has risen to isolate the Cecil No. 3 and should a well ever be completed on the Cecil tract in the Sour Lake, E. (Price) Field it would have no effect on the other wells. No acreage determination needs to be made for the Cecil Lease.

The pressure history and bond log of the Ranch No. 1 support Crown's contention that the Ranch No. 1 has produced oil from both members. It would be impossible to keep production from the two members separate with only a few feet of shale between, even if they were not in artificial communication. Hanson does not object to treating both members as a single field and the proposed correlative interval, shown on the log of Crown's Black Stone No. 3 between elevations of -11,040' and -11,160' (measured depths of 11,098' and 11,218'), should be adopted for the Sour Lake, E. (Price) Field. Based on this correlative interval, Hanson's T.P. Ranch Lease Well No. 1L should not be treated as a separate completion in another field and should not be assigned an allowable separate from Well No. 1U.

The productive acreage determination by Crown is consistent with production and pressure history in this field and should be adopted for the Crown and Hanson leases. Hanson is correct that the per-acre allowable requested by Crown may be excessive. Producing over 300 barrels of oil per day from the Black Stone No. 3 causes water coning and is therefore less efficient. Water coning may or may not have a long term effect on ultimate production in this reservoir but it may also cause waste. An allowable of 2 BOPD per productive acre should be adopted which will allow the Black Stone No. 3 to produce up to 278 BOPD.

Statewide Rule 52(6) requires that oil production which exceeds the permissible monthly oil limit shall be considered overproduction and must be made up by underproduction. The Black Stone No. 3 was completed after the discovery allowable for the Sour Lake, E. (Price) Field had expired. The yardstick allowable for wells on Statewide Rules is 212 BOPD and the Black Stone No. 3 has almost 18,000 barrels of overproduction. If the recommended field rules are adopted, the monthly allowable of the Black Stone No. 3 will be approximately 8450 barrels.

The difficulty completing the Black Stone No. 3 and re-establishing good production in the Ranch No. 1 after its workover of the Ranch No. 1 suggests that the Price reservoir is sensitive. If Crown believes that shutting-in the Black Stone No. 3 to make-up this well's overproduction could be harmful to the reservoir, it should make a separate application to either cancel the overproduction or to allow the Black Stone No. 3 to produce at a reduced rate while making up overproduction.

### **FINDINGS OF FACT**

1. Notice of this hearing was issued to all operators with acreage in the Sour Lake, E. (Price) Field ("Price field") on May 6, 2004.
2. The Price field was discovered in May 1999, with the completion of the Hanson Production Company ("Hanson") T.P. Ranch Lease, Well No. 1 ("Ranch No. 1).
3. The Ranch No. 1 was perforated in the upper member of the Price sand and produced over 500,000 BO from these perforations.
4. The second well in the field was the downdip Crown Petroleum Corporation ("Crown") Black Stone "A" Lease, Well No. 1R, drilled in 2000, which depleted after producing 50,000 BO from the upper member.
5. The structurally-highest well, Crown's Black Stone Gas Unit Lease, Well No. 3 ("Black Stone No. 3), drilled in May 2003, was the first well to perforate the lower member.
6. The two members of the Price sand were placed in communication behind pipe during the completion of the Ranch No. 1.
  - a. The two members are separated by only a few feet of shale, but had different original oil/water contacts before the discovery well was drilled.
  - b. The initial reservoir pressure was about 6220 psi in both upper and lower members of the Price sand, but the Black Stone No. 3 encountered a partially depleted pressure of 5119 psi.
  - c. The cement bond log of the Ranch well shows a four-foot interval with no cement behind the pipe across the shale bed separating the upper and lower members.
  - d. The oil/water contacts in both members rose in response to depletion before any well

was actually perforated in the lower member.

7. The correlative interval shown between elevations of -11,040' and -11,160' (11,098' MD and 11,218' MD) on the log of the Black Stone No. 3, includes both members of the Price sand and should be designated for the Sour Lake, E. (Price) Field.
8. Hanson's T.P. Ranch Lease Well No. 1L is not a separate completion and not entitled to a separate allowable in another field.
9. Field rules allowing 160 acre proration units with 40 acre optional units would allow each well in this field to be assigned the appropriate amount of productive acres.
  - a. The Price field has both a water drive and depletion drive and one well on top of the structure could drain all of the oil in the field.
  - b. No well has more than 160 productive acres to be assigned.
10. No acreage determination needs to be made for the Cecil Lease.
  - a. The depleted pressure measured in the upper member of the Price sand in the Samson Lone Star LP Cecil Lease No. 3, Well No. 3, indicates this well was at one time in a common source of supply with the wells in the Price field.
  - b. Samson Lone Star LP has completed the Cecil Lease No. 3, Well No 3 in different field and without perforating either member of the Price sand.
  - c. Future production from any well on the Cecil No. 3 Lease would not affect the existing wells and vice versa.
11. Well spacing of 467' from lease lines is standard for 40 acre optional units.
12. Allocation based on productive acreage will protect correlative rights.
  - a. The yardstick allowable for fields on 160 acre density is 562 BOPD (equal to 3.5 BO per acre).
  - b. If the Sour Lake, E. (Price) Field had 160-acre proration units and the Black Stone No. 3 assigned 139 productive acres, its allowable would of 488 barrels per day.
  - c. The discovery allowable for this field was 510 BOPD and the Ranch No. 1 produced up to this rate without damaging the reservoir.
  - d. Producing over 300 barrels of oil per day from the Black Stone No. 3 causes water coning and is therefor less efficient.
  - e. An allowable of 2 BOPD per productive acre will reduce the allowable of the Black

Stone No. 3 to less than 280 BOPD.

13. There were 139 productive acres under Crown's leases and 46 under Hanson's leases at original conditions in the upper member of the Price sand.
  - a. Logs from several wells, particularly Hanson's T.P. Ranch Lease Well No. 2, show the original oil/water contact in the upper member was at -10,880' before any production.
  - b. Cumulative production has been 635,000 barrels of oil confirming Crown's reservoir mapping.
  - c. Crown's isopach maps, based on an original contact of -10,880', show to the rise in oil/water contacts due to production has caused a reduction in reservoir volume of 672,000 barrels.
14. Crown's Black Stone No. 3 has accumulated about 18,000 barrels of overproduction.

#### **CONCLUSIONS OF LAW**

1. Proper notice was given as required by statute.
2. All things have been done or occurred to give the Railroad Commission jurisdiction to resolve this matter.
3. The recommended field rules for the Sour Lake, E. (Price) Field are necessary to prevent waste and protect correlative rights.
4. Under the recommended field rules, Hanson's T.P. Ranch Lease Well No. 1L is a completion within the designated interval for the Sour Lake, E. (Price) Field and therefor is not entitled to a separate allowable.
5. Crown is required to make up the approximately 18,000 barrels of overproduction attributed to its Black Stone No. 3.

#### **EXAMINERS' RECOMMENDATION**

Based on the above findings of fact and conclusions of law, the examiners recommend that field rules 1, 2 and 3, as proposed by Crown Petroleum Corporation be adopted for the Sour Lake, E. (Price) Field. The allowable should be 2 barrels of oil per day times the number of productive acres, with 139.3 productive acres assigned to the Black Stone Gas Unit and 46.1 productive acres assigned to the T.P. Ranch Lease. All production from the field's correlative interval in the Hanson Production Company T.P. Ranch Lease, Well No. 1-L, should be assigned to the Sour Lake, E. (Price) Field.

Respectfully submitted,

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