

STATE OF ALASKA
ALASKA OIL AND GAS CONSERVATION COMMISSION
333 West Seventh Avenue
Anchorage, Alaska 99501

Re: Inadequate LOT on surface casing shoe
Alkaid #1
Permit No. 214-208

Other Order No. 107
Docket No. OTH-15-016
July 29, 2015

DECISION AND ORDER

On April 22, 2015 the Alaska Oil and Gas Conservation Commission (AOGCC) issued a Notice of Violation (NOV) to Great Bear Petroleum Operating, LLC (Great Bear) regarding the Alkaid #1 exploration well (Alkaid #1). The Notice was based upon Great Bear's failure to properly conduct and analyze a surface casing formation integrity test as required by 20 AAC 25.030(f)¹. After review of the evidence submitted in response to the NOV AOGCC will impose the civil penalties set forth below.

Summary of Proposed Enforcement Action

The Notice cited a violation of 20 AAC 25.030(f) which required Great Bear to conduct a leak-off test (LOT) on Alkaid #1 by following an approved procedure in the Permit to Drill (PTD) application. The LOT procedure was not followed by Great Bear on March 9, 2015 after drilling out of the surface casing shoe. Furthermore, Great Bear's incorrect evaluation of the test data resulted in a higher LOT value than warranted by a correct interpretation of the data. For failing to follow the LOT procedures and proceeding to drill ahead without obtaining proper authorization from AOGCC, corrective actions and a civil penalty in the amount of \$20,000 are imposed.

¹ A formation integrity test must be performed if blowout prevention equipment is installed on casing. The test must be performed to a predetermined equivalent mud weight, leak-off, or fracture pressure as specified in the application for the Permit to Drill. The test results must demonstrate that the integrity of the casing shoe is sufficient to contain the anticipated wellbore pressures while drilling to the next casing point or total depth as appropriate. The Alkaid #1 Permit to Drill approved a leak-off test (LOT) as proposed by Great Bear to be conducted after drilling not more than 50 feet of new formation below the surface casing shoe.

Changes to an Approved PTD

On January 21, 2015, Great Bear was issued PTD 214-208 for Alkaid #1. The approved LOT procedure included an expected equivalent mud weight of 13 pounds per gallon (ppg), a weight deemed necessary to drill safely to the next casing setting depth. AOGCC's subsequent review of an application for sundry approval to allow for annular disposal in Alkaid #1 determined that the LOT value specified in the PTD was not achieved.² Drilling operations on Alkaid #1 continued without Great Bear obtaining approval for changes to the PTD. Two regulations were violated by Great Bear's actions:

- 1) 20 AAC 25.015(b)(2) which requires the operator to submit and obtain AOGCC approval of an Application for Sundry Approvals (Form 10-403) if there is a needed change to an approved PTD;
- 2) 20 AAC 25.030(g) which allows for a variance to the LOT procedure upon request of the operator if the well casing and cementing program requirements are satisfied.

There is no dispute that Great Bear failed to notify AOGCC of the change to its well plan.

Kick Tolerance and LOT Relationship to Well Integrity

Well design requires establishing the anticipated well pressures, including the potential for a wellbore influx (kick) and the integrity of the formation (fracture pressure). The casing shoe must be able to hold the predicted mud weight used for drilling the upcoming section and withstand the intensity of an unexpected influx. Kick tolerance is a safety requirement to account for the pressure increase in a well that can occur from an unexpected influx of gas or formation fluids. Kick tolerance also accounts for the maximum pressure at the casing shoe when a kick is circulated out of the well. The kick tolerance determination is influenced by the length of open hole below the last casing shoe, the intensity of the kick³ and the predicted mud weight used to drill to the next casing setting depth (or total depth). The LOT result provides the

² Submitted with the sundry application were the original LOT data as well as Daily Drilling and Weekly Activity Reports for Alkaid #1. Surface casing shoe LOT data fail to substantiate the equivalent mud weight value stated in the reports. AOGCC review of the test data revealed an even lower LOT value than reported (11 ppg versus the 12 ppg reported by Great Bear; expected LOT value used for the well design in the approved in PTD was 13 ppg).

³ Kick intensity is how underbalanced (in pounds per gallon) the current mud weight used in drilling the well is in relationship to a penetrated higher pressure zone (converted to an equivalent mud weight).

maximum mud weight inclusive of the kick tolerance. An accurate understanding of the well's ability to contain pressure is critical to maintaining wellbore integrity and containment of the wellbore fluids.

The Alkaid #1 LOT data reveals a significant pump-in rate change midway through the test.⁴ That rate change affects the quality of the LOT data and contradicts the validity of the 12 ppg value reported by Great Bear. Responding to information requested in the Notice on May 7, 2015, Great Bear supplied kick tolerance calculations using a volumetric method to justify its decision to continue drilling past the surface casing shoe. Review of Great Bear's calculation spreadsheets establishes that Great Bear's kick tolerance calculation did not include a realistic kick intensity component. Normally in the relatively unknown situation of an exploration well – with limited offset data to guide the well design – a minimum 0.5 ppg kick tolerance should be included; Great Bear's kick tolerance calculation used a negative kick intensity value (*i.e. always overbalanced with mud weight*) which made the kick tolerance overly optimistic.⁵

Great Bear offers four reasons for its failure to perform a proper LOT after drilling out the surface casing shoe in Alkaid #1 and why the AOGCC was not notified of any abnormalities. First, Nabors Rig 105E crews were not trained properly in the LOT procedure and did not realize that changing pump rates would impact the data. Second, Great Bear drilling/oversight staff did not see the need to notify the AOGCC of the LOT anomalies since they believed the resulting LOT value met the minimum safety margin using a volumetric method of calculating kick tolerance. Third, Great Bear concluded that the lower LOT value (12 ppg per Great Bear) was acceptable since Great Bear ultimately shortened the well's total depth. Fourth, coal seams directly below the surface casing shoe were seen on well logs and could explain the lower than expected LOT results. None of these reasons dispute the occurrence of the violations.

⁴ Pump in rate was changed from 0.33 to 0.55 barrels per minute midway through the test. Pump-in rate during a LOT is to remain constant.

⁵ From the well data provided, AOGCC calculated a kick tolerance of 11.4 barrels compared to 33.4 barrels determined with Great Bear's questionable volumetric method which included a negative kick intensity. With a much lower kick tolerance, the risk of fracture at the surface casing shoe and underground blowout is increased.

Conclusions

Great Bear violated both the regulations and the conditions upon which its drilling permit was approved. As the operator of the Alkaid #1 well, Great Bear has sole responsibility to understand and comply fully with all AOGCC regulations. Great Bear failed to follow the approved procedure for conducting a valid LOT and continued drilling without notifying the AOGCC of anomalies in the surface casing shoe LOT.

Great Bear's explanations for the violations are unpersuasive at best.

The criteria of AS 31.05.150(g) were considered by AOGCC in determining the civil penalty. Great Bear does not dispute:

- the findings in the Notice dated April 22, 2015;
- the LOT procedure was improperly conducted; and
- they failed to follow the procedure in the approved Alkaid #1 PTD.

Now Therefore It Is Ordered That:

Within 30 days after this Decision and Order becomes final, Great Bear must pay the AOGCC a civil penalty in the amount of \$20,000.

In addition, the following corrective actions are imposed:

1. Within 30 days following this decision, Great Bear must provide a plan to train its rig crews on the proper conduct of a formation integrity test (performed to a predetermined equivalent mud weight, leak-off, or fracture pressure as appropriate);
2. Prior to drilling its next well, Great Bear must modify its kick tolerance determination to eliminate the negative kick intensity component and obtain advanced approval of the means by which it will determine the kick tolerance of the well.

As an Operator involved in an enforcement action, you are required to preserve documents concerning the above action until after resolution of the proceeding.

Done at Anchorage, Alaska and dated July 29, 2015.



Cathy P. Foerster
Chair, Commissioner



Daniel T. Seamount, Jr.
Commissioner



RECONSIDERATION AND APPEAL NOTICE

As provided in AS 31.05.080(a), within **20** days after written notice of the entry of this order or decision, or such further time as the AOGCC grants for good cause shown, a person affected by it may file with the AOGCC an application for reconsideration of the matter determined by it. If the notice was mailed, then the period of time shall be **23** days. An application for reconsideration must set out the respect in which the order or decision is believed to be erroneous.

The AOGCC shall grant or refuse the application for reconsideration in whole or in part within 10 days after it is filed. Failure to act on it within 10-days is a denial of reconsideration. If the AOGCC denies reconsideration, upon denial, this order or decision and the denial of reconsideration are **FINAL** and may be appealed to superior court. The appeal **MUST** be filed within **33** days after the date on which the AOGCC mails, **OR 30** days if the AOGCC otherwise distributes, the order or decision denying reconsideration, **UNLESS** the denial is by inaction, in which case the appeal **MUST** be filed within **40** days after the date on which the application for reconsideration was filed.

If the AOGCC grants an application for reconsideration, this order or decision does not become final. Rather, the order or decision on reconsideration will be the **FINAL** order or decision of the AOGCC, and it may be appealed to superior court. That appeal **MUST** be filed within **33** days after the date on which the AOGCC mails, **OR 30** days if the AOGCC otherwise distributes, the order or decision on reconsideration.

In computing a period of time above, the date of the event or default after which the designated period begins to run is not included in the period; the last day of the period is included, unless it falls on a weekend or state holiday, in which event the period runs until 5:00 p.m. on the next day that does not fall on a weekend or state holiday.