CROW BUTTE RESOURCES, INC.
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DENVER, COLORADO 80202 **(303) 825-1544 FAX**

April 1, 1997

Mr. Joseph J. Holonich, Chief
Uranium Recovery Branch
Division of Waste Management, NMSS (T-7-J9)
Office of Nuclear Material Safety & Safeguards
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20850

RE: Docket No. 40-8943
License No. SUA-1534
Response to Acceptance Review Comments for the Renewal of Source Material License No. SUA-1534

Dear Mr. Holonich:

On January 24, 1997, Crow Butte Resources, Inc. (CBR) received a letter from the U. S. Nuclear Regulatory Commission (USNRC) which identified some deficiencies in the application for renewal of Source Material License No. SUA-1534. CBR is hereby responding to those deficiencies noted in your initial review and these responses follow:

1. The USNRC noted that some of the map copies were of poor quality and requested more legible copies at a scale of approximately 1:24,000. CBR has reviewed the map copies in the renewal application and hereby submits the following replacement map copies.
    - Figure 1.3-1: This map shows the Permit Area Boundary. The replacement map is at a scale of approximately 1:24,000.
    - Figure 2.1-1: This is a general Project Location Map that covers parts of three states. CBR has prepared a map of the general project location. A map with a scale of 1:24,000 is not feasible for this large area.
    - Figure 2.6-1: This map is a geologic map of Northwest Nebraska. This map was reproduced from the Geologic Bedrock Map of Nebraska prepared by the Nebraska Geological Survey. CBR is submitting original copies of the Nebraska Geological Survey map as a replacement for Figure 2.6-1.
    - Figure 2.7-12: This map is a Soils Map of the Permit Area. CBR has prepared a Soils Map of the Permit Area at a scale of approximately 1:20,000. This map is being submitted as a replacement for Figure 2.7-12.

NLOS 1/1

030093 Figures located in Central File

2. The USNRC noted that a topographic map was not provided as recommended in Section 2.1 of Regulatory Guide 3.46. CBR is providing a topographic map of the site environs and this map is identified as Figure 2.1-4

3. The USNRC noted that background data on land use, meteorology and surface water discharge data had not been updated since the original application for a commercial license in 1987. CBR is hereby submitting updated data on land use and meteorology. The period of record for surface water discharge is from 1931 to 1980. With such an extensive period of record, any changes over a 10 year period would be insignificant.

If you have any questions or require further information, please do not hesitate to contact the undersigned.

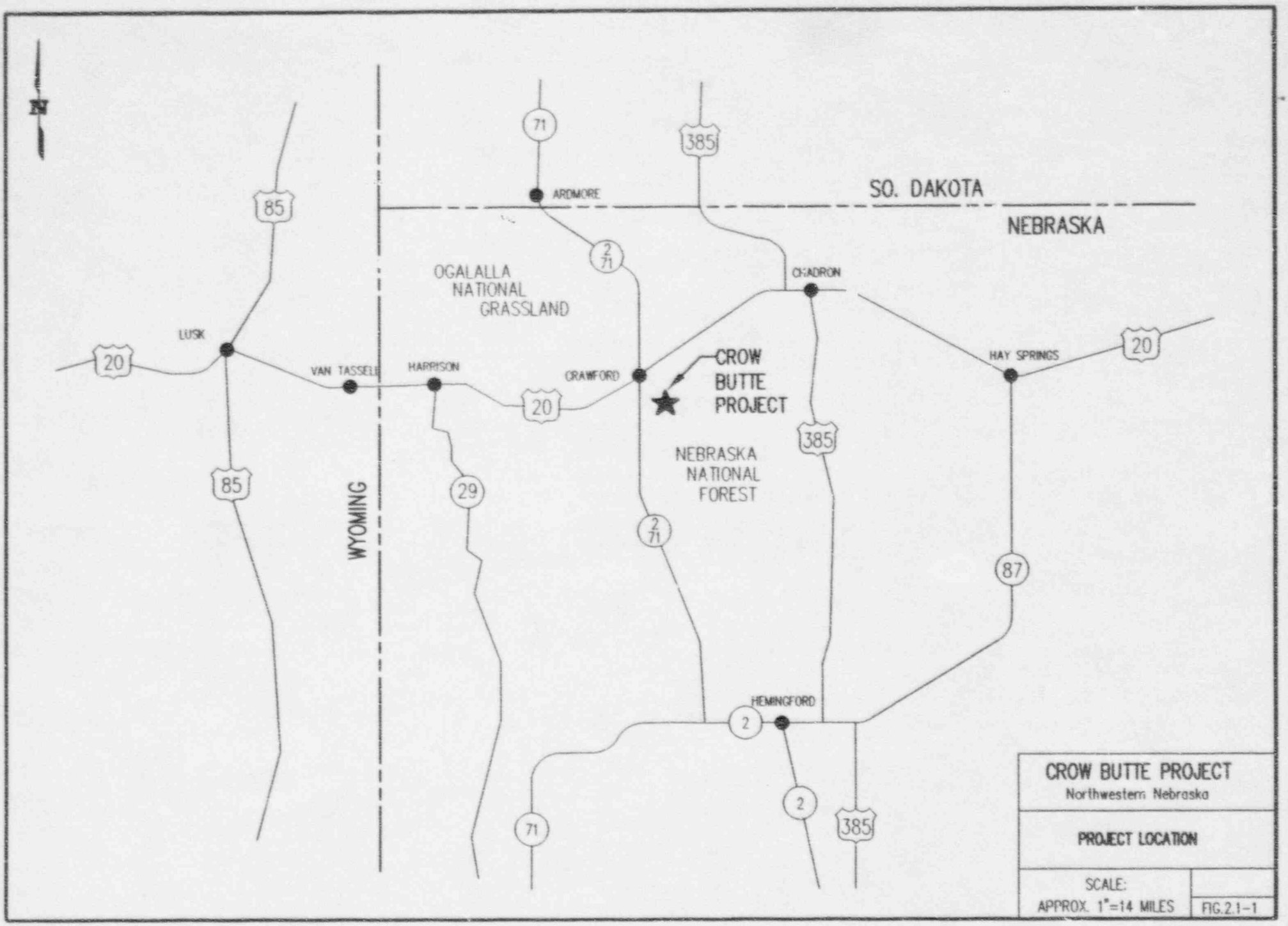
Sincerely,

CROW BUTTE RESOURCES, INC.

Steve Collings

Steve Collings
President

cc: Pat Mackin
Ross Scarano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HEMINGFORD
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CROW BUTTE PROJECT
Northwestern Nebraska
PROJECT LOCATION
SCALE:
APPROX. 1"=14 MILES
FIG.2.1-1

2.5. METEOROLOGY

2.5.1 INTRODUCTION

This section describes the meteorological conditions in the region surrounding the Crow Butte project. The data presented in this section were used to determine the effect of the local climate on the proposed commercial operation and will also be used to evaluate the continuation of the project. The joint frequency data will be used to assess the atmospheric dispersion characteristics present in the region.

Data sources for the meteorological conditions used for this report come from the National Weather Service Climatology obtained from the Natural Resources Conservation Service on-line computer database from Chadron, Nebraska and an on-site monitoring station located near the Crow Butte Facility. The Climatological Summary from Chadron covers 47 years of observation from 1948 through 1995. From April 1982 through April 1984, a monitoring station on the Crow Butte Project site monitored temperature, precipitation, evaporation, and wind speed and direction. Data are also included from the National Weather Service Stations at Scottsbluff, Nebraska and Rapid City, South Dakota.

The Crow Butte Project is located in Dawes County. This county is located in the north central portion of the Nebraska panhandle and its northern border is shared with South Dakota. The weather patterns are typical of a semi-arid continental climate. This climate is characterized by warm summers, cold winters, light precipitation and frequent changes in the weather.

The Rocky Mountains to the west and the Black Hills to the north effectively block moisture from these directions, while moisture from the south is directed eastward by a plateau south of the region. As a result of this topography the area is generally drier than the rest of the panhandle.

Precipitation during the winter months averages about 1.0 cm (0.39 in) per month generally occurring as light snow. Cold spells persist for only a few days ending with the advance of warmer air from the south or southwest. Occasionally there are winters with persistently cold temperatures and heavy snow.

Precipitation increases in the spring, with March usually posting the greatest monthly snowfall. The snow and gentle rains gradually change to showers and thundershowers as June approaches. The high temperatures increase to 21°C (70°F) in April and temperatures above 32°C (90°F) have been recorded as early as May.

Thunderstorms produce most of the precipitation during the summer months. In severe storms, hail and damaging winds can be problems but tornadoes are rare. The warmest month of the year is July with an average high temperature of 32°C (90°F) and an average low temperature of 15°C (59°F). Several times during the summer months, temperatures can be expected to climb above 38°C (100°F).

Precipitation becomes light again during the fall months. High temperatures drop to around 25°C (77°F) in September and by October they only reach to near 18°C (65°F). Increasing cloudiness and falling temperatures best characterize November. Early snows have been reported in September and by the end of November most of the precipitation is in the form of snow.

The following data were taken from the National Weather Service Climatology obtained from the Natural Resources Conservation Service on-line centralized forecasting system computer database (NRCS 1997) and the on-site monitoring station. The Climatological Survey data were collected at the Chadron Airport, latitude 42° 50' north, longitude 103° 05' west with a ground elevation of 1006 m (3300 ft) above mean sea level. The airport is located 7.2 km (4.5 miles) west of Chadron, 29 km (18.0 miles) east of Crawford, and 31 km (19.3 miles) east-northeast of the license area. The period of record for this data is 30 years, from 1948 through 1995. The on-site monitoring data have been collected from May 1982 through April 1984.

2.5.2 TEMPERATURE

Table 2.5-1 shows the mean daily maximum and minimum temperatures as well as the mean monthly temperatures. The months November through March all have mean daily minimum temperatures below freezing with January the coldest month with a mean daily minimum temperature of -12.4°C (9.7°F). December, January and February all have monthly mean temperatures below freezing. The warmest months are July and August with mean daily maximum temperatures above 31°C (87°F). The mean yearly temperature is 8.7°C (47.7°F).

The temperature extremes for the period of record are given in Table 2-5.1 along with the year of occurrence. Seven months, April through October, recorded temperatures in excess of 37.8°C (100°F). Only July and August did not have recorded low temperatures below freezing. Six months, October through March, had recorded low temperatures below -17.8°C (0°F). The lowest temperature for the period of record was -40°C (-40°F) in December 1990. The warmest temperature during the period of record was 43.3°C (109.9°F) in July 1954.

Table 2.5-2 lists the mean number of days per month with temperatures above or below selected values. There are an average of 41 days per year with maximum

temperatures exceeding 32.2°C (90°F) and 102 days per year when the maximum temperature will not exceed 0°C (32°F). On 43 percent of the days in a given year, the temperature will fall to 0°C (32°F) or below and on an average 17 of those days the temperature will go below -17.8°C (0°F).

The average date of the last 0°C (32°F) temperature is May 18 while the first fall freeze is expected on September 18. The average growing season is 120 to 130 days in length (USDA, 1981). These are average values and the exact occurrence of freezing temperatures is dependent on exposure.

2.5.3 PRECIPITATION

Precipitation in the region is generally light with the greatest occurrences in the spring and summer. Table 2.5-3 lists the monthly precipitation totals for the period of record. May has the greatest precipitation with a mean of 7.29 cm (2.89 in). The driest months are November through February, when average monthly precipitation is about 1.0 cm (0.393 in). The mean yearly precipitation is 39.29 cm (15.46 in). Also listed in Table are the maximum 24-hour precipitation events. The maximum 24-hour rainfall of 11.18 cm (4.40 in) was recorded on in September 1986. The greatest monthly accumulation was 26.37 cm (10.38 in) recorded during June 1947.

The mean and extreme snowfalls for the period of record are listed in Table 2.5-3. The mean annual snowfall is 103.5 cm (40.7 in). July and August are the only two months without a reported snowfall. The maximum mean monthly snowfall is in March and is reported to be 20.57 cm (8.10 in). The maximum monthly snowfall is 151.38 cm (59.60 in) recorded in January 1949, while the greatest June snowfall is 3.05 cm (1.20 in). The largest 24-hour total snowfall is 67.82 cm (26.70 in) recorded in January 1949.

Precipitation data from Scottsbluff, Nebraska, located 98 km (60.9 mi) south of the license area and from Rapid City, South Dakota 158 km (98.2 mi) north of the license area indicate that precipitation in excess of 0.03 cm (.01 in) can be expected on an average of 85 and 96 days per year, respectively (NOAA, 1980a, 1980b). These data are listed in Table 2.5-4. Also given in this table are the mean number of days on which thunderstorms may occur. The annual occurrences range from 44 in Scottsbluff to 15 in Rapid City. In the more severe thunderstorms, high winds and possibly hail can be expected to occur. Tornadoes are a rare occurrence. In the USNRC, Draft Generic Environmental Impact Statement on Uranium Milling, (USNRC, 1979) the authors calculated a mean annual frequency of 0.6 for tornadoes in intensity Category I at Rapid City. The annual probability of occurrence at this location is 4.8×10^{-4}. A tornado in intensity Category I has a rotational speed of 134 m/s and a translational speed of 26 m/s.

Table 2.5-1: Mean and Minimum Temperature Data for Chadron, Nebraska (1948 to 1995)

Month	Mean Daily Maximum (°C)	Mean Daily Minimum (°C)	Mean Monthly (°C)	Record High		Record Low	
				°C	Year	°C	Year
Jan.	1.7	-12.4	-5.0	21.1	1989	-33.9	1949
Feb.	4.8	-9.8	-2.5	24.4	1982	-32.8	1982
Mar.	9.1	-5.6	1.8	28.3	1978	-32.2	1989
Apr.	15.2	0.1	7.6	33.8	1989	-23.9	1975
May	21.1	6.2	13.6	36.6	1969	-8.9	1954
June	27.1	11.4	19.3	41.6	1989	-3.3	1969
July	31.8	14.8	23.3	43.3	1954	3.3	1971
Aug.	31.3	14.0	22.7	42.2	1980	2.2	1965
Sept.	25.4	7.7	16.6	40.0	1978	-6.1	1983
Oct.	18.3	1.0	9.6	34.4	1954	-21.6	1992
Nov.	8.9	-5.7	1.6	26.1	1981	-28.9	1987
Dec.	3.5	-10.5	-3.5	22.2	1981	-40.0	1990
Year	18.5	0.9	8.7	43.3	July 1954	-40.0	Dec. 1990

Source: NRCS 1997.

Table 2.5-2: Temperature Occurrences for Chadron, NE (From 1948 to 1995)

Month	Mean Number of Days with Maximum Temperatures		Mean Number of Days with Minimum Temperatures	
	> 32.2°C	< 0°C	< 0°C	< -17.8°C
Jan.	0	23	29	7
Feb.	0	16	23	3
Mar.	0	14	24	1
Apr.	<0.5	6	13	0
May	1	1	2	0
June	6	1	<0.5	0
July	15	0	0	0
Aug.	14	0	0	0
Sept.	4	1	2	0
Oct.	<0.5	4	13	<0.5
Nov.	0	14	25	1
Dec.	0	23	29	4
Year	44	102	158	17

Source: NRCS 1997.

Table 2.5-3: Mean and Maximum Precipitation Data for Chadron, NE (1948 to 1995)

Month	Water Equivalent		Snow Fall		
	Mean (cm)	Maximum 24-hour (cm)	Mean (cm)	Maximum Monthly (cm)	Maximum 24-hour (cm)
Jan.	1.09	2.72	16.0	151.38	67.82
Feb.	1.09	1.35	16.3	59.69	26.16
Mar.	1.91	3.51	20.6	53.85	22.86
Apr.	4.17	4.24	13.5	49.28	25.40
May	7.39	6.50	1.8	23.62	17.78
June	7.29	5.36	0.0	3.05	3.05
July	5.33	4.95	0.0	0.00	0.00
Aug.	3.30	4.62	0.0	0.00	0.00
Sept.	3.43	11.18	1.0	25.40	25.40
Oct.	2.13	3.18	5.3	24.64	18.29
Nov.	1.12	1.78	12.2	65.79	20.57
Dec.	1.04	1.80	16.8	46.99	15.24
Year	39.29	11.18	103.5	151.38	67.82

Source: NRCS 1997.

Table 2.5-4: Percent Relative Humidity Data (From 1941 to 1970)

Month	0500 Hours		1100 Hours		1700 Hours		2300 Hours	
	NE[a]	SD[b]	NE	SD	NE	SD	NE	SD
Jan.	74	68	59	60	60	64	72	68
Feb.	74	72	53	61	50	63	70	72
Mar.	75	74	49	56	44	55	68	72
Apr.	76	73	46	49	40	46	66	68
May	77	75	45	49	41	46	67	70
June	78	76	43	51	39	48	67	73
July	79	72	42	45	37	40	66	65
Aug.	80	69	44	41	38	36	67	60
Sep.	78	66	42	40	36	38	66	59
Oct.	74	64	42	40	39	44	64	60
Nov.	75	67	52	51	51	58	68	66
Dec.	74	68	55	59	57	65	70	68
Year	76	70	48	50	44	50	68	67
Period of Record	16	30	16	30	16	30	16	30

[a]Scottsbluff, NE
[b]Rapid City, SD

2.5.4 HUMIDITY

Relative percent humidities at the Scottsbluff and Rapid city weather stations are given in Table 2.5-4. The humidities at 0500, 1100, 1700, and 2300 hours are listed. Both locations have about the same humidity during the night but in the early morning, Scottsbluff is slightly more humid. By noon and throughout the afternoon, Scottsbluff becomes less humid than Rapid City. From Table 2.5-4 it can be seen that these humidity differences are slight and the humidity at the license is expected to be similar to these locations.

2.5.5 WINDS

Figure 2.5-1 and Figure 2.5-2 are the windroses for Scottsbluff, Nebraska and Rapid City, South Dakota respectively. These figures do show predominant wind patterns that are similar, however, the finer details are greatly influenced by the local topography. Rapid City has a predominant wind from the north-northwest while Scottsbluff has a slightly bimodal distribution with the predominant winds from the west-northwest and the east-southeast. The least prevalent wind direction at both locations is from the southwest.

2.5.6 LOCAL METEOROLOGICAL STATION

Local terrain will have a significant influence on the wind patterns in a given area. Because of this, a meteorological station was installed on the project site. This station was capable of measuring wind speed, direction, and the standard deviation of the wind direction. From this information joint frequency data was compiled. Figure 2.5-3; Windrose for Crow Butte Site exhibits the windrose that were identified for the site and Table 2.5-5 shows the frequency of winds by direction and speed for the six stability classes. Table 2.5-6 shows the annual relative joint frequency distribution. As shown on Figure 2.5-3, the predominant wind direction of the site is from a south-southwest direction approximately 45 percent of the time. Because of the differences between the site, Rapid City and Scottsbluff, the two-year site wind record is considered the most representative.

Precipitation was also recorded at the station with a heated tipping bucket rain gauge. Evaporation was measured using a 48" evaporation pan and an evaporation gauge with analog output. The air temperature was also recorded using a precision linear thermistor and fan aspirated radiation shoed. All the information was recorded on strip chart recorders. In addition, the information was run through a microprocessor and recorded on magnetic tape. The information from the tape was transferred to a computer and then verified by comparison from the strip charts and from visual observation records.

2.5.7 REFERENCES

Holzworth, George C., Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States, United States Environmental Protection Agency, PB-207-103, 1972.

National Oceanic and Atmospheric Administration, Local Climatological Data, Annual Summary with Comparative Data - Scottsbluff, Nebraska, United States Department of Commerce, Asheville, NC, 1980.

National Oceanic and Atmospheric Administration, Local Climatological Data, Annual Summary with Comparative Data - Rapid City, South Dakota, United States Department of Commerce, Asheville, NC, 1980.

Natural Resource Conservation Service, Centralized Forecasting System Computer, West National Technical Center, Portland, OR, 1997.

United States Department of Agriculture, "Draft Environmental Impact Statement. Nebraska National Forest, Land, and Resource Management Plan", USDA 02-07-81-07, USDA Forest Service, Chadron, NE, 1981.

United States Department of Commerce, "Climatological Summary For Chadron Nebraska", Climatography of the United States No. 20-25, 1941-1970.

United States Nuclear Regulatory Commission, Draft Generic Environmental Impact Statement on Uranium Milling, NUREG - 0511, Washington, D.C., 1979.

2.2. USES OF ADJACENT LANDS AND WATERS

A new land use map for the permit area **(Figure 2.2-1)** has been produced in 1997 by comparing the original mapping developed in 1982 with more recent aerial photography. Little change has been noted in land use reflecting the stagnant nature of economic activity in the area and slight decline in population of Crawford and Dawes County as described in Section 2.3.

The original map illustrated land use within a 5-mile (8 km) radius of the center of the project area. However, NRC guidelines call for land uses within a 2-mile (3.3 km) radius of the site. The new mapping includes land uses within the permit area as well as a 2¼-mile (3.6 km) radius from the permit area boundary. A 2¼-mile radius was used rather than the requested 2-mile radius to remain consistent with other resource descriptions. Since the site is elongated in a northwest-southeast direction, it seemed more appropriate to use distance from the site boundary rather than distance from the center of the site.

Table 2.2-1 presents land uses in 22½° sectors centered on each of the 16 compass points. **Table 2.2-2** explains each of the land use types. The total areas of the sectors vary because of the irregular site boundary. Pasture land comprises the greatest portion of land use (29 percent). Cropland (28 percent), forest land (13 percent), and wildlife habitat (10 percent) are the other significant land uses. The greatest change in land use since 1982 has been the change in the mines, quarries, or gravel pits category from 19.4 acres to 2811.6 acres. This change reflects the reclassification of land use within the permit area. **Table 2.2-3** shows the distance to the nearest residence and to the nearest site boundary from the center of the site for each 22½° sector centered on each compass point. More detailed information regarding land use can be found in the Crow Butte Uranium Project Application and Supporting Environmental Report for USNRC Commercial Source Material License (FEN, 1987).

Table 2.2-1
Present Land Use of the Site and Within a 2-1/4 (3.6 km) Radius of the Site Boundary (in acres)

COMPASS SECTOR[1]	LAND USE[2]											TOTAL
	C	F	M	P	R	W	H	C/S	Rc	UR	I	
N	890.9		101.9	894.1		13.7						1900.6
NNE	618.4		64.7	657.9								1341.0
NE	483.5	118.1	53.6	465.5	29.5							1150.2
ENE	126.5	470.9	59.7	476.6	69.9		58.2					1261.8
E	164.9	302.3	83.6	152.3			874.0					1577.1
ESE	116.0	101.0	185.2	39.5	6.0		1487.7					1935.4
SE	131.7	1109.6	481.0	239.4	779.9		543.0					2582.6
SSE	93.3	1318.5	446.8	440.6	232.8							2532.0
S	599.2	246.3	158.2	960.8	43.7							2008.2
SSW	607.0	27.7	47.8	742.0		8.0						1432.5
SW	628.0		12.7	467.3								1108.0
WSW	671.6	6.2	7.5	404					24.1			1113.4
W	622.1		27.1	405.4		3.0			607.9			1665.5
WNW	493.4		125.7	667.4		10.3		22.3	1038.9	61.0		2419.0
NW	1089.8	103.9	610.5	425.1		8.2	6.7	103.4	233.5	196.5	15.1	2792.7
NNW	888.0	57.5	345.6	1050.6		28.5		125.7				2370.2
TOTAL	8224.3	3860.0	2811.6	8488.5	461.8	71.7	2969.6		1904.4	257.5	15.1	29,719.2

[1]22-1/2° sectors centered on each of the 16 compass points
[2]See Table 2.2-2 for an explanation of land use types; C = cropland; F = forested land; M = mines, quarries or gravel pits; P = pastureland; R = rangeland; W = water; H = habitat; C/S = commercial and services; Rc = recreational; UR = urban residential; I = industrial.

Table 2.2-2 Crow Butte Study Area Land and Water Use Definitions

Croplands (C):	Harvested cropland, including grasslands cut for hay; cultivated summer-fallow and idle cropland.
Commercial and Services (C/S):	Those areas used predominantly for the sale of products and services. Institutional land uses, such as various educational, religious, health, and military facilities are also components of this category.
Forested Land (F):	Areas with a tree-crown density of 10 percent or more, are stocked with trees capable of producing timber or other wood products, and exert an influence on the climate or water regime. This category does not indicate economic use.
Habitat (H):	Land dedicated wholly or partially to the production, protection or management of species of fish or wildlife.
Industrial (I):	Areas such as rail yards, warehouses and other facilities used for industrial manufacturing or other industrial purposes.
Mines, Quarries, or Gravel Pits (M):	Those extractive mining activities that have significant surface expression.
Pastureland (P):	Land used primarily for the long-term product of adapted, domesticated forage plants to be grazed by livestock or occasionally cut and cured for livestock feed.
Rangeland (R):	Land, roughly west of the 100th meridian, where the natural vegetation is predominantly grasses, grasslike plants, forbs or shrubs; which is used wholly or partially for the grazing of livestock. This category includes wooded areas where grasses are established in clearings and beneath the overstory.

Urban Residential (UR): Residential land uses range from high density, represented by multi-family units, to low density, where houses are on lots of more than one acre. these areas are found in and around Crawford and Ft. Robinson. Areas of sparse residential land use, such as farmsteads, will be included in categories to which they are related.

Water (W): Areas of land mass that persistently are water covered.

Recreational (RC): Land used for public or private leisure-time use, including developed recreational facilities such as parks, camps and amusement areas, as well as areas for less intensive use such as hiking, canoeing, and other undeveloped recreational uses.

Table 2.2-3
Distance to Nearest Residence and Site Boundary From Center of Site for Each Compass Sector

Compass Sector[1]	Nearest Residence (ft.)	Nearest Site Boundary (ft.)
North	5,800	4,050
North-Northeast	11,850	3,050
Northeast	1,150	3,150
East-Northeast	15,000	2,900
East	None	4,250
East-Southeast	4,800	4,400
Southeast	5,700	8,100
South-Southeast	15,700	5,900
South	6,250	5,100
South-Southwest	17,250	2,250
Southwest	9,450	1,500
West-Southwest	5,500	1,250
West	15,100	1,200
West-Northwest	2,050	3,950
Northwest	6,400	6,300
North-Northwest	11,400	5,500

[1] 22½° sectors centered on each of the 16 compass points.

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DOCUMENT
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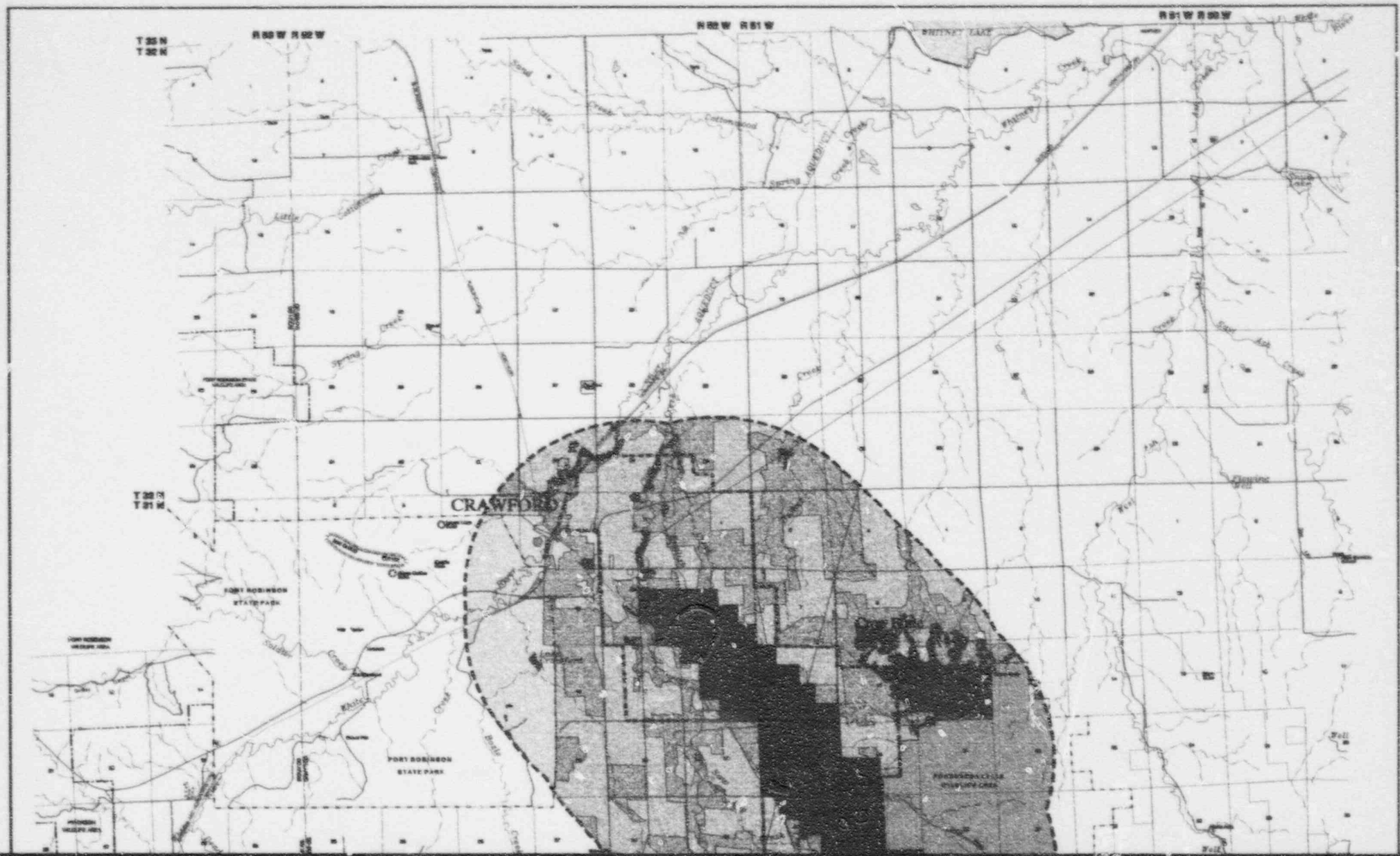
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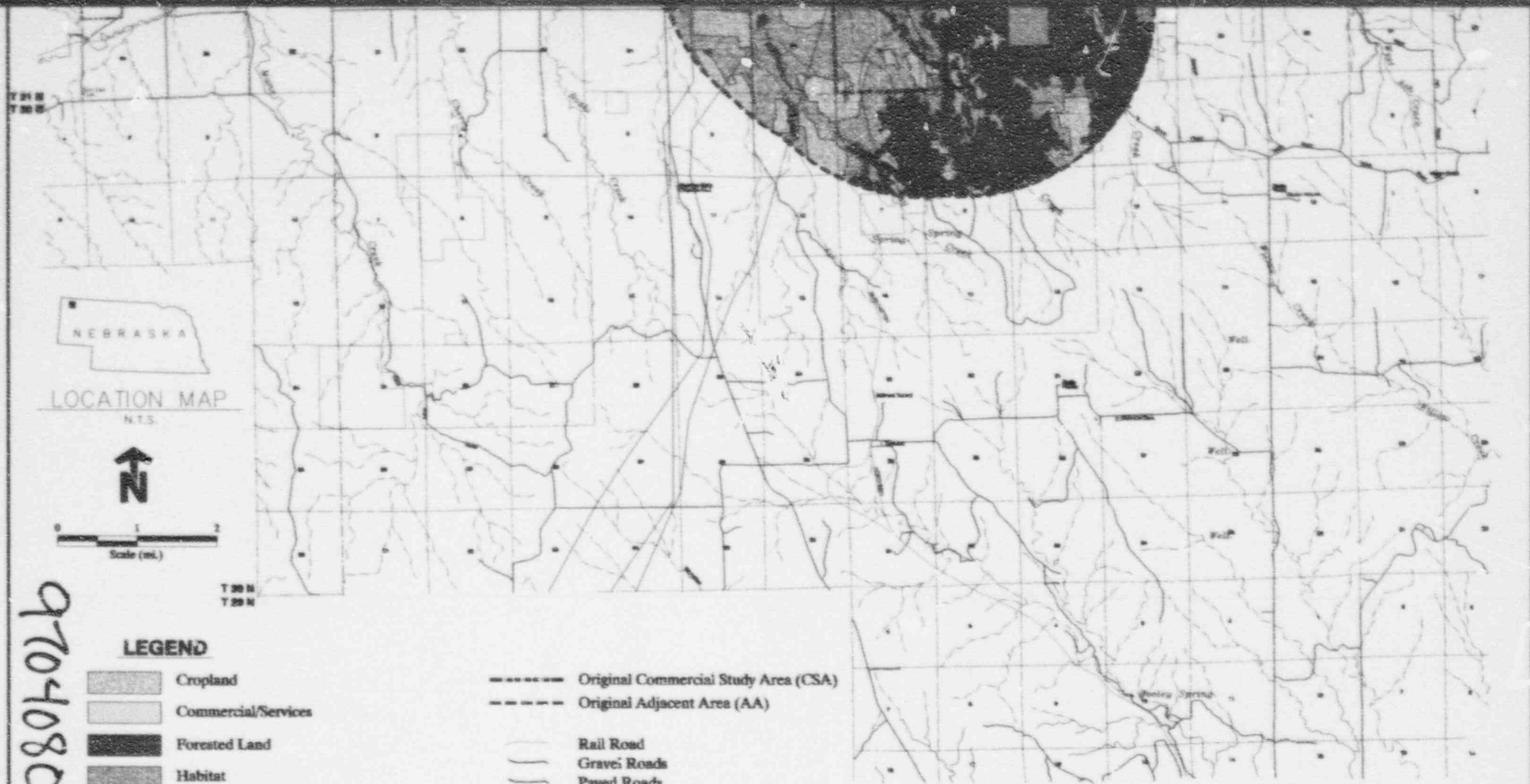

LEGEND

- Cropland
- Commercial/Services
- Forested Land
- Habitat
- Industrial
- Mines, Quarries, or Gravel Pits
- Pastureland
- Rangeland
- Recreational
- Urban Residential
- Water

- Original Commercial Study Area (CSA)
- Original Adjacent Area (AA)
- Rail Road
- Gravel Roads
- Paved Roads
- Perennial Stream
- Intermittent Stream
- Transmission Line

GREYSTONE

LANDUSE MAP

CROW BUTTE PROJECT
Dawes County, Nebraska

Scale: as shown | Date: 3/31/97 | Figure 2.2-1