

THE UNIVERSITY OF ALASKA
Institute of Arctic Biology
College, Alaska 99701

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items

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June 10, 1968

United States Atomic Energy Commission
Division of Materials Licensing
Isotopes Branch
Washington, D.C. 20545

Dear Sir:

I am enclosing the data and information you requested regarding my request to use radioactive isotopes under By-product Material License No. 50-02430-07 in two unrestricted areas in Alaska. This material is sent according to your letter dated 15 August, 1967. The two field stations, i.e. unrestricted areas, are in the vicinity of Nome and Cantwell, Alaska. An Alaska State map showing the approximate location of the two field sites is enclosed. You will note that we are supplying calculations for possible contamination for all the isotopes we have permission to use under the By-product Material License mentioned above.

The calculations are based on the condition that only one experiment using radioactive isotopes will be conducted each year on each grazing plot of 100 feet radius. The experiments are to be conducted during the four major climatic seasons and the animals will be tethered on previously ungrazed plots of tundra during each new experiment. We anticipate the total of five experiments per climatic season or a total of 20 radioisotope experiments on each field station per annum. Considering the expense of conducting these experiments under natural grazing conditions, it is most unlikely that the above figure, i.e. 20 experiments per annum per field station, will be realized.

I will be pleased to supply any further information you request, but respectfully ask that you give this application consideration at your earliest convenience as we must conduct our summer research work during early August.

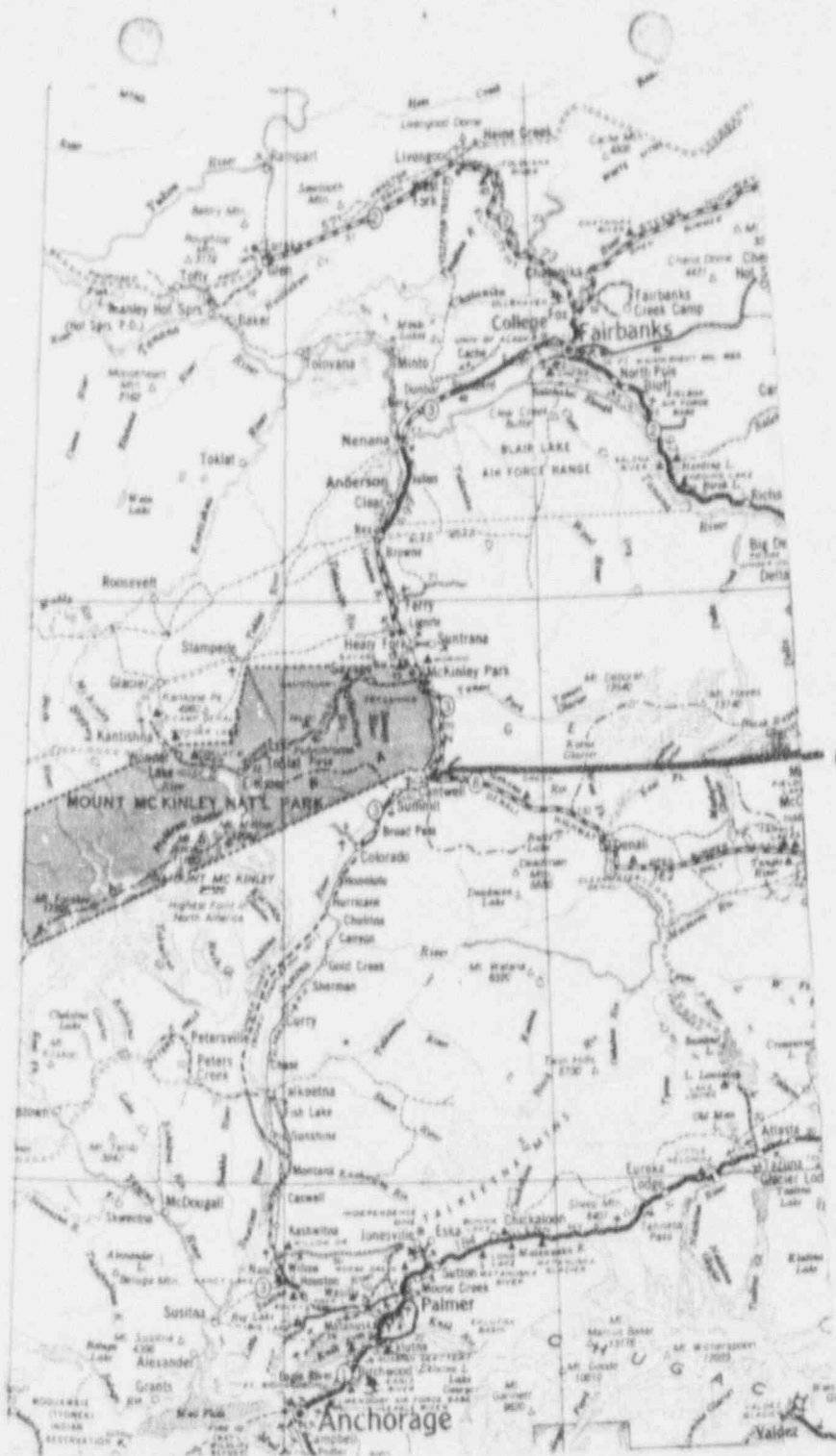
Respectfully submitted,

Jack R. Luick
Jack R. Luick, Ph.D.
Professor of Nutrition

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Enc.

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FOR DIV. OF COMMERCE



CANTWELL

CANTWELL FIELD SITE

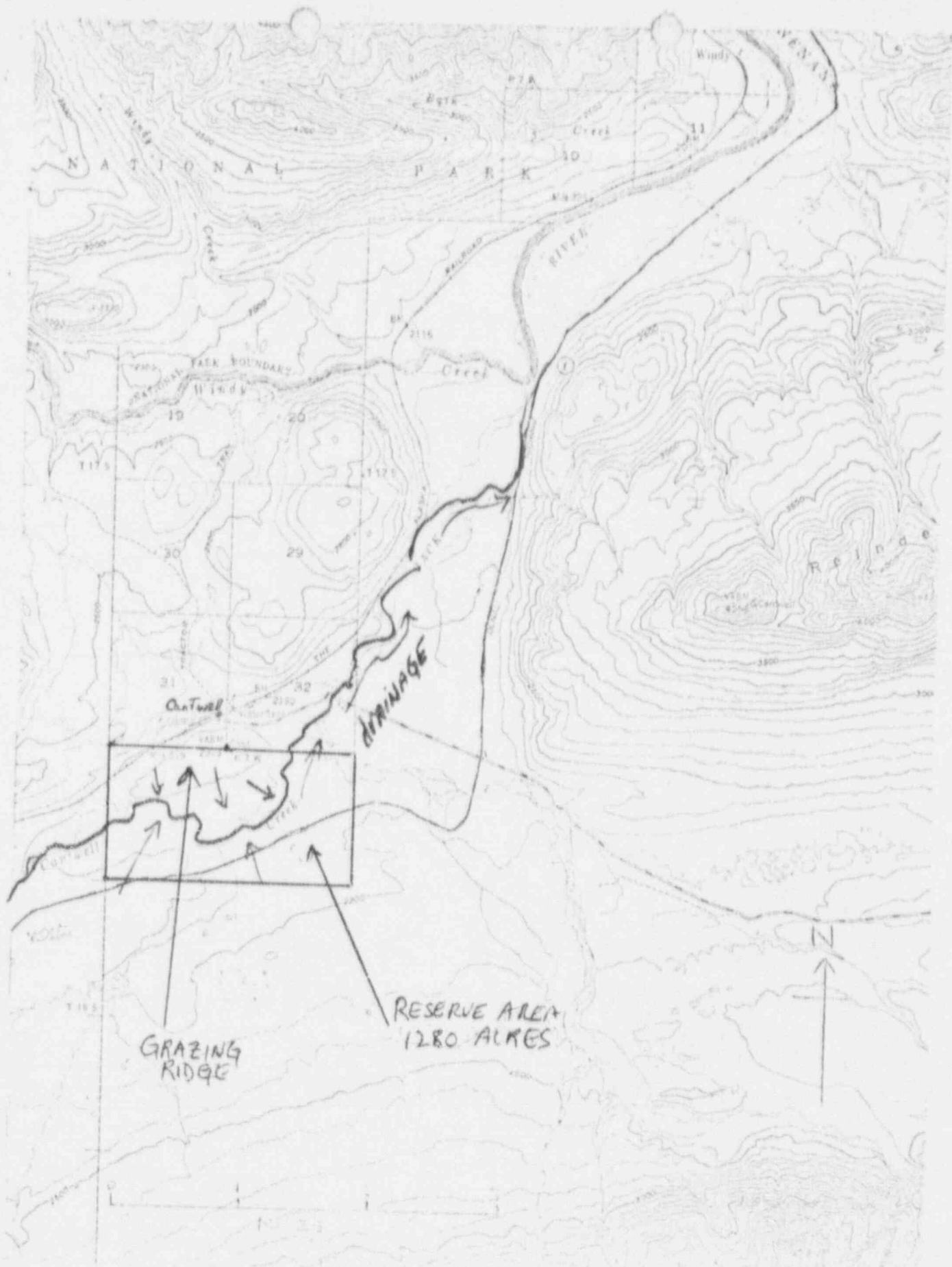
This research field site is located near Cantwell, Alaska, as found on USGS quadrangle map Healy B-4 and includes four sections immediately to the south of section 31 and four sections immediately to the south of section 32 (see figure 2). The point of land in this group of sections closest to the Town of Cantwell is at Marker R-7-W which lies 1/4 mile due south of the Cantwell road. The direct distance to the nearest dwelling is approximately 0.33 miles.

The land north of the site, i.e., between this marker and the town, is privately owned and not used at present. This land by consent of the owner and the next 0.25 miles south of the marker can serve as a full 0.5 mile buffer zone between our research site and the town. This 0.5 mile stretch of land has a northern slope down into the town. In contrast, the field site to the south, has a south facing slope and drains into the Cantwell Creek, which flows northeast across the north two sections of the field site. Approximately 0.25 miles after the creek leaves the field site, it joins the Jack River, which in turn flows into the Nenana River about 7 miles further downstream. To the best of our knowledge, there are no dwellings on Cantwell Creek and neither the Cantwell Creek or the Jack River at this point serve as domestic water sources. The rest of this proposed site to the south of the Cantwell Creek is all north sloping and drains

into the creek. The road to Summit, Alaska, from the Cantwell-Denali road intersection passes across the southeast corner of the field site. There is a major drainage stream passing under the road from the hills on the south to the creek on the north, so that drainage onto that highway would present no problem. All work with radioisotopes will be performed at considerable distance from this road.

Mean monthly temperatures during the summer months range from 40° to 50° F and mean monthly rainfall ranges from 1 to 4 inches. Due to its proximity to the town, the ridge area has not been grazed by caribou as has the terrain further afield, and the vegetation is remarkably lush in comparison. This will be of value in sublimating the nomadic tendencies of reindeer. The movement of all animals receiving radioactive isotopes will be severely restricted by use of tether, hobble, or portable fencing. The animals will be supervised at all times in the field.

Note: Cantwell is approximately 150 miles southeast of Fairbanks and is located near the entrance to McKinley Park. Cantwell itself is largely an indian settlement of about 80 residents. It is presently isolated by road for 8 months of the year but during the summer months receives some visitors who turn off the route into McKinley Park (Denali Highway) to purchase gasoline and provisions. Access to the area by hunters, campers and transients is limited to the two roads, and due to the open landscape, restrictive signs will be easily seen.



PROPOSED CANTWELL FIELD SITE

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
BUDGET BUREAU NO. 42-R996.3

Land Office and Serial Number

SPECIAL LAND-USE APPLICATION AND PERMIT

SEE INSTRUCTIONS ON REVERSE

1. Name (first, middle initial, and last) University of Alaska Institute of Arctic Biology	Address (include zip code) College, Alaska 99701
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2a. Give the legal description of the public lands for which you are applying

5 18 S. 7 W. Fairbanks, Alaska

6 18 S 7 W. Fairbanks, Alaska

Section Township Range Meridian, State of

b. For how many years are you requesting this permit? (Not to exceed five years) **5 Years**

c. Are the lands adjacent to a highway? ☒ Yes ☐ No (If "yes," complete the following)

Type of highway ☐ Federal ☒ State ☐ City Highway number **3**

d. How many miles are the lands from the nearest city or town? **1/4 Mile from Cantwell**

3a. Are you 21 years of age or over? ☐ Yes ☐ No b. Are you a citizen of the United States? ☐ Yes ☐ No

c. As applicant, are you a ☐ Partnership ☐ Association ☐ Corporation **University**

d. Are the statements required by Instruction Number 2 attached? ☒ Yes ☐ No

e. As applicant, are you an agency of the ☐ Federal Government ☒ State Government ☐ Political subdivision of any State?

4. Have you examined the lands described above? ☒ Yes ☐ No

5a. Are the lands now improved, occupied, or used? ☐ Yes ☒ No (If "yes," describe improvements and purposes, and identify users and occupants)

b. Are there springs or water holes on the lands?
☒ Yes ☐ No (If "yes," give particulars)
Cantwell Creek flows through the land.

c. What is the proposed source of water for domestic or other use?
Either Cantwell Store or Cantwell Creek.

d. Do the lands contain minerals? ☐ Yes ☐ No
(If "yes," specify)

Minerals Not Known

e. Do the lands contain timber? ☐ Yes ☐ No
(If "yes," list species and volume of timber)

**Scattered and largely immature
Picea Glauca. Volume unknown.**

6a. What do you propose to use the lands for?

Reindeer Research Project.

b. What improvements do you intend to make on the lands? (Describe improvements and attach drawings, if convenient)

None

c. What is the estimated cost of proposed improvements?

d. What are the proposed sanitation facilities?

None. No one will live on the land.

SPECIAL LAND-USE PERMIT

Permission is hereby granted to University of Alaska, Institute of Arctic Biology
of College, Alaska 99701

to use the following-described lands:

Sections 5 and 6 (unsurveyed), excludine T&M Site, F-031482

Section , Township 18S., Range 7W., Fairbanks
for the purpose of reindeer research project

Meridian. State of Alaska

and subject to the following conditions:

1. This permit is issued for the period from April 1 1968 to March 31, 1973, and is revocable for any breach of the conditions hereof. It is also revocable at the discretion of the authorized officer of the Bureau of Land Management, at any time, upon notice, if in his judgment the lands should be devoted to another use. The permit is subject to valid adverse claims heretofore or hereafter acquired.

2. The permittee shall pay annually, in advance, to the authorized officer as rental the sum of none dollars, or such other sum as may be required if an adjustment of rental is made.

3. The permittee shall observe all Federal, State, and local laws and regulations applicable to the premises, and to the erection or maintenance of signs or advertising displays, including the regulations for the protection of game birds and game animals, and shall keep the premises in a neat, orderly, and sanitary condition.

4. The use or occupancy of the land under this permit shall commence within months from the date hereof and shall be exercised at least days each year.

5. The permittee shall take all reasonable precautions to prevent and suppress forest, brush, and grass fires, and to prevent the pollution of waters on or in the vicinity of the lands.

14. Special Conditions:

The permit shall be revoked at the time the State of Alaska receives tentative approval to the lands.

6. Authorized representatives of the Department of the Interior and other Federal agencies, and game wardens shall at all times have the right to enter the premises on official business.

7. The permittee shall not enclose roads or trails commonly in public use.

8. The permittee shall pay the United States for any damage to its property resulting from this use.

9. The permittee shall immediately notify the authorized officer of a change of address.

10. This permit is subject to all of the applicable provisions of the regulations (43 CFR, Subpart 2236) which are made a part hereof.

11. The permittee agrees to have the serial number of this permit marked or painted on each advertising display erected or maintained under the authority of such permit.

12. The permittee shall not cut any timber on the lands without prior permission of the authorized officer.

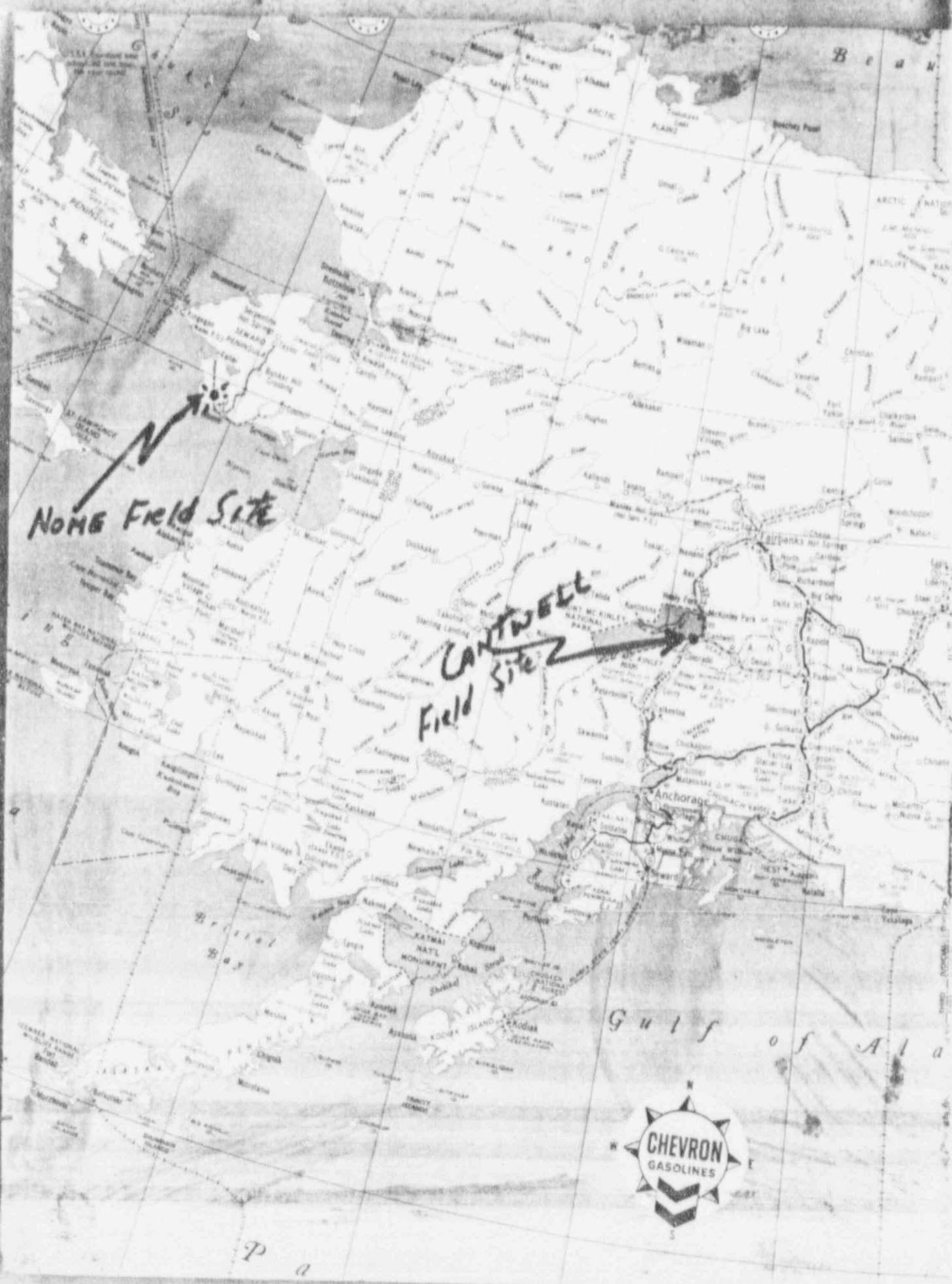
13. This permit is subject to the provisions of Executive Order No. 10925 of March 6, 1961, as amended, which sets forth the nondiscrimination clauses. A copy of this order may be obtained from the signing officer.


(Authorized Officer)

District Manager, Anchorage

(Title)

(Date)



ISOTOPES AND APPLICATION IN FIELD STATION STUDIES

<u>Isotope</u>	<u>Form</u> ⁽¹⁾	<u>Dose/Animal</u> ⁽²⁾ (uc)	<u>Excretion Pathway</u>
I ¹³¹	Thyroxin, Albumin	50	Urine, feces
Cr ⁵⁰	Red Blood Cells, EDTA	150	Urine, feces
Se ⁷⁵	Methionine	50	Urine, feces
C ¹⁴	ANY	100	CO ₂ (approx. 20%), urine, feces
H ³	ANY	140	Urine, feces
S ³⁵	Amino Acids	25	Urine, feces
Fe ⁵⁹	Organically bound	25	Urine, feces
P ³²	ANY	25	Urine, feces
Ca ⁴⁵	Inorganic	50	Urine, feces

(1) Isotopes to be used in tracer studies in experimental animals as specified in our application for By Product Material License 50-02430-07 with amendments.

(2) Maximum dose levels; in practise, the minimal dose needed for obtaining reliable data is used. Frequently the minimal dose is significantly lower than that listed above.

ANNUAL ISOTOPE LEVEL PER EXPERIMENTAL PLOT

NOME

Isotope	Amount (μc)	Dilution ⁽¹⁾ Volume (L)	Isotope Concentration ($\mu\text{c}/\text{ml.}$)	Permissible ⁽²⁾ Level ($\mu\text{c}/\text{ml.}$)
-C14	50	140x10 ⁴	4 x 10 ⁻⁸	8 x 10 ⁻⁴
-Cr ⁵¹	150	"	1 x 10 ⁻⁷	2 x 10 ⁻³
-Se ⁷⁵	50	"	4 x 10 ⁻⁸	3 x 10 ⁻⁴
-H ³	140	"	1 x 10 ⁻⁷	3 x 10 ⁻³
-S ³⁵	25	"	2 x 10 ⁻⁸	6 x 10 ⁻⁵
-Fe ⁵⁹	25	"	2 x 10 ⁻⁸	6 x 10 ⁻⁵
-P ³²	25	"	2 x 10 ⁻⁸	2 x 10 ⁻⁵
-Ca ⁴⁵	50	"	4 x 10 ⁻⁸	9 x 10 ⁻⁶
-I ¹³¹	50	"	4 x 10 ⁻⁸	3 x 10 ⁻⁷

TOTAL Isotope on field Station / year= 11.3 mc
 TOTAL Area of Distribution= $6.3 \times 10^5 \text{ ft}^2$
 TOTAL Dilution Volume (Precipitation)= $3.3 \times 10^7 \text{ L}$
 Average Isotope Concentration= $3.7 \times 10^{-7} \mu\text{c ml}$

Footnotes

(1) Average annual precipitation on plot

(2) Appendix B, 10 CFR 20

ANNUAL ISOTOPE LEVEL PER EXPERIMENTAL PLOT

CANTWELL

Isotope	Amount (μc)	Dilution ⁽¹⁾ Volume (L)	Isotope Concentration ($\mu\text{c}/\text{ml.}$)	Permissible ⁽²⁾ Level ($\mu\text{c}/\text{ml.}$)
C ¹⁴	50	166×10^4	3×10^{-8}	8×10^{-4}
Cr ⁵¹	150	"	9×10^{-8}	2×10^{-3}
Se ⁷⁵	50	"	3×10^{-8}	3×10^{-4}
H ³	140	"	8×10^{-8}	3×10^{-3}
S ³⁵	25	"	1.5×10^{-8}	6×10^{-5}
Fe ⁵⁹	25	"	1.5×10^{-8}	6×10^{-5}
P ³²	25	"	1.5×10^{-8}	2×10^{-5}
Ca ⁴⁵	50	"	3×10^{-8}	9×10^{-6}
I ¹³¹	50	"	3×10^{-8}	3×10^{-7}

Anticipated Useage: 20 plots/year
(5 plots/climatic season; 4 seasons)

Total Isotope on Field Station/year = 11.3 mc
(20 x 565 μc)

Total Area of Distribution = $6.3 \times 10^5 \text{ ft}^2$

Total Dilution Volume = $3.3 \times 10^7 \text{ L}$

Average Isotope Conc. = $3 \times 10^{-7} \mu\text{c ml.}$

Footnotes

(1) Average annual percipitation on plot

(2) Appendix B, 10 CFR 20

Calculation of Ratios for Mixtures of Radioisotopes
According to Appendix B from 25 FR 10914*

<u>ISOTOPE</u>	<u>RATIO</u> <u>Ca/MPCa</u>	
	Nome	Cantwell
C ¹⁴	0.00005	0.00004
Cr ⁵¹	0.00005	0.00004
Se ⁷⁵	0.00010	0.00010
H ³	0.00003	0.00003
S ³⁵	0.00030	0.00030
Fe ⁵⁹	0.00030	0.00030
P ³²	0.00100	0.00100
Ca ⁴⁵	<u>0.00440</u>	<u>0.00300</u>
C/MPC	0.006	0.004

* I¹³¹ is not included because of its short halftime
 (physical) and relatively long biological retention.

Control Procedures

- 1) All isotope work except actual dosing and sample collecting will be done in a field laboratory. This laboratory is equipped with all instruments needed for monitoring. One area of the building is designed for safehandling of radioactive isotopes and is fully equipped with glassware, waste containers, shielding materials, non-porous surfaces, disposable absorbent paper, etc., to insure proper handling of the materials.
- 2) Caution signs and labels will be used where necessary in the field laboratory. Entry into the field laboratory will be restricted to authorized personnel.
- 3) Field laboratory and confinement areas will be monitored periodically.
- 4) All glassware, radioisotopes, and liquid and solid waste material will be returned to Institute of Arctic Biology Radioisotope Laboratory for processing.
- 5) All animals dosed with radioactivity will carry cautionary halter tags.
- 6) All animals dosed with radioactivity will be returned to the University of Alaska upon completion of the experiment.
- 7) Animals will be constrained in an area not less than 100 feet in radius.

Calculation for C^{14} Contamination at Cantwell Field Site

- 1) Minimum restraining area/animal = $3.14 \times 10^4 \text{ ft}^2$ (100' radius)
- 2) Average annual precipitation = 22.2"
- 3) Precipitation in restraining area = $3.14 \times 10^4 \times 1.87 = 5.86 \text{ ft}^3 = 166 \times 10^4 \text{ Liters}^4$.
- 4) Isotope dose (C^{14}) = 50 uc.
- 5) Isotope concentration** = $\frac{50 \text{ uc}}{166 \times 10^4 \text{ Liters}} = 3.5 \times 10^{-8} \text{ uc/ml.}$
- 6) Permissible C Concentration in water above background, annual ave.** = $8 \times 10^{-4} \text{ uc/ml.}$
- 7) Ratio: $\frac{\text{Possible Contamination}}{\text{Permissible Contamination}} = \frac{3.57 \times 10^{-8}}{8 \times 10^{-4}} = \frac{1}{20,000}$

* Assuming no physical decay and that all Isotope is deposited on ground.

** Appendix B, 10 CFR 20

DUPLICATE

NOME FIELD SITE

The Nome field site is located near the Bureau of Indian Affairs (B.I.A.) site and corral area at the junction of Sections 2,3,34,35 of U.S.G.S. maps Nome (C-2) Quadrangle Alaska (see figure 1). Experimental animals will be contained by corral, portable fencing, hobbling, and/or tethering no further from this location than the outside perimeter of these four sections.

This area is at the juncture of two topographic zones. To the south and west of this two mile square is broad alluvial plain extensively underlaid by permafrost and characterized, consequently, by many shallow ponds and by generally wet ground conditions during the summer months. Vegetation is typical of regions of this kind, being predominately the Eriophorum-Carex-dwarf shrub type with some lichens, especially Cladonia, occupying the locally drier sites. The area north of the road consists of the southern slopes of rounded hills formed by early glaciation and interspersed with minor watercourses which lead in a southerly direction to the sea. Upland vegetation is primarily of the dwarf-shrub-lichen (Cladonia and Centraria) type with riparian willows occurring along most streams. The climate during the summer is cold, windy and relatively dry, and extremely cold and windy during winter. Mean monthly temperatures from May through August range between 40° and 50°F and the mean monthly rainfall ranges from 1 to 2 inches.

The only residents within several miles of the field station are two Eskimo reindeer herders who live on higher ground approximately 400 yards north of the road where it passes by the corral area. A statement of permission to use this area for our studies follows figure 1.

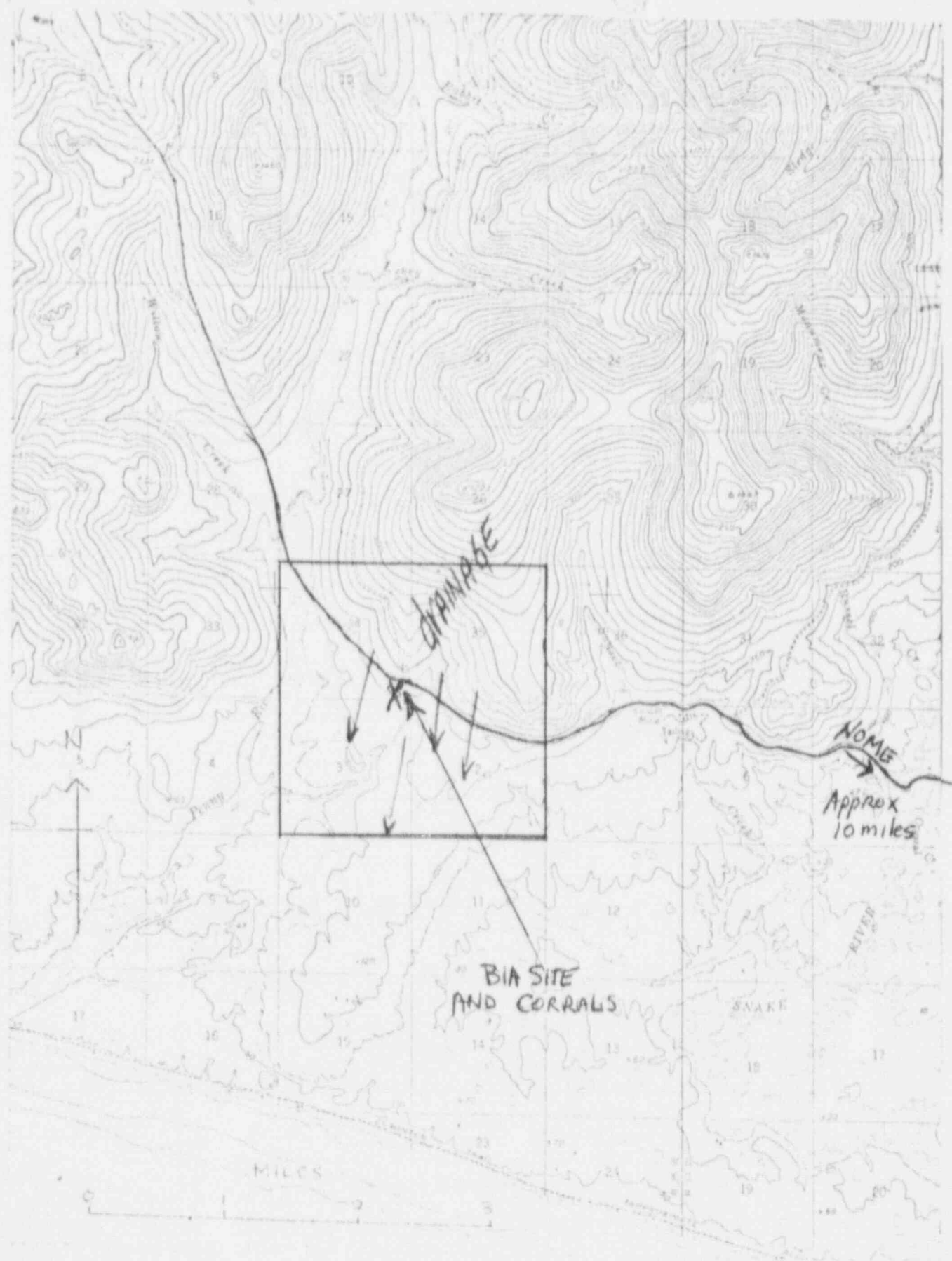


FIG 1.

BUREAU OF INDIAN AFFAIRS, MODEL HERD RANGE, NOME, ALASKA.
(entire area shown is within Range boundary)