KUPARUK RIVER UNIT

APPLICATION FOR THE SIXTH EXPANSION OF THE UNIT AREA AND FORMATION OF THE TARN PARTICIPATING AREA

DECISION AND FINDINGS OF THE COMMISSIONER
ALASKA DEPARTMENT OF NATURAL RESOURCES

SEPTEMBER 4, 1998

KUPARUK RIVER UNIT

SIXTH EXPANSION OF THE UNIT AREA AND
FORMATION OF THE TARN PARTICIPATING AREA

I. INTRODUCTION AND BACKGROUND

ARCO Alaska, Inc. (ARCO), as Kuparuk River Unit Operator, and on behalf of the Working Interest Owners (WIOs) in the Kuparuk River Unit (KRU), applied to expand the KRU and form the Tarn Participating Area (TPA) within the expanded KRU. The unit expansion proposes to add seventeen leases and approximately 45,903 acres. The acreage surrounds the four Tarn wells, drilled and completed by ARCO in the 1996/1997 and 1997/1998 winter drilling seasons, and the lands that are viewed as having significant exploration potential in the same or similar geologic horizons as the Tarn discovery. ARCO provided geological and engineering data for the proposed unit expansion supporting inclusion of all or part of the potential hydrocarbon accumulations within these geologic horizons. The proposed KRU TPA includes approximately 15,292 acres that encompass part of the newly expanded unit acreage around the four Tarn wells and the Bermuda well. The geologic, well, and production data that ARCO submitted justifies the formation of the TPA. The data indicate that the Bermuda and Cairn Intervals within the Tarn Sands sequence are capable of producing or contributing to the production of hydrocarbons in paying quantities.

The Division approves the expansion of the KRU subject to the leases being included in a participating area within five years of the effective date of this unit expansion. The WIOs in the expansion leases agreed that lease or portions of a lease not included in a participating area within five years of the effective date would be automatically eliminated from the KRU.

The Division approves ARCO's application to form the TPA subject to ARCO drilling the TPA development wells indicated in Attachment 15 of the application. If the wells are not drilled as indicated in Attachment 15 within two years of the effective date of the TPA, the non-drilled areas will automatically contract out of the TPA. The TPA should be limited to the area proposed by ARCO because that area has been shown to be "reasonably known to be underlain by hydrocarbons and known or reasonably estimated...to be capable of producing or contributing to production of hydrocarbons in paying quantities." 11 AAC 83.351(a). [1] If additional data are obtained or

[1] ARCO based the TPA boundary on their interpretation of the zero net pay line. ARCO has not shown that all of the area included in the TPA is known or reasonably estimated to be capable of producing or contributing to production of hydrocarbons in paying quantities. Division staff believes, in the case of the Tarn reservoir, that there is no reliable way to accurately map net pay or to judge with any certainty what acreage will contribute to production. ARCO has shown, however, that all of the tracts in the proposed TPA may reasonably produce or contribute to production by their willingness to propose and drill development wells in the tracts (See Attachment 15 of the application). For the reasons expressed in Section III (C)(2), the division is willing to accept the TPA as proposed.

submitted in the future, the boundaries of the TPA may be revised. The division also approves the Tract Allocation Schedule for the TPA proposed in Exhibit 3 of the application. The tract allocation schedule "equitably allocates production and costs among the leases" in the TPA.

The KRU expansion area leases/tracts, a map of the proposed KRU expansion area, and the TPA leases/tracts and tract allocation schedule are Attachments 1, 2 and 3, respectively to this Decision and Findings. The effective date of the unit expansion, the TPA and the TPA Tract Allocation Schedule is July 1, 1998.

II. APPLICATION FOR THE EXPANSION OF THE UNIT AREA AND FORMATION OF THE TARN PARTICIPATING AREA

ARCO applied to expand the KRU and form the TPA within the expanded KRU on June 4, 1998. The WIOs in the expansion area leases and the TPA are ARCO, BPXA, UNOCAL, Mobil, and Chevron. The seventeen state oil and gas leases proposed for the KRU expansion are ADL380050 (Tract 127), ADL 380049 (Tract 128), ADL 375107 (Tract 129), ADL 380052 (Tract 130), ADL 380051 (Tract 131), ADL 375108 (Tract 132), ADL 380054 (Tract 133), ADL 380053 (Tract 134), ADL 375075 (Tract 135), ADL 375074 (Tract 136), ADL 375073 (Tract 137), ADL 375077 (Tract 138), ADL 375078 (Tract 139), ADL 375080 (Tract 140), ADL 375079 (Tract 141), ADL 373112 (Tract 142), and ADL 373111 (Tract 143). The proposed KRU expansion covers approximately 45,903 acres. The total unit area after the expansion would be approximately 373,172 acres.

Nine leases, ADL 375107 (Tract 129), ADL 375198 (Tract 132), (ADL 375075 (Tract 135), ADL 375074 (Tract 136), ADL 375073 (Tract 137), ADL 375077 (Tract 138), ADL 375078 (Tract 139), ADL 375080 (Tract 140), ADL 375079 (Tract 141) were acquired in state Lease Sale No.70A (Kuparuk Uplands: Canning R. to Colville R), held on January 29, 1991. These leases were issued on state lease form DNR 10-4037 (Rev. 9/90) effective April 1, 1991 for a term of 10 years. The leases provide for a 12.5 percent royalty to the state. The Tarn #4 Well is located on ADL 375073.

Six leases, ADL380050 (Tract 127), ADL 380049 (Tract 128), ADL 380052 (Tract 130), ADL 380051 (Tract 131), ADL 380054 (Tract 133), ADL 380053 (Tract 134), were acquired in state Lease Sale No.75 (Kuparuk Uplands: between NPRA and the Sag R.; ASRC lands in the Colville R. Delta), held on December 8, 1992. The leases were issued on state lease form #DOG 9208 effective February 1, 1992 for a term of 10 years. The leases provide for a 12.5 percent royalty to the state. Tarn #2, Tarn #3, and the Bermuda Well are located on ADL 380051, ADL 380054 and ADL 380053, respectively.

The last two leases, ADL 373112 (Tract 142) and ADL 373111 (Tract 143), was acquired in state Lease Sale No.69A (Kuparuk Uplands: Canning R.to Colville R.), held on September 28, 1988. These leases were issued on state lease form DNR 10-4037 (Rev.2/88) effective December 1, 1988 for a term of 10 years. The leases provide for a 12.5 percent royalty to the state.

Simultaneously with the application to expand the KRU, ARCO applied to form the TPA within the existing and expanded KRU. The proposed TPA acreage encompasses the Cairn and Bermuda Intervals of the Tarn reservoir within the Tarn Sands, which are capable of producing or contributing to the production of hydrocarbons in paying quantities. The proposed vertical definition for the TPA is the sequence of oil-bearing sandstones and mudstones within the Cairn Interval and the Bermuda Interval of the Tarn reservoir (See Attachment 8 of the application). The portions of leases proposed for TPA and the proposed tract allocation schedule for the leases in the TPA, and a map depicting the proposed TPA are included as Attachment 3 and 4 respectively to this Decision and Findings.

Geologic evidence supports the formation of the TPA to develop the Cairn and Bermuda Intervals of the Tarn reservoir within the KRU under a unified plan of development. ARCO drilled and tested at least six wells between 1991 and 1997 and acquired 3-D seismic data to evaluate the extent of the Tarn reservoir. In addition, the Tarn Owners are developing the Cairn and Bermuda Intervals of the Tarn reservoir. The proposed TPA includes those areas of the Tarn reservoir that the WIOs now believe are commercially viable. The current development will have two new KRU drillsites, 2N and 2L, approximately 40 wells, two pipelines, a road, and power lines. Early test production rates from two Tarn reservoir wells, 2N-323 and 2N-329, indicates over 6000 BOPD per well.

ARCO filed several exhibits in support of its application. These included: a proposed plan of development for the TPA; a further plan of exploration for the expansion acreage outside the TPA; a map and legal description of the leases proposed for the KRU expansion and the TPA; geological data supporting the proposed unit expansion and TPA; a Tarn Reservoir Paying Quantities Determination; a proposed methodology for allocating production from the participating areas that will share the Kuparuk infrastructure, facilities, and gathering system prior to any stream passing through a custody transfer meter; proposed methods for reporting the allocated production and gas reserve/gas debits from each PA sharing the Kuparuk facilities; a copy of the Tarn Special Provisions to the KRU Operating Agreement; and the initial tract allocation schedule for the TPA. ARCO requested that the effective date for the Unit Expansion and TPA be effective on July 1, 1998

The Department of Natural Resources (DNR) determined that the unit expansion application was complete on June 12, 1998. On June 18, 1998, public notice was published in the Anchorage Daily News and in the Arctic Sounder, as required by 11 AAC 83.311. Copies of the public notice were provided to interested parties in conformance with 11 AAC 83.311. These parties included the City of Barrow, the North Slope Borough, the Arctic Slope Regional Corporation, the Kuukpik Corporation, the Alaska Department of Environmental Conservation, the Alaska Department of Fish and Game, the Alaska Department of Natural Resources, Division of Land, and the Alaska Oil and Gas Conservation Commission (AOGCC).

The public notices invited interested parties and members of the public to submit comments by July 20, 1998. One comment was received from the public, interested parties, or state or local agencies. That comment was from an individual who has hunted, fished, and guided for nearly twenty years in the area. He expressed concern that "the oil fields are taking over the area" and "that one day I will be told that I can no longer utilize this land as I have in the past." This public comment will be addressed in section III (C) (1) of the Decision and Findings.

III. DISCUSSION OF DECISION CRITERIA

The commissioner may approve expansion of a unit area if that expansion is "necessary or advisable to protect the public interest." AS 38.05.180(p) and 11 AAC 83.303(c). Approval of ARCO's application must be based on the criteria in 11 AAC 83.303(a) and the factors enumerated in 11 AAC 83.303(b).

The commissioner will approve a proposed expansion of a unit area, a proposed expansion of a participating area (PA), or a proposed production or cost allocation formula if the commissioner finds that each requested approval is necessary or advisable to protect the public interest. AS 38.05.180(p). To find that any or all of the requested approvals are necessary or advisable to protect the public interest, the commissioner must find that the requested approvals will meet each of the criteria listed in 11 AAC 83.303(b) and discussed below. 11 AAC 83.303(b).

A PA may include only land reasonably known to be underlain by hydrocarbons and known or reasonably estimated through use of geological, geophysical, or engineering data to be capable of producing or contributing to the production of hydrocarbons in paying quantities. 11 AAC 83.351(a). "Paying quantities" means:

> quantities sufficient to yield a return in excess of operating costs, even if drilling and equipment costs may never be repaid and the undertaking as a whole may ultimately result in a loss; quantities are insufficient to yield a return in excess of operating costs unless those quantities, not considering the costs of transportation and marketing, will produce sufficient revenue to induce a prudent operator to produce those quantities.

11 AAC 83.395(4).

(A) <u>Promote the Conservation of All Natural Resources.</u>

The unitization of oil and gas reservoirs and the formation of PAs within unit areas to develop hydrocarbon-bearing reservoirs are a well-accepted means of hydrocarbon conservation. Without unitization, the unregulated development of reservoirs tends to be a race for possession by competitive operators. The results can be: (1) overly dense drilling, especially along property lines; (2) rapid dissipation of reservoir pressure; and (3) irregular advance of displacing fluids. These all contribute to the loss of ultimate recovery or economic waste. The proliferation of surface activity; duplication of production, gathering, and processing facilities; and haste to get oil to the surface also increase the likelihood of environmental damage (such as spills and other surface impacts). Requiring lessees to comply with conservation orders and field rules issued by the AOGCC would mitigate some of these impacts without an agreement to unitize operations. Unitization, however, provides a practical and efficient method for maximizing oil and gas recovery, and minimizes negative impacts on other resources.

The concern of lessees competing for the reservoir is less evident in the proposed KRU expansion area and TPA because the WIOs, ARCO, BPXA, UNOCAL, Chevron, and Mobil, have already aligned their leasehold interests in the proposed expansion acreage and the existing KRU.[2] The WIOs have executed various alignment agreements for the Greater Kuparuk Area that establish an area of common equity, establishing ownership percentages covering all horizons within the boundaries of the KRU and certain adjacent areas, between the various WIOs. However, even with only one primary working interest owner group, expansion of the KRU and formation of the TPA will provide a comprehensive plan for developing the TPA and exploring all the reservoirs within the expanded KRU. The Tarn Plan of Development and the planned exploration activities for the areas nearby the TPA provide for an efficient, integrated approach to development of the Tarn reservoirs.

The KRU expansion will promote the conservation of both surface and subsurface resources through the unitized (rather than lease-by-lease) development. Unitization allows the unit operator to explore the area as if it were one lease. The expansion of the KRU and the formation of the TPA over the Tarn reservoir will allow this area to be comprehensively and efficiently explored and developed. Adoption of an operating agreement and plan of development governing that production will help avoid unnecessary duplication of development efforts on and beneath the surface. Facilities can be located to maximize recovery and to minimize environmental impacts, without regard for individual lease ownership.

Producing hydrocarbon liquids from the TPA through the existing KRU production and processing facilities will reduce the incremental environmental impact of the additional production. The planned Tarn development will include two new stand-alone drillsites, but will utilize the existing KRU processing facilities, gravel roads, and infrastructure.

(B) <u>The Prevention of Economic and Physical Waste</u>

Traditionally, under unitized operations, the assignment of undivided equity interests in the oil and gas reservoirs to each lease largely resolves the tension between lessees to compete for their share of production. Economic and physical waste, however, could still occur without an equitable cost sharing formula, and a well-designed and coordinated development plan. Consequently, unitization must equitably divide costs and production, and plan to maximize physical and economic recovery from any reservoir. It must also treat the royalty owner fairly.

An equitable allocation of hydrocarbon shares among the WIOs discourages hasty or unnecessary surface development. Similarly, an equitable cost-sharing agreement promotes efficient development of reservoirs and common surface facilities and encompasses rational operating strategies. Such an agreement further allows the WIOs to decide well spacing requirements; scheduling, reinjection and reservoir management strategies; and the proper common, joint-use surface facilities. Unitization prevents economic and physical waste by eliminating redundant expenditures for a given level of production, and avoiding loss of ultimate recovery by adopting a unified reservoir management plan.

Unitized operations greatly improve development of reservoirs beneath leases that may have

[2] Some of the lease assignments regarding this alignment have been submitted to the Division for approval.

variable productivity. Marginally economic reserves, which otherwise would not be produced on a lease by lease basis, often can be produced through unitized operations in combination with more productive leases. Facility consolidation saves capital and promotes better reservoir management by all WIOs. Pressure maintenance and secondary recovery procedures are much more predictable and attainable through joint, unitized efforts than would otherwise be possible. In combination, these factors allow less profitable areas of a reservoir to be developed and produced in the interest of all parties, including the state.

The lessees in the proposed unit expansion leases and TPA have signed the KRU Agreement, the KRU Operating Agreement, and the Alignment Agreement, Greater Kuparuk Area, and will share the existing KRU production capacity and the KRU infrastructure. Using this infrastructure and facilities eliminates the need to construct stand-alone facilities to process the volume of recoverable hydrocarbons from the unit expansion area and TPA.

Facility consolidation will save capital and promote better reservoir management through pressure maintenance and enhanced recovery procedures. In combination, these factors allow the Tarn reservoirs within the KRU to be developed and produced in the interest of all parties.

Expanding the KRU and forming the TPA to include the leases that contain productive Tarn reservoirs by allowing these areas to access existing unit facilities and infrastructure prevents economic and physical waste.

(C) Protection of All Parties

The proposed expansion of the KRU and formation of the TPA seeks to protect the economic interests of all working interest owners of the reservoirs in the expanded unit and TPA, as well as the royalty owner. Combining interests and operating under the terms of the KRU Agreement, the KRU Operating Agreement, and the Greater Kuparuk Area Alignment Agreement assures each individual working interest owner an equitable allocation of costs and revenues commensurate with the value of their lease(s).

Because hydrocarbon recovery will be maximized and additional production-based revenue will be derived from the TPA production, the state's economic interest is promoted. Diligent development and exploration under a single approved unit plan without the complications of competing leasehold interests is certainly in the state's interest. It promotes efficient evaluation and development of the state's resources, yet minimizes impacts to the area's cultural, biological, and environmental resources.

The KRU expansion leases were issued on the new form lease contract. The lease form provides, in part, that the state's royalty share will be free and clear of all lease expenses. Including the leases into the KRU will not subject them to Appendix I of the KRU Agreement. Operating under the terms and conditions of the lease and KRU Agreement, also provides for accurate reporting and record keeping, royalty settlement, in kind taking, and emergency storage of oil, all of which will further the state's interest.

Finally, conditions were proposed and agreed to by the Owners and the DNR for including the expansion acreage within the KRU and forming the TPA. First, ARCO proposed and the DNR agreed that those lands which are not entitled to be included in a participating area after 5 years from the effective date of this Decision and Findings will be automatically contracted from the KRU. Furthermore, it was agreed that if any portion of a lease is included in a PA, the rest of that lease will not be severed. However, the rest of the lease will no longer be part of the unit. It will continue in full force and effect so long as production is allocated to the unitized portion of the lease and the lessee satisfies the remaining terms and conditions of the lease.

Second, Attachment 15 of ARCO's application indicates the Tarn Reservoir proposed development wells for 1998 and 1999. If any of these wells are not drilled two years after the effective date of this Decision and Finding, the TPA will be contracted to exclude the areas of the TPA not drilled as shown in Attachment 15. The TPA will be contracted to those tracts or parts of tracts with active production or injection wells 2 years from the effective date of this Decision and Finding. The well spacing of 160 acres around each well drilled will be the basis for determining the area of a tract to be included in the TPA.

These conditions assure that the inclusion of the expansion lands in the unit and the formation of the TPA promote the state's interest in the evaluation and development of those lands sooner rather than later.

In reviewing the above criteria, the following factors were considered:

(1) The Environmental Costs and Benefits of Unitized Exploration and Development

State regulations require the Commissioner to assess the environmental cost and benefits of the proposed KRU expansion and TPA formation. 11 AAC 83.303 (b) (2) and (4). DNR develops lease stipulations through the lease sale process to mitigate the potential environmental impacts from oil and gas activity. Alaska statutes require DNR to give public notice and issue a written finding before disposal of the state's oil and gas resources. AS 38.05.035(e), AS 38.05.945, 11 AAC 82.415. In preparing a written finding before an oil and gas lease sale, the commissioner may impose additional conditions or limitations beyond those imposed by law. AS 38.05.035(e).

DNR considered all comments filed before holding Lease Sale 69A, 70A and 75. DNR included mitigation measures in the leases issued. The proposed KRU expansion leases contain many stipulations designed to protect the environment and address any outstanding concerns regarding impacts to the area's fish and wildlife species and to habitat and subsistence activities. They address such issues as the protection of primary waterfowl areas, site restoration, construction of pipelines, seasonal restrictions on operations, public access to, or use of, the leased lands, and avoidance of seismic hazards. Including these leases in the KRU will not result in additional restrictions or limitations on access to the lands or to public and navigable waters. All lease operations after unitization are subject to a coastal zone consistency determination, and must comply with the terms of both the state and North Slope Borough coastal zone management plans.

Ongoing mitigation measures such as seasonal restrictions on specific activities in certain areas can reduce the impact on bird, fish, and mammal populations. Designating primary waterfowl areas is one method of protecting the bird habitat. DNR requires consolidation of facilities to minimize surface disturbances. Regulating waste disposal is another way to limit environmental impacts. With these mitigating measures, the anticipated exploration and development related activity is not likely to significantly impact bird, fish, and mammal populations. Area residents use the unit area for subsistence hunting and fishing. Oil and Gas activity may impact some wildlife habitat, and some subsistence activity. The environmental impact will depend on the level of development activity, the effectiveness of mitigation measures and the availability of alternative habitat and subsistence areas. In any case, the anticipated activity under the expanded KRU will impact habitat and subsistence activity less than if the lessees developed the leases individually. Unitized exploration, development and production will minimize surface impact.

A resident of the North Slope who has hunted, fished, and guided for nearly twenty years in the area around the KRU and the Prudhoe Bay Unit submitted a comment on the KRU expansion during the public comment period. He expressed concern that "the oil fields are taking over the area" and "that one day I will be told that I can no longer utilize this land as I have in the past." The proposed KRU expansion leases contain many stipulations designed to protect the environment and address any outstanding concerns regarding impacts to the area's fish and wildlife species and to habitat and subsistence activities. The expansion leases address the issue of public access to, or use of, the leased lands. The Mitigation Measures for Sale 70A, provide the following: (1) No restriction of public assess to, or use of, the leased area will be permitted as a consequence of oil and gas activities except in the immediate vicinity of drill sites, buildings, and other related structures; (2) No lease facilities or operations may be located where they would block public access to or along navigable and public waters as defined in AS 38.05.965(12) and (16). If lease facilities will be located in the vicinity of these public waters, an easement will be reserved under AS 38.05.127 and 11 AAC 53.330 to ensure the right of public access; and (3) The director, DO&G, will restrict lease-related surface use when the director determines it is necessary to prevent unreasonable conflicts with local subsistence harvests. Including the leases in the KRU will not change these stipulations.

Furthermore, state unitization regulations require the commissioner to approve a Plan of Operations before the unit operator performs any field operations. 11 AAC 83.346. A proposed Plan of Operations must describe the operating procedures designed to prevent or minimize adverse effects on natural resources. The unit operator must guarantee full payment for all damage sustained to the surface estate before beginning operations. The Plan of Operations must include plans for rehabilitation of the unit area. When the lessees propose to explore or develop the expansion area and submit a Unit Plan of Operations, the DNR will ensure that it complies with the lease stipulations and lessee advisories developed for the most recent North Slope areawide lease sale.

The approval of the KRU expansion and formation of the TPA itself has no environmental impact. The unit expansion and PA formation do not entail any environmental costs in addition to those that may occur when permits to conduct lease-by-lease exploration or development are issued. The commissioner's approval of the unit expansion and PA formation is an administrative action, which, by itself, does not convey any authority to conduct any operations within the unit. Unitization does not waive or reduce the effectiveness of the mitigating measures that condition the lessee's right to conduct operations on these leases. DNR's approval of the Unit POE and/or POD is only one step in the process of obtaining permission to drill a well or wells or develop the known reservoirs within the unit area. The Unit Operator must still obtain approval of a Plan of Operations from the state, and permits from various agencies on state leases before drilling a well or wells or initiating development activities to produce known reservoirs within the unit area.

ARCO applied for permits and authorizations for the Tarn development project from the various federal, state, and local agencies. ARCO received the permits and authorizations necessary for the construction of the Tarn development project. These permits and authorizations include the approval of a plan of operations from the DNR, a determination by the State of Alaska-Division of Governmental Coordination that the plan of operations is consistent with the Alaska Coastal Management Program and issuance of a permit from the Corps of Engineers.

(2) The Geological and Engineering Characteristics of the Proposed Expansion Area and Participating Area

The proposed KRU expansion area is adjacent to the current southwest corner of the KRU. ARCO provided adequate confidential technical data in support of the Sixth KRU expansion and proposed initial TPA. ARCO submitted the following geological, geophysical, and engineering data in support of the unit expansion and formation of the TPA: (1) prospect map – illustrating development drilling locations and exploration targets; (2) representative strike and dip seismic lines over the TPA and KRU expansion area; (3) correlated and annotated well log cross sections across the TPA; (4) structure and net pay maps of productive Seabee intervals over the TPA; (5) well test data for key Tarn wells; and (6) a drilling and completion schedule and map for the TPA development wells.

The vertical definition of the TPA includes two producing intervals, the Bermuda and overlying Cairn intervals, within the Cretaceous Seabee formation. The Bermuda and Cairn intervals are included within a marine sequence of reservoir sandstones, siltstones, and mudstones, and their lateral equivalents that are informally referred to as the Tarn Sands. The Tarn Sands were first encountered in 1991 in the interval between 4376' – 5990' (md) in the ARCO Bermuda #1 well.

ARCO has reasonably demonstrated by geological, geophysical, and engineering data that the Bermuda and Cairn intervals within the proposed TPA contain hydrocarbons in paying quantities. ARCO has proposed expanding the KRU to include the proposed TPA and surrounding acreage that contain other potential Tarn Sand interval exploration prospects within the Seabee Formation.

The areal extent of the Tarn Sands that will contribute to production is not currently known. ARCO's seismic amplitude analyses accurately define the prospective areas and roughly predict the gross thickness of the pay zones. The initial TPA is based on the zero contour of their expected net pay map. One of the major uncertainties with the Tarn reservoir is predicting the geometry and distribution of reservoir sands that are deposited as non-continuous sandstone bodies. Although 3-D seismic can readily identify channels, the lithology of the rock present cannot be predicted. The currently proposed drilling schedule and development plans (Attachment 15 of the application) justify the size of the proposed TPA.

Results of planned drilling within the TPA will delineate the geometry and sand distribution of the individual Tarn zones and more accurately define its true shape. Exploratory wells to be drilled within the expanded KRU area may lead to the expansion of the TPA. Conversely, areas included within the proposed TPA that are currently interpreted to be hydrocarbon-bearing may turn out to be disappointing because of the unpredictability of the geometry and sand distribution of the Tarn turbidite system. The areal extent of the productive intervals and will be constrained by the actual wells drilled and the results of exploration and delineation drilling.

(3) Prior Exploration Activities and the Applicant's Plan for Exploration or Development for the Expansion Areas

Prior exploration activity in the area included the drilling of the ARCO Bermuda #1 well in 1991 and the ARCO Tarn 1 well in 1992. 3-D seismic data was acquired over the expansion area in early 1996. Interpretation of the data led to the drilling of the Tarn 2, Tarn 3, Tarn 3A, and Tarn 4 wells in the 1996/1997 winter drilling season. Additional 3-D seismic data was acquired in the winters of 1996/1997 and 1997/1998 to the north and south of the Tarn discovery area.

The TPA development plan has two drillsites located approximately 3 miles apart, approximately 40 wells, two pipelines, a road, and power lines. A gravel road connects the two drillsites and extends approximately 7 miles into the existing KRU infrastructure at KRU Drillsite 2M. The roads, pipelines, and powerline were all built in early 1998. Development drilling, which started in April 1998, will be spread over two years. Approximately 20 wells are scheduled for 1998, and the remaining 20 wells are scheduled for 1999. Miscible Injectant (a mixture of natural gas and natural gas liquids) will be injected into the Bermuda and Cairn intervals of the Tarn reservoir to maximize oil rate and recovery.

Three exploration prospects similar to the Tarn discovery in the Bermuda and Cairn intervals have been identified from seismic data (See Attachment 6 of the application). Exploration wells are planned into the Arete and Iceberg features from Tarn Drillsite 2L in 1998.

The Tarn Owners also plan to drill one or more wells to test the Cairn prospect in ADL 375077 (south half), ADL 375078 (south half), ADL 375079, ADL 375080, ADL 373111, ADL 373112. The Tarn Owners have committed to drilling at least one well into the area outlined by these leases prior to October 1, 2000, or have an approved Authorization For Commitment (AFC) in place by that date to drill the well during the 2000/2001 winter drilling season. As a condition of including these leases into the KRU, the Owners agree that if one well is not drilled on the leases, or funded to be drilled during the winter drilling season of 2000/2001, the six leases will automatically contract from the KRU, and relinquished to the state by October 1, 2000 for leasing in the February 2001 area-wide lease sale.

(4) The Economic Costs and Benefits to the State and Other Relevant Factors

As discussed in section III (C) above, increased production and revenues, in and of themselves and without consideration of other relevant factors, may not always be in the state's best interest.

ARCO has represented to the division that development of the Tarn reservoir is possible because the existing KRU facilities and infrastructure will be shared. Tarn production will be commingled with Kuparuk Participating Area (KPA) production, and potentially other reservoirs in the KRU production gathering system, before any production passes through a custody transfer meter. ARCO proposes to allocate the KRU production amongst the various streams based on an individual well test allocation methodology that is the same methodology proposed and provisionally approved for the KRU West Sak Participating Area (WSPA). See Attachment 18 and 18A of the application.

The TPA will employ the same type of separation device to meter the Tarn production before it enters the KRU facilities; the Accuflow metering system. This multiphase meter system uses a separation approach in handling the oil/gas/water flow stream by first separating the gas from the liquid stream and then measuring the gas and the oil/water separately. This Accuflow system is the same multiphase metering system that was provisionally approved for well testing purposes at the KRU WSPA. Tarn will be the second application of the Accuflow system on the North Slope.

The Division Director on July 7, 1998 authorized early test production of two Tarns wells, 2N323 and 2N-329. While ARCO originally stated that they would use Accuflow equipment for well testing at Tarn, the early production tests indicated that the Accuflow system was not giving satisfactory results. The nature of these testing problems and ARCO's proposed interim solution to acquire accurate well tests and allocate the TPA production are detailed in ARCO correspondence to the division, dated July 24, 1998 and July 30, 1998. After reviewing the early test results with ARCO and discussions regarding their proposed interim solution of testing the wells, division staff are satisfied that the interim procedures will obtain reasonably accurate data until ARCO installs Accuflow equipment with sufficient capacity. In the interim, ARCO plans to use conventional test separator data for well tests. ARCO will meet with the various state agencies to evaluate the early Tarn well test data and production allocated through the KRU facilities.

ARCO's proposed production allocation methodology for the TPA is similar to procedures proposed and approved elsewhere on the North Slope. The division approves ARCO's TPA production commingling, allocation and well testing procedures for volume and royalty accounting with the following conditions: (1) the Allocation Factor (AF) for the TPA will be 1.0 for the first year of TPA production to evaluate either the Accuflow metering system or a conventional test separator, the individual well test allocation methodology, well test frequency and quality of the individual well test data; (2) during the first year of production, the individual well test frequency will be a minimum of 2 well tests per month; (3) ARCO submit a monthly production allocation report similar to the report currently submitted for the KRU WSPA; (4) an allocation and well test review meeting be held with the DNR, DOR, and AOGCC after 6 and 12 months of commingled production; and (5) after 12 months of commingled production, the TPA production allocation methodology will be evaluated to determine the continued use of the allocation procedures.

ARCO submitted an allocation of production and cost for the leases in the proposed TPA (Attachment 3 to this Decision and Findings) as required by 11 AAC 83.371. The proposed allocation distributes working interest equity among the lease tracts on a surface acreage basis. All the leases within the TPA reserve a 12.5% royalty to the state and the state is the sole royalty owner of the leases in the TPA. Also, the WIOs represented at meetings between ARCO and the Division before the application was submitted that there would be no field costs associated with the TPA production through the KRU facilities. The application does not propose field costs. Based on the above, ARCO's tract allocation schedule is acceptable for allocating production and costs among the leases within the TPA.

The TPA will be the Third PA in the KRU that will share the KRU facilities and infrastructure. In order to properly allocate KPA, WSPA, TPA, and any other KRU participating area produced gas, gas used for fuel, flare, gas reinjected into the KPA reservoir or any other participating area reservoir established in the KRU, and natural gas liquids that go through the KRU facilities, the TPA Owners should continue to use the gas reserve and gas debit reporting procedures already established for the facility sharing at the KRU. The monthly gas reserves and gas debit report should be similar to the form approved for the WSPA. (See WSPA Decision and Findings, dated December 18, 1997)

Finally, in accordance with the applicable WIO Alignment Agreements that have been filed with the division, ARCO, BPXA, UNOCAL, Chevron, and Mobil are the only WIOs in the Sixth KRU Expansion Area. Currently, the division's title ownership records do not reflect this realignment of interests in the Greater Kuparuk Area. The WIOs have represented that the lease assignments implementing the realigned interests will be filed with the Division before the end of 1998. To simplify the monthly royalty reporting for the TPA, the Division will permit the WIOs to use the same procedures in the TPA as are now used in the KPA and WSPA for royalty reporting. Attachment 4 to this Decision and Findings describes those procedures.

IV. FINDINGS AND DECISION

Considering the facts discussed in this document and the administrative record, I hereby make findings and impose conditions as follows:

1. The expansion of the KRU and the formation of the TPA are necessary and advisable to protect the public interest. AS 38.05.180(p) and 11 AAC 83.303.

2. The available well data and development plans justify the inclusion of the proposed lands within the KRU. Under the regulations governing formation and operation of oil and gas units (11 AAC 83.301 - 11 AAC 83.395) and the terms and conditions under which these lands were leased from the State of Alaska, the following lands are to be included in the expanded KRU area:

T.10.N., R.7.E., U.M., Secs. 3, 4, 9, and 10
(ADL 380050 (Tract 127)).

T.10.N., R.7.E., U.M., Secs. 1, 2, 11, and 12
(ADL 380049 (Tract 128)).

T.11.N., R.7.E., U.M., Secs. 17 and 20
(ADL 375107 (East Half)(Tract 129));

T.10.N., R.7.E., U.M., Secs. 15, 16, 21, and 22
(ADL 380052 (Tract 130)).

T.10N., R.7.E., U.M., Secs. 13, 14, 23, and 24

(ADL 380051(Tract 131)).
T.10.N., R.7.E., U.M., Secs. 29 and 32
(ADL 375108 (East Half)(Tract 132));

T.10.N., R.7.E., U.M., Secs. 27, 28, 33, and 34
(ADL 380054 (Tract 133)).

T.10.N., R.7.E., U.M., Secs. 25, 26, 35, and 36
(ADL 380053 (Tract 134)).

T.9.N., R.7.E., U.M., Secs. 5 and 8
(ADL 375075 (East Half)(Tract 135)).

T.9N., R.7.E., U.M., Secs. 3, 4, 9, and 10
(ADL 375074 (Tract 136)).

T.9.N., R.7.E., U.M., Secs. 1, 2, 11, and 12
(ADL 375073 (Tract 137)).

T.9N., R.7.E., U.M., Secs. 15, 16, 21, and 22
(ADL 375077 (Tract 138)).

T.9.N., R.7.E., U.M., Secs. 13, 14, 23 and 24
(ADL 375078 (Tract 139)).

T.9.N., R.7.E., U.M., Secs. 27, 28, 33, and 34
(ADL 375080 (Tract 140)).

T.9.N., R.7.E., U.M., Secs. 25, 26, 35, and 36
(ADL 375079 (Tract 141)).

T.8.N., R.7.E., U.M., Secs. 4-9 and 16-18
(ADL 373112 (Tract 142)).

T.8N., R.7.E., U.M., Secs. 1-3 and 10-15
(ADL 373111 (Tract 143)).

3. The expansion leases shall be included in the KRU for a period of five years and will not be subject to Appendix I of the KRU Agreement. The leases or portions of the leases not included in a participating area within five years of the effective date of this Decision and Findings will be automatically eliminated from the KRU. If conditions warrant the continuation of the leases within the KRU after the five years, ARCO may then apply to defer the automatic contraction of the lands from the KRU.

4. The unitized development and operation of the leases in this proposed unit will reduce the amount of land and fish and wildlife habitat that would otherwise be disrupted by individual

lease development. This reduction in environmental impacts and interference with subsistence activity is in the public interest.

5. The Agreement will not diminish access to public and navigable waters beyond those limitations (if any) imposed by law or already contained in the oil and gas leases covered by this Agreement.

6. The Agreement provides for expansions and contractions of the unit area in the future as warranted by data obtained by exploration. The Agreement thereby protects the public interest, the rights of the parties, and the correlative rights of adjacent landowners.

7. The available geological and engineering data demonstrate that a paying quantities certification is appropriate for the tracts proposed for the TPA. The data also suggest that the acreage is underlain by hydrocarbons and known and reasonably estimated to be capable of production or contributing to production in sufficient quantities to justify the formation of the TPA within the KRU.

8. The available geological and engineering data justify the inclusion of the proposed tracts within the TPA. Under the regulations governing formation and operation of oil and gas units (11 AAC 83.301 - 11 AAC 83.395) and the terms and conditions under which these lands were leased from the State of Alaska, the following lands are to be included in the TPA:

T.10.N., R.8.E., U.M., Secs. 18 and 19
(ADL 25603 (Tract 90)).

T.10.N., R.8.E., U.M., Sec. 30
(ADL 25608 (Tract 95)).

T.10.N., R.7.E., U.M., Secs. 15 and 22
(ADL 380052 (Tract 130)).

T.10N., R.7.E., U.M., Secs. 13, 14, 23, and 24
(ADL 380051(Tract 131)).

T.10.N., R.7.E., U.M., Sec. 32
(ADL 375108 (Tract 132)).

T.10.N., R.7.E., U.M., Secs. 27, 28, 33, and 34
(ADL 380054 (Tract 133)).

T.10.N., R.7.E., U.M., Secs. 25, 26, 35, and 36
(ADL 380053 (Tract 134)).

T.9.N., R.7.E., U.M., Sec. 5
(ADL 375075 (Tract 135)).

T.9N., R.7.E., U.M., Secs. 3 and 4
(ADL 375074 (Tract 136)).

T.9.N., R.7.E., U.M., Secs. 1, and 2
(ADL 375073 (Tract 137)).

9. The TPA is approved subject to ARCO drilling the TPA development wells indicated in Attachment 15 of the application. If the wells are not drilled to the indicated areas of the TPA within two years of the effective date of the TPA, the TPA will automatically be contracted to exclude the non-drilled areas.

10. The formation of the TPA equitably divides costs and allocates produced hydrocarbons, and sets forth a development plan designed to maximize physical and economic recovery from the Tarn Reservoirs within the approved TPA.

11. Pursuant to 11 AAC 83.351(a) and 11 AAC 83.371(a), the Division approves the allocations of production and costs for the tracts within the TPA 3 under the terms and conditions of Section III (C)(5) of this Decision and Findings.

12. The production of TPA hydrocarbon liquids may be commingled with other KRU production in surface facilities before custody transfer. Facility sharing reduces the environmental impact of the additional production. Utilization of existing facilities will avoid unnecessary duplication of development efforts on and beneath the surface.

13. The proposed well test allocation methodology, as conditioned in Section III(C)(5), is acceptable for royalty allocation purposes and for allocating the commingled gas and hydrocarbon liquids production among the other participating areas within the KRU.

ARCO, as KRU Operator, shall provide the division with the monthly production allocation reports and well test data for the TPA wells by the 20th of the following month. The Division reserves the right to request any information it deems pertinent to the review of those reports from ARCO. Moreover, this approval of the allocation methodology is conditioned upon the operator's agreement to promptly and fully reply to any such requests.

The monthly allocation report shall include a summary of monthly allocation by well, and specific well test data for all tests which have been conducted.

14. The Division reserves the right to review the well test allocations to insure compliance with the methodology prescribed in this decision. Such review may include, but is not limited to, inspection of facilities, equipment, well test data.

15. During the first year in which commingled production from the TPA is allocated, semi-annual reviews of the allocation methodology will be scheduled with the Division. Following its review, the Division, in its discretion, may require revision of the allocation procedure. Either the Division or the operator may request subsequent reviews. The allocation procedure may only be revised with the written consent of, or upon the written direction of, the Division.

16. To account for the gas produced from each participating area within the KRU, the gas volume disposition and gas reserves debited from or credited to each PA using the shared KRU facilities, ARCO shall submit a monthly gas disposition and reserves debit report using the form indicated in Attachment 2. The gas disposition report shall be submitted with the monthly production allocation reports.

17. Diligent exploration and delineation of the Tarn reservoir underlying the approved participating area is to be conducted by the Unit Operator under the KRU plans of development and operation approved by the state. Before undertaking any specific operations, the unit operator must submit a Plan of Operations to the DNR and other appropriate state and local agencies for review and approval. All agencies must grant the required permits before drilling or development operations may commence. DNR may condition its approval of a unit Plan of Operations and other permits on performance of mitigating measures in addition to those in the leases if necessary or appropriate. Requiring strict adherence to the mitigating measures will minimize adverse environmental impacts.

18. The plan of development for the TPA meets the requirements of 11 AAC 83.303 and 11 AAC 83.343. The plan is approved for a period of two years from the effective date of this Decision and Finding. Annual updates to the plan of development which describe the status of projects undertaken, drilling results, and the work completed, any changes or expected changes to the plan, and a further plan of development, must be submitted in accordance with 11 AAC 83.343.

19. The plan of exploration for the KRU expansion area subject to the conditions of Section III(C)(4), meets the requirements of 11 AAC 83.303 and 11 AAC 83.341. Further plans of exploration which describe the status of projects undertaken and the work completed, any changes or expected changes to the plan must be submitted in accordance with 11 AAC 83.341.

20. Approval of the expansion of the KRU, formation of the TPA, and the TPA tract allocation schedule are effective July 1, 1998.

Kenneth A. Boyd
Kenneth A. Boyd, Director
Division of Oil and Gas

4 SEPT '98
Date

Attachments: 1) Sixth KRU expansion area leases/tracts
2) Map of the proposed KRU expansion area
3) The TPA leases/tracts and tract allocation schedule
4) KRU Allocation and Ownership of Production, DNR letter dated April 7, 1998

KRU.exp.TPAform.Appv.doc

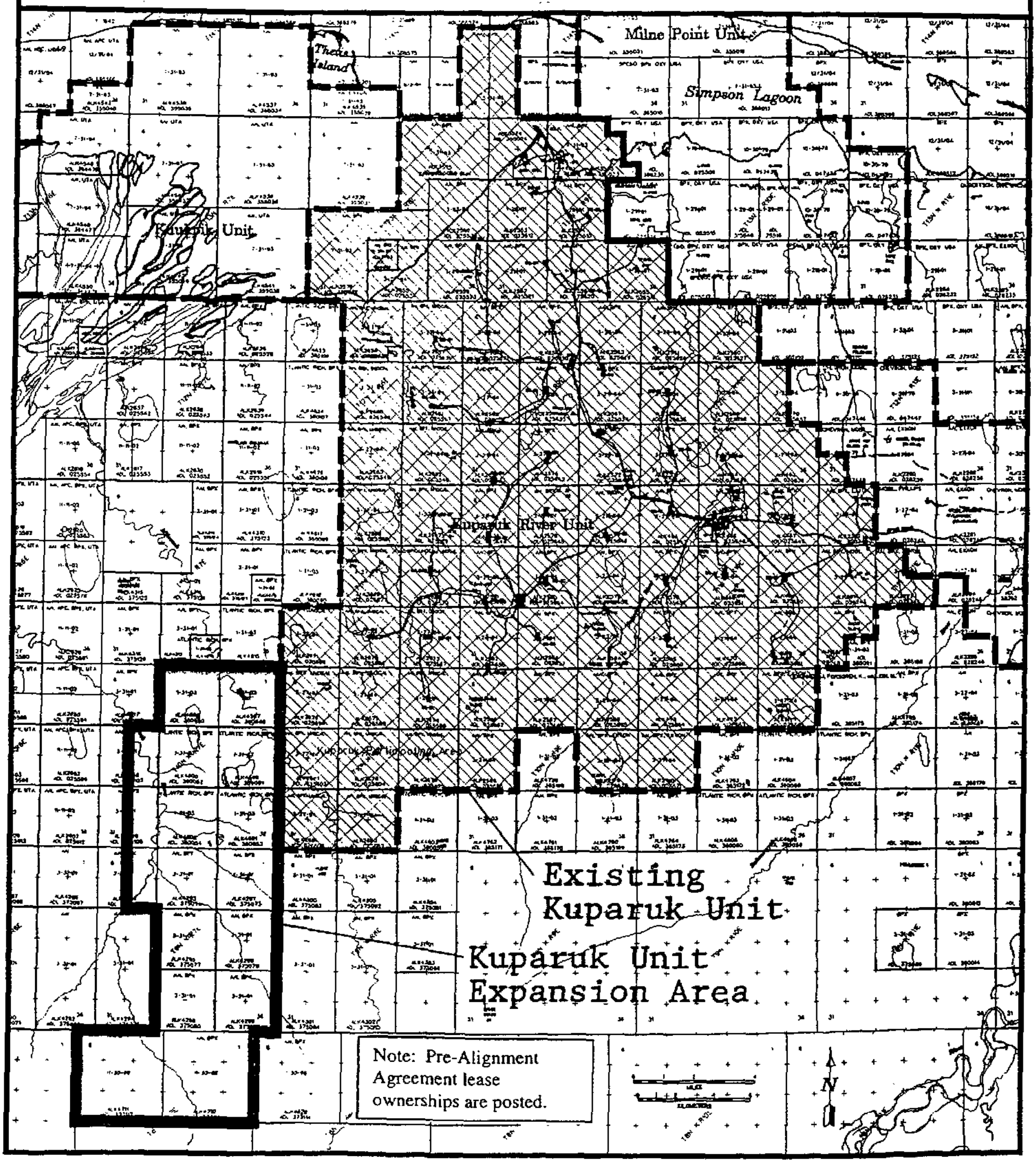
Attachment 1
Kuparuk Unit Expansion Area Tracts

						Alaska Net	Agreed Leasehold Working Interests *				
Tr. No.	Lease No.	Exp. Date	Legal Description	Lease Acres	Lessor Royalty	Profit Share	ARCO	BPX	UNOCAL	MOBIL	CHEVRON
127	ADL380050	01/31/03	T10N, R07E, UM: Sec. 3: All; Sec. 4: All; Sec. 9: All; Sec. 10: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
128	ADL380049	01/31/03	T10N, R07E, UM: Sec. 1: All; Sec. 2: All; Sec. 11: All; Sec. 12: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
129	ADL375107 (East Half)	03/31/01	T10N, R07E, UM: Sec. 17: All; Sec. 20: All.	1,280	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
130	ADL380052	01/31/03	T10N, R7E, UM: Sec. 15: All; Sec. 16: All; Sec. 21: All; Sec. 22: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
131	ADL380051	01/31/03	T10N, R07E, UM: Sec. 13: All; Sec. 14: All; Sec. 23: All; Sec. 24: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
132	ADL375108 (East Half)	03/31/01	T10N, R07E, UM: Sec. 29: All; Sec. 32: All.	1,280	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
133	ADL380054	01/31/03	T10N, R07E, UM: Sec. 27: All; Sec. 28: All; Sec. 33: All; Sec. 34: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
134	ADL380053	01/31/03	T10N, R07E, UM: Sec. 25: All; Sec. 26: All; Sec. 35: All; Sec. 36: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
135	ADL375075 (East Half)	03/31/01	T09N, R07E, UM: Sec. 5: All; Sec. 8: All.	1,280	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
136	ADL375074	03/31/01	T09N, R07E, UM: Sec. 3: All; Sec. 4: All; Sec. 9: All; Sec. 10: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
137	ADL375073	03/31/01	T09N, R07E, UM: Sec. 1: All; Sec. 2: All; Sec. 11: All; Sec. 12: All	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
138	ADL375077	03/31/01	T09N, R07E, UM: Sec. 15: All; Sec. 16: All; Sec. 21: All; Sec. 22: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
139	ADL375078	03/31/01	T09N, R07E, UM: Sec. 13: All; Sec. 14: All; Sec. 23: All; Sec. 24: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
140	ADL375080	03/31/01	T09N, R07E, UM: Sec. 27: All; Sec. 28: All; Sec. 33: All; Sec. 34: All	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
141	ADL375079	03/31/01	T09N, R07E, UM: Sec. 25: All; Sec. 26: All; Sec. 35: All; Sec. 36: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
142	ADL373112	11/30/98	T08N, R07E, UM: Sec. 4: All; Sec. 5: All; Sec. 6: All; Sec. 7: All; Sec. 8: All; Sec. 9: All; Sec. 16: All; Sec. 17: All; Sec. 18: All.	5,583	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
143	ADL373111	11/30/98	T08N, R07E, UM: Sec. 1: All; Sec. 2: All; Sec. 3: All; Sec. 10: All; Sec. 11: All; Sec. 12: All; Sec. 13: All; Sec. 14: All; Sec. 15: All.	5,760	12.50%	0.0%	55.293767%	39.282233%	4.950600%	0.364800%	0.108600%
			Total Lease Acres	45,903							

*The lease assignments implementing the re-aligned interests will be filed with the Division before the end of 1998.

Attachment 2

Sixth Expansion of the KRUA



Attachment 3
Tarn Participating Area Tracts and Tract Participation Decimals

Tr. No.	Lease No.	Exp. Date	Legal Description	Lease Acres	Lessor Royalty	Alaska Net Profit Share	Agreed Leasehold Working Interests: ARCO	BPX	UNOCAL	MOBIL	CHEVRON	Area Inside 0' Contour (Acres)	Tract Participation
90	ADL025603 (West Half)	03/27/84	T10N, R08E, UM: Sec. 18: All; Sec. 19: All.	1,232	12.50%	0.0%	55.293767%	39.282233%	4.95060%	0.364800%	0.108600%	997	10.7230%
95	ADL025608 (NW Quarter)	03/27/84	T10N, R08E, UM: Sec. 30: All.	620	12.50%	0.0%	55.293767%	39.282233%	4.95060%	0.364800%	0.108600%	539	5.7970%
130	ADL380052 (East Half)	01/31/03	T10N, R7E, UM: Sec. 15: All; Sec. 22: All.	1,280	12.50%	0.0%	55.293767%	39.282233%	4.95060%	0.364800%	0.108600%	243	2.6130%
131	ADL380051	01/31/03	T10N, R07E, UM: Sec. 13: All; Sec 14: All; Sec. 23: All; Sec. 24: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.95060%	0.364800%	0.108600%	1365	14.6810%
132	ADL375108 (SE Quarter)	03/31/01	T10N, R07E, UM: Sec. 32. All.	1,280	12.50%	0.0%	55.293767%	39.282233%	4.95060%	0.364800%	0.108600%	147	1.5810%
133	ADL380054	01/31/03	T10N, R07E, UM: Sec. 27: All; Sec. 28: All; Sec. 33: All; Sec. 34: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.95060%	0.364800%	0.108600%	2265	24.3600%
134	ADL380053	01/31/03	T10N, R07E, UM: Sec. 25: All; Sec. 26: All; Sec. 35: All; Sec. 36: All.	2,560	12.50%	0.0%	55.293767%	39.282233%	4.95060%	0.364800%	0.108600%	2165	23.2850%
135	ADL375075 (NE Quarter)	03/31/01	T09N, R07E, UM: Sec. 5: All.	640	12.50%	0.0%	55.293767%	39.282233%	4.95060%	0.364800%	0.108600%	129	1.3870%
136	ADL375074 (North Half)	03/31/01	T09N, R07E, UM: Sec. 3: All; Sec. 4: All.	1,280	12.50%	0.0%	55.293767%	39.282233%	4.95060%	0.364800%	0.108600%	945	10.1630%
137	ADL375073 (North Half)	03/31/01	T09N, R07E, UM: Sec. 1: All; Sec. 2: All.	1,280	12.50%	0.0%	55.293767%	39.282233%	4.95060%	0.364800%	0.108600%	503	5.4100%
Totals				15,292								9298	100.0000%

Note: Tract participation values are based upon the area in each tract inside the 0' contour on exptected net pay map (Exhibit "Tarn D-2") divided by the sum of the areas inside the 0' contour from all the leases in the Tarn PA.