

OOOGURUK UNIT

APPROVAL OF THE APPLICATION TO EXPAND THE  
OOOGURUK-KUPARUK PARTICIPATING AREA

Findings and Decision of the Director  
of the Division of Oil and Gas  
Under a Delegation of Authority  
from the Commissioner of the State Of Alaska  
Department of Natural Resources

July 11, 2018

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## I. INTRODUCTION AND DECISION SUMMARY

The Division received the Application for the Expansion of the Oooguruk Kuparuk Participating Area (Application) on March 5, 2018 from the Oooguruk Unit (OU) Operator, Caelus Natural resources Alaska, LLC (Caelus). The Application proposes adding 600 acres to the northeastern edge of the participating area. The Division had previously met with Caelus to discuss the application on February 7, 2018.

A participating area “must be expanded to include acreage 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, and must be contracted to exclude acreage reasonably proven through the use of geological, geophysical, and engineering data to be incapable of producing hydrocarbons in paying quantities, subject to approval by the commissioner.” 11 AAC 83.351(c).

Caelus submitted confidential and public information in the Application. The confidential geological, geophysical, and engineering data indicate that the acreage proposed for inclusion in the Oooguruk Kuparuk Participating Area (OKPA) is producing or contributing to production of hydrocarbons in paying quantities, or is reasonably estimated to be capable of producing or contributing to production of hydrocarbons in paying quantities.

The Division finds that the expansion of the OKPA promotes conservation of all natural resources, promotes the prevention of economic and physical waste, and provides for the protection of all parties of interest, including the State. AS 38.05.180(p); 11 AAC 83.303. I approve the Application under the terms and conditions of Section III. The effective date of the revision of the OKPA is retroactive to June 1, 2008.

## II. APPLICATION AND LEASE SUMMARY

The OU was formed effective July 11, 2003 with Pioneer Natural Resources Alaska, Inc. as the Operator with 70% working interest and ENI Petroleum US LLC with 30% working interest ownership. The OU comprises 25 state leases for a total of approximately 53,344 acres. On April 15, 2014 Caelus succeeded Pioneer as operator of the Unit. Formation of the Kuparuk participating area was approved in 2009, retroactive to June 1, 2008 when regular production began from the OKPA

The Application includes Exhibit C (Attachment 1), legally describing the proposed revised participating area, its leases, and ownership interests, and a map of the proposed revised participating area (Attachment 2).

Revisions to the participating area are summarized below and described in detail in Attachments 1 and 2.

**Table 1: Lease Proposed for Expansion**

Unit Tract №	Lease №	Legal Description	Expansion Acres
13	355036	T. 13 N., R. 7 E., Umiat Meridian Section 1, Protracted, E/2, E/2 W/2, SW/4 NW/4 Section 2, Protracted, S/2 NW/4	600.00

### **III. DISCUSSION OF DECISION CRITERIA**

The Department of Natural Resources Commissioner (Commissioner) reviews applications related to units, including participating area formations, expansions, and contractions, under 11 AAC 83.303-395. By memorandum dated September 30, 1999, the Commissioner approved a revision of Department Order 003 and delegated this authority to the Division Director. The Division's review of the Application is based on the criteria set out in 11 AAC 83.303 (a) and (b). A discussion of the subsection (b) criteria, as they apply to the Application, is set out directly below, followed by a discussion of the subsection (a) criteria. Analysis and discussion of subsection (b) requirements precedes and supports the findings under subsection (a).

#### **A. Decision Criteria considered under 11 AAC 83.303(b)**

##### **1. Environmental Costs and Benefits**

Approval of the OKPA revision has no direct environmental impact. This decision is an administrative action and does not authorize any on-the-ground activity. The Unit Operator must 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 reservoirs within the unit area. 11 AAC 83.346. Potential effects on the environment are analyzed when permits to conduct exploration or development in the unit area are reviewed. Caelus has obtained the required permits for the current OKPA wells and is operating under an approved plan of operations and plan of development. DNR considers environmental issues during the lease sale process and the unit plan of operations approval process.

##### **2. Geologic and Engineering Characteristics and Prior Exploration and Development Activities of the Expanded Kuparuk Participating Area**

###### **Introduction**

The Division received the application to expand the OKPA on March 5, 2018. With the Application, Caelus also submitted public and confidential data to the Division in support of the Application. Data included: structural and interval maps, digital grids, geologic and geophysical cross sections, formation tops, petrophysical log analysis of reservoir properties, and hydrocarbon analyses.

After technical discussions with Caelus and review of the submitted data, for the reasons discussed below, the Division has determined Caelus has provided sufficient information to justify the expansion of the OKPA and the proposed allocation of production within the expanded PA.

###### **Kuparuk Geologic Setting**

The Kuparuk River Formation of Early Cretaceous age (120-145 million years old) has a unique and complex depositional history. The Kuparuk River Formation is informally subdivided into four members designated by letters A (oldest) through D (youngest). Each member is further subdivided into sub-members designated by numbers, such as A-1 (with one being the oldest sub-member). The lower A and B sandstone members (Berriasian and Valanginian in age) were derived from a subaerially exposed northern provenance that foundered during Late Jurassic-

Early Cretaceous time. The Kuparuk A sandstone sub-members are predictable, continuous, coarsening-upward marine offshore bars to shoreface sequences that were deposited over large contiguous areas. Following the deposition of overlying shallow marine Kuparuk B sediments, the area became tectonically active due to regional rifting and extension tectonics that resulted in regional tilting and the formation of localized topographic highs that were subsequently eroded by the Lower Cretaceous Unconformity (LCU), a major regional scouring event. As the northern source terrain subsided, erosion of the Kuparuk B sediments and underlying Kuparuk A sandstone members in the uplifted blocks along the Prudhoe Bay structural high became the primary sediment source of the Kuparuk C and D intervals. Sediment erosion from these highs were re-deposited as the Kuparuk C and D members and preserved in grabens along with other low-lying areas on top of the LCU erosional surface.

Within the OU, the Kuparuk C member is preserved and locally concentrated in structural depressions and grabens on the down thrown side of a system of northwest-southeast trending syn-depositional normal faults that extend from the 3M and 3H pads within the Kuparuk River Unit. Vertical displacement of these faults can range up to 200 feet. Away from the grabens and on the upthrown side of these faults the Kuparuk C is thin to absent and decreases in reservoir quality. The Kuparuk C reservoir in the OU ranges from 0 feet to approximately 40 feet in thickness and correlates to the basal portions of the Kuparuk C in the adjacent Kuparuk River Unit and nearby Milne Point and Colville River Units. The reservoir quality rock within the Kuparuk C member generally consists of fine to coarse-grained, bioturbated, fining-upward quartz sandstone with 5–25 percent glauconite and 10-35 percent secondary siderite cement. Porosity ranges from 13–32 percent with an average of 17 percent. Permeability ranges 0–500 millidarcies and averages 50–100 millidarcies. Average water saturation is 30 percent. No oil-water contact has been identified within the Kuparuk in the OU.

### **Prior activities in the proposed expanded OKPA**

OU was formed in 2003 and continued development drilling led to the unit being expanded in 2007, 2011, and 2014. The unit currently encompasses approximately 53,344 acres within 25 state leases.

The OKPA is currently comprised of four state leases encompassing approximately 5,160 acres within the OU. The proposed OKPA expansion will add approximately 600 acres adjacent to the northeast boundary of the existing OKPA within state lease ADL 355036.

The current OKPA includes six Kuparuk development wells of which four are active: two producers (ODSK-14 and ODSK-41) and two injectors (ODSK-35i and ODSK-38i). The cumulative volume of oil produced from the OKPA, as of year-end, 2017 is approximately 8.7 Million Barrels of Oil (MMBO) with an expected ultimate recovery of 10.4 MMBO.

In 2011, the ODSK-13PB2 (pilot hole) and ODSK-13 (horizontal lateral) wells were drilled outside the current OKPA into the adjacent graben (Ivik fault block) to the northeast to test the thickness and productivity of the Kuparuk C interval within the Ivik fault block. The wellbores encountered approximately 16 feet of Kuparuk C sandstone, but the horizontal lateral would not sustain production. Multiple workovers, clean-outs, and attempts to chemically stimulate the lateral from 2012 thru 2013 were not successful in achieving economic production. Short term injection testing of ODSK-13 in 2013 and 2014 indicated that the Ivik fault block is not in

hydraulic communication with the producing OKPA wells in the adjacent Kalubik fault block to the west. Analyses of cuttings samples from ODSK-13 well indicate a higher content of asphaltene than is found in the producing wells within the Kalubik fault block. This increased asphaltene and subsequent low mobility is thought to explain the low productivity from the well. ODSK-13 has been shut-in since 2014.

From 2012 to 2016 continued drilling of Nuiqsut development wells allowed for several additional penetrations and evaluation of the shallower Kuparuk interval within the Ivik fault block. Analysis and integration of this additional information suggested that thicker Kuparuk sandstone, higher mobilities, and potential economic resource existed within the Ivik fault block to the southeast of the ODSK-13 well.

In September 2017, a rig workover was conducted in the existing ODSN-29 well to isolate the producing Nuiqsut interval and complete, perforate, and test the approximately 37-foot-thick Kuparuk interval within the well. Since October 2017, the well has consistently produced approximately 1,500 Barrels of Oil Per Day (BOPD) from the Kuparuk interval. While the Kuparuk testing in ODSN-29 has temporarily shut-in Nuiqsut production of approximately 450 BOPD, the long-term plan for the well will be to either get approval from the AOGCC to commingle production from the Kuparuk and Nuiqsut intervals in the well (after the reservoir pressure equalizes between the two zones), or to alternate production from the two reservoirs.

Initial Kuparuk pressures measured in the ODSN-29 well confirms communication with the existing OKPA and Kalubik fault block to the southwest, but not to ODSK-13 well in the northwest portion of the Ivik fault block. For this reason, the OKPA expansion area is limited to the area of relatively thick Kuparuk reservoir around the ODSN-29 well, but does not include the area around the ODSK-13 well to the northwest.

Original oil in place of the proposed OKPA expansion area is estimated to be approximately 6.6 million barrels of oil, based on publicly available data. Expected ultimate recovery from the proposed expansion area, assuming no additional development beyond the production from the ODSN-29 well, is estimated to be 600,000 barrels of oil.

## **Conclusion**

Caelus has demonstrated through production, well, and engineering data that the proposed expansion area is capable of producing or contributing to the production of hydrocarbons in paying quantities and the acreage is justified for inclusion in the OKPA.

The revision of the OKPA includes all quarter-quarter sections partially or totally within a 1,500-foot radius of the productive section of each operable OKPA well. This defines the estimated areal extent of the existing waterflood pattern drainage area. The allocation of production within the drainage area is based on original oil in place.

The Division reviewed Caelus's geological, geophysical, and engineering data and found that the data submitted justifies the inclusion of the proposed acreage in the OKPA and that tract participations are consistent with ongoing production.

### **3. Plans of Development**

The Division approved the OU Twelfth POD on June 26, 2018, effective for the period September 1, 2018 through August 31, 2019. Caelus suspended drilling operations in April 2016 “due to market conditions,” however it conducted eight well workovers during the Eleventh POD period. Caelus has no plans for drilling additional wells during the current POD period, however it has plans to conduct ODSN well workovers which include casing repairs and recompletions with new electric submersible pumps during the Twelfth POD period. Caelus will also continue facility maintenance and optimization activities to maximize production.

### **4. The Economic Costs and Benefits to the State and Other Relevant Factors**

The revised OKPA will provide more accurate allocation of royalty payments on production. Because some of the acreage is already producing or contributing to production, though, there is no additional direct royalty benefit.

## **B. Decision Criteria considered under 11 AAC 83.303(a)**

### **1. Promote the Conservation of All Natural Resources**

The unitization of oil and gas reservoirs and the expansion and contraction of participating areas within unit areas to develop hydrocarbon-bearing reservoirs are well-accepted means of hydrocarbon conservation. Expansion and contraction of a participating area within an existing unit, with development occurring under the terms of a unit agreement, promotes efficient evaluation and development of the State’s oil and gas and minimizes impacts to the area’s cultural, biological, and environmental resources.

### **2. The Prevention of Economic and Physical Waste**

The acreage within the revised OKPA already produces and contributes to production from the OU. Approval of the Application will prevent economic and physical waste because the approval will more accurately allocate production revenue under the approved OKPA tract allocations, and equitably allocate production revenues among the working interest owners (WIOs).

Revising the OKPA to include all areas capable of producing or contributing to the production of hydrocarbons allows the operator to place wells in the optimum location for recovery and prevents drilling unnecessary wells in an attempt to extend lease terms.

Annual approval of the OU development activities as described in future PODs must also provide for the prevention of economic and physical waste.

### **3. The Protection of All Parties of Interest, Including the State**

A participating area “must be expanded to include acreage 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 and must be contracted to exclude acreage reasonably proven through the use of geological, geophysical, and engineering data to be incapable of producing hydrocarbons in paying quantities, subject to approval by the commissioner.” 11 AAC 83.351(c).

The Division reviewed confidential geophysical, geological and engineering data to determine if the proposed expansion of the OKPA meets the above criteria. Caelus has demonstrated that the acreage proposed for the OKPA expansion is “reasonably estimated” to be capable of producing or contributing to production of hydrocarbons in paying quantities.

The revised OKPA will equitably allocate production from the PA and therefore protect all parties, including the State. The State is further protected as the OKPA only contains leases contributing to production, therefore allowing leases outside the OKPA to contract from the unit and potentially expire unless held by another means. The OKPA allocates production based on an original oil in place basis. The Division finds this to be an appropriate allocation methodology and supports the protection of all parties.

#### **IV. FINDINGS AND DECISION**

##### **A. The Conservation of All Natural Resources**

1. Revision of the OKPA under the OU Agreement will maximize the efficient recovery of oil and gas and minimize the adverse impacts on the surface and other resources, including hydrocarbons, gravel, sand, water, wetlands, and valuable habitat.

##### **A. The Prevention of Economic and Physical Waste**

1. Caelus submitted geological, geophysical, and engineering data to the Division in support of the Application, as approved. Division technical staff determined that the revised OKPA area is “reasonably estimated” to be capable of producing or contributing to production in paying quantities.
2. The available geological, geophysical and engineering data justify committing the lands described in attachment 1 and 2 of this decision to the OKPA.

##### **B. The Protection of All Parties in Interest, Including the State**

1. The economic, geological, geophysical, and engineering data that Caelus provided reasonably justify the inclusion of the acreage into the revised OKPA under the terms of the applicable regulations governing formation, expansion, and operation of oil and gas units and participating areas (11 AAC 83.301-395) and the terms and conditions under which these lands were leased from the State.
2. The OKPA revision provides for the equitable division of costs and an equitable allocation of produced hydrocarbons under a POD designed to maximize physical and economic recovery from the reservoirs within the approved participating areas. The allocations of production and costs for the tracts within the revised OKPA are approved.
3. Whenever a participating area (or revision thereof) is approved pursuant to 11 AAC 83.351, Exhibits C, D, E, and F (when relevant) must be timely filed in accordance with the Division’s instructions. These Exhibits constitute supporting documents for the purposes of filing NPSL reports prescribed by 11 AAC 83.245. The Division approves Caelus’s submission of revised OKPA Exhibits C and D, reflecting the approved revision of the OKPA. Further, the Oooguruk WIOs shall file Revised NPSL reports (Volume/Value report



(VV), Account (AC), and Production Tax Lease Allowance Report (PT) Forms) no later than 60 days after the date of this decision or the reports will be subject to an Administrative Fee pursuant to 11 AAC 245(h). The VV Form must be revised back to June 1, 2008 and the AC Form, and the PT Form must be revised back to the date of the first capital expenditure. Note though that PT Forms are only required starting with April 2006. These reports are subject to audit under AS 38.05.036.

4. Accounting Unit codes OO01 terminated effective July 31, 2011 and OO13 terminated effective May 31, 2018. Revised royalty reports (O1 and A1 Forms) for OO01 production from May 1, 2011 to July 31, 2011, as well as the OO13 production from October 1, 2017 to May 31, 2018 should be zeroed out and allocated to the OKPA royalty accounting unit code OOKU. Caelus shall submit revised operator reports (O1 Forms) and the WIOs shall submit revised royalty reports (A1 Forms) back to June 2008 production month. From this date forward, production must be allocated to OKPA as set forth in the approved OKPA tract allocation schedule. Caelus as operator and the Oooguruk WIOs as lessees shall submit the revised royalty reports (O1 and A1 Forms) within 60 days after the approval of this decision or be subject to an Administrative Fee pursuant to 11 AAC 04.080.

For the reasons discussed in this Findings and Decision, I hereby approve the OKPA Revision.

An eligible person affected by this decision may appeal it, in accordance with 11 AAC 02. Any appeal must be received within 20 calendar days after the date of "issuance" of this decision, as defined in 11 AAC 02.040(c) and (d), and may be mailed or delivered to Andrew T. Mack, Commissioner, Department of Natural Resources, 550 W. 7th Avenue, Suite 1400, Anchorage, Alaska 99501; faxed to 1-907-269-8918; or sent by electronic mail to [dnr.appeals@alaska.gov](mailto:dnr.appeals@alaska.gov). This decision takes effect immediately. An eligible person must first appeal this decision in accordance with 11 AAC 02 before appealing this decision to Superior Court. A copy of 11 AAC 02 may be obtained from any regional information office of the Department of Natural Resources.

If you have any questions regarding this decision, contact Kevin Pike with the Division at 907-269-8451, or by email at [kevin.pike@alaska.gov](mailto:kevin.pike@alaska.gov).

Sincerely,



Chantal Walsh  
Director  
Division of Oil and Gas

Date *July 11, 2018*

## V. ATTACHMENTS

1. Exhibit C
2. Exhibit D
3. Exhibit E
4. Exhibit F

**Attachment One – Revised Exhibit C:  
Oooguruk-Kuparuk Participating Area Tract Descriptions**

**Exhibit C**  
**Attached to and made a part of that certain Oooguruk Unit Agreement**  
**Kuparuk Participating Area**

Unit Tract	Lessor & Lease No.	Working Interest Owner	Working Interest	Effective Date	Description	Acreage	Royalty	ORR Burden	Unit Tract Participation (OOIP)
13	State of AK ADL 355036 <b>Segment 1</b>	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC  Upper Interval (i.e. the interval from the surface down to the stratigraphic equivalent of 8,373' (Driller's total depth + 100') which is equivalent to 8,402' (Wireline Logger's total depth + 100') below the Kelly Bushing as shown on the Dual Laterolog Run #3 log dated April 5, 1992, in the ARCO-Kalubik #1 well located in Sec. 11, T.13 N., R. 7 E., U.M. known in the DNR computer records as "Segment 1" of the Lease.)	70.000000% 30.000000%	8-1-83	T13N, R7E, UMIAT MERIDIAN Sec 1: Protracted, E/2, E/2 W/2, SW/4 NW/4 Sec 2: Protracted, S/2 NE/4, S/2, S/2 NW/4, NW/4 N/W/4 Sec 3: Protracted, All Sec 10: Protracted, E/2, E/2 NW/4, NW/4 NW/4 Sec 11: Protracted, All Sec 12: Protracted, W/2 W/2 Sec 13: Protracted, SW/4 NE/4, SE/4, W/2 Sec 14: Protracted, E/2, NE/4 SW/4, SE/4 NW/4, N/2 NW/4 Sec 15: Protracted, N/2 NE/4	3,800.00	12.5%* 30% NPS	Total 5.021390% See Details Below	94.84880%
14	State of AK ADL 355037 <b>Segment 1</b>	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC  Upper Interval (i.e. the interval from the surface down to the stratigraphic equivalent of 8,373' (Driller's total depth + 100') which is equivalent to 8,402' (Wireline Logger's total depth + 100') below the Kelly Bushing as shown on the Dual Laterolog Run #3 log dated April 5, 1992, in the ARCO-Kalubik #1 well located in Sec. 11, T.13 N., R. 7 E., U.M. known in the DNR computer records as "Segment 1" of the Lease.)	70.000000% 30.000000%	8-1-83	T13N, R7E, UMIAT MERIDIAN Sec 4: Protracted, NE/4, N/2 SE/4, SE/4 SE/4, NE/4 SW/4, E/2 NW/4	400.00	12.5%* 30% NPS	Total 5.0767380% See Details Below	0.36739%
15	State of AK ADL 355038 <b>Segment 1</b>	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC  Upper Interval (i.e. the interval from the surface down to the stratigraphic equivalent of 8,373' (Driller's total depth + 100') which is equivalent to 8,402' (Wireline Logger's total depth + 100') below the Kelly Bushing as shown on the Dual Laterolog Run #3 log dated April 5, 1992, in the ARCO-Kalubik #1 well located in Sec. 11, T.13 N., R. 7 E., U.M. known in the DNR computer records as "Segment 1" of the Lease.)	70.000000% 30.000000%	8-1-83	T13N, R7E, UMIAT MERIDIAN Sec 23: Protracted, NE/4 NE/4 Sec 24: Protracted, E/2, E/2 SW/4, NW/4 SW/4, NW/4 Sec 25: Protracted, NE/4	800.00	12.5%* 30% NPS	Total 5.0767380% See Details Below	4.78381%
17	State of AK ADL 389959	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC	70.000000% 30.000000%	9-1-02	T14N, R7E, UMIAT MERIDIAN Sec 33: Protracted, S/2 Sec 34: Protracted, SW/4 SE/4, S/2 SW/4, NW/4 SW/4	480.00	16.66667%* Anadarko Petroleum Corp 4.25000%		0.000000%
<b>Total</b>						<b>5,480.00</b>			<b>100.000000%</b>

**Exhibit C**  
**Attached to and made a part of that certain Oooguruk Unit Agreement**  
**Kuparuk Participating Area**

**Working Interest Owners:**

Caelus Natural Resources Alaska, LLC 3700 Centerpoint Dr., Suite 500 Anchorage, AK 99503	Eni Petroleum US LLC 1201 Louisiana St., Suite 3500 Houston, TX 77002-5609
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**Tract 13 is burdened by Overriding Royalty Interests ("ORRI") held by the following parties in the stated percentages:**

Tract 13 Segment 1 - Upper Interval		
	XH, LLC 1601 Elm Street, Suite 4700 Dallas, TX 75201	0.252100%
	Eni Petroleum US LLC 1201 Louisiana, Suite 3500 Houston, TX 77002	0.514290%
	Caelus Natural Resources Alaska, LLC 3700 Centerpoint Dr., Suite 500 Anchorage, AK 99503	1.200000%
	ConocoPhillips Alaska, Inc. 700 G Street Anchorage, AK 99501	2.500000%
	William D. Armstrong** 1421 Blake Street Denver, CO 80202	0.404000%
	GMT North Slope Royalty Exploration Company LLC** 1560 Broadway, Suite 800 Denver, CO 80202	0.074000%
	Jesse V. Sommer** 4531 West Geddes Avenue Littleton, CO 80128	0.012000%
	Edgar Kerr** 6750 Lemon Gulch Dr. Castle Rock, CO 80108	0.012000%
	Jeffery A. Lyslo** 91 Buckthorn Drive Littleton, CO 80127	0.012000%
	Reed LIGC, LLC** P.O. Box 411 Franktown, CO 80116	0.012000%
	Matthew X. Furin** 2001 South Madison Denver, CO 80210	0.012000%

**Exhibit C**  
**Attached to and made a part of that certain Oooguruk Unit Agreement**  
**Kuparuk Participating Area**

Stuart W. Gustafson** P.O. Box 1466 La Conner, WA 98257	0.006000%
Macco Family Trust** P.O. Box 5 Edmonds, WA 98020	0.006000%
Chester E. Paris** 1208 Mesa Court Golden, CO 80403	0.005000%
<b>Tracts 14 &amp; 15 are burdened by Overriding Royalties ("ORRI") held by the following parties in the stated percentages:</b>	
<b>Tracts 14 &amp; 15</b> <b>Segment 1 - Upper</b> <b>Interval</b>	
Anadarko Petroleum Corporation P.O. Box 1330 Houston, TX 77251-1330	0.093548%
David L. Herbaly as Trustee of the David L. Herbaly Revocable Trust dated May 24, 2004 1420 W Canal Ct Ste 150 Littleton, CO 80120	1.350000%
XH, LLC 1601 Elm Street, Suite 4700 Dallas, TX 75201	0.126050%
George Alan Joyce, Jr. 3528 Eisenhower Lane Plano, TX 75023	0.150000%
Eni Petroleum US LLC 1201 Louisiana, Suite 3500 Houston, TX 77002	0.257140%
Caelus Natural Resources Alaska, LLC 3700 Centerpoint Dr., Suite 500 Anchorage, AK 99503	0.600000%
ConocoPhillips Alaska, Inc. 700 G Street Anchorage, AK 99501	2.500000%

\*The state's royalty interest in ADL 355036, ADL 355037, ADL 355038, ADL 355039, ADL 389950, ADL 389952, ADL 389954, ADL 389958 and ADL 389959 is subject to that certain Final Findings and Determination of the Commissioner of DNR dated February 1, 2006 (modifying lease royalty in response to the Oooguruk Development Royalty Modification Application filed on May 20, 2005).

\*\*These Overriding Royalty Interests (ORRI) are borne exclusively by Eni Petroleum US LLC, considered Other Burdens as defined in Article 4.4 Oooguruk Unit Operating Agreement; not borne by Caelus Natural Resources Alaska, LLC.

**Attachment Two – Revised Exhibit D:  
Oooguruk-Kuparuk Participating Area Map**



**Attachment Three – Revised Exhibit E:  
Oooguruk-Kuparuk Participating Area Expense Allocation**



**Exhibit E**  
**Attached to and made a part of that certain Oooguruk Unit Agreement**  
**Kuparuk Participating Area**

Unit Tract	Lessor & Lease No.	Working Interest Owner	Working Interest	Effective Date	Description	Acreage	Royalty	ORR Burden	PA Expense
13	State of AK ADL 355036 <b>Segment 1</b>	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC  Upper Interval (i.e. the interval from the surface down to the stratigraphic equivalent of 8,373' (Driller's total depth +100') which is equivalent to 8,402' (Wireline Logger's total depth + 100') below the Kelly Bushing as shown on the Dual Laterolog Run #3 log dated April 5, 1992, in the ARCO-Kalubik #1 well located in Sec. 11, T.13 N., R. 7 E., U.M. known in the DNR computer records as "Segment 1" of the Lease.)	70.000000% 30.000000%	8-1-83	T13N, R7E, UMIAT MERIDIAN Sec 1: Protracted, E/2, E/2 W/2, SW/4 NW/4 Sec 2: Protracted, S/2 NE/4, S/2, S/2 NW/4, NW/4 N/W4 Sec 3: Protracted, All Sec 10: Protracted, E/2, E/2 NW/4, NW/4 Sec 11: Protracted, All Sec 12: Protracted, W/2 W/2 Sec 13: Protracted, SW/4 NE/4, SE/4, W/2 Sec 14: Protracted, E/2, NE/4 SW/4, SE/4 NW/4, N/2 NW/4 Sec 15: Protracted, N/2 NE/4	3,800.00	12.5%* 30% NPS	Total 5.021390% See Details Below	94.84880%
14	State of AK ADL 355037 <b>Segment 1</b>	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC  Upper Interval (i.e. the interval from the surface down to the stratigraphic equivalent of 8,373' (Driller's total depth +100') which is equivalent to 8,402' (Wireline Logger's total depth + 100') below the Kelly Bushing as shown on the Dual Laterolog Run #3 log dated April 5, 1992, in the ARCO-Kalubik #1 well located in Sec. 11, T.13 N., R. 7 E., U.M. known in the DNR computer records as "Segment 1" of the Lease.)	70.000000% 30.000000%	8-1-83	T13N, R7E, UMIAT MERIDIAN Sec 4: Protracted, NE/4, N/2 SE/4, SE/4 SE/4, NE/4 SW/4, E/2 NW/4	400.00	12.5%* 30% NPS	Total 5.0767380% See Details Below	0.36739%
15	State of AK ADL 355038 <b>Segment 1</b>	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC  Upper Interval (i.e. the interval from the surface down to the stratigraphic equivalent of 8,373' (Driller's total depth +100') which is equivalent to 8,402' (Wireline Logger's total depth + 100') below the Kelly Bushing as shown on the Dual Laterolog Run #3 log dated April 5, 1992, in the ARCO-Kalubik #1 well located in Sec. 11, T.13 N., R. 7 E., U.M. known in the DNR computer records as "Segment 1" of the Lease.)	70.000000% 30.000000%	8-1-83	T13N, R7E, UMIAT MERIDIAN Sec 23: Protracted, NE/4 NE/4 Sec 24: Protracted, E/2, E/2 SW/4, NW/4 SW/4, NW/4 Sec 25: Protracted, NE/4	800.00	12.5%* 30% NPS	Total 5.0767380% See Details Below	4.78381%
17	State of AK ADL 389959	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC	70.000000% 30.000000%	9-1-02	T14N, R7E, UMIAT MERIDIAN Sec 33: Protracted, S/2 Sec 34: Protracted, SW/4 SE/4, S/2 SW/4, NW/4 SW/4	480.00	16.66667%* 4.25000%	Anadarko Petroleum Corp See Details Below	0.000000%
<b>Total</b>						<b>5,480.00</b>			<b>100.000000%</b>

**Exhibit E**  
**Attached to and made a part of that certain Oooguruk Unit Agreement**  
**Kuparuk Participating Area**

**Working Interest Owners:**

Caelus Natural Resources Alaska, LLC 3700 Centerpoint Dr., Suite 500 Anchorage, AK 99503	Eni Petroleum US LLC 1201 Louisiana St., Suite 3500 Houston, TX 77002-5609
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**Tract 13 is burdened by Overriding Royalty Interests ("ORRI") held by the following parties in the stated percentages:**

Tract 13 Segment 1 - Upper Interval		
	XH, LLC 1601 Elm Street, Suite 4700 Dallas, TX 75201	0.252100%
	Eni Petroleum US LLC 1201 Louisiana, Suite 3500 Houston, TX 77002	0.514290%
	Caelus Natural Resources Alaska, LLC 3700 Centerpoint Dr., Suite 500 Anchorage, AK 99503	1.200000%
	ConocoPhillips Alaska, Inc. 700 G Street Anchorage, AK 99501	2.500000%
	William D. Armstrong** 1421 Blake Street Denver, CO 80202	0.404000%
	GMT North Slope Royalty Exploration Company LLC** 1560 Broadway, Suite 800 Denver, CO 80202	0.074000%
	Jesse V. Sommer** 4531 West Geddes Avenue Littleton, CO 80128	0.012000%
	Edgar Kerr** 6750 Lemon Gulch Dr. Castle Rock, CO 80108	0.012000%
	Jeffery A. Lyslo** 91 Buckthorn Drive Littleton, CO 80127	0.012000%
	Reed LIGC, LLC** P.O. Box 411 Franktown, CO 80116	0.012000%
	Matthew X. Furin** 2001 South Madison Denver, CO 80210	0.012000%

**Exhibit E**  
**Attached to and made a part of that certain Oooguruk Unit Agreement**  
**Kuparuk Participating Area**

Stuart W. Gustafson** P.O. Box 1466 La Conner, WA 98257	0.006000%
Maeco Family Trust** P.O. Box 5 Edmonds, WA 98020	0.006000%
Chester E. Paris ** 1208 Mesa Court Golden, CO 80403	0.005000%
<b>Tracts 14 &amp; 15 are burdened by Overriding Royalties ("ORRI") held by the following parties in the stated percentages:</b>	
<b>Tracts 14 &amp; 15</b>	
<b>Segment 1 - Upper</b>	
<b>Interval</b>	
Anadarko Petroleum Corporation P.O. Box 1330 Houston, TX 77251-1330	0.093548%
David L. Herbaly as Trustee of the David L. Herbaly Revocable Trust dated May 24, 2004 1420 W Canal Ct Ste 150 Littleton, CO 80120	1.350000%
XH, LLC 1601 Elm Street, Suite 4700 Dallas, TX 75201	0.126050%
George Alan Joyce, Jr. 3528 Eisenhower Lane Plano, TX 75023	0.150000%
Eni Petroleum US LLC 1201 Louisiana, Suite 3500 Houston, TX 77002	0.257140%
Caelus Natural Resources Alaska, LLC 3700 Centerpoint Dr., Suite 500 Anchorage, AK 99503	0.600000%
ConocoPhillips Alaska, Inc. 700 G Street Anchorage, AK 99501	2.500000%

\*The state's royalty interest in ADL 355036, ADL 355037, ADL 355038, ADL 355039, ADL 389950, ADL 389952, ADL 389954, ADL 389958 and ADL 389959 is subject to that certain Final Findings and Determination of the Commissioner of DNR dated February 1, 2006 (modifying lease royalty in response to the Oooguruk Development Royalty Modification Application filed on May 20, 2005).

\*\*These Overriding Royalty Interests (ORRI) are borne exclusively by Eni Petroleum US LLC, considered Other Burdens as defined in Article 4.4 Oooguruk Unit Operating Agreement; not borne by Caelus Natural Resources Alaska, LLC.

**Attachment Four – Revised Exhibit F:  
Oooguruk-Kuparuk Participating Area,  
Allocation of Unit Area Expense**

**Exhibit F**  
**Attached to and made a part of that certain Oooguruk Unit Agreement**  
**Kuparuk Participating Area**

Caelus Natural Resources Alaska, LLC, as the Oooguruk Unit Operator, estimates the total Unit economic reserves will be contributed 88.80% from the Nuiqsut PA, 10.00% from the Kuparuk PA and 1.20% from the Torok PA. The current Unit Plan of Development contemplates the drilling a total of 36 wells for Oooguruk development, 5 wells in the Kuparuk, 28 in the Nuiqsut and 3 wells in the Torok. On a relative well count basis 13.889% of the unit wells will be drilled to produce Kuparuk reserves, 77.778% of the unit wells will be drilled to produce Nuiqsut reserves and 8.333% of the unit wells will be drilled to produce Torok reserves. Caelus Natural Resources Alaska, LLC proposes that expenses be broadly captured in four different cost centers and such costs be allocated as follows:

1. Well Costs – Will be first allocated to the specific Participating Area into which the wells are drilled (Kuparuk PA, Nuiqsut PA or Torok PA) and then to each Tract within a PA by the PA Tract Participation factor.
2. Oooguruk Drill Site (ODS) - Costs including all drillsite facilities, (i.e. well-bay modules, flowline manifolds, etc.) will be first allocated to the specific Participating Area by relative well count and then to each Tract within a PA by the PA Tract Participation factor.
3. Flowline Costs – Costs include all downstream of the ODS, include sub-sea three-phase production, gas, water and diesel flowlines, shore crossing and above ground vertical support member supported flowlines and all facilities at the Onshore Tie-in Pad (OTP).  
These will be first allocated to the specific Participating Area by relative total reserves contribution and then to each Tract within a PA by the PA Tract Participation factor.

Unit Tract	Lessor & Lease	Working Interest Owner	Working Interest	Effective Date	Description	Acreage	Royalty	TOTAL ORR Burden	Unit Tract OOIIP Allocation	Relative Reserve Allocation (0.100 x Tract Allocation)	Well Count Allocation (5/36 x Tract Allocation)
13	State of AK ADL 355036 Segment 1	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC  Upper Interval (i.e. the interval from the surface down to the stratigraphic equivalent of 8,373' (Driller's total depth +100') which is equivalent to 8,402' (Wireline Logger's total depth + 100') below the Kelly Bushing as shown on the Dual Laterolog Run #3 log dated April 5, 1992, in the ARCO-Kalubik #1 well located in Sec. 11, T.13 N., R. 7 E., U.M. known in the DNR computer records as "Segment 1" of the Lease.)	70.000000% 30.000000%	8-1-83	T13N, R7E, UMIAT MERIDIAN Sec 1: Protracted, E/2, SW/4, E/2 NW/4, SW/4 NW/4 Sec 2: Protracted, S/2 NE/4, S/2, S/2 NW/4, NW/4 N/W4 Sec 3: Protracted, All Sec 10: Protracted, E/2, E/2 NW/4, NW/4 NW/4 Sec 11: Protracted, All Sec 12: Protracted, W/2 W/2 Sec 13: Protracted, SW/4 NE/4, SE/4, W/2 Sec 14: Protracted, E/2, NE/4 SW/4, SE/4 NW/4, N/2 NW/4 Sec 15: Protracted, N/2 NE/4	4,080.00	12.5%* 30% NPS	Total 5,021,390% See Details Below	94.84880%	9.48%	13.173%
14	State of AK ADL 355037 Segment 1	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC  Upper Interval (i.e. the interval from the surface down to the stratigraphic equivalent of 8,373' (Driller's total depth +100') which is equivalent to 8,402' (Wireline Logger's total depth + 100') below the Kelly Bushing as shown on the Dual Laterolog Run #3 log dated April 5, 1992, in the ARCO-Kalubik #1 well located in Sec. 11, T.13 N., R. 7 E., U.M. known in the DNR computer records as "Segment 1" of the Lease.)	70.000000% 30.000000%	8-1-83	T13N, R7E, UMIAT MERIDIAN Sec 4: Protracted, NE/4, N/2 SE/4, SE/4 SE/4, NE/4 SW/4, E/2 NW/4	400.00	12.5%* 30% NPS	Total 5,076,7380% See Details Below	0.36739%	0.04%	0.051%
15	State of AK ADL 355038 Segment 1	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC  Upper Interval (i.e. the interval from the surface down to the stratigraphic equivalent of 8,373' (Driller's total depth +100') which is equivalent to 8,402' (Wireline Logger's total depth + 100') below the Kelly Bushing as shown on the Dual Laterolog Run #3 log dated April 5, 1992, in the ARCO-Kalubik #1 well located in Sec. 11, T.13 N., R. 7 E., U.M. known in the DNR computer records as "Segment 1" of the Lease.)	70.000000% 30.000000%	8-1-83	T13N, R7E, UMIAT MERIDIAN Sec 23: Protracted, NE/4 NE/4 Sec 24: Protracted, E/2, E/2 SW/4, NW/4 SW/4, NW/4 Sec 25: Protracted, NE/4	800.00	12.5%* 30% NPS	Total 5,076,7380% See Details Below	4.78381%	0.48%	0.664%
17	State of AK ADL 389959	Caelus Natural Resources Alaska, LLC Eni Petroleum US LLC	70.000000% 30.000000%	9-1-12	T14N, R7E, UMIAT MERIDIAN Sec 33: Protracted, S/2 Sec 34: Protracted, SW/4 SE/4, S/2 SW/4, NW/4 SW/4	480.00	16.66667% Anadarko Petroleum Corporation	4.25000% Anadarko Petroleum Corporation	0.00000%	0.00%	0.000%
Total Acres						5,760.00			100.00000%	10.00%	13.889%

**Exhibit F**  
**Attached to and made a part of that certain Oooguruk Unit Agreement**  
**Kuparuk Participating Area**

**Working Interest Owners:**

Caelus Natural Resources Alaska, LLC 3700 Centerpoint Dr., Suite 500 Anchorage, AK 99503	Eni Petroleum US LLC 1201 Louisiana St., Suite 3500 Houston, TX 77002-5609
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<b>Tracts 14 &amp; 15</b>	
<b>Segment 1 - Upper Interval</b>	
Anadarko Petroleum Corporation P.O. Box 1330 Houston, TX 77251-1330	0.093548%
David L. Herbaly as Trustee of the David L. Herbaly Revocable Trust dated May 24, 2004 1420 W Canal Ct Ste 150 Littleton, CO 80120	1.350000%
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\*The state's royalty interest in ADL 355036, ADL 355037, ADL 355038, ADL 355039, ADL 389950, ADL 389952, ADL 389954, ADL 389958 and ADL 389959 is subject to that certain Final Findings and Determination of the Commissioner of DNR dated February 1, 2006 (modifying lease royalty in response to the Oooguruk Development Royalty Modification Application filed on May 20, 2005).

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