

STATE OF ALASKA
ALASKA OIL AND GAS CONSERVATION COMMISSION
333 West 7th Avenue, Suite 100
Anchorage Alaska 99501

Re: **THE APPLICATION OF BPXA**) **Area Injection Order No. 22**
EXPLORATION (ALASKA) INC.) Prudhoe Bay Field
for an order allowing underground) Aurora Oil Pool
injection of fluids for enhanced oil)
recovery in Aurora Oil Pool, Prudhoe)
Bay Field, North Slope, Alaska)
) September 7, 2001

IT APPEARING THAT:

1. By letter and application dated June 15, 2001, BPXA Exploration (Alaska) Inc. ("BPXA") requested an order from the Alaska Oil and Gas Conservation Commission ("Commission") authorizing the injection of fluids for enhanced oil recovery in the Aurora Oil Pool ("AOP") within the Aurora Participating Area and defined expansion areas ("APA") in the Prudhoe Bay Unit.
2. Notice of opportunity for public hearing was published in the Anchorage Daily News on June 22, 2001.
3. The Commission did not receive a protest.
4. A hearing concerning BPXA's request was convened in conformance with 20 AAC 25.540 at the Commission's offices, 333 W. 7th Avenue, Suite 100, Anchorage, Alaska 99501 on July 24, 2001. Concurrently, the Commission heard testimony concerning proposed pool rules for the AOP. BPXA submitted a revised application "Aurora Pool Rules and Area Injection Application-July 23, 2001". This application included supplemental information requested by the Commission.
5. Additional information and data was requested by the Commission at the hearing and has been provided to the Commission. This supplemental information was submitted by letter from BPXA dated July 31, 2001.

FINDINGS:

1. Commission regulation 20 AAC 25.402 provides authority to issue an order governing underground injection of fluids on an area basis for all wells within the same field, facility site, reservoir, project, or similar area.

2. Concurrent to this order, the Commission revised pool rules governing the AOP (Kuparuk River Oil Pool) by Conservation Order 457.
3. The APA is located in portions of Township 12N-R12E, and T11N-R12E, Umiat Meridian, on Alaska State Leases ADL-28255, ADL-28256, ADL-28257, ADL-28258, ADL-28259, and ADL 28261. The APA is located within the current boundaries of the Prudhoe Bay Unit ("PBU"), North Slope, Alaska.
4. BPXA is the operator of the APA. BPXA, Phillips Petroleum, Co., ExxonMobil Corporation, and Forest Oil are working interest owners ("WIOs") in the APA. The State of Alaska is the surface owner.
5. The reservoir interval for proposed injection is the Kuparuk River Formation. The AOP is defined as an accumulation of oil that is common to, and correlates with, the interval between 6765' - 7765' measured depth ("MD") in the Mobil Oil Corporation Mobil-Phillips North Kuparuk State No. 26-12-12.
6. Initial reservoir pressure based upon RFT data from V-200 is 3433 psi at 6700' tvdss. Reservoir temperature is approximately 150 degrees Fahrenheit at 6700' tvdss.
7. Original oil in place ("OOIP") is estimated to be 110 to 146 MMSTB.
8. Waterflood is part of BPXA current development plans. Additional recovery by waterflood over primary recovery in the AOP is estimated between 15-25% of the original oil in place.
9. Production rate peak for the proposed development plan with water injection is estimated at 14,000-17,000 bopd with a maximum water injection rate of 20,000-30,000 bwpd.
10. BPXA plans to fully replace and balance voidage with waterflood. Initially, an injection to production ratio greater than 1:1 may be required to restore reservoir pressure.
11. Produced water from PBU Gathering Center 2 will be injected into the AOP.
12. Water injection operations at the AOP are expected to be conducted at pressures above the Kuparuk River Formation parting pressure to enhance injectivity and improve recovery of oil.
13. Based upon S-101 leakoff test, the fracture gradient within the Kuparuk formation of the AOP is approximately .73 psi/ft
14. The Kuparuk River Formation at the AOP is overlain by the Kalubik, HRZ/CM1 shales, which have a combined thickness of approximately 150-268 feet in the S-pad area. Mechanical properties determined from dipole sonic log and core data in well S-104 for the HRZ and Kalubik intervals indicate a fracture gradient from approximately 0.83 to 0.92 psi/ft.
15. Underlying the Kuparuk River Formation is the Miluveach/Kingak shale sequence. Leakoff tests in the Kingak shale show a fracture gradient of approximately .85 psi/ft.

16. Expected average wellhead injection pressure is 1800 psi with present facilities.
17. A surface booster pump may be installed at a later date to increase wellhead pressure and ensure injection rates. BPXA plans to keep injection pressures below 5500 psi at 6700' TVD, under the fracture gradient of the confining intervals. This roughly corresponds to a maximum surface pressure of 2600 psi.
18. BPXA is concurrently requesting conversion of S-101 to water injection for support of current producers (S-100 and S-102).
19. The development of the proposed APA is planned entirely from the PBU drill site, S-Pad and will utilize existing Prudhoe Bay Unit facilities and pipelines for production and water injection. Production will be processed at Gathering Center 2 (GC2). A 24" low pressure pipeline, a 10" gas lift supply line, and a 14" water injection supply line are also in place.
20. Additional facilities expansions are as follows:
 - a. A gravel expansion of S Pad to accommodate additional wells at S-pad, completed in April, 2000.
 - b. A new production manifold system to accommodate up to 20 Aurora wells.
 - c. An extension of an existing 6" water injection supply line.
21. There are no freshwater strata in the area of the proposed injection.

CONCLUSIONS:

1. The application requirements of 20 AAC 25.402 have been met.
2. An Area Injection Order is appropriate for the project area in accordance with 20 AAC 25.460.
3. There are no freshwater strata in the AOP area.
4. The proposed injection operations will be conducted in permeable strata, and may involve injection above the parting pressure of the Kuparuk Formation in the AOP. The injection pressures will be maintained below the fracture pressures of the confining intervals.
5. Injected fluids will be confined within the appropriate receiving intervals by impermeable lithology, cement isolation of the wellbore and appropriate operating conditions.
6. Implementation of an enhanced recovery operation involving injection of produced water from the Prudhoe Bay Unit will preserve reservoir pressure/energy and enhance ultimate recovery.
7. The proposed APA water injection project will result in approximately twenty (20) percent increased recovery over primary production alone.
8. Reservoir surveillance, operating parameter surveillance and mechanical integrity tests will demonstrate appropriate performance of the enhanced oil recovery project

or disclose possible abnormalities.

9. An Area Injection Order enabling enhanced oil recovery activity will not cause waste nor jeopardize correlative rights.

NOW, THEREFORE, IT IS ORDERED THAT the underground injection of produced water pursuant to the project described in BPXA's application is permitted in the following area, subject to the conditions, limitations, and requirements established in the rules set out below:

Umiat Meridian

Township	Range	Sections
T11N	R12E	N ½ Sec. 3
T12N	R12E	S ½ Sec 17; SE ¼ Sec 18; E ½ Sec 19; All Sec 20; All Sec 21; W 1/2NW 1/4, S ½ Sec 22; SW ¼ Sec 23; SW ¼ Sec 25; All Sec 26; All Sec 27; All Sec 28; N ½, Se ¼ Sec 29; E ½ Sec 32; All Sec 33; All Sec 34; All Sec 35; N ½, SW ¼ Sec 36

Rule 1 Authorized Injection Strata for Enhanced Recovery

Injection is permitted into the accumulation of hydrocarbons that is common to, and correlates with, the interval between 6765' - 7765' measured depth ("MD") in the Mobil Oil Corporation Mobil-Phillips North Kuparuk State No. 26-12-12 well.

Rule 2 Injection Pressures

The injection pressure shall be limited to 2600 psi at 6700' tvdss, so as to ensure fractures do not propagate into the confining shale intervals.

Rule 3 Fluid Injection Wells

The underground injection of fluids must be through a well permitted for drilling as a service well for injection in conformance with 20 AAC 25.005, or through a well approved for conversion to a service well for injection in conformance with 20 AAC 25.280.

Rule 4 Monitoring the Tubing-Casing Annulus Pressure Variations

The tubing-casing annulus pressure and injection rate of each injection well must be checked at least weekly to confirm continued mechanical integrity.

Rule 5 Demonstration of Tubing-Casing Annulus Mechanical Integrity

A schedule must be developed and coordinated with the Commission that ensures that the tubing-casing annulus for each injection well is pressure tested prior to initiating injection, following well workovers affecting mechanical integrity, and at least once every four years thereafter.

Rule 6 Notification of Improper Class II Injection

The operator must notify the Commission if it learns of any improper Class II injection. Additionally, notification requirements of any other State or Federal agency remain the operator's responsibility.

Rule 7 Other conditions

- a. It is a condition of this authorization that the operator comply with all applicable Commission regulations.
- b. The Commission may suspend, revoke, or modify this authorization if injected fluids fail to be confined within the designated injection strata.

Rule 8 Administrative Action

Upon proper application, the Commission may administratively waive the requirements of any rule stated above or administratively amend any rule 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 a USDW.

DONE at Anchorage, Alaska and dated September 7, 2001.

Cammy Oechsli Taylor, Chair
Alaska Oil and Gas Conservation Commission

Daniel T. Seamount, Jr., Commissioner
Alaska Oil and Gas Conservation Commission

Julie M. Heusser, Commissioner
Alaska Oil and Gas Conservation Commission

AS 31.05.080 provides that within 20 days after receipt of written notice of the entry of an order, a person affected by it may file with the Commission an application for rehearing. A request for rehearing must be received by 4:30 PM on the 23rd day following the date of the order, or next working day if a holiday or weekend, to be timely filed. The Commission shall grant or refuse the application in whole or in part within 10 days. The Commission can refuse an application by not acting on it within the 10-day period. An affected person has 30 days from the date the Commission refuses the application or mails (or otherwise distributes) an order upon rehearing, both being the final order of the Commission, to appeal the decision to Superior Court. Where a request for rehearing is denied by nonaction of the Commission, the 30 day period for appeal to Superior Court runs from the date on which the request is deemed denied (i.e., 10th day after the application for rehearing was filed).