

STATE OF ALASKA
ALASKA OIL AND GAS CONSERVATION COMMISSION
333 West 7th Avenue
Anchorage Alaska 99501

Re: THE APPLICATION OF BP Exploration) Docket Number: CO-15-009
(Alaska) Inc. for amendment of Prudhoe Oil Pool) Conservation Order No. 341F
Rule 9.)
) Prudhoe Bay Field
) Prudhoe Bay Unit
) Prudhoe Bay Oil Pool
) North Slope Borough, Alaska
)
) October 15, 2015

IT APPEARING THAT:

1. By application received July 17, 2015, BP Exploration (Alaska) Inc. (BPXA) on behalf of itself and ExxonMobil Alaska Production Inc. (ExxonMobil) as working interest owners (WIOs) in the Prudhoe Bay Unit requested that Conservation Order (CO) 341E be amended to increase the allowable gas offtake limit in Rule 9 from an annual average of 2.7 billion standard cubic feet per day (BSCFPD) to 4.1 BSCFPD.
2. Pursuant to 20 AAC 25.540, the Alaska Oil and Gas Conservation Commission (AOGCC) scheduled a public hearing for August 27, 2015. On July 20, 2015, the AOGCC published notice of that hearing on the State of Alaska's Online Public Notice website and on the AOGCC's website, electronically transmitted the notice to all persons on the AOGCC's email distribution list, and mailed printed copies of the Notice of Public Hearing to all persons on the AOGCC's mailing distribution list. On July 21, 2015, the notice was published in the ALASKA DISPATCH NEWS.
3. On July 23, 2015, the AOGCC published notice of that the location of the hearing had changed on the State of Alaska's Online Public Notice website and on the AOGCC's website, electronically transmitted the notice to all persons on the AOGCC's email distribution list, and mailed printed copies of the Notice of Public Hearing to all persons on the AOGCC's mailing distribution list. On July 24, 2015, the notice was published in the ALASKA DISPATCH NEWS.
4. By letter received August 19, 2015, ConocoPhillips Alaska, Inc. (CPAI) on behalf of itself and Chevron U.S.A. Inc. (Chevron) as PBU WIOs supported BPXA's request to increase the allowable gas offtake limit, but requested the limit to be set at 3.6 BSCFPD.
5. On August 25, 2015, the AOGCC received pre-filed testimony from BPXA.
6. On August 27, 2015, the AOGCC received a letter from ExxonMobil supporting BPXA's application
7. The hearing commenced at 9:00 AM on August 27, 2015, in the Alaska State Legislature Building, Legislative Information Office located at 716 West 4th Avenue, Anchorage, Alaska.

8. Testimony was received from representatives of BPXA, CPAI, and a Mr. Tom Lakosh, a private citizen.
9. The record was held open until September 8, 2015, to allow the presenter to respond to requests made during the hearing.
10. The AOGCC received written comments from Mr. Lakosh on August 27, 2015, the requested additional information from CPAI on September 3, 2015, and the requested additional information from BPXA on September 8, 2015.

FINDINGS:

1. Operator and Owners: BPXA is the operator of the leases in the portion of the PBU covered by the Affected Area of this order. BPXA, ExxonMobil, CPAI, and Chevron are the WIOs, and the State of Alaska, Department of Natural Resources (DNR) is the landowner of the Affected Area, which is located within the North Slope Borough, along Alaska's northern coastline.
2. Affected Area: The Affected Area is defined in CO 341E and remains unchanged for this amended order.
3. BPXA Request: BPXA and ExxonMobil request that the allowable gas offtake from the Prudhoe Oil Pool be increased from annual average of 2.7 BSFPD to 4.1 BSCFPD to provide the opportunity to sell gas to the Alaska LNG Project (AK LNG), which is currently being planned, beginning in or about 2025. According to the request, the anticipated sales volume from the Prudhoe Oil Pool to the AK LNG project is 2.7 BSCFPD, and estimated fuel usage for the PBU along with continued small local sales amounts to approximately 0.6 BSCFPD, for a total anticipated annual average daily offtake rate of 3.3 BSCFPD. BPXA believes the requested annual average 4.1 BSCFPD offtake allowable would enable the Prudhoe Oil Pool to provide the full 3.5 BSCFPD planned capacity for the AK LNG project, should other anticipated gas sources for the AK LNG project not come to fruition, as well as meet fuel-gas needs for the PBU and continue the small volume sales from PBU that are currently taking place.
4. CPAI Request: CPAI and Chevron request that the allowable gas offtake from the Prudhoe Oil Pool be increased, but only to an annual average of 3.6 BSCFPD. The basis for this request is CPAI's disagreement with BPXA'S assumption that the Prudhoe Oil Pool must provide the full 3.5 BSCFPD capacity of the AK LNG project for an indefinite period of time. CPAI and Chevron contend this assumption is unrealistic because an annual average limit of 3.6 BSCFPD will provide the ability to meet the full 3.5 BSCFPD capacity of the AK LNG project for several months in the event of an extended period of disruption to the other sources of gas feeding the AK LNG project. CPAI also requests that CO 341E be amended to allow for future modifications of the allowable gas offtake limit to be achieved administratively.
5. Alternative Development Plans Considered: During the hearing, confidential information and testimony were presented in which the WIO's discussed reservoir simulation model construction, showed simulation results for BPXA's proposal along with several other development options—including alternative offtake rates and AK LNG project start dates, and presented sensitivity analyses for different aspects of the simulation model. The

simulation results show that ultimate recovery from the Prudhoe Oil Pool could only be maximized with major gas sales as there are significantly more barrels of oil equivalent (BOE) of reserves in the form of gas within the pool than there are in the liquids that remain within the pool. The simulation results also indicate that ultimate recovery is relatively insensitive to size and timing of gas sales and to the various sensitivity cases that were also analyzed. The only sensitivity case that may have a significant impact on ultimate recovery is the size of the Prudhoe Oil Pool being significantly different than expected, which is unlikely given the amount of well, seismic, and reservoir data available for the pool.

6. Reservoir Development and Management: The Prudhoe Oil Pool will continue to be developed with the goal of maximizing liquids recovery until major gas sales in support of the AK LNG project begin (currently envisioned to commence in or about 2025). Once major gas sales begin, production from the field would continue, but the volume of gas available for reinjection for enhanced oil recovery purposes will be reduced by the amount sold to the AK LNG project. However, an effluent stream from the AK LNG gas treatment plant (GTP) that is nearly pure carbon dioxide will be available for injection. Eventually, the production wells within the Prudhoe Oil Pool will not be able to provide enough gas to meet the AK LNG project sales requirement. At that time, the WIO's anticipate existing gas cap injection wells will begin to be converted from injectors to producers in order to meet sales requirements.

CONCLUSIONS:

1. Selling gas from the Prudhoe Oil Pool is necessary to maximize ultimate recovery from the reservoir. The ultimate recovery achievable under major gas sales is relatively insensitive to differences in the specifics of the sale.
2. An annual average gas offtake rate of 3.6 BSCFPD provides adequate capacity to meet the anticipated gas sales requirements for the AK LNG project. This determination is made without prejudice to future reconsideration should circumstances change. Monitoring of development operations within the Prudhoe Oil Pool prior to commencement of major gas sales is vital to ensure that liquids recovery is maximized.
3. CO₂ within the AK LNG GTP effluent stream may prove to be a very valuable resource for enhanced recovery projects on the North Slope.

NOW THEREFORE IT IS ORDERED:

The following rules, in addition to the statewide requirements under 20 AAC 25 (to the extent not superseded by these rules), govern development in the affected area described below:

Affected Area: Umiat Meridian

Township	Range	Section
T10N	R12E	1, 2, 3, 4, 10, 11, 12
T10N	R13E	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 24
T10N	R14E	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 36
T10N	R15E	all
T10N.	R16E	5, 6, 7, 8, 17, 18, 19, 20, 29, 30, 31
T11N	R11E	1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 24, 25
T11N	R12E	all
T11N	R13E	all
T11N	R14E	all
T11N	R15E	all
T11N	R16E	17, 18, 19, 30, 31, 32
T12N	R10E	13, 24,
T12N	R11E	15, 16, 17, 18, 19, 20, 21, 22, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36
T12N	R12E	23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36
T12N	R13E	19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36
T12N	R14E	25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 36
T12N	R15E	25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36

Rule 1 Pool Definition

The Prudhoe Oil Pool is defined as (i) the accumulations of oil that are common to and that correlate with the accumulations found in the Atlantic Richfield - Humble Prudhoe Bay State No. 1 well between the depths of 8,110 feet and 8,680 feet, and (ii) the accumulation of oil that is common to and correlates with the interval from 9,638 to 9,719 measured feet on the Borehole Compensated Sonic Log, Run 2, Dated September 28, 1975, in the Atlantic Richfield-Exxon NGI No. 1 well, and that is in hydraulic communication with the gas cap of the former accumulations in the Sag River Formation.

The latter accumulation is found within the following area:

T11N R14E: Sections: 1, 2, 11(N/2 and SE/4), 12, 13, 14(E/2), 23(NE/4), 24, 25(N/2)

T11N R15E: Sections: 6, 7, 8, 17, 18, 19, 20, 29(N/2), 30(N/2)

T12N R14E: Sections 35, 36 Umiat Meridian.

Rule 2 Well Spacing

There shall be no restrictions as to well spacing except that no pay shall be opened in a well closer than 500 feet to the boundary of the affected area.

Rule 3 Casing and Cementing Requirements

- (a) Conductor casing shall be set at least 75 feet below the surface and sufficient cement shall be used to fill the annulus behind the pipe to the surface. Rigid high-density polyurethane foam may be used as an alternate to cement, upon approval by the AOGCC. The AOGCC may also administratively approve other sealing materials upon application and presentation of data which show the alternate is appropriate based on accepted engineering principles.
- (b) Surface casing to provide proper anchorage for equipment, to prevent uncontrolled flow, to withstand anticipated internal pressure, and to protect the well from the effects of permafrost thaw-subsidence or freeze-back loading shall be set at least 500 feet, measured depth, below the base of the permafrost but not below 5000 feet true vertical depth. Sufficient cement shall be used to fill the annulus behind the casing to the surface. The surface casing shall have minimum axial strain properties of 0.5% in tension and 0.7% in compression.
- (c) Alternate casing programs may be administratively approved by the AOGCC upon application and presentation of data, which show the alternatives, are appropriate, based upon accepted engineering principles.

Rule 4 Blowout Prevention Equipment and Practice (Revoked C.O. 341D)

Rule 5 Automatic Shut-in Equipment (Revoked Other Order 66)

Rule 6 Pressure Surveys

- (a) Prior to regular production, a static bottom hole or transient pressure survey shall be taken on at least one in three wells drilled from a common drilling site.
- (b) An annual pressure surveillance plan shall be submitted to the AOGCC in conjunction with the Annual Prudhoe Pool Reservoir Surveillance Report by April 1, each year. The plan will contain the number of pressure surveys anticipated for the next calendar year and be subject to approval by the AOGCC by May 1. These surveys are needed to effectively monitor reservoir pressure in the Prudhoe Oil Pool. The surveys required in (a) of this rule may be used to fulfill the minimum requirements.
- (c) Data from the surveys required in (a) and (b) of this rule shall be submitted with the Annual Prudhoe Oil Pool Reservoir Surveillance Report by April 1 each year. Data submitted shall include rate, pressure, time depths, temperature, and any well condition

necessary for the complete analysis of each survey. The datum for the pressure surveys is 8800 feet subsea. Transient pressure surveys obtained by a shut in buildup test, an injection well pressure fall-off test, a multi rate test or an interference test are acceptable. Other quantitative methods may be administratively approved by the AOGCC.

- (d) Results and data from any special reservoir pressure monitoring techniques, tests, or surveys shall also be submitted as prescribed in (c) of this rule.

Rule 7 Gas-Oil Contact Monitoring

- (a) Prior to initial sustained production, a cased or open hole neutron log shall be run in each well. This requirement is waived for waterflood/EOR areas encompassed by the expanded Prudhoe Bay Miscible Gas Project outlined in C.O. 290, and for those areas not expected to have significant GOC movement or gas encroachment from the gravity drainage area defined by the AOGCC through Administrative Approval.
- (b) A minimum of 40 repeat cased hole neutron log surveys shall be run annually.
- (c) The neutron logs run on any well and those required in (a) and (b) of this rule shall be filed with the AOGCC by the last day of the month following the month in which the logs were run.

Rule 8 Productivity Profiles

- (a) A spinner flow meter or tracer survey shall be run in each well during the first six months the well is on production. This requirement is waived for wells completed with a single perforated interval, or with perforations in a single reservoir zone including highly deviated (greater than 65 degrees) and horizontal wells.
- (b) Follow-up surveys shall be performed on a rotating basis so that a new production profile is obtained on each well periodically. Nonscheduled surveys shall be run in wells which experience an abrupt change in water cut, gas-oil ratio, or productivity.
- (c) The complete spinner flow meter or tracer data and results shall be recorded and filed with the AOGCC by the last day of the month following the month in which each survey is taken.

Rule 9 Pool Off-Take Rates (Revised this order)

The maximum annual average oil offtake rate is 1.5 million barrels per day plus condensate production. The maximum annual average gas offtake rate is 3.6 billion standard cubic feet per day, which contemplates an annual average rate of 2.7 billion standard cubic feet per day shipped to the proposed AK LNG GTP and additional capacity to account for production upsets at other fields that feed the proposed AK LNG GTP. Daily offtake rates in excess of these amounts are permitted only as required to sustain these annual average rates. The annual average offtake rates as specified shall not be exceeded without the prior written approval of the AOGCC.

Annual average offtake rates mean the daily average rate calculated by dividing the total volume produced in a calendar year by the number of days in that year. However, in the first calendar year that large gas offtake rates are initiated, following the completion of a large gas sales pipeline, the annual average offtake rate for gas shall be determined by dividing the total volume

of gas produced in the calendar year by the number of days remaining in the year following initial delivery to the large gas sales pipeline.

Rule 10 Facility Gas Flaring (Revoked CO 341C)

Rule 11 Annual Surveillance Reporting

An annual Prudhoe Oil Pool surveillance report will be required by April 1 of each year. The report shall include but is not limited to the following:

1. Progress of enhanced recovery project(s) implementation and reservoir management summary including engineering and geotechnical parameters.
2. Voidage balance by month of produced fluids, oil, water and gas, and injected fluids, gas, water, low molecular weight hydrocarbons, and any other injected substances (which can be filed in lieu of monthly Forms 10-413 for each EOR project).
3. Analysis of reservoir pressure surveys within the field.
4. Results and where appropriate, analysis of production logging surveys, tracer surveys and observation well surveys.
5. Results of gas movement and gas-oil contact surveillance efforts including a summary of wells surveyed and analysis of gas movement within the reservoir. The analysis shall include map(s) and/or tables showing the locations of various documented gas movement mechanisms as appropriate.
6. Progress of the Gas Cap Water Injection project with surveillance observations including:
 - (a) volume of water injected,
 - (b) reservoir pressure results, maps, and analysis (in conjunction with (3.) of this rule),
 - (c) water movement and zonal conformance maps derived from surveillance (such as Pulsed Neutron Logs and 4-D gravity surveys)
 - (d) results of reservoir evaluations of performance (such as material balance and reservoir simulation studies),
 - (e) surveillance plans for the upcoming year, and
 - (f) any plans for change in project operation.

Rule 12 Prudhoe Bay Miscible Gas Project (PBMGP)

- (a) Expansion of the PBMGP and infill expansion of miscible gas injection in the NWFB is approved for the 59,740 acre portion of the Prudhoe Oil Pool defined in the record.
- (b) An annual report must be submitted to the AOGCC detailing performance of the PBMGP and outlining compositional information for the current miscible injectant (MI) necessary to maintain miscibility under anticipated reservoir conditions.
- (c) The minimum miscibility pressure (MMP) of the Miscible Injectant must be maintained at least 100 psi below the average reservoir pressure in the Prudhoe Bay Miscible Project area. When the Operator demonstrates that the reservoir pressure is no longer declining within the Prudhoe Bay Miscible Project Area (as evidenced by reservoir

pressure measurements), the MMP may be maintained at or below the average reservoir pressure in the Prudhoe Bay Miscible Project area.

Rule 13 Waiver of GOR Limitation

The AOGCC waives the requirements of 20 AAC 25.240(b) for all oil wells in the Prudhoe Oil Pool of the Prudhoe Bay Field so long as the gas from the wells is being returned to the pool, or so long as the additional recovery project is in operation.

Rule 14 Waiver of "Application for Sundry Approval" Requirement for Workover Operations

The requirements of 20 AAC 25.280(a) are waived for development wells in the Prudhoe Oil Pool of the Prudhoe Bay Field. Sundry work application and reporting requirements shall be done in accordance with the "Well Work Operations and Sundry Notice/Reporting Requirements for Pools Subject to Sundry Waiver Rules" matrix maintained by the AOGCC

Rule 15 Waterflooding

The AOGCC approves the December 1980 additional recovery application for water-flooding in the Prudhoe Oil Pool subject to the requirements listed in Rule 11 above.

Any proposed changes must be submitted to the AOGCC for approval.

Rule 16 Orders Revoked (Revised this Order)

The following Conservation Orders and associated Administrative Approvals and letter approvals are hereby revoked. Conservation orders 78, 83B, 85, 87, 88, 96, 97, 98B, 117, 117A, 118, 130, 137, 138, 139, 140, 141, 143, 145, 145A, 148, 155, 160, 164, 165, 166, 167, 169, 174, 178, 180, 181, 183, 184, 185, 186, 188, 189, 192, 194, 195, 195.1, 195.2, 195.4, 197, 199, 200, 204, 208, 213, 214, 219, 220, 223, 224, 238, 258, 259, 279, 290 and 333, and March 20, 1981 and August 22, 1986 letter approvals.

Additionally, conservation orders 341, 341A, 341B, 341C, 341D, and 341E and all associated administrative approvals (except CO 341D.001 and CO 341E.003, which remain in effect) are hereby revoked.

The hearing records of these orders are made part of the record for this order.

Rule 17 Gas Cap Water Injections

The Gas Cap Water Injection Project as described in the operator's application and testimony is approved. Ongoing reservoir surveillance is required to determine that water movement within the reservoir is confined as intended and does not negatively impact overall hydrocarbon recovery, and to determine that the project has resulted in stabilization of reservoir pressure.

Rule 18 Commingling of Production in the Same Wellbore (Source: CO 341E.005)

Commingling production from the Aurora and Prudhoe Oil Pools in Well S-26 is approved on the condition that BPXA allocates production to the separate pools using the geochemical test, production log, and regular well test results outlined below:

- (a) Prior to commingling production in Well S-26, a bottom-hole static reservoir pressure and production test must be obtained and geochemical sampling and analysis must be

performed on oil from the Aurora Oil Pool (in isolation from the Prudhoe Oil Pool).

- (b) For the first six months after commingled production starts, geochemical sampling and analyses must occur monthly at the time stabilized production tests are performed. Thereafter, geochemical sampling and analysis must occur at least twice per year and not less frequently than once every seven months.
- (c) Production logs must be obtained and compared to the geochemical and regular well test results within the first two months and again six months after commingled production starts. Thereafter, production logs or isolated well tests of each pool must be obtained when major changes in production characteristics occur which could result in less accuracy in allocation of gas or water to the separate pools.
- (d) In addition to the other requirements of Rule 4 of CO 457B, the monthly reports required by Rule 4(e) of CO 457B must identify the Well S-26 production allocated to the Aurora Oil Pool and Prudhoe Oil Pool.
- (e) The volumes reported on Form 10-405—*i.e.*, in accordance with 20 AAC 25.230(b)—must identify the Well S-26 production allocated to the Aurora Oil Pool and Prudhoe Oil Pool.
- (f) A summary report documenting the results and effectiveness of the commingled production allocation must be provided to the AOGCC within 9 months after the start of commingled production and shall include the results of the production allocated to the Aurora and Prudhoe Oil Pools, along with the analyses of the geochemical tests, production logs, and regular well tests.

Rule 19 CO₂ Utilization Study (New this order)

By December 31, 2020, the WIOs shall complete a study and submit a report to the AOGCC detailing the best use of the effluent gas stream projected to come from the AK LNG GTP to maximize total hydrocarbon recovery. The study and report shall evaluate the suitability of using CO₂ for enhanced recovery purposes in the oil pools on the North Slope in which any of the four main WIOs (BPXA, ExxonMobil, CPAI, or Chevron) have an ownership interest. The study and report shall look at the benefits to using CO₂, and mixtures containing CO₂, for enhanced recovery purposes (including miscible injection, viscosity reducing, and pressure maintenance type projects as appropriate) and include estimates of additional recovery that would be attributable to CO₂ injection. The report shall also evaluate challenges to implementing CO₂ injection in these pools.

Rule 20 Liquid Hydrocarbon Recovery Maximization Report (New this order)

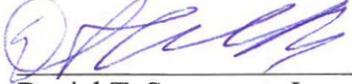
By June 30, 2021, the WIOs shall submit a report to the AOGCC that provides detailed information about the results of projects and operations undertaken from the effective date of this order through December 31, 2020, as well as information about projects underway or planned at that time to accelerate liquid hydrocarbon production to maximize recovery in advance of the proposed major gas sales associated with the AK LNG project.

Rule 21 Administrative Relief (New this order)

Upon proper application, or its own motion, and unless notice and public hearing are otherwise required, the AOGCC may administratively waive the requirements of any rule stated herein or administratively amend this order as long as the change does not promote waste or jeopardize correlative rights, is based on sound engineering and geoscience principles, and will not result in an increased risk of fluid movement into freshwater.

DONE at Anchorage, Alaska and dated October 15, 2015.


Cathy P. Foerster
Chair, Commissioner


Daniel T. Seamont, 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.