# Enclosure 11: Correspondence, in Sherwood, K.W., and Amoco Oil Co., 1977 geologic field investigations, Point Lay area, North Slope, Alaska

Amoco Oil Co.

GMC DATA REPORT 445H

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2019
State of Alaska
Department of Natural Resources
Division of Geological & Geophysical Surveys
**GEOLOGIC MATERIALS CENTER**

CORRESPONDENCE

(11)

CF 800101

6001

Union Oil and Gas Division: Western Region

Union Oil Company of California
P.O. Box 6247, Anchorage, Alaska 99502
Telephone: (907) 276-7600

UNION 76

Exploration Department
Alaska District

June 8, 1977


CF 800101

Mr. Dan Hartman
Amoco Production Company
Security Life Building
Denver, Colorado 80202

File title

CRETACEOUS FIELD PROGRAM-1977
WESTERN BROOKS RANGE

Dan, attached is the write-up by Dick Stewart on purpose and general objectives for the A.S.R.C. work this summer. He is presently detailing the specific areas and work schedule which will by necessity remain flexible pending actual surface inspection.

It looks now as though the field work will start on July 11 or July 12. Your man will probably want to schedule in on July 10. If he needs help with reservations, let us know. Also, any items of field gear or clothing needed can be purchased here and we will just charge it directly to the AFE. He should be prepared to dress for cool and wet conditions, including long johns.

I will give you a call later in the month with firm dates and see how your personal plans are shaping up.

Jack

R.J. Merryman
District Exploration Geologist-North

RJM/lc

see Norm Kent for list of stores at wh/ Union has an account.
Dick Stewart located in Anchorage.
Chuck Williamson from Research.
Leave 7:20 AM Tuesday for Pt. Hay.

CRETACEOUS FIELD PROGRAM 1977
WESTERN BROOKS RANGE
AFE 471003

By R. L. Stewart
5/31/77

## PURPOSES

The Union-Amoco 1977 Western Brooks Range Field Party will seek to gain a better understanding of the Albian (uppermost Lower Cretaceous) and Neocomian section as exposed in the western Brooks Range foothills and along the streams in and around A.S.R.C. area "A".

The rock units of primary concern are the Kukpowruk and Corwin Formations, both of late Albian age and beds of Neocomian age exposed at and near Tingmerkpuk Mountain, and considered to be part of the Fortress Mountain Formation.

Exposures of these units will be visited and sedimentary features described in detail with the purpose in mind of obtaining as much environmental information as is possible. Sampling will be for the purpose of: 1) palynologic examination to determine paleoenvironment, thermal alteration index, and age; 2) core analysis of porosity and permeability; 3) paleontologic age and environmental determinations, and 4) geochemical determination of source rock potential. Sampling priorities will fall in roughly the order given above.

## DISCUSSION

The most likely objective units in A.S.R.C. area A are the three formations mentioned above: the Kukpowruk, a marine to marginal marine unit; its partial time equivalent, the mostly nonmarine Corwin; and the Fortress Mountain, of presumably shelf to deep water marine affinities.

Fortress Mountain: Rocks mapped as Fortress Mountain by Chapman and Sable (1960) crop out in the core of the Driftwood anticline, along Iligluruk Creek and on Tingmerkpuk Mountain. The rocks on Tingmerkpuk Mountain are apparently unique in being high in quartz sand (90-95%) and generally fairly clean, especially when compared to most other rocks in the area.

The unit, of interbedded sand and shale, sandier near the top, is about 300 feet thick and appears to be of turbidite origin, the sandstone beds being in part graded, and exhibiting ripple marks, soft sediment deformation and indistinct flute casts, tool casts, and animal markings (Rosé and Abrahamson, 1972).

Samples from Tingmerkpuk Mountain have yielded palynologic ages of Hauterivian-Barremian to probable Albian (?) with the former being more certain. Strong foram evidence of Berriasian age came from other samples in the same section.

An attempt will be made to ascertain the relation of this exposure to the overall depositional picture: 1) why is this facies here, and where did it come from? and 2) is it reasonable to expect similar favorable reservoirs in the subsurface to the north? To this end, the section will be measured and described insofar as possible, with particular emphasis on sedimentary structures, particularly those yielding directional data, like flute casts, tool marks, ripples, etc. Petrographic work has been done on two samples collected from this locality (Enlows, 1974), which indicated porosities less than 3%. Inasmuch as no conventional core porosities are known from this area, samples will be taken for that purpose. Additionally, paleo, paly, and source rock samples will be collected as deemed necessary.

Other exposures of what is mapped as Fortress Mountain are found along Iligluruk Creek (about 12 mi east of Tingmerkpuk Mtn.) and in the core of the Driftwood anticline. The former will be visited, although exposures are rather poor, and studied. The latter is on NPRA and, hence, inaccessible.

Kukpowruk: The Kukpowruk Formation is exposed on the flanks of all of the major synclines in the area and becomes prospective only in the northern part of the area where it is not breached at the surface. Here, too, surface exposures are obscured by tundra.

As mentioned previously, the Kukpowruk is a marginal marine to marine partial equivalent of the Corwin Formation. It is fairly sandy in the southern part of the area but becomes decreasingly so to the north. In the Kaolak test well, very little sand was encountered in the Kukpowruk interval.

The study of this unit will center around the more northerly exposures, particularly those in the Howard and Kasegaluk synclines (the Kukpowruk-type section) and the Snowbank anticline along the Kukpowruk river. Exposures further south will be visited, too, to enable comparisons up and down the depositional dip. It has been demonstrated that, in the basal part of the formation, near and above the contact with the Torok, the Kukpowruk loses sand to the north and east at a measurable rate (Sable, 1952; Chapman and Sable, 1960, p. 91-96). The basal contact of the Kukpowruk has been mapped as the lowest laterally persistent sandstone trace, but it can be shown to be

"equivalent to successively younger sequences of the Torok formation to the north and east, and that, cumulatively, several thousand feet of sandy section... grades to shale in those directions" (Chapman and Sable, 1960). Hence, detailed examination of this unit from southwest to northeast will be fruitful.

Lateral comparisons are going to be hampered by the inaccessibility of exposures on NPRA. Comparisons of exposures in Oxbow and Howard synclines along the Kokolik River with those along the lower reaches of the Kukpowruk River would be valuable. Kukpowruk Formation exposures in Kokolik Warp syncline could still be visited, however.

The method of study, once again, will be detailed examination of the sedimentary features exposed, to reconstruct the depositional environment and allow prediction of environmental conditions into the subsurface to the north. This would include measurement of directional depositional features, like crossbeds, ripple marks, etc. Palynologic samples will be taken to enable further environmental determinations to be made, in addition to thermal alteration and age-dating work. Samples for porosity and permeability analysis will be taken along with paleo and source rock samples as deemed necessary.

An additional facet of the study of the Kukpowruk would be to visit some of the coastal exposures, particularly those east of Cape Sabine. While not bearing as heavily on the evaluation of the A.S.R.C. subsurface, these outcrops might enable some extrapolation into the area offshore from the A.S.R.C.

Corwin: The Corwin is the nonmarine equivalent of the Kukpowruk and is generally thought to represent a deltaic progradation over the Kukpowruk. The Corwin is generally less prospective than other units for the following reasons: 1) in the prospective areas, it will be shallower than other units; 2) it is generally less sandy; and 3) porosities and especially permeabilities in the sands tend to be low.

For these reasons, examination of Corwin at outcrop will occupy a lower priority for field work.

As time permits, however, a few key overcrops will be visited -- particularly the type section along Corwin Bluffs, and some of the better northern exposures. Much interfingering of the Corwin with the underlying Kukpowruk makes delineation of the two occasionally difficult and work at some Kukpowruk exposures will likely extend up into the Corwin to some extent.

Outcrop study will take the form outlined for the Kukpowruk, namely, detailed examination of selected outcrops. The mode of deposition of the more favorable sand bodies will be studied with the goal of predicting their likelihood of occurrence in the subsurface to the north. Measurement of directional depositional structures (ripple marks, cross beds, etc.) and sampling for

porosity and permeability, palynology, geochemical, and paleontologic examination will be carried out.

Priorities: Owing to the uncertainty of weather, mechanical malfunctions, and to some extent the quality of exposures to be visited, a system of priorities has been established, as alluded to previously. These priorities can be roughly listed as shown.

| Areas of Study | |
|---|---|
| Priority | Item |
| 1a | Key northern Knk* exposures |
| 1b | Tingmerkpuk Mtn. problem |
| 2 | Northern Knk exposures on NPRA** |
| 3 | More southerly exposures of Knk |
| 4 | Selected exposures of Knc* |
| 5 | Type section of Knc |

| Sampling | |
|---|---|
| Priority | Type |
| A | Palynologic*** |
| B | Porosity & perm. |
| C | Paleontologic*** |
| D | Geochem-source rock |

* Knk = Kukpowruk; Knc = Corwin
** If permission is forthcoming
*** For age and environmental determination

## SUMMARY

The Union-Amoco 1977 Western Brooks Range Field Party will have as its goal a better understanding of the Kukpowruk, Fortrèss Mountain, and Corwin Formations in order to enable projection of their reservoir properties into the subsurface. This will be gained through detailed description of features to be observed in available outcrops. Data to be gathered will include measurement of directional sedimentary features, and multidisciplinary sampling, in addition to ordinary measurement of section.

RLS/lc

SOURCES CITED

Chapman, R. M., and E. G. Sable, 1960, Geology of the Utukok-Corwin region, northwestern Alaska: U.S.Geol. Survey, Prof. Paper 303-C, Part 3, Areal geology, p. 47-167.

Enlows, H. E., 1974, Petrographic analysis of 50 sandstone samples from the North Slope of the Brooks Range, Alaska: Rept. prepared for Union Oil Company, Alaska District, (unpublished).

Rosé, R. R., and D. W. Abrahamson, 1972, Cretaceous field study of the foothills physiographic province of North Slope, Alaska: Report, Union Oil Company, Alaska District, (unpublished). Amoco CF-72-1217

Sable, E. G., 1952, Shaling studies in the western part of NPR-4 and adjoining areas: U.S. Geol. Survey Inv. Naval Petroleum Reserve No. 4 and adjacent areas Spec. Rept. No. 37; open file, 1954.

DIVISION/SUBSIDIARY: Oil & Gas Western Region

**Authority for Expenditure**
Energy Resources
Union Oil Company of California

union 76

AUTHORITY NUMBER: 471003

| REGION/DEPARTMENT | LOCATION | DATE |
|---|---|---|
| Exploration Department | Anchorage, Alaska | 1/7/77 |

PURPOSE
☐ PROGRAMMED EXPANSION, COST REDUCTION, AND OPTIONAL REPLACEMENTS AND ADDITIONS SUBJECT TO MINIMUM RETURN ON INVESTMENT.
☐ NECESSARY REPLACEMENTS, AND "OTHER" EXPENDITURES NOT SUBJECT TO RETURN ON INVESTMENT.

BUDGETED ☐ YES ☐ NO

| RETURN ON INVESTMENT | REQUIRED | THIS PROPOSAL | CALCULATED BY | AMOUNT REQUESTED |
|---|---|---|---|---|
| | % | % | | $ 129,100 |

EXPENDITURE DESCRIPTION

## CRETACEOUS FIELD PROGRAM
## 1977 WESTERN BROOKS RANGE

To conduct a 40 day field program (50% Union-50% Amoco) in the foothills physiographic province of the North Slope. The purpose will be to evaluate strategically located stratigraphic sections in the southern part of the Chukchi Basin. Emphasis will be placed on depositional environment, petrography, potential reservoir analysis, palynology and source rock analysis. The results of this program will be important in developing a comprehensive exploration program in the A.S.R.C. acreage to be acquired this year.

| Description of Expenditures: | | |
|---|---|---|
| Geologists: | | |
| Union research man | Helicopter | $ 43,000 |
| 1 geol Union — Dick Stuart shortened | Fixed Wing | $ 37,500 |
| ( 1 geol Amoco — Williamson | Field | $ 39,000 |
| 1 extra geol Union | Equipment & Supplies | $ 7,100 |
| | Services | $ 2,500 |
| | TOTAL | $129,100 |

APPROVAL:

By: _____
Amoco Production Co.

Date: _____

country - Driftwood - within 1 hour of all stops
Cape Beaufort

| O F F. | COST CENTER GRP. | COST CENTER NUMBER | ACCOUNT CODE GEN. LEDGER | ACCOUNT CODE DETAIL | ACCOUNT CODE SUB DETAIL | O. C. | CAP. BUDG. CATG. | AUTHORITY | ADDITIONAL INFORMATION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

CHARGE ☐ EXPENSE ☐ CAPITAL

| ESTIMATE BY | A.F.E. MADE BY | CHECKED BY |
|---|---|---|
| RJM | RJM/sk | RJM |

APPROVED: Harvey C. Lee

APPROVED

APPROVED

APPROVED

SENIOR VICE PRESIDENT

| | | |
|---|---|---|
| Material Transferred | $ | |
| Cash Outlay | | $ 129,100 |
| Contingencies ___% | | |
| TOTAL COST | | 129,100 |
| Salvage (Pres. Value) | ( ) | |
| Chargeable to Others 50 % | ( 64,550 ) | ( 64,550 ) |
| NET COST | | $ 64,550 |

| COMPTROLLER | EXECUTIVE COMMITTEE - (SECRETARY OR ASS'T SECRETARY) | DATE APPROVED |
|---|---|---|
| | | |

FORM 4-2J20 (REV. 12-71) PRINTED IN U.S.A.

1/7/77
AFE #471003

# ESTIMATED EXPENSES
# UOCO OPERATED FIELD SURVEY (40 Days)
# NORTH SLOPE, ALASKA

## Helicopter

| | | |
|---|---|---|
| Jet Ranger $16,500/mo. (40 days) | $22,000 | |
| 140 hrs. @ $150.00/hr. | $21,000 | |
| | | $ 43,000 |

## Fixed Wing

| | | |
|---|---|---|
| Fuel, fuel moves & cache placements | $18,500 | |
| Camp move | $ 5,500 | |
| Clean-up | $ 5,500 | |
| Reconnaissance | $ 3,500 | |
| Support | $ 4,500 | |
| | | $ 37,500 |

## Field

| | | |
|---|---|---|
| Room & board | | |
| Tent camp (8 men) | $28,500 | |
| Transportation, crew & gear | $ 5,500 | |
| Helicopter crew expenses | $ 1,000 | |
| Sample shipping | $ 4,000 | |
| | | $ 39,000 |

## Equipment & Supplies

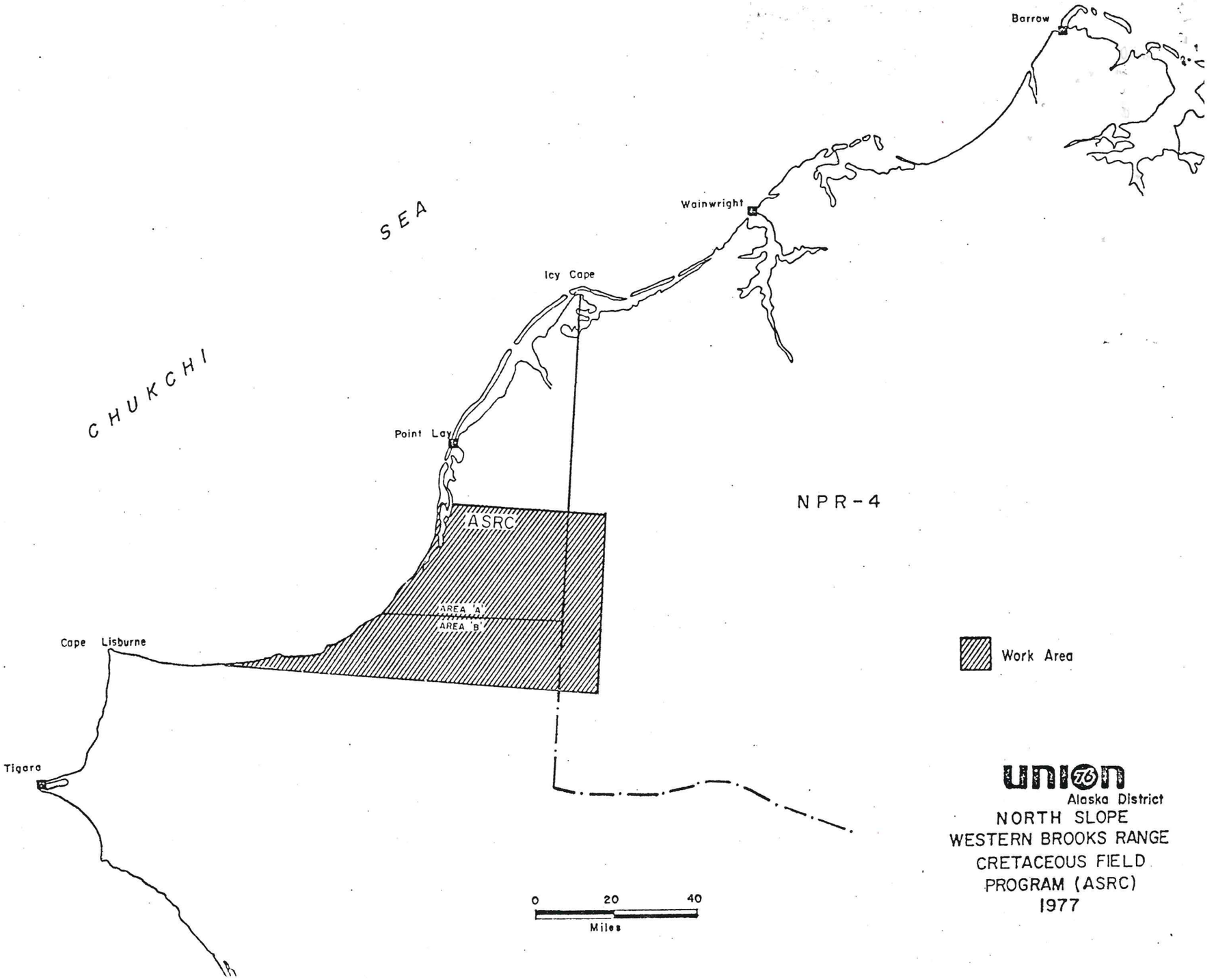
| | | |
|---|---|---|
| Field gear & misc. supplies | $ 2,000 | |
| Radio rental & communication | $ 1,500 | |
| Film & processing | $ 500 | |
| Maps, publications & aerial photos | $ 2,000 | |
| Medical supplies | $ 400 | |
| Survival gear | $ 700 | |
| | | $ 7,100 |

| | | |
|---|---|---|
| Misc. Services | $ 2,500 | |
| | | $ 2,500 |

| | |
|---|---|
| TOTAL | $129,100 |

RJM/sk

Fly to Anchorage July 10 (Sun).
Meet w/ Union folks July 11.
Fly to Pt. Lay camp July 12.

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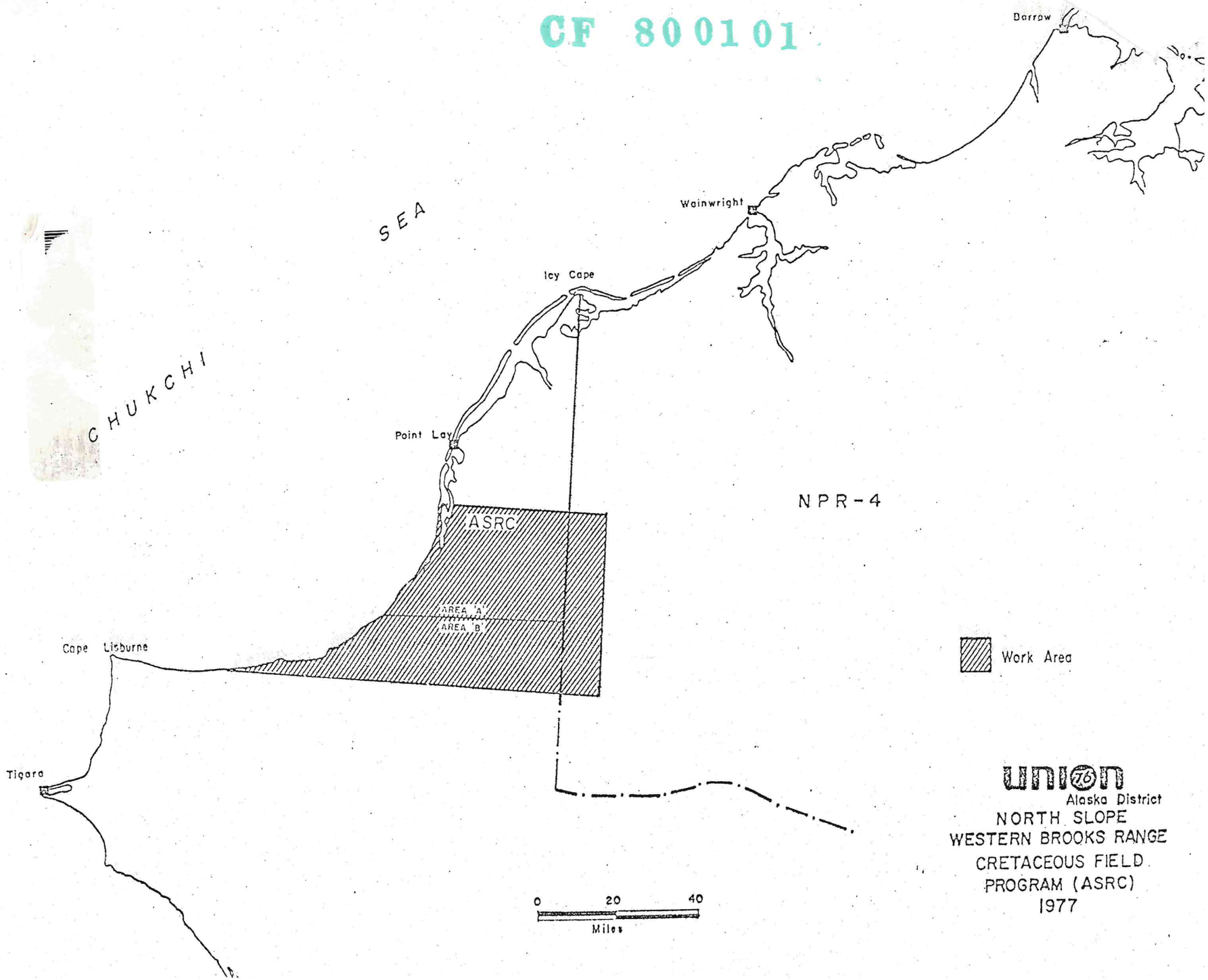
NORTH SLOPE
WESTERN BROOKS RANGE
CRETACEOUS FIELD
PROGRAM (ASRC)
1977

CF 800101

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