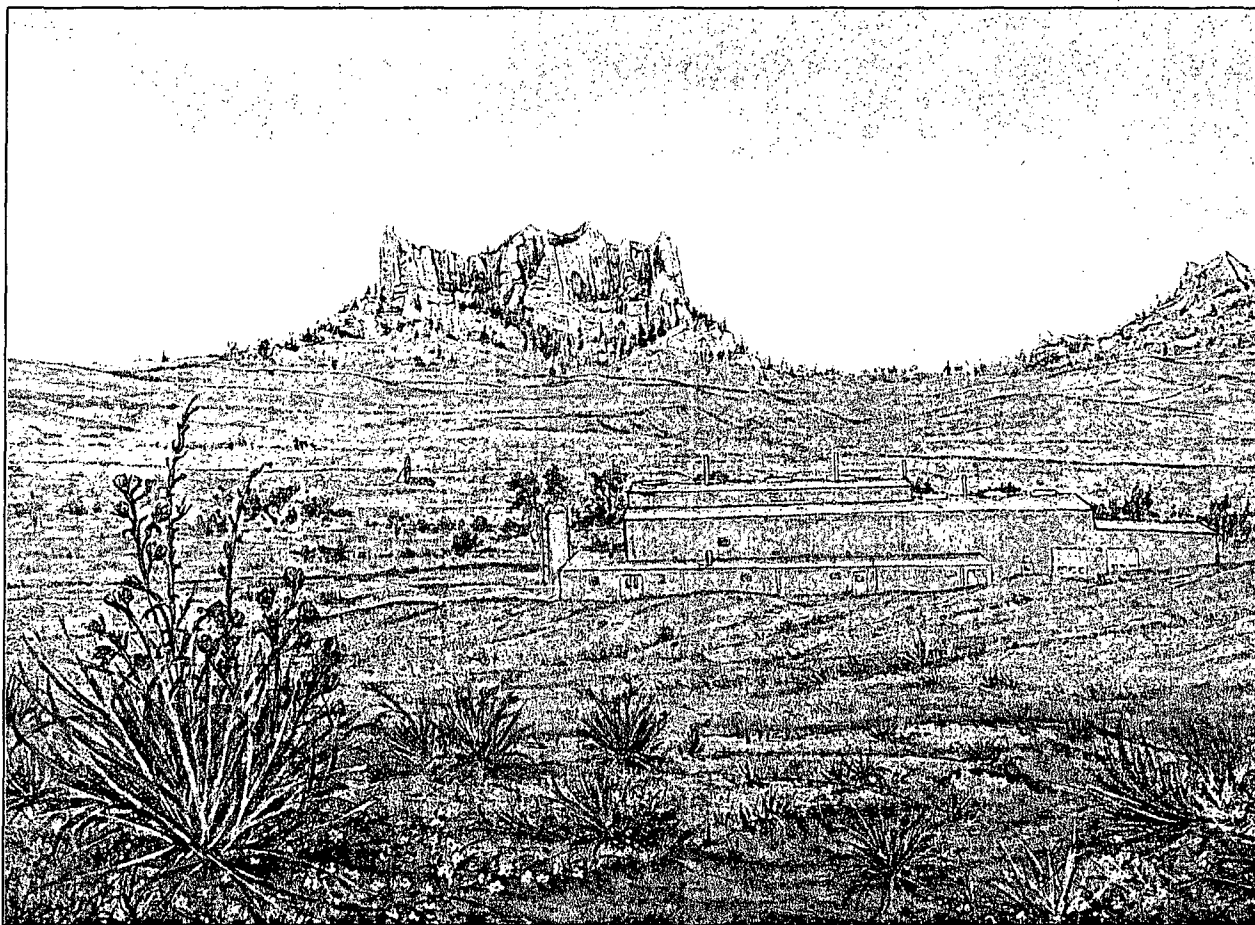


**Application for Amendment of
USNRC Source Materials License SUA-1534
North Trend Expansion Area
Technical Report – Volume I**

Sections 1 through 10



**Prepared By: Crow Butte Resources, Inc.
86 Crow Butte Road
Crawford, Nebraska 69339**



CROW BUTTE RESOURCES, INC.

141 Union Blvd., Suite 330
Lakewood, Colorado 80228
Tel: (720) 879-5140
Fax: (720) 917-0188

May 30, 2007

Mr. Charles L. Miller, Director
Office of Federal and State Materials and Environmental Management Programs
U. S. Nuclear Regulatory Commission
Two White Flint North, Mailstop T8F5
11545 Rockville Pike
Rockville, MD 20852

RE: Request for License Amendment
Docket No. 40-8943
License No. SUA-1534

COPY

Dear Mr. Miller:

Crow Butte Resources, Inc. (CBR) is submitting this request for an amendment to Source Materials License SUA-1534 for the development of additional uranium in-situ leach mining resources. The proposed development area for use as a satellite facility to the main CBR plant is referred to as the North Trend Expansion Area.

Enclosed with this letter is NRC Form 313, with associated additional information. Under separate cover CBR is sending three copies of the amendment application.

If you or your staff has any questions regarding CBR's application for the license amendment please contact me.

Sincerely,

Stephen P. Collings
President



A member of the Cameco group of companies

Estimated burden per response to comply with this mandatory collection request: 4.4 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

APPLICATION FOR MATERIAL LICENSE

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, MISSISSIPPI, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

LICENSING ASSISTANCE TEAM
DIVISION OF NUCLEAR MATERIALS SAFETY
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-4005

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR (Check appropriate item)

☐

A. NEW LICENSE

☒

B. AMENDMENT TO LICENSE NUMBER SUA-1534

☐

C. RENEWAL OF LICENSE NUMBER _____

2. NAME AND MAILING ADDRESS OF APPLICANT (Include ZIP code)

Crow Butte Resources, Inc.
141 Union Blvd.
Suite 330
Lakewood, CO 80228

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Crow Butte Resources, Inc.
Dawes County Nebraska
86 Crow Butte Road
Crawford, NE 69339

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Stephen P. Collings

TELEPHONE NUMBER

(720) 879-5518

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL

a. Element and mass number; b. chemical and/or physical form; and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSE FEES (See 10 CFR 170 and Section 170.31)

FEE CATEGORY 2.A.(2)

AMOUNT ENCLOSED \$ 0.00

13. CERTIFICATION. (Must be completed by applicant) THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39, AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER - TYPED/PRINTED NAME AND TITLE

Stephen P. Collings, President

SIGNATURE

Stephen P. Collings

DATE

5-25-07

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			\$		
APPROVED BY				DATE	

**APPLICATION FOR AMENDMENT
SOURCE MATERIALS LICENSE SUA-1534
DOCKET NUMBER 40-8943**

**Responses to Items 5 through 11, NRC Form 313
Page One**

Licensee: Crow Butte Resources, Inc.
141 Union Blvd, Suite 330
Lakewood, Colorado 80228

5. RADIOACTIVE MATERIAL:

a) Element and Mass Number:

Uranium (natural uranium, or Unat; a mixture of U_{238} , U_{234} , and U_{235})

b) Chemical and/or physical form:

Chemical form is U_3O_8 ; uranium product is termed yellowcake and is present as a solution (0 to 50 grams/liter), a slurry (1% to 50% U), or dried product (50% to 80% U).

c) Maximum amount which will be possessed at any one time:

Crow Butte Resources, Inc. requests Unlimited possession amount.

6. PURPOSE FOR WHICH LICENSED MATERIAL WILL BE USED:

Fuel for the generation of electricity by nuclear power plants.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE:

This information is provided in detail in Section 5.0 of Crow Butte Resources, Inc.'s "Application for Amendment of USNRC Source Materials License SUA-1534 North Trend Expansion Area Technical Report Volume I".

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS:

This information is provided in detail in Section 5.0 of Crow Butte Resources, Inc.'s "Application for Amendment of USNRC Source Materials License SUA-1534 North Trend Expansion Area Technical Report Volume I".

9. FACILITIES AND EQUIPMENT:

This information is provided in detail in Section 3.0 of Crow Butte Resources, Inc.'s "Application for Amendment of USNRC Source Materials License SUA-1534 North Trend Expansion Area Technical Report Volume I".

10. RADIATION SAFETY PROGRAM:

This information is provided in detail in Section 5.0 of Crow Butte Resources, Inc.'s "Application for Amendment of USNRC Source Materials License SUA-1534 North Trend Expansion Area Technical Report Volume I".

11. WASTE MANAGEMENT:

This information is provided in detail in Section 5.0 of Crow Butte Resources, Inc.'s "Application for Amendment of USNRC Source Materials License SUA-1534 North Trend Expansion Area Technical Report Volume I".



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1 PROPOSED ACTIVITIES

1.1 LICENSING ACTION REQUESTED

Crow Butte Resources Inc. (CBR) makes this amendment application to the United States Nuclear Regulatory Commission (NRC) for amendment of Radioactive Source Materials License SUA-1534 concerning development of additional uranium in-situ leach mining resources located in Dawes County, Nebraska. The proposed development area for use as a satellite facility to the main CBR plant is referred to as the North Trend Expansion Area. The current NRC License Number SUA-1534 (Amendment 21) for the Crow Butte Project was issued on January 29, 2007. The expiration date of this license is February 28, 2008.

This amendment application has been prepared using suggested guidelines and standard formats from both state and federal agencies. The application is presented primarily in the NRC format found in Regulatory Guide 3.46, *Standard Format and Content of License Applications, Including Environmental Reports, For In Situ Uranium Solution Mining* (June 1982). NRC document NUREG-1569, *Standard Review Plan for In Situ Leach Uranium Extraction License Applications* (June 2003) was used to ensure that all information is provided to allow NRC Staff to complete their review of this amendment application.

1.2 CROW BUTTE URANIUM PROJECT BACKGROUND

The original development of what is now the Crow Butte Uranium Project was performed by Wyoming Fuel Corporation, which constructed a Research and Development (R&D) Facility in 1986. The project was subsequently acquired and operated by Ferret Exploration Company of Nebraska until May 1994, when the name was changed to Crow Butte Resources, Inc. This change was only a name change and not an ownership change. CBR is the owner and operator of the Crow Butte Project.

The Research and Development Facility was located in N1/2SE1/4 of Section 19, Township 31 North, Range 51 West. Operations at this facility were initiated in July 1986, and mining took place in two wellfields (WF-1 and WF-2). Mining in WF-2 was completed in 1987 and restoration of that wellfield has been completed. WF-1 was incorporated into Mine Unit 1 of Commercial Operations.

The current production wellfield is located within the license area as shown in Figure 2.1-2. The process plant is located in Section 19, Township 31 North, Range 51 West, Dawes County, Nebraska. This original license area is approximately 3,300 acres and the surface area affected over the estimated life of the project is approximately 1,100 acres.

CROW BUTTE RESOURCES, INC.

Technical Report North Trend Expansion Area



CBR has successfully operated the current production area since commercial operations began in 1991. Production of uranium has been maintained at design quantities throughout that period with no adverse environmental impacts. Groundwater restoration was successfully completed in Mine Unit 1 in 1999. Mine Unit 1 is currently undergoing surface reclamation activities. The operating history and schedules for the current production area are discussed in more detail in Section 1.7.

1.3 SITE LOCATION AND DESCRIPTION

The location of the original Crow Butte Project Area is in portions of Sections 11, 12, 13, and 24 of Township 31 North, Range 52 West and Sections 18, 19, 20, 29, and 30 of Township 31 North, Range 51 West, Dawes County, Nebraska. The plant site is situated approximately 4.0 miles southeast of the City of Crawford.

The proposed North Trend Expansion Area is located in Sections 21, 22, 27, 28, 33, and 34 of Township 32 North, Range 52 West. Figure 1.3-1 shows the general location of the current license area and the proposed North Trend Expansion Area.

Approximately 100% of the minerals leased in the North Trend Expansion Area are on private lands. Figure 1.3-2 shows the land ownership in the proposed North Trend Expansion Area.

1.4 ORE BODY DESCRIPTION

In the current license area, uranium is recovered by in-situ leaching from the Chadron Sandstone at a depth that varies from 400 feet to 900 feet. The overall width of the mineralized area varies from 1000 feet to 5000 feet. The ore body ranges in grade from less than 0.05% to greater than 0.5% U_3O_8 , with an average grade estimated at 0.27% U_3O_8 .

In the North Trend Expansion Area, uranium will also be recovered from the Chadron Sandstone. The depth in the North Trend Expansion Area ranges from 400 to 800 feet. The width varies from 100 feet to 1,000 feet. The ore body ranges in grade from less than 0.05% to greater than 0.5% U_3O_8 , with an average grade estimated at 0.20% U_3O_8 .

FIGURE 1.3-1

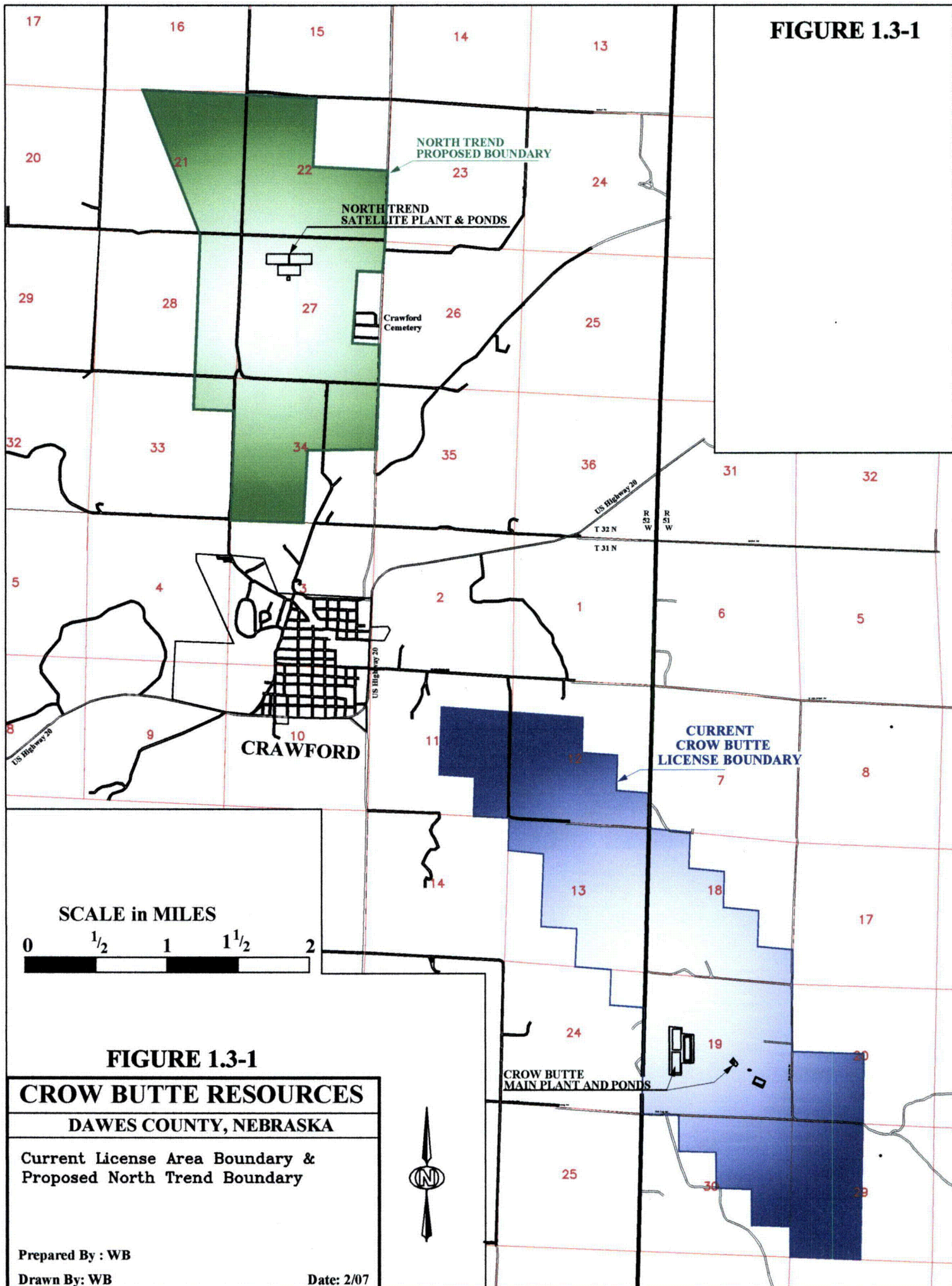
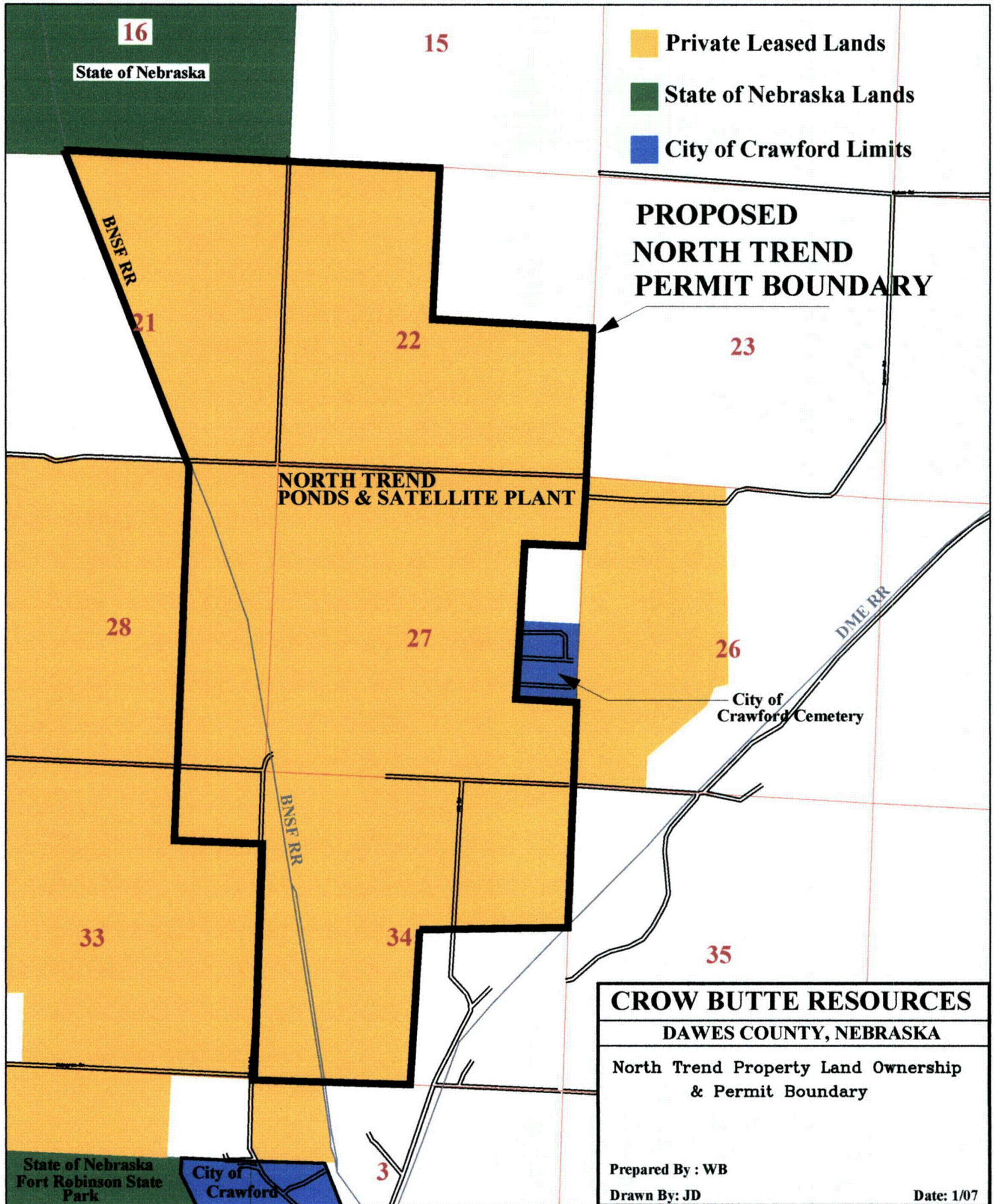


FIGURE 1.3-2
North Trend Property Land Ownership





1.5 SOLUTION MINING METHOD AND RECOVERY PROCESS

The in-situ leaching (ISL) process for uranium recovery consists of an oxidation step and a dissolution step. Gaseous oxygen or hydrogen peroxide is used to oxidize the uranium, and bicarbonate is used for dissolution. The uranium-bearing solution that results from the leaching of uranium underground is recovered from the wellfield and the uranium extracted in the process plant. The plant process uses the following steps:

- Loading of uranium complexes onto ion exchange resin;
- Reconstitution of the solution by the addition of bicarbonate and oxygen;
- Elution of the uranium complexes from the resin;
- Drying and packaging of the uranium.

1.5.1 Advantages of ISL Uranium Mining

ISL uranium mining is a proven technology that has been successfully demonstrated commercially in Wyoming, Texas, and at the Crow Butte Project in Nebraska. ISL mining of uranium is environmentally superior to conventional open pit and underground uranium mining as evidenced by the following:

1. ISL mining results in significantly less surface disturbance since mine pits, waste dumps, haul roads, and tailings ponds are not needed;
2. ISL mining requires much less water demand than conventional mining and milling, avoiding the water usage associated with pit dewatering, conventional milling, and tailings transport;
3. The lack of heavy equipment, haul roads, waste dumps, etc. result in very little air quality degradation at ISL mines;
4. Fewer employees are needed at ISL mines, thereby reducing transportation and socioeconomic concerns;
5. Aquifers are not excavated, but remain intact during and after ISL mining;
6. Tailings ponds are not used, thereby eliminating a major groundwater pollution concern. State of the art lined evaporation ponds may be used to manage liquid waste streams; and



7. ISL uranium mining results in leaving the majority of other contaminants (e.g., heavy metals) where they naturally occur instead of moving them to waste dumps and tailings ponds where their presence is of more environmental concern.

1.5.2 Ore Amenability to the ISL Mining Method

Amenability of the uranium deposits in the Crow Butte Project area to ISL mining was demonstrated initially through core studies. Results of the core studies were confirmed in the R&D project at the Crow Butte site using bicarbonate/carbonate leaching solutions with oxygen. Reports concerning the results of the R&D activities, including restoration of affected groundwater, were previously submitted to NRC and the Nebraska Department of Environmental Quality (NDEQ).

The information and experience gained during these pilot programs formed the basis for the commercial uranium ISL mining operations. CBR believes that the current commercial project, including the successful restoration of groundwater in Mine Unit 1, demonstrates that such a program can be implemented with minimal short-term environmental impacts and with no significant risk to the public health or safety. The remainder of this application describes the Mining and Reclamation Plans for this project and the concurrent environmental monitoring programs employed to ensure that any impact to the environment or public is minimal.

1.6 OPERATING PLANS, DESIGN THROUGHPUT, AND PRODUCTION

The current Crow Butte Plant is licensed for a flow rate of 5,000 gallons per minute, excluding restoration flow, under SUA-1534. Total annual production is limited to 2 million pounds of yellowcake.

Uranium extracted from the North Trend wellfield will be processed at a satellite facility located within the North Trend Expansion Area. The North Trend Satellite Plant will operate at a flow rate of 4,500 gpm with an expected annual production rate of 500,000 to 600,000 pounds U_3O_8 . Total reserves for the North Trend Expansion Area are not developed at this time. However, CBR has estimated recoverable resources at approximately 5,000,000 pounds U_3O_8 . The proposed North Trend license area encompasses approximately 2,110 acres. The planned mine units will impact approximately 1,310 acres based on CBR's current knowledge of available reserves.

The uranium extracted from the North Trend Expansion Area will be loaded onto ion exchange resin at the Satellite Plant. The ion exchange resin will then be transported by tanker truck to the Crow Butte Central Plant for elution, drying and packaging. Barren resin will be returned to the North Trend Satellite Plant by tanker truck.

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1.7 PROPOSED OPERATING SCHEDULES

1.7.1 Current Production Area

Sufficient reserves in the current license area have been estimated to allow mining operations to continue until the end of 2014. Completion of groundwater restoration in the current license area is scheduled for 2023. Status of the current mine unit operations is shown in Table 1.7-1. Projected production and restoration schedules for the current production area are shown in Figure 1.7-1.

Table 1.7-1: Current Production Area Mine Unit Status

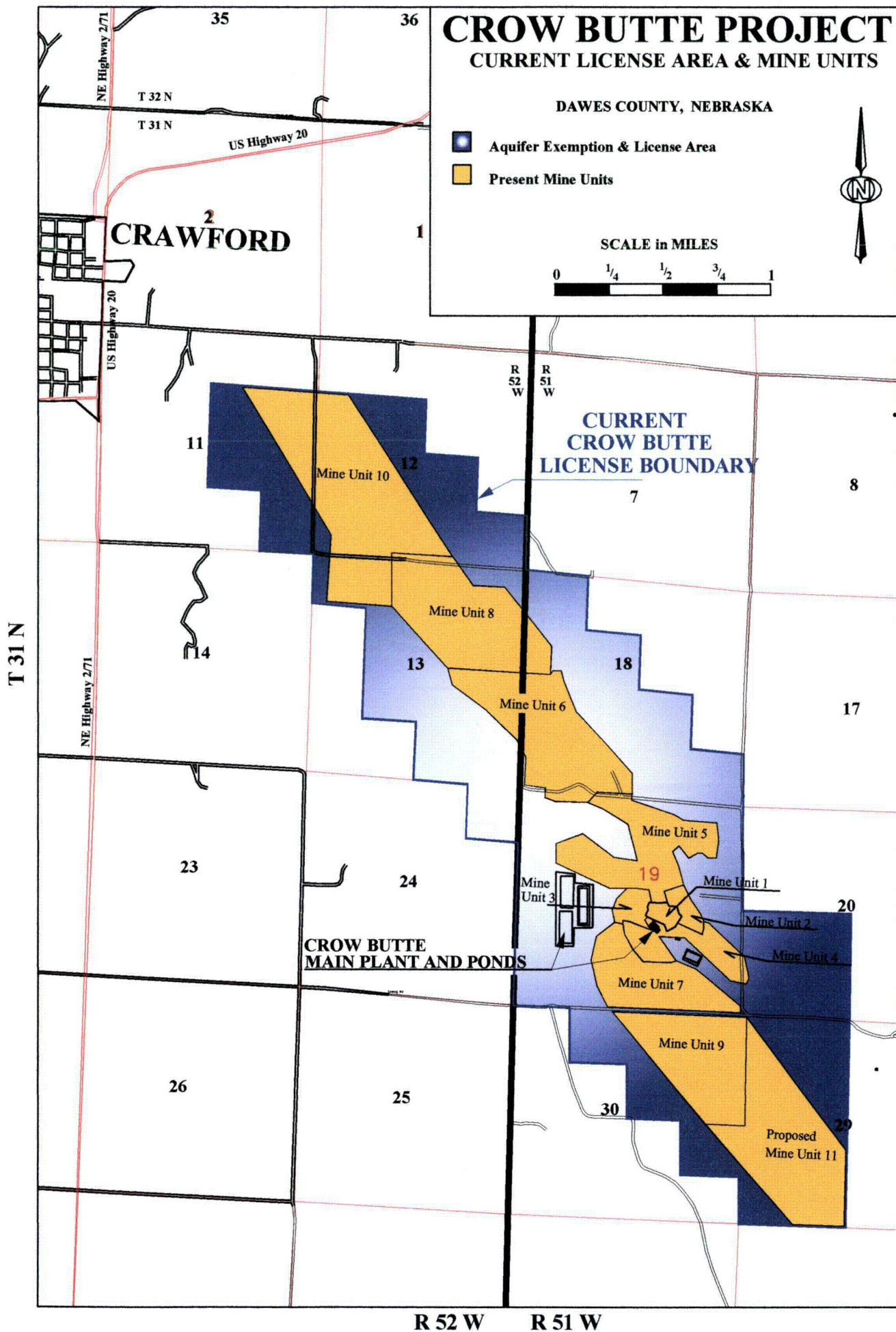
Mine Unit	Production Initiated	Current Status
Mine Unit 1	April 1991	Groundwater Restored; Reclamation Underway
Mine Unit 2	March 1992	Groundwater Restoration
Mine Unit 3	January 1993	Groundwater Restoration
Mine Unit 4	March 1994	Groundwater Restoration
Mine Unit 5	January 1996	Production
Mine Unit 6	March 1998	Production
Mine Unit 7	July 1999	Production
Mine Unit 8	July 2002	Production
Mine Unit 9	October 2003	Production

Additional mine unit plans are developed approximately one year prior to the planned commencement of new mining operations. For the current production area, planning and construction are underway for Mine Units 10 and 11. The layout of the current and planned mine units in the current license area is shown in Figure 1.7-2.

Figure 1.7-1 Current Production Area Mine Unit Schedule



FIGURE 1.7-2





1.7.2 North Trend Expansion Area Schedule

Assuming favorable regulatory action by the NRC and State of Nebraska regulatory agencies, CBR projects initial construction of the North Trend Satellite Plant and associated facilities in 2009. Production is scheduled to begin in late 2009 and last for approximately 11 years. Groundwater restoration activities at North Trend are expected to begin in late 2012 with Mine Unit NT-1. Groundwater restoration will extend for eight years with final site decommissioning completed by mid-2023.

Projected production and restoration schedules for the North Trend Expansion Area are shown in Figure 1.7-3. The layout of the proposed North Trend license area and mine units is shown in Figure 1.7-4.

Figure 1.7-3 North Trend Expansion Area Schedule

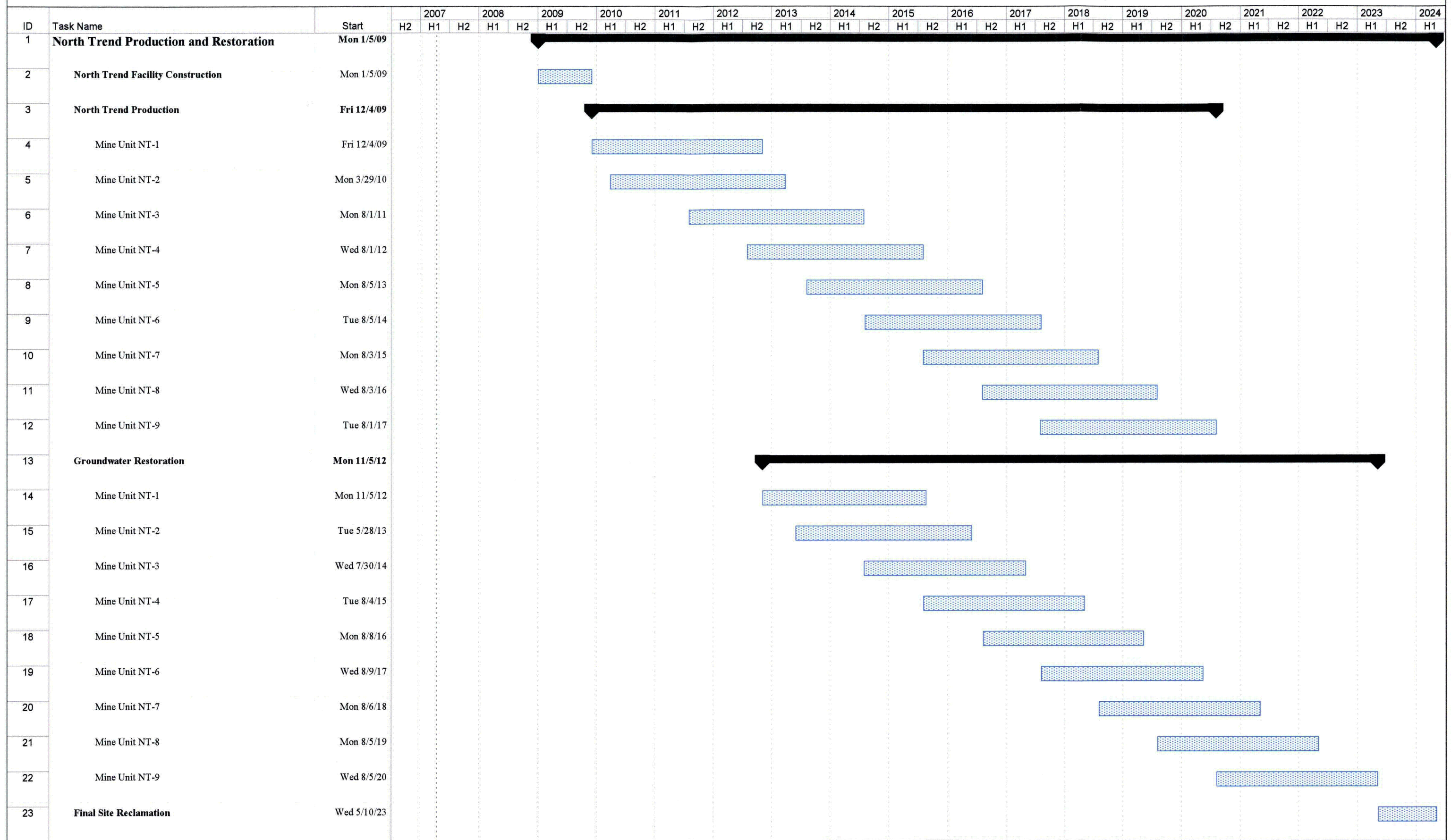
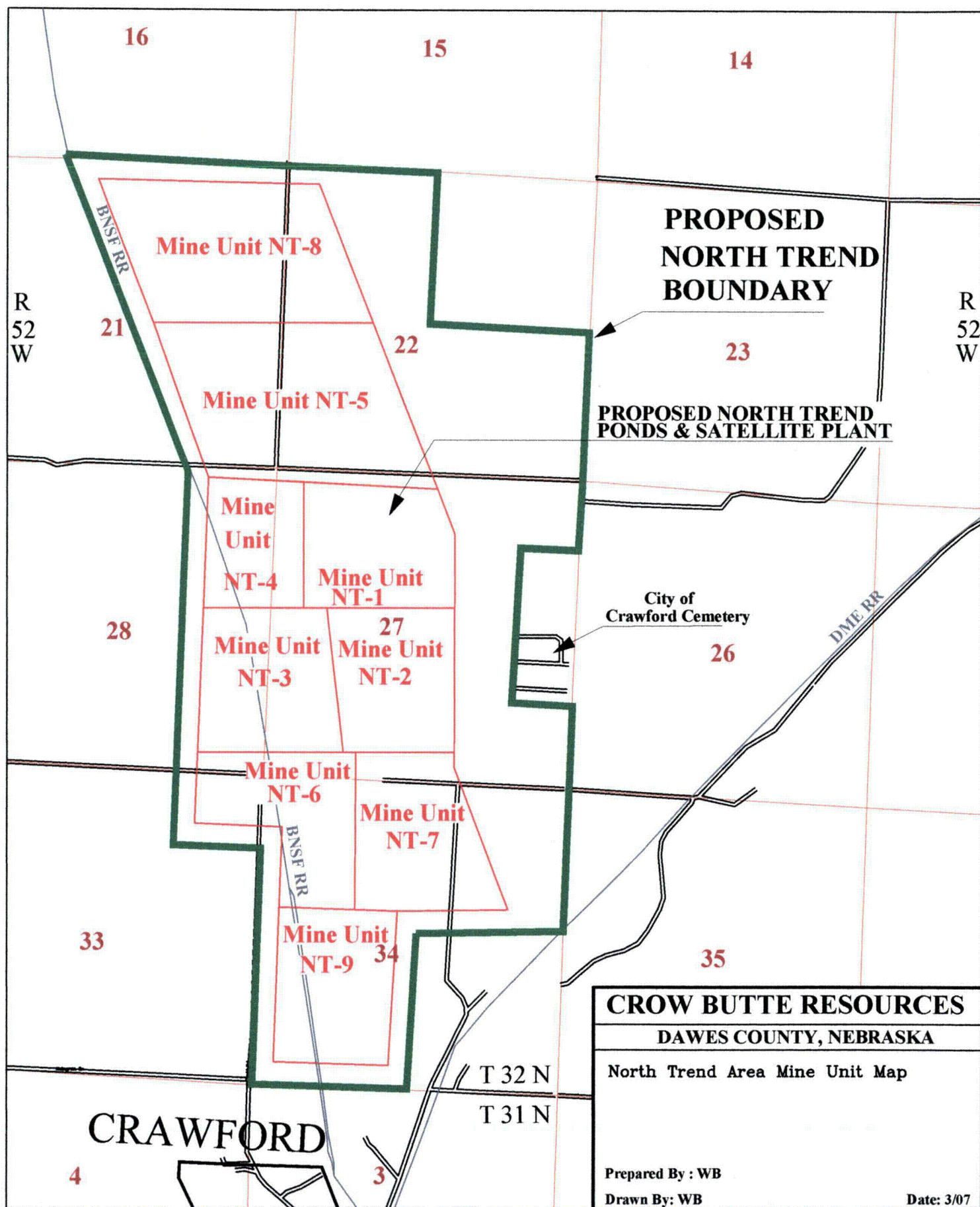


FIGURE 1.7-4
North Trend Area Mine Unit Map





1.8 WASTE MANAGEMENT AND DISPOSAL

1.8.1 Liquid Waste

There are currently three wastewater disposal options for the Crow Butte Project: evaporation in solar evaporation ponds, deep well injection, and land application. The specific method utilized depends upon the volume and characteristics of the waste stream.

The operation of the current process facility results in three sources of water that are collected on the site. They include the following:

- **Water generated during well development** - This water is recovered groundwater that has not been exposed to any mining process or chemicals. The water is discharged directly to one of the solar evaporation ponds and silt, fines and other natural suspended matter collected during well development is settled out. This water may be land applied, used in plant processing, or disposed of in a deep disposal well following treatment.
- **Liquid process waste** - The operation of the process plant results in two primary sources of liquid waste, an eluent bleed and a production bleed. This water is also routed to the evaporation ponds or injected into the deep well.
- **Aquifer restoration** - Following mining operations, restoration of the affected aquifer commences which results in the production of wastewater. The restoration waste is primarily brine from the reverse osmosis unit, which is sent to the waste disposal system. The permeate is either reinjected into the wellfield or sent to the waste disposal system.

Operation of the North Trend Satellite Plant will result in the following liquid waste streams:

- **Water generated during well development** - This water is recovered groundwater and is similar to well development water currently produced at the process plant. This water may be disposed of in the evaporation ponds or used in plant processing or disposed of in a deep disposal well following treatment.
- **Liquid process waste** - The operation of the satellite facility results in one primary source of liquid waste, a production bleed. This bleed will be routed to either the deep disposal well or evaporation ponds.



Technical Report North Trend Expansion Area

- **Aquifer restoration** - Following mining operations, restoration of the affected aquifer commences, which results in the production of wastewater similar to that produced during current restoration activities at the process plant.

Domestic liquid waste will be disposed of in an on-site wastewater treatment (i.e., septic) system properly permitted by the NDEQ under the Class V Underground Injection Control (UIC) Regulations.

Sources and methods of handling liquid wastes are discussed in more detail in Section 4.

1.8.2 Solid Waste

Solid wastes generated consist of spent resin, resin fines, filters, miscellaneous pipe and fittings, and domestic waste. These wastes are classified as contaminated or non-contaminated waste according to radiological survey results. Contaminated byproduct waste that cannot be decontaminated is packaged and stored until it can be shipped to a licensed waste disposal site or licensed mill tailings facility. Non-contaminated solid waste is collected on the site on a regular basis and disposed of in a sanitary landfill permitted by the NDEQ.

1.8.3 Contaminated Equipment

Materials and equipment that become contaminated as a result of normal operations are decontaminated if possible and disposed of by conventional methods. Equipment and materials that cannot be decontaminated are treated in the same manner as other contaminated solid waste.

1.9 GROUNDWATER RESTORATION

Restoration activities will be carried out at the North Trend Expansion Area concurrent with mining activities. The restoration process will be similar to that used to restore wellfields at the Crow Butte Project site, and consist of four basic activities:

- **Groundwater transfer-** groundwater is transferred between the mining unit commencing restoration and a mine unit commencing production or another water source.
- **Groundwater sweep-** water is pumped from the wellfield, which results in an influx of baseline quality water from the wellfield perimeter.

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- **Groundwater treatment-** water from injection wells is pumped to the restoration plant where ion exchange, reverse osmosis, filtration or other treatment methods take place.
- **Wellfield recirculation** - water is recirculated by pumping from the production wells and reinjecting the recovered solution. This will act to homogenize the quality of the aquifer.

Following these restoration phases, a groundwater stabilization monitoring program is initiated. Once the restoration values are reached and maintained, restoration is deemed complete. Results are documented in a Restoration Report and submitted to the NDEQ and the NRC for approval. Groundwater restoration is described in more detail in Section 6.

1.10 DECOMMISSIONING AND RECLAMATION

At the completion of mine life and after groundwater restoration has been completed, all injection and recovery wells will be plugged and the site decommissioned. Decommissioning will include satellite plant disassembly and disposal, pond reclamation and land reclamation of all disturbed areas. Appropriate NRC Regulatory Guidelines will be followed as required. Decommissioning and reclamation are discussed in more detail in Section 6.

1.11 SURETY ARRANGEMENTS

Crow Butte Resources maintains a NRC-approved financial surety arrangement consistent with 10 CFR 40, Appendix A, Criterion 9 to cover the estimated costs of reclamation activities. Crow Butte maintains an Irrevocable Standby Letter of Credit issued by the Royal Bank of Canada in favor of the State of Nebraska in the present amount of \$22,980,913. The surety amount is revised annually in accordance with the requirements of SUA-1534. The surety amount will be revised to reflect the estimated costs of reclamation activities for the North Trend Expansion Area as development activities proceed.



2 SITE CHARACTERISTICS

2.1 SITE LOCATION AND LAYOUT

The location of the current license area of the Crow Butte project is in Sections 11, 12, and 13 of Township 31 North, Range 52 West and Sections 18, 19, 20, 29, and 30 of Township 31 North, Range 51 West, Dawes County, Nebraska. The proposed North Trend Expansion Area is located in Sections 21, 22, 27, 28, 33, and 34 of Township 32 North, Range 52 West.

The maps used in this section and other sections of this amendment application are Vector 7.5 minute quad maps. These are CAD/GIS drawings where each road, stream, and contour line are individual entities. The layers in these maps were derived from the U.S. Census Bureau's TIGER/Line data, USGS Digital Line Graph (DLG) Data, USGS Digital Elevation Model (DEM) data, Bureau of Land Management (BLM) Section Line data, National Geodetic Survey (NGS) Benchmark data, and USGS Geographical Names Information System (GNIS) data. This base map was then used for each of the figures prepared for this document with the addition of the pertinent information for that figure.

Figure 2.1-1 shows the general area surrounding the project area including the current license area and the proposed North Trend Expansion Area. Figure 2.1-1 also shows the original Commercial Study Area (CSA) and the 2.0-mile review area associated with the North Trend Expansion Area.

Figure 2.1-2 shows the general project site layout and Restricted Areas for the current license area including the Central Processing Plant building area, the R&D facility, the current mine unit boundaries, the deep disposal well, and the R&D and commercial evaporation ponds.

Figure 2.1-3 shows the proposed location of the satellite plant, wellfields, evaporation pond, deep disposal well, and controlled area boundaries within the North Trend Expansion Area.

Figure 2.1-4 shows the project location with topographical features, drainage and surface water features, nearby population centers and political boundaries as well as principal highways, railroads, transmission lines, and waterways.

FIGURE 2.1-2

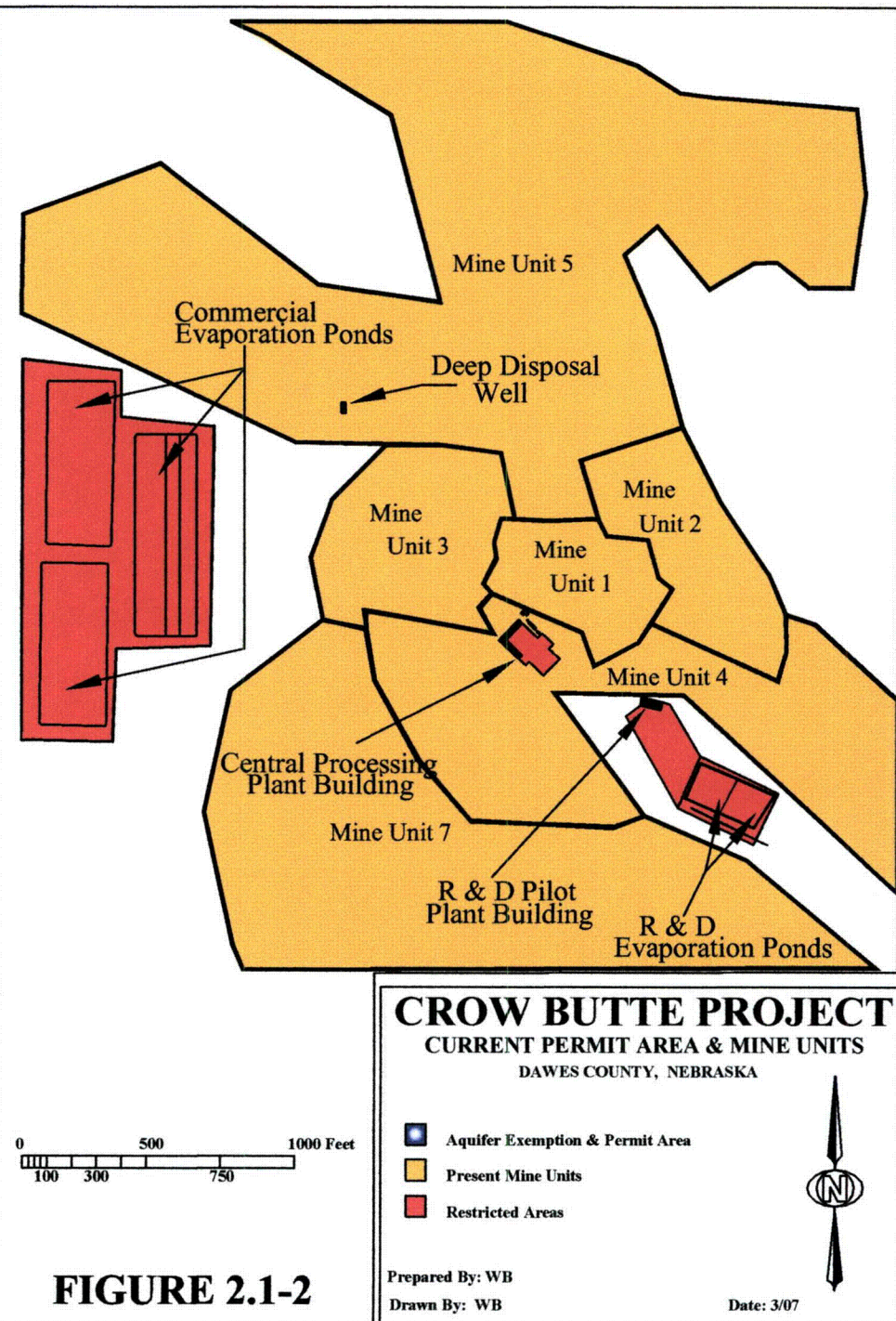
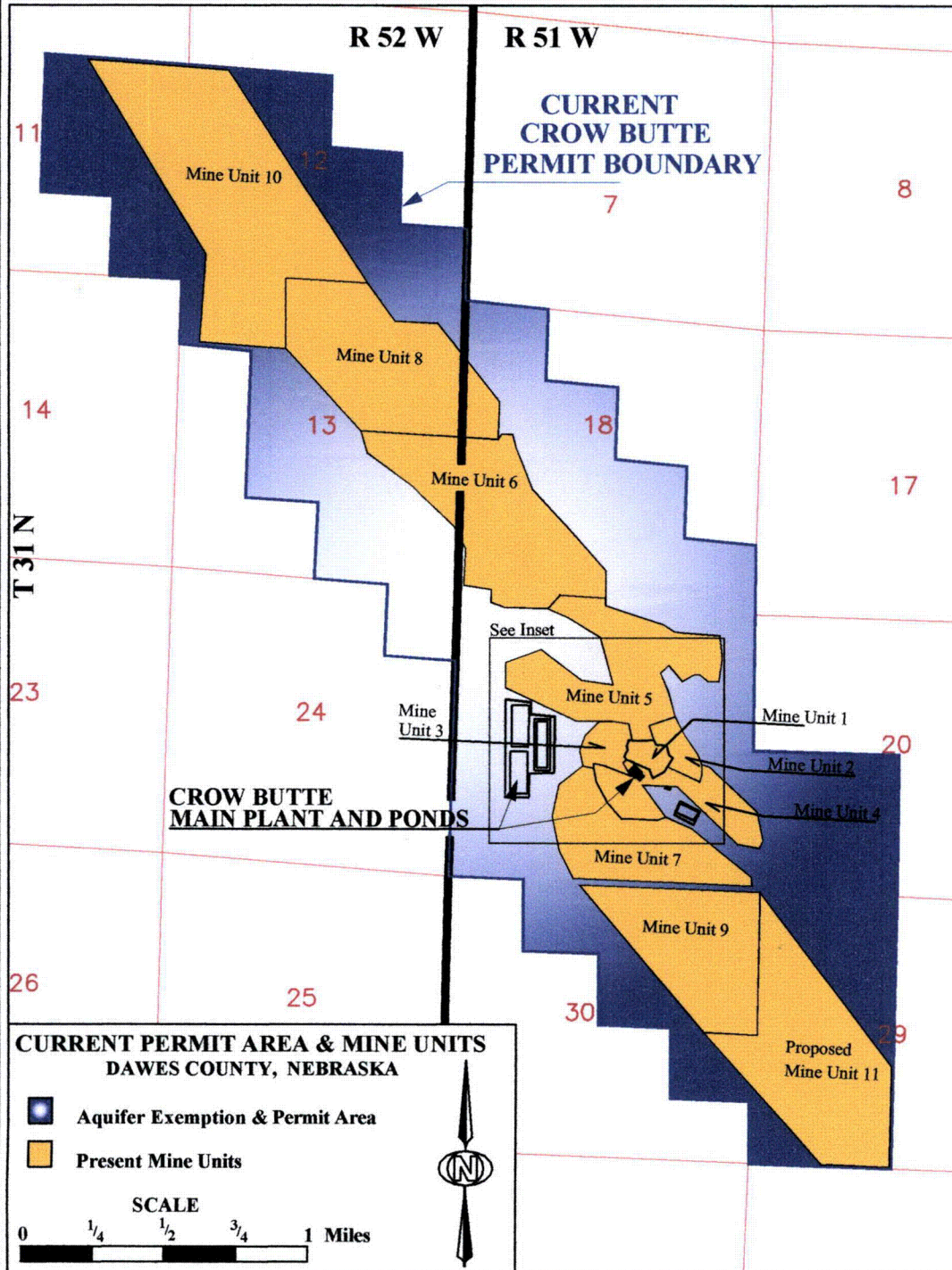
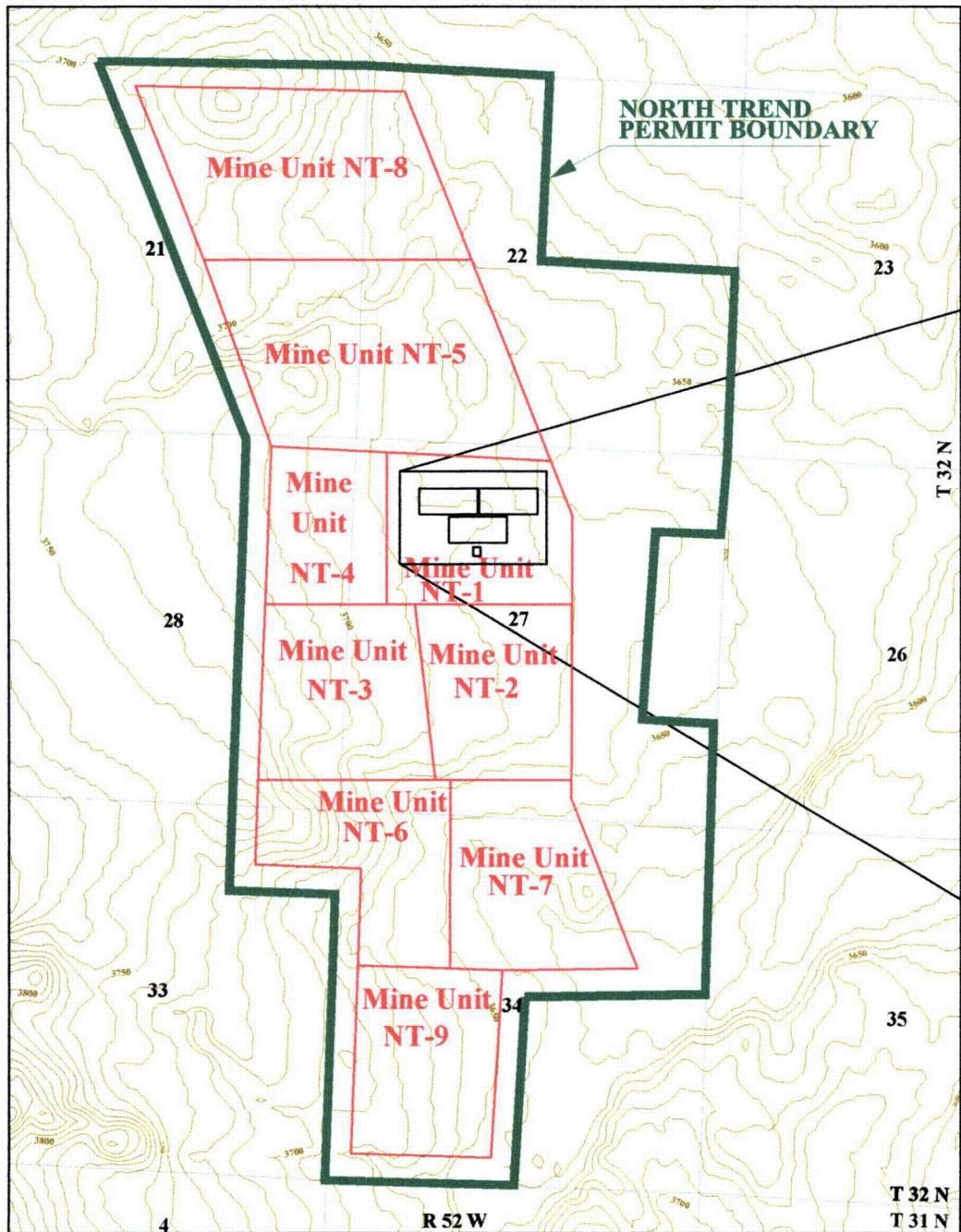


FIGURE 2.1-2



CROW BUTTE RESOURCES, INC.
License Amendment Application
North Trend Expansion Area

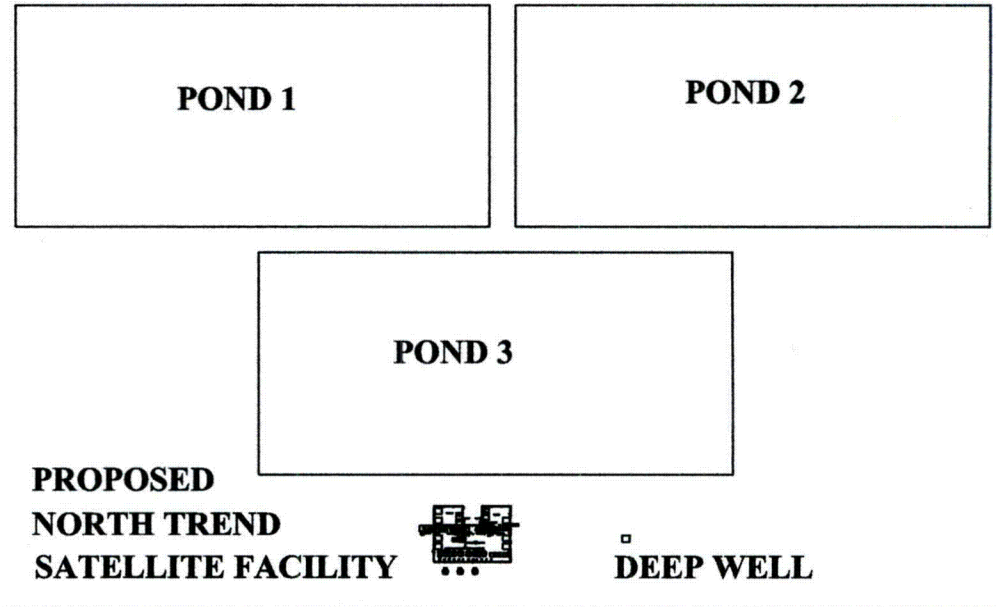


FIGURE 2.1-3

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General Arrangement
Satellite Plant
Plan View

Figure 2.1-4

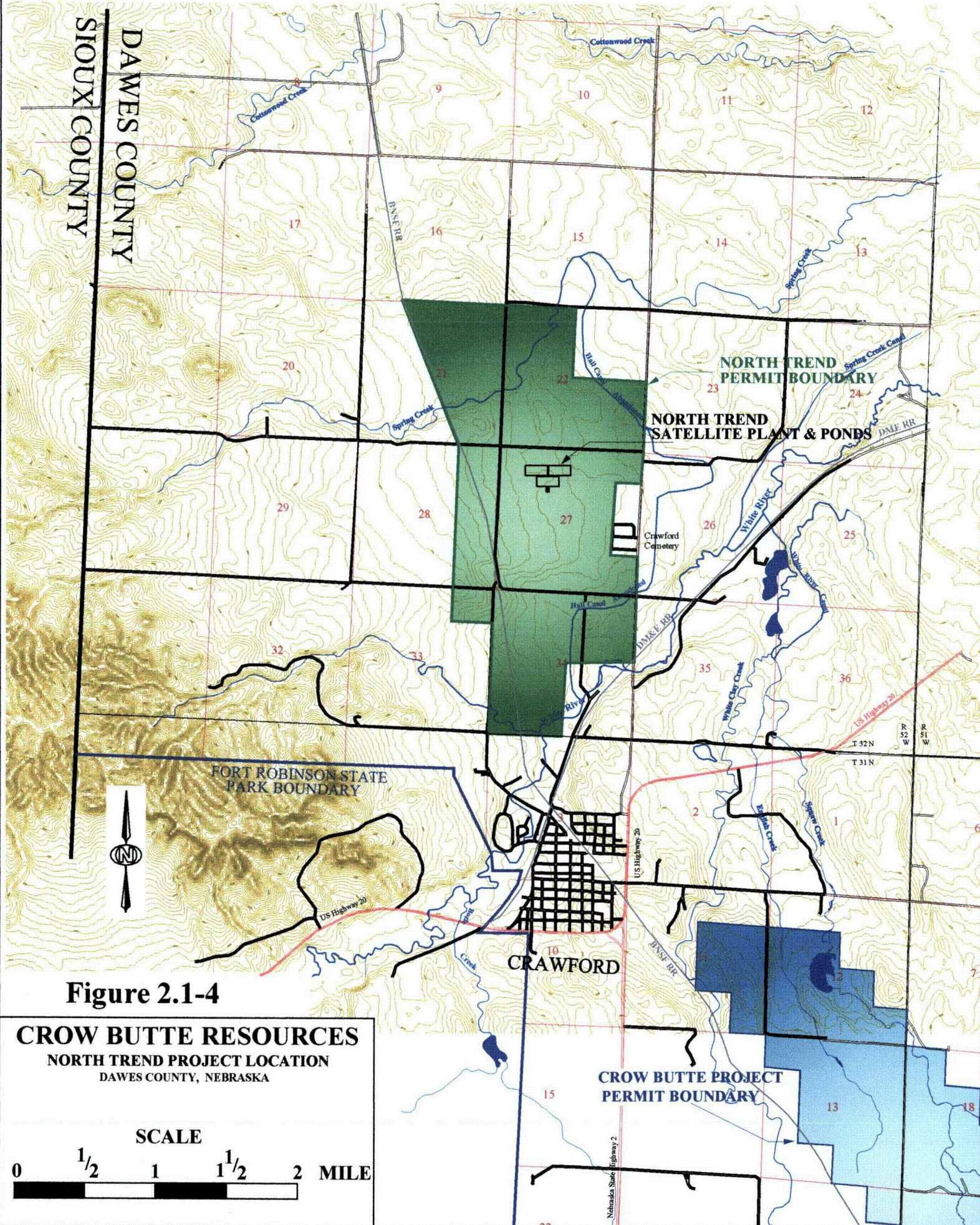


Figure 2.1-1

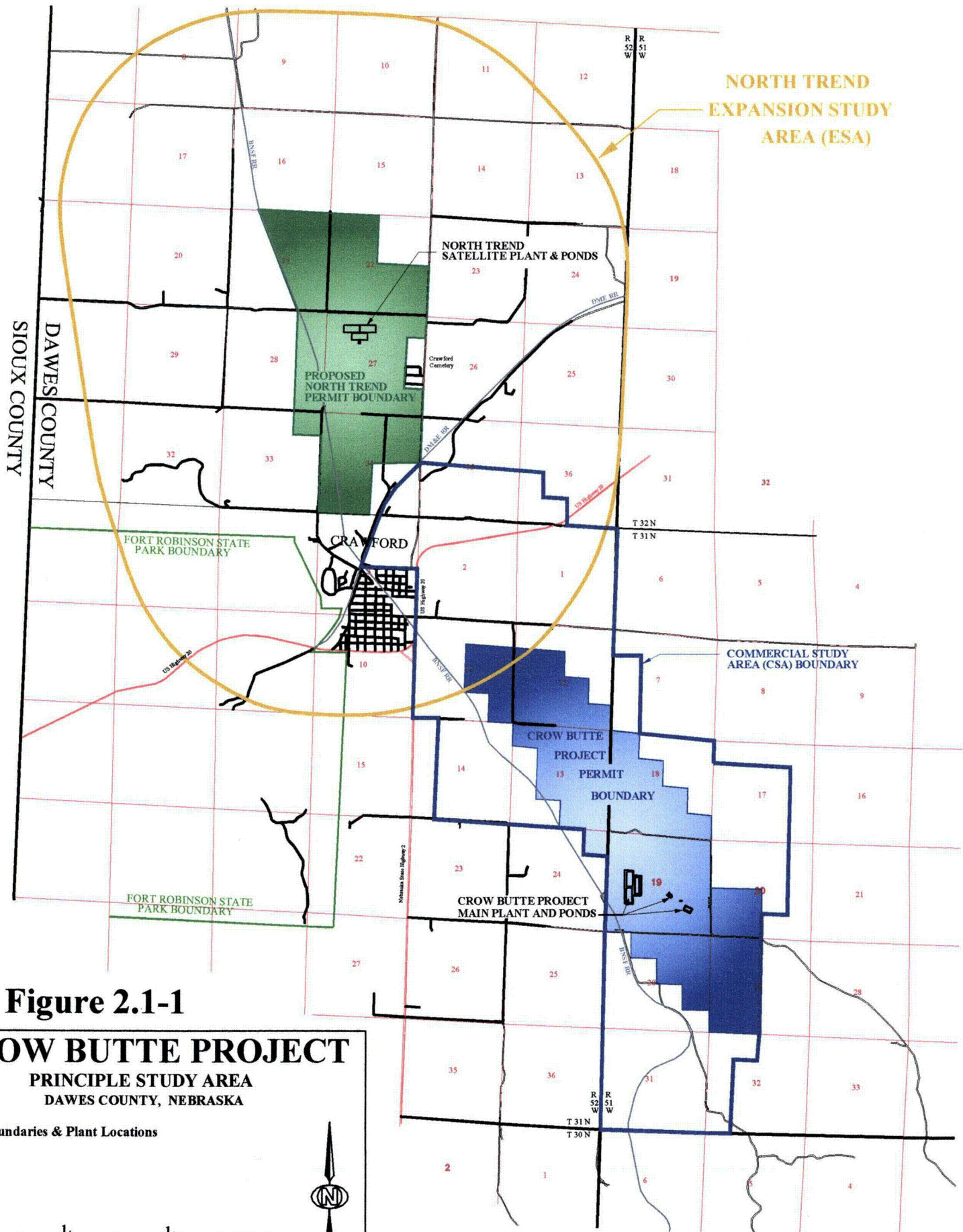


Figure 2.1-1

CROW BUTTE PROJECT

**PRINCIPLE STUDY AREA
DAWES COUNTY, NEBRASKA**

Permit Boundaries & Plant Locations

SCALE 0 1/2 1 1 1/2 2 MILE



2.2 USES OF ADJACENT LANDS AND WATERS

The information in this section provides relevant data concerning the physical, ecological, and social characteristics of the current license area, the proposed North Trend Expansion Area, and the surrounding environs for uranium in situ mining.

This section indicates the nature and extent of present and projected land and water use and trends in population or industrial patterns. The information in this section was initially developed over a 9-month period in 1982 as part of the Research and Development (R&D) License Application and updated in 1987 for the Commercial License Application and in 1997 for the License Renewal Application. Preliminary data were obtained from several sources followed by field studies to collect on-site data to check land uses. Interviews with various state and local officials provided additional information.

NUREG 1569 requires discussion of land and water use in the proposed License Area, and within a 2.0-mile radius surrounding the License Area. Because previous historical studies were performed assuming a 2.25-mile review area, some data in this section are based on a 2.25-mile radius. A 2.25-mile radius was used rather than the required 2.0-mile radius to remain consistent with other resource descriptions. For water resources, oil and gas resources and well locations, the standard 2.0-mile review area is used.

Specifically for the North Trend Area Application, population, land use, and water use data were re-evaluated by CBR during the spring of 2004. These original data were updated through additional data collection and review, personal communications, and site reconnaissance. Population distribution characteristics were updated in 2004 as well.

Land use within the North Trend Area and a 2.25-mile review area is illustrated on Figure 2.2-1. Little change has been noted in area land use in the past 23 years, reflecting the stagnant nature of economic activity in the area and slight decline in the populations of the city of Crawford and Dawes County.

2.2.1 General Setting

The Crow Butte project site is located in west-central Dawes County, Nebraska, just north and west of the Pine Ridge Area.

Figure 2.2-1 shows land use in the general location of the current license area and the proposed North Trend Area. Table 2.2-1 provides a description of the land use types depicted on Figure 2.2-1.

CROW BUTTE RESOURCES, INC.

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The current License Area is located about 4.0 miles southeast of the City of Crawford on Squaw Creek Road. State Highway 2/71 provides access to the project area from points north and south of Crawford. U.S. Highway 20 provides access to Crawford and the project area from points east and west.

The North Trend Expansion Area is located north of the city of Crawford (Figure 2.2-1).

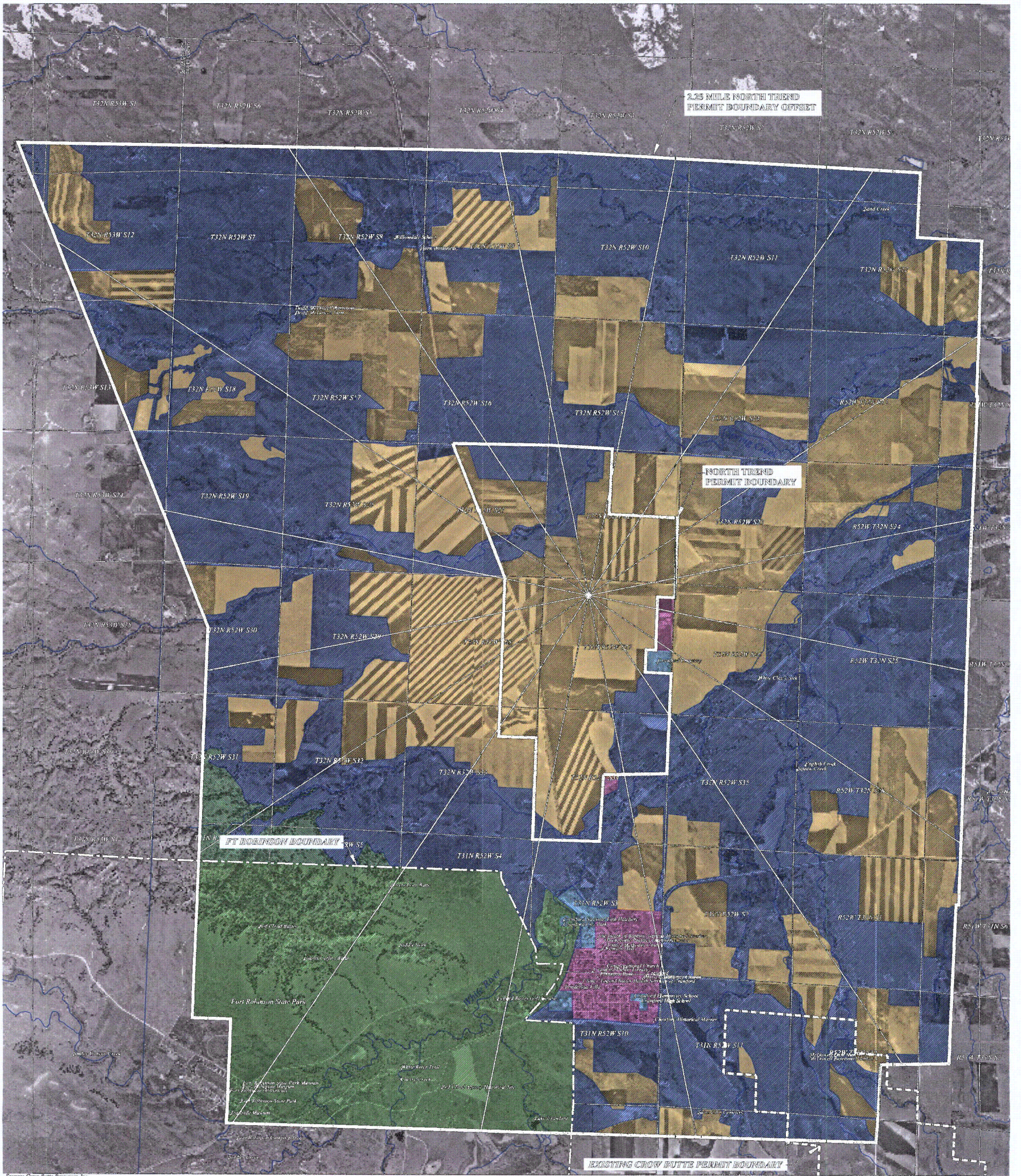
2.2.2 Land Use

The current license area and the proposed North Trend Expansion Area are located in west-central Dawes County, Nebraska, just north and west of the Pine Ridge Area. Land use within the North Trend Expansion Area and a 2.25-mile review area around the North Trend Expansion Area is illustrated on Figure 2.2-1. (A 2.25-mile review area radius was used for land use rather than the 2-mile review area required in Regulatory Guide 3.46 radius to remain consistent with other resource descriptions.)

Figure 2.2-1 shows land use in the general location of the proposed North Trend Expansion Area. Table 2.2-1 describes the land use types depicted on Figure 2.2-1.

The current license area is located about 4 miles southeast of the City of Crawford via West Ash Creek Road and Squaw Creek Road. State Highway 2/71 provides access to the project area from points north and south of Crawford. U.S. Highway 20 provides access to Crawford and the project area from points east and west.

The North Trend Expansion Area is located approximately 0.5 mile north of Crawford and approximately 4.5 miles northwest of the current process plant. State Highway 2/71 runs along the east boundary of the North Trend Expansion Area.



Source: Crow Butte Resources, Inc.

LEGEND

- RANGELAND
- CROPLAND
- FORESTED LAND
- COMMERCIAL AND SERVICES
- RECREATIONAL LAND
- RESIDENTIAL

CROW BUTTE PROJECT

REGIONAL AREA BASE MAP
DAWES & SIOUX COUNTIES, NEBRASKA

FIGURE 2.2-1 NORTH TREND LAND USE



Date: 3/7/07 Drawn: PBB Fig. 22-1

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TABLE 2.2-1 LAND USE DEFINITIONS

Croplands (C)	Harvested cropland, including grasslands cut for hay, cultivated summer-fallow, and idle cropland.
Commercial and Services (C/S)	Those areas are 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 production 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 1 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 are persistently water-covered.
Recreational (RC)	Land used for public or private leisure, 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.



2.2.2.1 Current License Area

Table 2.2-2 presents land uses in 22 1/2° sectors centered on each of the 16 compass points. These sectors radiate out from the geographic center of the current License Area. Table 2.2-1 explains each of the land use types. The total areas of the sectors vary because of the irregular site boundary. Pastureland comprises the greatest portion of land use within the current license area and surrounding 2.25-mile area (29 percent). Cropland (28 percent), forest land (13 percent), and wildlife habitat (10 percent) are the other significant land uses.

2.2.2.2 North Trend Expansion Area

Table 2.2-3 presents land uses in 22 1/2° sectors centered on each of 16 compass points radiating out from the geographic center of the North Trend Expansion Area. Table 2.2-1 explains each of the land use types. Rangeland comprises the greatest portion of land use within the North Trend Expansion Area and surrounding 2.25-mile review area (52.2 percent). Cropland (33.3 percent), recreation (11.8 percent), forest land, urban land, and residential land are the other significant land uses.

Livestock raising is the primary land use within the North Trend Expansion Area and the surrounding 2.25-mile review area. In the North Trend Area, most of the land is cropland; however, most of the review area is rangeland, resulting in a higher proportion of land used for grazing. In 2003, an average of 48,000 head of livestock was reported in Dawes County (NASS 2004). Native grasslands are used for grazing or for cut hay. Livestock values have remained consistent between the years 1990 and 2001, the last year for which livestock values are available. In 2001, cash receipts for livestock and products totaled \$21.0 million in Dawes County.

The primary land use specifically in the North Trend Expansion Area is cropland, primarily for the production of wheat. A small amount of cropland in the North Trend Expansion Area is used for producing alfalfa. In 2003, the total wheat production in Dawes County was 1,836,500 bushels, an increase of 169 percent over the 2002 wheat production of 682,200 bushels.

Recreational lands also are present in Dawes County (see Table 2.2-4). Recreational opportunities provided by federal and state lands in the county have become an increasingly important component of the local economy. Fort Robinson State Park, the largest state park in Nebraska, is located within the 2.25-mile review area for the North Trend Expansion Area. Approximately 9 percent of the area within an 8-km (5-mile) radius of the current license area site is located within the Fort Robinson State Park. This part of the state park is west of Crawford, and includes portions of the Red Cloud Agency

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Historical Site, the White River Trail, and several scenic landforms in a rugged area of buttes and Ponderosa Pine forest.

Other facilities at the park include lodging, showers, electrical hookups, pit toilets, ski and snowmobile trails, a rodeo arena, and a museum. Visitors to the park may go hunting, fishing, hiking, swimming, or horseback riding. Other recreational facilities in Dawes County include the Ponderosa Wildlife Management Area, Chadron State Park, Soldier Creek Management Unit, and the Red Cloud Picnic Area and associated trails in the Nebraska National Forest (Nebraska Game and Parks Commission 1982).

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Technical Report North Trend Expansion Area



TABLE 2.2-2 LAND USE OF THE CURRENT LICENSE AREA AND WITHIN A 2.25-MILE (3.6-KM) RADIUS OF THE LICENSE 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					3284.6
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						1432.6
SW	628.0		12.7	467.3								1108.0
WSW	671.6	6.2	7.5	404.0					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				2495.9
TOTAL	8224.3	3862.0	2811.6	8488.5	1161.8	71.7	2969.6	251.4	1904.4	257.5	15.1	30017.9

¹ 22 1/2° sectors centered on each of the 16 compass points

² See Table 2.2-1 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 2.2-3 PRESENT LAND USE OF THE NORTH TREND LICENSE AREA AND WITHIN A 2.25-MILE (3.6-KM) RADIUS OF THE PROPOSED NORTH TREND LICENSE BOUNDARY (IN ACRES)

COMPASS SECTOR	LAND USE											TOTAL
	C	F	M	P	R	W	H	C/S	RC	UR	I	
N	557.1	0.0	0.0	0.0	894.2	0.0	0.0	0.0	0.0	0.0	0.0	1451.3
NNE	427.8	0.0	0.0	0.0	1211.4	0.0	0.0	0.0	0.0	0.0	0.0	1639.2
NE	674.9	0.0	0.0	0.0	1221.7	0.0	0.0	0.0	0.0	0.0	0.0	1896.6
ENE	998.5	0.0	0.0	0.0	317.6	0.0	0.0	0.0	0.0	0.0	0.0	1316.0
E	331.6	0.0	0.0	0.0	739.7	0.0	0.0	0.0	0.0	8.7	0.0	1080.0
ESE	410.9	0.0	0.0	0.0	803.2	0.0	0.0	0.0	0.0	22.4	0.0	1236.5
SE	731.6	0.0	0.0	0.0	1245.9	0.0	0.0	22.6	0.0	2.7	0.0	2002.7
SSE	847.7	0.0	0.0	0.0	1626.5	0.0	0.0	0.0	0.0	10.4	0.0	2484.5
S	549.9	0.0	0.0	0.0	684.3	0.0	0.0	77.7	541.5	327.6	0.0	2181.1
SSW	326.9	0.0	0.0	0.0	375.7	0.0	0.0	0.0	1807.9	0.0	0.0	2510.5
SW	410.5	191.0	0.0	0.0	529.0	0.0	0.0	0.0	1082.8	0.0	0.0	2213.3
WSW	676.1	124.8	0.0	0.0	501.4	0.0	0.0	0.0	0.0	0.0	0.0	1302.2
W	546.7	0.0	0.0	0.0	620.4	0.0	0.0	0.0	0.0	0.0	0.0	1167.1
WNW	652.0	0.0	0.0	0.0	1328.9	0.0	0.0	0.0	0.0	0.0	0.0	1980.9
NW	1018.8	0.0	0.0	0.0	1943.2	0.0	0.0	0.0	0.0	0.0	0.0	2962.0
NNW	557.7	0.0	0.0	0.0	1197.5	0.0	0.0	0.7	0.0	0.0	0.0	1755.8
TOTAL	9718.6	315.8	0.0	0.0	15240.7	0.0	0.0	101.0	3432.1	371.8	0.0	29180.0

1 22 1/2° sectors centered on each of the 16 compass points

2 See Table 2.2-1 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

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**TABLE 2.2-4 RECREATIONAL FACILITIES WITHIN 50 MILES OF THE
CURRENT AND PROPOSED NORTH TREND LICENSE AREAS**

Name of Recreational Facility	Distance From Current License Area (miles)	Distance From North Trend Expansion Area (miles)
Red Cloud Campground	19.0	20.0
Pine Ridge National Recreation Area	13.0	15.0
Roberts Trailhead and Campground	11.0	14.0
Museum of the Fur Trade	24.0	27.0
Toadstool Park	18.0	11.0
Warbonnet Battlefield	24.0	22.0
Hudson-Meng Bison Kill Site	17.0	11.0
Crawford City Park	2.0	1.0
Whitney Lake	10.0	8.0
Legend Buttes Golf Course	2.0	1.0
Box Butte Reservoir	24.0	21.0
Ponderosa Wildlife Area	2.0	5.0
Peterson Wildlife Area	11.0	8.0
Walgren Lake State Recreation Area	38.0	45.0
Soldier Creek Wilderness	7.0	8.0
Chadron State Park	17.0	18.0
Agate Fossil Beds National Monument	27.0	25.0

Source: Nebraska Department of Roads, 2004.
DeLorme Maps, 1996

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Technical Report North Trend Expansion Area

Residential and industrial land uses in the county are concentrated within the city limits of Crawford and Chadron. Industrial land uses are located within the city limits of Crawford, and occur primarily around railroad facilities.

2.2.2.2.1 Agriculture

Several of the soil types found in the vicinity of the North Trend Expansion Area are classified as prime farmland (Dixon 1982). However, in Dawes County, soils are classified by the U.S. Soil Conservation Service (SCS) as prime farmland only if irrigated. According to 2004 Nebraska State Agricultural Statistics, only two percent of Dawes County agricultural land is irrigated, and about 10 percent of harvested cropland acreage is irrigated. The remainder of the irrigated land is used for pasture, habitat, or rangeland (Nebraska Crop and Livestock Reporting Service 1980; 1981).

Table 2.2-5 through Table 2.2-7 show agricultural productivity within Dawes County and the North Trend Expansion Area. Wheat and hay are the major crops grown on croplands within the area. Most of these crops are used for livestock feed while the remaining crops are commercially sold. The livestock inventory for Dawes County indicates that cattle account for more than 80 percent of all livestock. According to a report prepared for the Economic Development Department of the Nebraska Public Power Corporation (2005), the market value of livestock products accounted for 85.7 percent of the total market value of all agricultural products sold in 2002. Livestock and livestock products had a value of \$28.81 per acre, indicating that livestock production on rangeland within the review area has a potential value of more than \$440,000.

2.2.2.2.2 Habitat

Habitat lands are those dedicated wholly or partially to the production, protection, or management of species of fish or wildlife. Significant areas classified as habitat include the Ponderosa State Wildlife Management Area, which is south of the North Trend Expansion Area and adjacent to the current license area as shown in Figure 2.2-1. Deer and turkey hunting are permitted within the Ponderosa State Wildlife Management Area. There is no land within the license area that is used primarily for wildlife habitat. Wildlife habitat is a secondary use of rangeland, forestland, and recreational land within the license area and the 2.25-mile review area.



TABLE 2.2-5 AGRICULTURAL YIELDS FOR CROPLANDS IN DAWES COUNTY, 2001

	<u>Harvested</u>		<u>Yield</u>		<u>Production</u>
	Acres ^a	km ²	Per acre	Per km ²	
Corn for Grain (bu)	3,100	12.65	97.5 bu	24,093 bu	302,300 bu
Sorghum for Grain (bu)	200	0.81	35.0 bu	8,649 bu	7,000 bu
Oats for Grain (bu)	400	1.62	46.0 bu	11,367 bu	18,400 bu
Winter Wheat for Grain (bu)	33,700	13.64	35.6 bu	8,797 bu	1,198,700 bu
All hay ^b (tons)	77,000	136.38	1.6 tons	395 tons	123,800 tons
Dry Edible Beans (lbs)	700	2.83	2,106 lbs	520,000 lbs	14,740 lbs
Sunflowers (lbs.)	1,200	4.86	988 lbs	244,000 lbs	1,185,000 lbs
Sugarbeets (tons)	600	2.43	20.2 tons	4,992 tons	12,100 tons

Notes: bu bushels
 a 1 acre = 0.0040469 km²
 b Includes wild and tame alfalfa.



**TABLE 2.2-6 POTENTIAL AGRICULTURAL PRODUCTION FOR
CROPLAND IN THE NORTH TREND EXPANSION AREA AND 2.25-MILE REVIEW AREA**

	Percent of Total Planted^a	Total Cropland (acres)^b	Percent of Planted/ Harvested^a	Harvested (acres)	Harvested (km²)	County Yield (bu/acre)	County Yield (bu/km²)
Wheat	33.3	9,718.6	89.03	8,652.5	35	35.6	1,830

Notes: ^a Same as for Dawes County.
^b 1 acre = .0040469 km².
 bu bushels

Source: Nebraska Agricultural Statistics Service 2001



TABLE 2.2-7 LIVESTOCK INVENTORY, DAWES COUNTY, 2002

	Number	Percent of Total	<u>Animal Units ^a</u>	
			Pounds (000s)	Percent
All Cattle, except dairy	47,258	94.7	47,258	98.8
Dairy cattle	148	0.003	148	0.003
Hogs	305	0.006	67.1	0.001
Sheep	1,740	0.03	348	0.007
Chickens	431	0.01	2.2	0.00005
Total animals	49,882	100.0	47,823.3	100.0

Notes:

^a Animal unit conversions:

1 cow = 1,000 lb.
 1 hog = 220 lb.
 1 sheep = 200 lb.
 1 chicken = 5 lb.
 1 animal unit = 1,000 lb.

Source: U.S. Census of Agriculture 2002.



2.2.2.2.3 Residential

Based on a site reconnaissance (conducted in June 2004 and recently updated) and a Nebraska Department of Natural Resources aerial photo of the license area, there is one occupied housing unit in the North Trend Expansion Area. The unit is in the south portion of the license area. The City of Crawford is located south of the license area within the 2.25-mile review area. The review area includes Crawford, which contains 537 housing units, of which 473 are occupied, and an estimated 44 occupied rural housing units that are located outside of Crawford and the North Trend Expansion Area (US Census 2000). There are 526 occupied housing units within the 2.25-mile review area.

Table 2.2-8 shows the distance to the nearest residence and to the nearest site boundary of residences within the 2.25-mile radius review area from the center of the North Trend Expansion Area for each 22 1/2° sector centered on each compass point.

There are no dwelling units within 1 km (0.62 miles) of the center point of the proposed North Trend Expansion Area. Four dwelling units are within 2 km (1.24 miles). Table 2.2-9 shows the distance to the nearest residence and to the nearest site boundary from the center of the site for each 22 1/2° sector centered on each compass point for the proposed North Trend Expansion Area.

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**TABLE 2.2-8 DISTANCE TO NEAREST RESIDENCE AND SITE BOUNDARY
FROM CENTER OF CURRENT LICENSE AREA FOR EACH COMPASS SECTOR**

Compass Sector¹	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 22 1/2° sectors centered on each of the 16 compass points.

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**TABLE 2.2-9 DISTANCE TO NEAREST RESIDENCE AND SITE BOUNDARY
FROM CENTER OF NORTH TREND EXPANSION AREA FOR EACH COMPASS
SECTOR**

Compass Sector ¹	Nearest Residence (ft.)	Nearest Site Boundary (ft.)
North	None	11,000
North-Northeast	7,500	6,000
Northeast	8,400	4,200
East-Northeast	16,900	3,600
East	9,000	3,500
East-Southeast	3,400	3,500
Southeast	6,600	3,100
South-Southeast	5,000	4,800
South	4,700	4,800
South-Southwest	8,800	4,700
Southwest	11,700	3,000
West-Southwest	None	2,800
West	10,600	2,800
West-Northwest	None	3,200
Northwest	9,600	5,000
North-Northwest	5,300	6,300

¹ 22 1/2° sectors centered on each of the 16 compass points

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2.2.2.2.4 Commercial and Services

There are retail and commercial establishments within Crawford and at Fort Robinson State Park. Commercial establishments are also secondary uses of some residential areas in Crawford. The four largest establishments include the Legend Buttes Health Clinic, the Ponderosa Villa Nursing Home, a livestock sale barn, and railroads. Facilities located outside of Crawford, and within the 2.25-mile review area include the Crawford Cemetery, located at the east-central boundary of the license area.

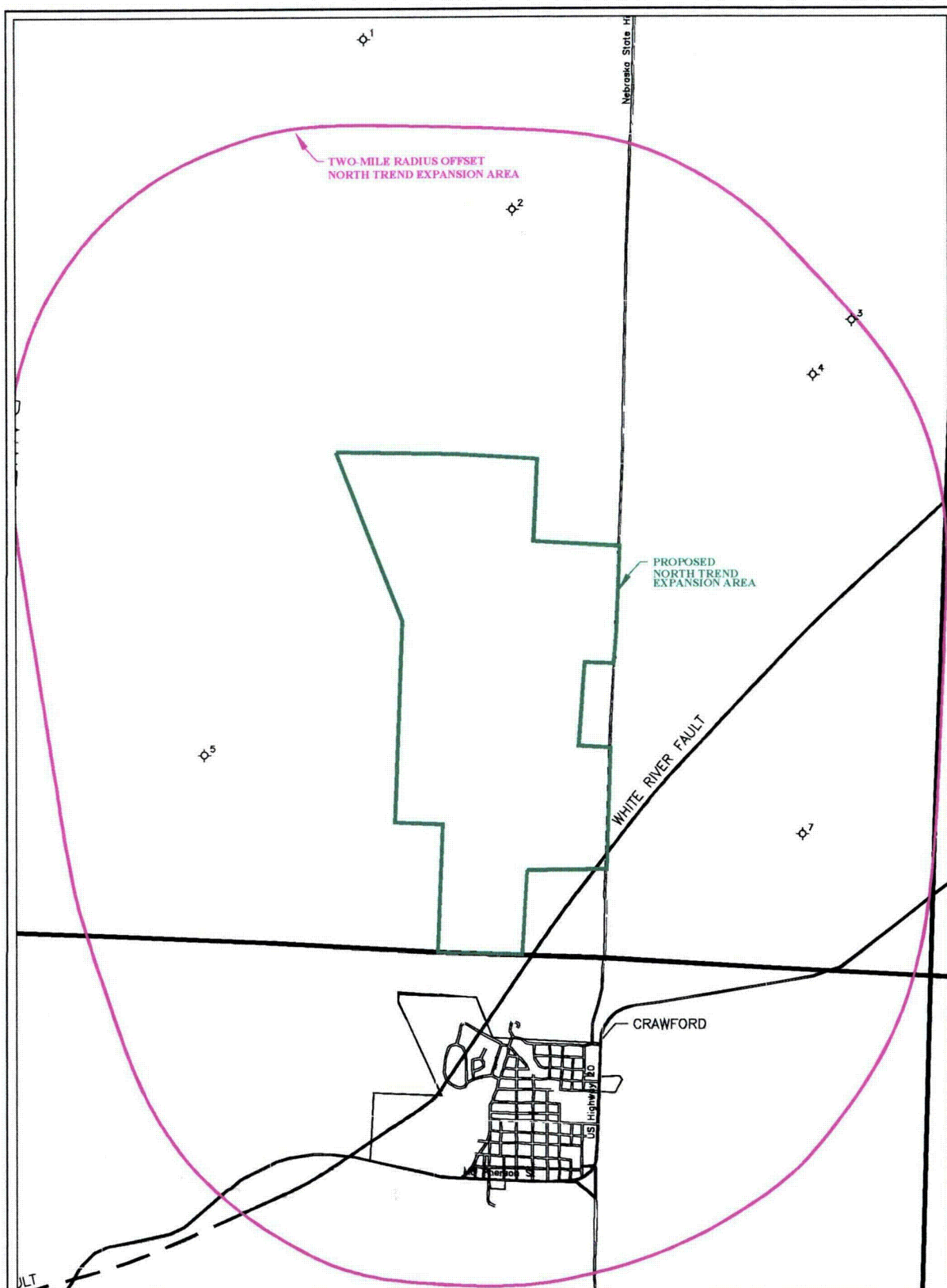
2.2.2.2.5 Industrial and Mining

There are no industrial or mining uses within the license area (Figure 2.2-2). There are gravel pits on Fort Robinson State Park. Most of the pits are inactive, although a few are mined periodically for local road construction purposes.

Besides Crow Butte Resources, Conoco, Amoco Minerals, Santa Fe Mining, and Union Carbide have also drilled exploratory testing holes in the area. There are no other industrial facilities within the 2.25-mile review area.

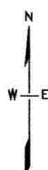
There is one oil and gas test hole located within the North Trend Area. This well, referred to as the E.A. Soester No.1, is located in Section 34, T32N, R52W, and was drilled to a total depth of 2,006 feet. Five oil and gas test holes are located within a 2.0-mile North Trend review area. Figure 2.2-2 shows the locations of the oil and gas test holes within the North Trend license area, and the 2.0-mile North Trend review area.

Based on review of public plugging records, all the referenced oil and gas test holes have been properly plugged in accordance with the Nebraska Oil and Gas Conservation Commission regulations (Ferret Exploration Company of Nebraska, 1993). A listing of oil and gas test holes pertinent to the North Trend Area is presented in Section 2.6.4.



LEGEND

⬠⁵ LOCATION OF DRY OIL/GAS TEST HOLE



0 1500 3000 6000
SCALE IN FEET 1" = 3000'



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FIGURE 2.2-2
NORTH TREND LOCATION OF GRAVEL PITS
AND OIL/GAS TEST HOLES

PROJECT: 223-37	DATE: MARCH 2007
DWG: CBRNT3CBase.dwg	BY: KRS CHECKED: HPD

Petrotek

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Liberal, Colorado 81017-6229
303-250-6414
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2.2.2.2.6 Recreational

Part of the Fort Robinson State Park lies within the 2.25-mile review area of the North Trend Expansion Area (see Figure 2.2-1). Other recreation areas within the review area include the Crawford City Park and the Legend Buttes Golf Course.

2.2.2.2.7 Aesthetics

The North Trend Expansion Area is located on rolling plains with a backdrop of the spectacular buttes of the Fort Robinson State Park, located west of the project area. The North Trend Expansion Area landscape is rural and agricultural in character. The landscape colors are dominated by tan, gold, and green vegetation and tan soils. Riparian vegetation along the White River and Spring Creek exhibits considerable variety in form, texture, and color. Dark to light green colors and a variety of forms and textures of the riparian vegetation provide pleasing contrasts to the flat, horizontal lines of the surrounding agricultural land in the project area. As the North Trend Expansion Area has been used historically for cropland and grazing, it is unlikely that any undisturbed area exists within the proposed license boundary. Human influence is evidenced by producing croplands, scattered farmhouses, and fencing.

2.2.2.2.8 Transportation and Utilities

Nebraska Highway 2/71 and U.S. Highway 20 converge in Crawford. The 2003 average daily traffic counts are 360 vehicles on Nebraska Highway 2/71 at the east side of the North Trend Expansion Area, and between 1,330 and 1,720 vehicles on U.S. Highway 20 at Crawford south of the license area (Nebraska Department of Roads, 2003). County roads that cross through the North Trend Expansion Area are Moody and Mill Roads. These roads provide access to residences and agriculture within the license area. The county roads are accessed from Highway 2/71. The Burlington Northern Railroad runs in a northwesterly direction through the west side of the license area. The D M & E Railroad runs in a northeasterly direction, and forms a portion of the southeast boundary of the license area. The junction of the two railroads is about 0.50 miles south of the license area.



2.2.2.2.9 Land Use References

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2.2.3 Water Use

The North Trend Expansion Area is drained by the White River, which flows to the northeast along the southern boundary of the proposed license area and through the 2.0-mile review area.

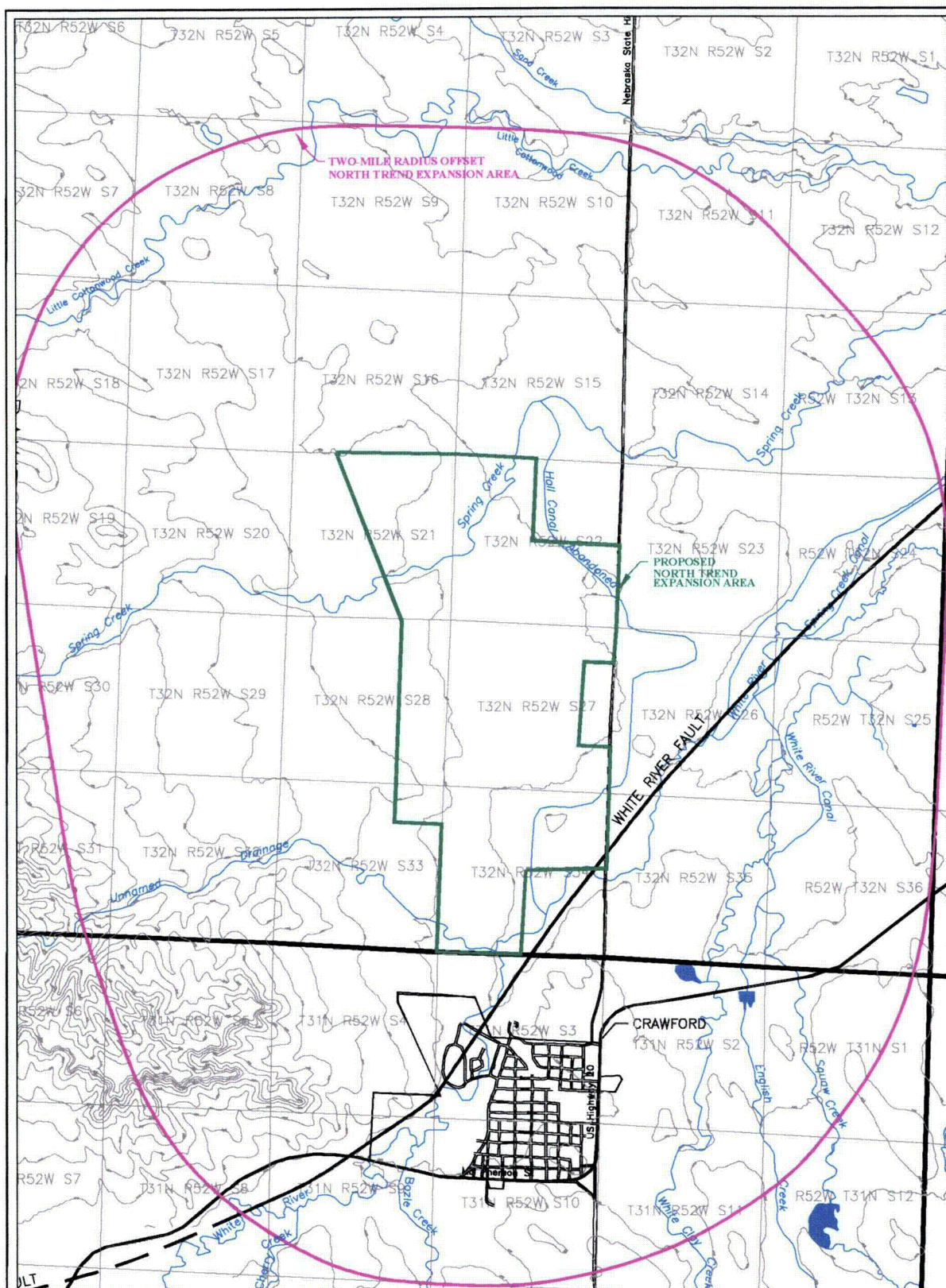
The White River is used to support agricultural production, wildlife habitat, and both warm- and cold-water fish. For the period of record from 1931 to 1991, USGS data (USGS, 2004) indicate that the average monthly mean flow ranged from 6.3 to 122 cubic feet per second (cfs), with a mean value of 20.4 cfs. Based on data from the Nebraska Department of Natural Resources (Nebraska DNR, 2001), the flow of the White River in 2001 ranged from 8.5 to 69 cfs, with an annual mean of 20.0 cfs. Historical extremes related to flow in the White River are discussed in Section 2.7.

The Crawford National Fish Hatchery formerly was located in the Crawford City Park, adjacent to the White River (Figure 2.2-3).

Spring Creek flows west to east through the northern portion of the North Trend Expansion Area (Figure 2.2-3). Little Cottonwood and Sand Creeks flow from west to east along the northern portion of the 2-mile review area where they join the White River. Squaw, English and White Clay Creeks flow to the White River in the southeastern portion of the 2.0-mile review area. On the south side of the review area, Dead Man's, Cherry and Bozle Creeks flow northward to the White River.

To assess surface water quality in the project vicinity, data were retrieved from the EPA STORET database (<http://www.epa.gov/storet/dbtop.html>) for the White River at Crawford. Those data (11 sampling events during 1971 and 1972) indicate an average specific conductance of 330 μ mhos. Data from the White River tributaries in the vicinity of North Trend were also retrieved from the STORET database. Those data include: Soldier Creek (west of Crawford); Squaw, White Clay and English Creeks (east of Crawford) and Dead Man's Creek (south of Crawford). Specific conductance readings for these tributaries ranged from 360 to 507 μ mhos.

No surface water impoundments are located within the North Trend Expansion Area. Several small impoundments are located on private ranches within the 2.0-mile review area, primarily along Squaw and White Clay Creeks (eastern portion of the review area) and Little Cottonwood Creek (northern portion of the review area). Surface water features are shown on Figure 2.2-3. Based on field inspections by CBR personnel, there is no irrigated farmland within the North Trend Expansion Area boundary.



LEGEND



0 1500 3000 6000
SCALE IN FEET 1" = 3000'



**CROW BUTTE
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FIGURE 2.2-3
NORTH TREND SURFACE WATER FEATURES

PROJECT: 223-37	DATE: MARCH 2007
DWG: CBRNT3CBase.dwg	BY: KRS/CHECKED: HPD

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The White River and associated tributaries indirectly supply some of the drinking water to the citizens of Crawford. The city system, which serves a population of 1,115 (Nebraska Department of Health & Human Services, 2004), is supplied by three infiltration galleries (located along the White River, Dead Man's Creek, and Soldier Creek) and two wells which produce "groundwater under the influence of surface water" (University of Nebraska Cooperative Extension HE Form 526). In 1981, average daily usage ranged from a low of 199 gallons per day per person (gpd) in February to a high of 508 gpd in July. The maximum recorded daily water usage in Crawford up to 1981 was nearly 1 million gallons. Based on the Crawford Municipal Water Conservation Plan (Spring 2003), the average per capita water use in 2002 (including residential and business customers; public facilities including parks etc.; and water lost to system leaks) was 323 gallons per day. Information regarding the City of Crawford water system is summarized in Table 2.2-10 (personal communication with CBR staff, February, 2007).

Table 2.2-10:
Summary of City of Crawford Water System

Description	Capacity
Raw Water Storage Capacity	500,000 gallons
Treated Water Capacity	
West Tank	1,000,000 gallons
East Tank	750,000 gallons
Average Daily Use (2006)	419,181 gallons
Maximum Daily Use	1,000,000 gallons
Supply Wells	
South Well #1 (100 feet deep); Reg: G-93533 NW1/4 SW1/4 Sec. 15, T31N, R52W	104 gpm
West Well #2 (100 feet deep); Reg: G-93532. NW1/4 SW1/4 Sec. 15, T31N, R52W	54 gpm
Infiltration Gallery	
Pump #1; 27 feet; Reg: G-93551 SE1/4 SW1/4 Sec. 8 T31N R52W	420 gpm
Pump #2; 27 feet; Reg: G-93551 SE1/4 SW1/4 Sec. 8 T31N R52W	420 gpm
Dewatering Wells; 20 to 26 feet deep SE1/4 SW1/4 Sec. 8 T31N R52W Reg Nos: 93528, 93529, 93530	33 gpm (each)

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In general, groundwater supplies in the vicinity of the North Trend Expansion Area are limited due to topography and shallow geology (University of Nebraska-Lincoln, 1986). Groundwater quality within the White River drainage generally is poor (Engberg and Spalding, 1978). Locally, groundwater is obtained at limited locations from shallow alluvial sediments. The primary groundwater supply is the Brule Formation, typically encountered at depths from 60 to 100 feet. The static water level for Brule wells in the North Trend Area ranges, based on topography, from 10 to 60 feet below ground surface.

Alternate supplies of stock water are provided by the underlying Basal Chadron Sandstone (400 to 900 feet). However, because of greater depth and inferior water quality, the Basal Chadron is not used for a domestic supply within the North Trend Expansion Area. In this regard, Gosselin et al. (1996) state that (1) "the sands near the bottom of the Chadron Formation yield sodium-sulphate water with high total dissolved solids", and (2) "near uranium deposits in the Crawford area, groundwater from the Chadron Formation is not suitable for domestic or livestock purposes because of high radium concentrations". Because of artesian pressure, most Chadron wells in the vicinity of North Trend either flow at the surface, or have water levels very close to surface elevation.

Based on National Groundwater Association website (www.ngwa.org), average water use for rural (domestic) wells in Nebraska is approximately 380 gallons per day (gpd). Assuming an average family size of four persons, this correlates well with data from USGS (National Handbook of Recommended Methods for Water Data Acquisition – Chapter 11) who suggest an average per capita use on the order of 97 gallons per day. As discussed previously, there are only two residences located within the proposed North Trend License Area. Using an average use of 380 gallons per day per residence, the total groundwater use within the expansion area likely is on the order of 760 gallons per day.

A summary of groundwater quality data collected from 1982 to 1987 to establish background conditions in the vicinity of the Crow Butte Project follows (Table 2.2-11). The data are presented for three hydrogeologic units: (1) the Chadron Sandstone (mining zone), the Brule Formation, which supplies the majority of groundwater in the project area, and (3) the Brule Alluvium. It is noted that supplies of Brule Alluvium are limited, and few wells produce from this interval, none of which are located in the North Trend Expansion Area.

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Technical Report North Trend Expansion Area



Table 2.2-11: Summary of Groundwater Quality Data – Crow Butte Vicinity

Constituent ¹	Brule Formation		Chadron Formation		Brule Alluvium	
	Range	Mean	Range	Mean	Range	Mean
Calcium	7.1 - 98	48	11 - 41	20	67 - 74	70.6
Magnesium	0.3 - 16	6.6	0.8 - 7.2	3.2	6.4 - 10	8.7
Sodium	12 - 340	104	340 - 540	411	34 - 41	36.5
Potassium	4.1 - 15.9	9.9	7.0 - 19.8	12.4	10.3 - 13	11.1
Bicarbonate	137 - 627	364	308 - 411	368	299 - 364	321
Sulfate	1 - 23	10	254 - 620	407	11 - 20	16.3
Chloride	1.6 - 192	48	134 - 250	176	5 - 10	6.7
Specific Conductance (µmhos)	246 - 1481	714	1500 - 2500	1932	507 - 614	548
PH	6.80 - 8.50	7.80	7.60 - 8.70	8.20	7.10 - 8.40	7.70
(pH units)						
Uranium	0.001 - 0.021	0.0064	<0.001 - 2.40	0.092	0.006 - 0.022	0.015
(mg/l)						
Radium-226	0.1 - 3.0	0.7	0.1 - 619	53	0.4 - 18.3	2.5
(pCi/l)						

¹⁾ Concentrations in mg/l, unless otherwise noted.

A water well survey conducted by CBR in 1996 and updated in 2004 for the expansion area indicates that all of the groundwater pumped from active wells surveyed within a 2.0-mile radius of the proposed North Trend License Area boundary is used either to water livestock or for domestic purposes. Figure 2.2-4 shows the location of all active and abandoned water wells in the North Trend License Area and the 2.0-mile review area. Within the proposed License Area, all of the 14 active wells are completed in the Brule; there are no active wells completed in the Chadron in the License Area. Within the 2.0-mile review area, 41 of the wells are completed in the Brule Formation and 9 are completed in the Chadron Formation. With one exception (Well No. 61, located approximately 1.5 miles southeast of the expansion area boundary), the Chadron wells are all used exclusively for watering livestock. As discussed previously, the only domestic groundwater supply within the proposed license boundary is the Brule Formation.

Table 2.2-12 lists the active and abandoned groundwater wells in the expansion area and the 2.0-mile review area. Table 2.2-12 follows the text in this section.

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In summary, there is no domestic groundwater use of the Basal Chadron Sandstone within the North Trend Expansion Area. Two residences are supplied by wells completed in the Brule Formation. Based on population projections (see Section 2.3), future water use within the North Trend Expansion Area and the 2.0-mile review area likely will be a continuation of present use. It is unlikely that any irrigation development will occur within the license area due to the limited water supplies, topography, and climate. Irrigation within the review area is anticipated to be consistent with the past (e.g., limited irrigation in the immediate vicinity of the White River). It is anticipated that the City of Crawford municipal water supply will continue to be provided by the groundwater and infiltration galleries related to the White River and associated tributaries.



2.2.3.1 Water Use References

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Table 2.2-12: Active and Abandoned Water Wells in the North Trend Expansion Area and 2.0-Mile Review Area

Well #	Estimated Depth	Formation	Well Use
52	420	Chadron	Agricultural
55	320	Chadron	Agricultural
56	200	Brule	Domestic
60	312	Chadron	Agricultural
61	280	Chadron	Domestic/Agricultural
65	260	Chadron	Agricultural
74	60	Brule	Agricultural
75	65	Brule	Agricultural
76	30	Brule	Abandoned
77	70	Brule	Domestic
78	98	Brule	Domestic
79	98	Brule	Abandoned
81	630	Chadron	Abandoned
82	120	Brule	Abandoned
83	50	Brule	Domestic
84	50	Brule	Agricultural
85	80	Brule	Domestic
86	300	Brule	Abandoned
87	50	Brule	Agricultural
88	60	Brule	Domestic
89	35	Brule	Agricultural
90	35	Brule	Agricultural
91	80	Brule	Domestic/Agricultural
92	167	Brule	Domestic
93	85	Brule	Domestic
94	52	Brule	Domestic
95	100	Brule	Domestic
96	86	Brule	Domestic
97	380	Chadron	Agricultural
99	50	Brule	Domestic
100	35	Brule	Agricultural
101	75	Brule	Domestic
102	100	Brule	Domestic
103	125	Brule	Agricultural
104	25	Brule	Domestic
105	70	Brule	Agricultural
106	100	Brule	Domestic
107	100	Brule	Domestic
108	75	Brule	Agricultural
109	55	Brule	Domestic
110	100	Brule	Domestic
111	90	Brule	Domestic
112	110	Brule	Domestic
113	110	Brule	Domestic
114	50	Brule	Agricultural
115	90	Brule	Domestic
116	35	Brule	Domestic
117	160	Brule	Agricultural
118	90	Brule	Agricultural
121	16	Brule	Agricultural
122	60	Brule	Agricultural
123	280	Chadron	Agricultural

Table 2.2-12: Active and Abandoned Water Wells in the North Trend Expansion Area and 2.0-Mile Review Area

Well #	Estimated Depth	Formation	Well Use
126	290	Brule	Agricultural
127	105	Brule	Domestic
149	175	Brule	Agricultural
161	60	Brule	Domestic
162	*	Brule	Domestic
168	65	Brule	Agricultural
172	20	Brule	Abandoned
173	30	Brule	Agricultural
174	30	Brule	Agricultural
175	25	Brule	Domestic / Agricultural
176	70	Brule	Domestic
184	60	Brule	Domestic
185	70	Brule	Domestic
186	20	Brule	Domestic
187	78	Brule	Agricultural
188	95	Brule	Domestic
189	30	Brule	Agricultural
190	30	Brule	Agricultural
197	70	Brule	Agricultural
198	*	Brule	Agricultural
199	21	Brule	Agricultural
200	30	Brule	Agricultural
201	30	Brule	Abandoned
207	30	Brule	Agricultural
208	30	Brule	Agricultural
209	100	Brule	Agricultural
210	*	Brule	Abandoned
211	*	Brule	Abandoned
212	*	Brule	Abandoned
213	30	Brule	Agricultural
214	37	Brule	Agricultural
215	50	Brule	Agricultural
216	37	Brule	Agricultural
217	*	Brule	Agricultural
218	*	Brule	Agricultural
219	*	Chadron	Abandoned
220	35	Brule	Agricultural
221	35	Brule	Agricultural
224	*	Brule	Agricultural
RC1	350	Chadron	Agricultural
RC2	592	Chadron	No-Use
RC3	293	Chadron	No-Use
* No Reported Depth			



2.3 POPULATION DISTRIBUTION

Information presented in this section concerns those demographic and social characteristics of the environs that may be affected by the proposed expansion of the Crow Butte Uranium Project to include operations in the North Trend Expansion Area. Data were obtained through the 1980, 1990, and 2000 U.S. Census of Population and various State of Nebraska government agencies.

2.3.1 Demography

2.3.1.1 Regional Population

The area within an 80-km (50-mile) radius of the project site includes portions of six counties in northwestern Nebraska, two counties in southwestern South Dakota, and two counties in eastern Wyoming. Because the 80-km radius extends only slightly into two very rural counties in Wyoming (with populations of less than 2,000 persons), the regional demography in Wyoming is not discussed in detail beyond that summarized in Table 2.3-1 through Table 2.3-3. Figure 2.3-1 depicts significant population centers within an 80 km radius of the proposed North Trend Expansion Area.

Historical and current population trends in the project area counties and communities are contained in Table 2.3-1. Between 1960 and 1980, Box Butte County exhibited the fastest rate of growth with more than a 17 percent population increase, largely occurring in the latter half of the 1970's. Box Butte County lost population between 1980 and 2000, with the greater population losses occurring during the 1990's.

All of the Nebraska counties comprising the project area experienced slight growth or actual population decline between 1960 and 1980 and population decline between 1980 and 1990. The state experienced its fastest growth since the 1920s during the years between 1990 and 2000. The total state population in 2000 was 1.7 million, which was an 8.4-percent increase over the 1990 population of 1.6 million. The Nebraska counties in the project area experienced little of the state's growth spurt. However, with the exception of Box Butte, the counties experienced a reversal of the downward trends of the 1980's. In general, population trends for the last decade show that population in urban areas is increasing, while population in rural areas is declining. Areas within 80 km of the project site that are defined as urban (all territory, population, and housing units in urbanized areas and in places of more than 2,500 persons outside of urbanized areas) by the U.S. Census 2000 are the cities of Chadron in Nebraska, and Hot Springs and Pine Ridge in South Dakota.

Dawes County grew slightly between 1990 and 2000, gaining 0.4 percent in population. Most of this growth occurred in the City of Chadron. The Dawes County communities of Chadron

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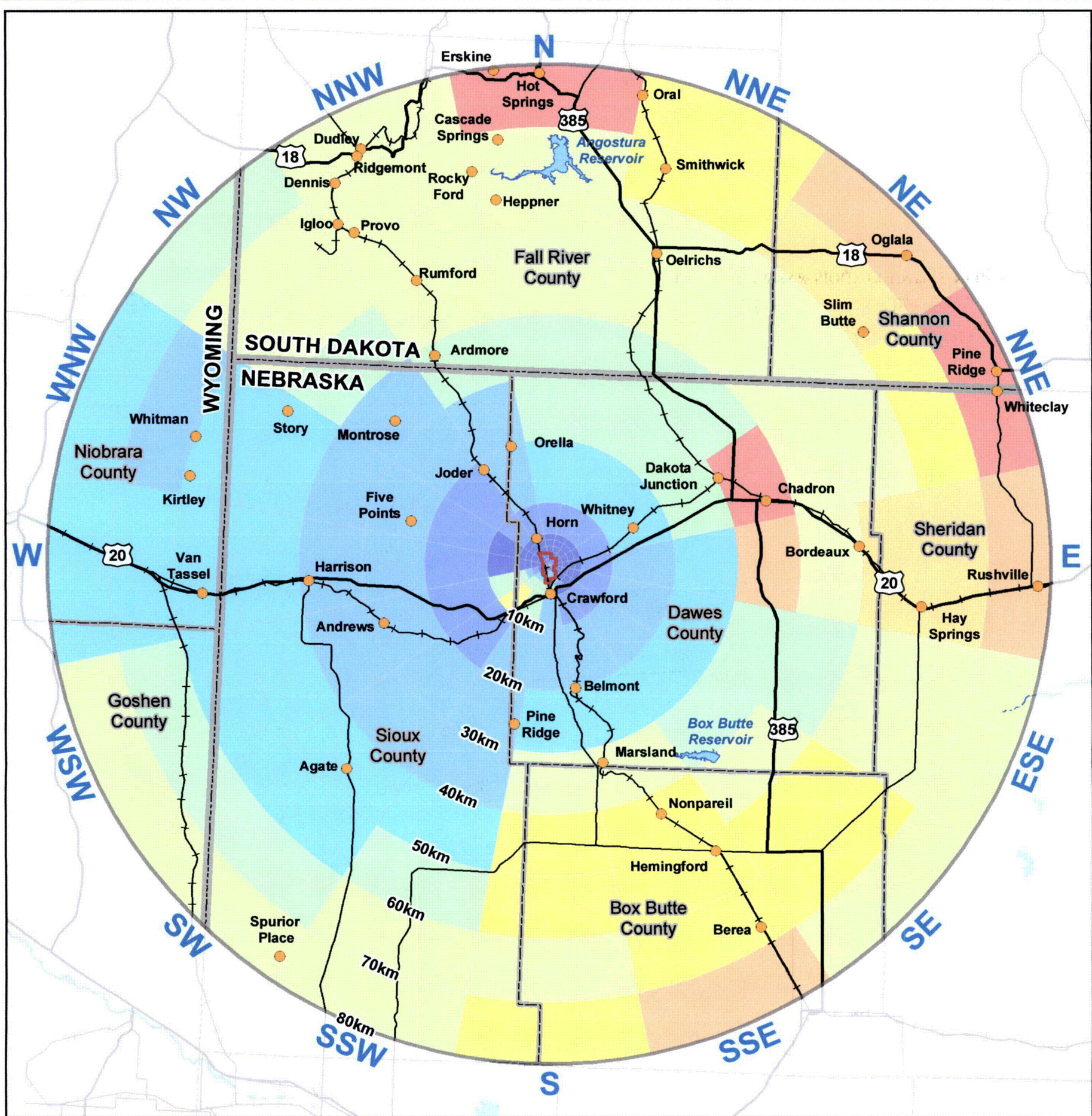


and Crawford are the nearest communities to the project site. Chadron is located approximately 40 km (25 miles) northeast of the project site with a 2000 population of 5,634, an increase of 0.8 percent from 1990. The community of Crawford, within 10 km (2.0 miles) of the site, had a 2000 population of 1,107. Chadron experienced a small population gain between 1990 and 2000, while Crawford lost population.

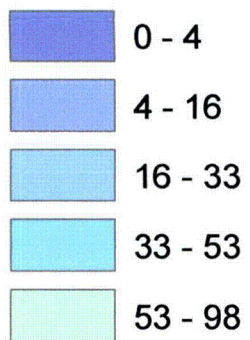
Sioux County lost population at a slower rate in the years between 1980 and 1990 than in the previous decade. The slower decline of the county population occurred in part because the town of Harrison gained nearly 16 percent, which is a reversal of a trend that shows a decline in population since 1960. Between 1980 and 1985, the downward trend continued in Sioux and Morrill Counties, with Sheridan County exhibiting a slight turnaround. Between 1985 and 1990, the downward trend continued in the Nebraska counties, with the exception of Morrill County, which experienced an increase of 6.3 percent. However, this growth is a decrease from the 1980 population.

Sheridan County has experienced an overall decline of nearly 32 percent since 1960. Population has declined in the towns of Hay Springs and Rushville between 1980 and 2000, despite earlier gains in the 1980's. Scotts Bluff County experienced gradual population growth over the two-decade period between 1960 and 1980.

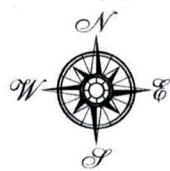
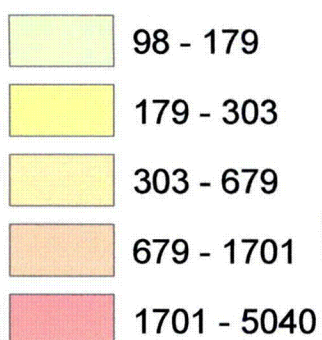
Scotts Bluff County, which is just south of the 80-km radius around the project site, was included within the 80-km radius of the original license area. The county experienced population gains between 1990 and 2000 primarily because the City of Scottsbluff, which is an urban area, showed a strong increase in population of 7.4 percent between 1990 and 2000.



Legend Population



North Trend



0 2.5 5 10 15 20 Miles

CROW BUTTE PROJECT

REGIONAL AREA BASE MAP

DAWES & SIOUX COUNTIES, NEBRASKA

FIGURE 2.3-1
SIGNIFICANT POPULATION
CENTERS WITHIN 80
KILOMETERS

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TABLE 2.3-1 HISTORICAL AND CURRENT POPULATION CHANGE FOR COUNTIES AND TOWNS WITHIN 80 KM OF THE NORTH TREND EXPANSION AREA SITE, 1960-2000

State County City	Population					Average Annual Percent Change			
	1960	1970	1980	1990	2000	1960/ 1970	1970/ 1980	1980/ 1990	1990/ 2000
<u>NEBRASKA</u>									
Dawes	9,536	9,761	9,609	9,021	9,060	2.4	-1.6	-6.1	0.4
Chadron	5,079	5,921	5,933	5,588	5,634	16.6	0.2	-5.8	0.8
Crawford	1,588	1,291	1,315	1,115	1,107	-18.7	1.9	-15.2	-0.7
Box Butte	11,688	10,094	13,696	13,130	12,158	-13.6	35.7	-4.1	-7.4
Alliance	7,845	6,862	9,869	9,765	8,959	-12.6	43.8	-1.1	-8.3
Hemingford	904	734	1,023	953	993	-18.8	39.4	-6.8	4.2
Sheridan	9,049	7,285	7,544	6,750	6,198	-19.5	3.6	-10.5	-8.2
Hay Springs	823	682	794	693	652	-17.1	16.4	-12.7	-5.9
Rushville	1,228	1,137	1,217	1,127	999	-7.4	7.0	-7.4	-11.4
Sioux	2,575	2,034	1,845	1,549	1,475	-21.0	-9.3	-16.0	-4.8
Harrison	448	377	361	241	279	-15.8	-4.2	-33.2	15.8
<u>SOUTH DAKOTA</u>									
Fall River	10,688	7,505	8,439	7,353	7,453	-29.8	12.4	-12.9	1.4
Hot Springs	4,943	4,434	4,742	4,325	4,129	-10.3	6.9	-8.8	-4.5
Oelrichs	132	94	124	138	145	-28.8	31.9	11.3	5.1
Ardmore	73	14	16	NA		-80.8	14.3		
Shannon	6,000	8,198	11,323	9,902	12,466	36.6	38.1	-12.6	25.9
Pine Ridge CDP	NA	NA	NA	422	1,229	NA	NA	NA	191.2
<u>WYOMING</u>									
Goshen	11,941	10,885	12,040	12,373	12,538	-8.8	10.6	2.8	1.3
Niobrara	3,750	2,924	2,924	2,499	2,407	-22.0	0.0	-14.5	-3.7
Lusk	1,890	1,495	1,650	1,504	1,447	-20.9	10.4	-8.8	-3.8

Note – CDP (Census Designated Place) is a statistical entity defined for each decennial census according to Census Bureau guidelines, comprising a densely-settled concentration of population that is not within an incorporated place, but is locally identified by a name.

Sources: U.S. Bureau of the Census, 1972a, 1972b, 1972c, 1979, 1981, 1986, 1990a, 1990b, 1990c, 2000

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The two South Dakota counties in the 80-km study area include Fall River and Shannon. Fall River County experienced an overall population decline by more than 30 percent between 1960 and 2000; however, between 1990 and 2000, there was a small increase of 1.4 percent. The town of Ardmore lost more than 80 percent of its population between 1960 and 1980, and was disincorporated in 1984 (U.S. Census 1990e). Shannon County, on the other hand, grew by 25.9 percent between 1990 and 2000; more than double the 1960 population. Much of the growth occurred in the Pine Ridge and Oglala Census Designated Places (CDP), which are urban areas as defined by the U.S. Census, but are not incorporated municipalities. Most of Fall River County is included within 80 km of the project site; however, only the southwest portion of Shannon County is within 80 km of the project site.

The population declines in the counties within the 80-km radius reflect trends in the overall region, where declines have been attributed to the declines in the rural farming based economy and limited economic opportunities for youth. Persistent drought conditions have also contributed to the shrinking of the agriculture-based economy. Rural residents have been migrating to larger cities, depopulating the largely rural Great Plains states. Many of the people migrating out of the state are young adults and families, which results in fewer people of childbearing age, and therefore, fewer children. This trend also contributes to the increasing proportion of the elderly population in the state.

2.3.1.2 Population Characteristics

2000 population by age and sex for counties within 80 km of the Crow Butte project area is shown in Table 2.3-2. Overall, 67.7 percent of the population in the region is more than 20 years old. Fall River and Niobrara Counties reported the highest percentage of persons older than 18 with 75.0 percent. About 6.7 percent of the population was less than 5 years old in 2000. Shannon County reported the youngest population, with 10.9 percent less than 5 years old and slightly more than half (51.0 percent) at 18 years of age and under. Females slightly outnumbered males in most counties, with an overall population of 50.1 percent female to 49.9 percent male.

In 2000 slightly more than 75 percent of the ten-county population was classified as white. American Indians and persons of Hispanic origin comprised 21.2 percent and 4.3 percent, respectively, of the total population. Nearly 80 percent of the American Indians were Sioux living on the Pine Ridge Reservation in Shannon County, South Dakota.

2.3.1.3 Population Projections

The projected population for selected years by county within the 80-km radius of the proposed Crow Butte Project is shown in Table 2.3-3. The population is expected to decrease in the Nebraska Counties of Box Butte, Sheridan, and Sioux. These counties are primarily



rural, with agriculture-based economies. It is anticipated that the declining population trends of the last two decades will continue into the foreseeable future for these counties. The projected population for Dawes County is expected to increase at an annual rate of less than 1 percent over the next 20 years. This rate reflects recent increases in the population of Chadron that are expected to continue. In addition, Dawes County provides a scenic setting for a variety of outdoor recreation activities. The Pine Ridge region will probably increase in popularity with visitors and recreationists from outside of the region, as participation in outdoor recreational activities is expected to increase nationwide. An increase in visitor utilization of recreation facilities in Dawes County would revitalize the local economy, adding to the overall attractiveness of the region to potential residents.

2.3.1.4 Seasonal Population and Visitors

According to the Final Environmental Impact Statement for the Northern Great Plains Management Plans Revision (May 2001), the various state parks in northwest Nebraska, the Pine Ridge Ranger District and the Oglala National Grassland, are increasingly becoming regional tourist destinations.

Approximately 358,000 people visited Fort Robinson State Park in 2002. This number represents a 4.8-percent increase from 2001, but a decrease of 5.1 percent from the 1981 visitation of 377,000 people and a slight decrease of less than 1 percent from the 359,000 visitors in 1984 (Nebraska Department of Economic Development 2003). Visitor figures were up slightly for 2005, with a total of 361,230 visitors to the park ((Nebraska Department of Economic Development 2007). Approximately 50 percent of the visitors in 2002 were from other states, which is an increase in the number of out-of-state visitors from 1981, as the majority of 1981 visitors were Nebraskan families. It is likely that the decline of visitors from Nebraska has resulted from the overall decline of population in rural counties within a few hours commuting distance of the park.

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**TABLE 2.3-2 POPULATION BY AGE AND SEX FOR COUNTIES WITHIN THE
80-KM RADIUS OF THE NORTH TREND EXPANSION AREA, 2000**

State County	Age	Male	Female	Total	Total Percent Breakdown
Nebraska					
Box Butte	Under 5	436	361	797	6.6
	5 - 19	1,530	1,409	2,939	24.2
	20 - 34	935	963	1,898	15.6
	35 - 64	2,446	2,308	4,754	39.1
	65+	707	1,063	1,770	14.6
	Total	6,054	6,104	12,158	100.0
Dawes	Under 5	213	238	451	5.0
	5 - 19	1,143	1,043	2,186	24.1
	20 - 34	1,133	1,110	2,243	24.8
	35 - 64	1,400	1,438	2,838	31.3
	65+	540	802	1,342	14.8
	Total	4,429	4,631	9,060	100.0
Sheridan	Under 5	192	167	359	5.8
	5 - 19	716	660	1,376	22.2
	20 - 34	415	403	818	13.2
	35 - 64	1,132	1,170	2,302	37.1
	65+	580	763	1,343	21.7
	Total	3,035	3,163	6,198	100.0
Sioux	Under 5	43	36	79	5.4
	5 - 19	188	132	320	21.7
	20 - 34	98	95	193	13.1
	35 - 64	324	320	644	43.7
	65+	123	116	239	16.2
	Total	776	699	1,475	100.0

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**TABLE 2.3-2 POPULATION BY AGE AND SEX FOR COUNTIES WITHIN THE
80-KM RADIUS OF THE NORTH TREND EXPANSION AREA, 2000**

State County	Age	Male	Female	Total	Total Percent Breakdown
South Dakota					
Fall River	Under 5	214	145	359	4.8
	5 - 19	847	661	1,508	20.2
	20 - 34	397	406	803	10.8
	35 - 64	1,596	1,513	3,109	41.7
	65+	846	828	1,674	22.6
	Total	3,900	3,553	7,453	100.0
Shannon	Under 5	676	684	1,360	10.9
	5 - 19	2,460	2,294	4,754	38.1
	20 - 34	1,205	1,297	2,502	20.1
	35 - 64	1,614	1,642	3,256	26.1
	65+	265	329	594	4.8
	Total	6,220	6,246	12,466	100.0
Wyoming					
Goshen	Under 5	378	349	727	5.8
	5 - 19	1,460	1,322	2,782	22.2
	20 - 34	1,001	946	1,947	15.5
	35 - 64	2,459	2,451	4,910	39.2
	65+	936	1,236	2,172	17.3
	Total	6,234	6,304	12,538	100.0
Niobrara	Under 5	60	55	115	4.8
	5 - 19	268	219	487	20.2
	20 - 34	134	180	314	13.0
	35 - 64	507	533	1,040	43.2
	65+	205	246	451	18.7
	Total	1,174	1,233	2,407	100.0

Source: U.S. Bureau of the Census 1981a, 1981b, 1981c, 1990a, 1990b, 1990c, 2000

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TABLE 2.3-3 POPULATION PROJECTIONS FOR COUNTIES WITHIN AN 80-KM RADIUS OF THE CURRENT CROW BUTTE PROJECT AREA, 2000-2020

County	Census 2000	Projected 2005	Projected 2010	Projected 2015	Projected 2020
Box Butte	12,158	11,759	11,387	11,048	10,662
Dawes	9,060	9,168	9,273	9,339	9,368
Sheridan	6,198	5,962	5,732	5,540	5,368
Sioux	1,475	1,424	1,364	1,294	1,215
Fall River	7,453	N/A	N/A	N/A	N/A
Shannon	12,466	N/A	N/A	N/A	N/A
Goshen	12,538	12,401	12,429	N/A	N/A
Niobrara	2,407	2,399	2,399	N/A	N/A

N/A not available

Sources: University of South Dakota, Bureau of Business Research 2004.

University of Nebraska-Lincoln, Bureau of Business Research 2004.

Wyoming Department of Administration and Information 2004.

There were 55,000 visitors to the Pine Ridge District of the Nebraska National Forest in 2001. Camping and motorized travel/viewing scenery are the two most popular recreation categories on the Pine Ridge Ranger District and the Oglala National Grassland.

The forest provides a wide range of other undeveloped backcountry recreation opportunities such as hunting, hiking, backpacking, fishing and wildlife observation. The district provides the greatest number of miles of mountain biking trails in the state. District trails also attract horseback riders and off-highway motorized vehicle use. The Pine Ridge is an important destination for deer hunting, and provides the most popular turkey hunting area in Nebraska.

One source of seasonal population in this region is Chadron State College, located approximately 35 km (21.6 miles) from the site. During the 2001 fall semester, enrollment was 2,804, an increase of 25 percent over the fall 1986 enrollment of 2,240 (Nebraska Department of Economic Development, 2002; Schmiedt 1987). In the 1994 fall semester, a total of 3,296 students were enrolled at the college (Taylor 1995).



2.3.1.5 Schools

Crawford is served by the Crawford Public School District. The Crawford High School and grade school are presently under capacity. Total enrollment in these two schools as of fall 2001 was 146 in the high school and 140 in the elementary school with maximum capacities of 545 and 185, respectively (National Center for Educational Statistics 2004; Crawford High School 1995; Crawford Elementary School 1995). Current enrollment numbers are 134 in the grade school and 134 in the high school (Crawford Public Schools 2007) and are comparable to annual enrollments since 1987 for both schools. The grade school currently has a student to teacher ratio of 13 to 1 and the high school has a ratio of 8 to 1. No historical high enrollment was given for the grade school. However, it was estimated in 1995 that the high school historical high enrollment was more than 200 pupils.

There is one rural school supporting grades one through eight within the Crawford district. The Belmont School is a two-room schoolhouse. Students living in the rural district attend Crawford High School. There were 6 pupils as of fall 2007 at the Belmont School from which Crawford High School draws, a decline from the 1995 enrollment of an estimated 100 pupils in seven rural school districts.

Families moving into the Crawford district as a result of the proposed North Trend Expansion Area operations would not stress the current school system because it is presently under capacity.

2.3.1.6 Sectorial Population

Existing population, as determined for the original analysis in the CBR commercial license application prepared in 1987 for the 80-km radius, was estimated for 16 compass sectors, by concentric circles of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70 and 80 km from the site (a total of 208 sectors). Sectorial population for the application prepared in 2004 was updated with data from the 2000 U.S. Census. Subtotals by sector and compass points as well as the total population are shown in Table 2.3-4.

Population within the 80-km radius was estimated using the following techniques:

U.S. Census 2000 data were used to estimate the total population within an 80-km radius, measured from the center of the proposed North Trend Expansion Area site. The data were created by Geographic Data Technology, Inc., a division of ESRI, from Census 2000 boundary and demographic information for block groups within the United States.

ArcInfo Geographic Information System (GIS) was used to extract data from U.S. Census 2000 population estimates for 40 Census Tract Block Groups located wholly or partially

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within the 80-km radius from the approximate center of the North Trend Expansion Area site. Urban areas within each county were generally assigned their own block group.

To assign a population to each sector, a percentage area of each sector within one or more block groups was calculated for all of the block groups.

2000 U.S. Census of population estimates for cities and counties in Nebraska, South Dakota and Wyoming were used to determine total urban population.



TABLE 2.3-4 2000 POPULATION WITHIN AN 80-KM (50-MILE) RADIUS OF THE NORTH TREND EXPANSION AREA ^A

	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	Total
N	0	0	0	0	1	9	38	63	87	112	137	161	3,682	4,292
NNE	0	0	0	0	1	9	38	63	88	112	147	205	223	886
NE	0	0	0	0	1	9	38	63	88	109	116	624	679	1,728
ENE	0	0	0	0	1	9	37	58	5,039	113	132	224	3,139	8,754
E	0	0	0	0	1	9	29	48	1,007	113	587	435	1,207	3,436
ESE	0	0	0	0	1	7	29	48	69	91	117	131	107	601
SE	0	0	0	0	0	7	29	48	68	146	263	303	153	1,016
SSE	0	11	21	9	2	7	29	48	125	242	273	194	1,701	2,663
S	0	16	41	58	72	27	29	48	136	190	188	164	179	1,149
SSW	0	14	41	58	74	75	21	25	30	38	67	115	133	690
SW	0	4	39	58	74	291	13	21	29	38	46	70	112	794
WSW	0	0	6	33	60	75	13	21	29	38	53	83	98	509
W	0	0	0	0	1	3	13	21	29	38	33	39	49	226
WNW	0	0	0	0	1	4	13	21	29	38	38	32	37	212
NW	0	0	0	0	1	6	13	21	30	71	110	113	78	444
NNW	0	0	0	0	1	9	28	26	65	112	136	148	164	691
Total	0	46	148	214	293	560	409	645	6,950	1,601	2,443	3,041	11,741	28,092

Notes:

^a Current population living between 10 and 80 km of the mine site were estimated using 2000 census data. Field reconnaissance was conducted in 2004 to verify data collected within 2.25 miles (3.6 km). See Section 2.3.1. for a detailed description of the methodology.



2.3.2 Local Socioeconomic Characteristics

2.3.2.1 Major Economic Sectors

In 2002, average annual unemployment rates in Dawes and Box Butte Counties decreased from the 1994 rates. Table 2.3-5 summarizes unemployment rates and employment in the Nebraska project area counties. Dawes and Box Butte Counties exhibited unemployment rates at 3.8 percent in Dawes County and 5.0 percent in Box Butte County. Unemployment rates for both counties increased between 1994 and 2002. In 1994, unemployment levels declined from February 1987 levels. These rates were a little higher than the statewide rate of 3.5 percent. Dawes County was close to the state unemployment rate, while the Box Butte rate was higher.

The major economic sectors in the project area have changed little in recent years, although individual sectors have shifted in their relative proportion in the overall economy. The area continues to depend on trades, government, and services. Economic activities in the Crawford area include farming, ranching, cattle feed lots, tourism, and retail sales.

Agriculture accounts for slightly more than 1 percent of the total employed labor force in Dawes County, while farm employment was 14 percent of total employment in Box Butte County. Government employment in Dawes County makes up 37 percent of total non-farm employment, followed by trade (16 percent), leisure and hospitality services (14 percent), and education and health services (9 percent). Construction and mining account for 5 percent. In Box Butte County, the largest four non-farm employment sectors are transportation (25 percent), government (22 percent), trade (16 percent), and manufacturing (9 percent).

Agriculture employment has a small share of total employment in both counties. However, agriculture provides the economic base for the counties, as other economic sectors support the agricultural industry. Events that affect agriculture are generally felt throughout rural economies. According to the Nebraska Department of Economic Development (2002), Farm employment in Nebraska is expected to decline by nearly 14,000 jobs (20 percent) between 2000 and 2045, while overall non-farm employment will increase by nearly 26 percent. The decrease in jobs in the agricultural sector could continue to fuel migration from rural counties to urban areas, resulting in overall declines in other sectors of the local economy as dollars spent from personal income and agricultural business expenditures move out of the counties.

Per capita personal income is the income that is received by persons from all sources, including wages and other income over the course of 1 year. In 2002, personal income in

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Dawes County was \$19,760, which was 68 percent of the state average of \$29,182. The county ranks 84th out of 93 counties in the state (BEA 2004).

**TABLE 2.3-5 ANNUAL AVERAGE LABOR FORCE AND EMPLOYMENT
ECONOMIC SECTORS* FOR DAWES AND BOX BUTTE COUNTIES,
1994 AND 2002**

	Dawes		Box Butte	
	1994	2002	1994	2002
Labor Force	4,490	4,663	6,156	5,670
Unemployment	149	175	235	282
Unemployment Rate	3.3	3.8	3.8	5.0
Employment	4,341	4,489	5,921	5,387
Farm Employment	564	550	763	760
Non-Farm Employment Total	3,479	3,903	5,446	5,241
Manufacturing	165	201	402	465
Construction and Mining	136	179	80	0
Transportation, Communication, and Utilities	N/A	N/A	1,909	1,288
Trade	952	N/A	1,106	825
Retail	824	636	840	539
Wholesale	128	N/A	265	286
Financial, Insurance, and Real Estate	77	117	215	205
Services	548	N/A	779	N/A
Information	N/A	0	N/A	110
Professional and Business Services	N/A	N/A	N/A	219
Education and Health Services	N/A	358	N/A	424
Leisure and Hospitality	N/A	533	N/A	372
Other Services	N/A	133	N/A	203
Government	1,384	1,450	955	1,130
Federal	144	161	65	67
State	721	719	67	62
Local	519	571	824	1,001

*: Industry employment estimates are based on the Standard Industry Classification System before 2001, and on the North American Industry Classification System after 2001.

N/A = not available

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2.3.2.2 Housing

Between 1970 and 1980, total housing units increased by 17 percent in Dawes County from 3,388 to 3,965 units. By 2002, the growth of the preceding decades had slowed, and total housing units increased by 2.4 percent to 4,004 units from 3,909 units in 1990. Chadron, the largest community in Dawes County and within 40 km (25 miles) of the project site, experienced a 25 percent increase in housing stock between 1970 and 1980, and a 5 percent increase between 1990 and 2000. Crawford housing stock decreased by nearly 7 percent from 576 units in 1990. By 2000, there were 2,441 housing units in Chadron and 537 units in Crawford. Alliance, in Box Butte County (approximately 72 km [45 miles] from the project site) exhibited a 1 percent loss in total housing units between 1990 and 2000. In 2000, there were 4,062 housing units in Box Butte County (U.S. Department of Commerce, Bureau of the Census 1981a, 1990d, 2004).

In 2000, Dawes and Box Butte Counties had homeowner vacancy rates of 1.7 and 1.4 percent, respectively. A June 2004 listing of property for sale revealed two ranch properties near Crawford. Housing prices averaged \$53,915 in 1999. According to the Dawes County Tax Assessor, no new houses are being built, as current housing needs are being met.

A local Crawford realtor indicated in 1999 that rental property in Crawford was scarce. The rental housing stock has not increased in 2000, as rental vacancy rates were 4.4 percent in Dawes County and 4.7 percent in Box Butte County (U.S. Department of Commerce 2004), compared with rental vacancy rates in 1990, which were 12.6 percent in Dawes County and 14.9 percent in Box Butte County (U.S. Department of Commerce 1990a).

High interest rates and tax rates were the major deterrents for potential homebuyers in the project area in the past. Current deterrents are economic uncertainty and unemployment. Recent interest rates on most home mortgages have ranged between 5 and 7 percent.

Population projections for Dawes County indicate an average annual growth rate of 10 percent between 2000 and 2020. Most of this growth is likely to occur in Chadron, as suggested by population growth between 1990 and 2000, rather than Crawford, which lost population. The majority of housing demand expected over the next two decades is most likely to occur in Chadron. However, housing stock in Crawford has decreased so that homeowner vacancy rates have also decreased. In the event that the various scenic and recreational amenities of the region stimulate the local tourist economy, it is likely that both population and housing stock would increase in Crawford.

The purchase of homes by Crow Butte employees provides the town of Crawford with ad valorem property taxes. The town of Crawford levies taxes at a dollar per hundred of

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valuation. In 2001, the total levy was 0.43346, which would result in taxes on a \$50,000 property of approximately \$217 per year (Nebraska Department of Property Assessment and Taxation 2001).

2.3.3 Environmental Justice

The 2000 Census provides population characteristics for Census Tracts, which contain Block Groups that are further divided into Blocks. The Blocks are the smallest Census area that contains the race characteristics of the population in Dawes County. The Proposed Study Area (PSA) contains all or a portion of 68 Blocks within Census Tract 9506. Block Groups are the smallest Census area that contains poverty level information. There is no poverty data for individual Blocks within each Block. There are three Block Groups that are located partially within the PSA; however, the Block Groups area includes most of the north portion of Dawes County.

The affected area selected for the Environmental Justice analysis includes the race characteristics of the population within the City of Crawford and the surrounding Census Tract Blocks within the PSA. The population with an annual income below the poverty level was determined from Block Group characteristics.

According to the 2000 Census and summarized in Table 2.3-6, the combined population of the city of Crawford and the surrounding Census Blocks within the PSA was 1,265. Minority populations accounted for a small percentage of the total population. The majority of minority populations resided within Crawford.

The state of Nebraska was selected to be the geographic area to compare the demographic data for the population in the affected Blocks. This determination was based on the need for a larger geographic area encompassing affected area Block Groups in which equivalent quantitative resource information is provided. The population characteristics of the PSA are compared with Nebraska population characteristics to determine whether there are concentrations of minority or low income populations in the PSA relative to the state.

The data in Table 2.3-6 shows that minority populations in the affected Blocks account for considerably smaller proportion of the total PSA population than the proportion of minority populations at the state level. No concentrations of minority populations were identified as residing near the proposed Project facilities, as residents nearest to the Permit Area rural populations, while most of the minority population lives in Crawford. There would be no disproportionate impact to minority population from the construction and implementation of the North Trend Project.

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With the exception of Block Group 3, the populations within the Block Groups have higher rates of people living below the poverty level than the state. However, lower income levels are characteristic of predominantly rural populations and small communities that serve as a local center of agricultural activity. No adverse environmental impacts would occur to the population within the PSA from proposed Project activities; therefore there would be no disproportionate adverse impact to populations living below the poverty level in these Block Groups.

TABLE 2.3-6 RACE AND POVERTY LEVEL CHARACTERISTICS OF THE POPULATION IN THE STATE OF NEBRASKA, DAWES COUNTY, AND THE PSA

	Nebraska	Percent of Nebraska Pop.	Dawes County	Percent of Dawes County Pop.	Crawford City	Total Block Pop.	Crawford & Block Pop. (PSA)	Percent of Crawford & Block Pop.	Block Group 1	Block Group 2	Block Group 3
Total Population	1,711,263	100.0%	9,060	100.00%	1,107	158	1,265	100.0%	1,111	1,137	890
White alone	1,533,261	89.6%	8,457	93.34%	1,037	151	1,188	93.9%	-	-	-
Black or African American	68,541	4.0%	73	0.81%	1	0	1	0.1%	-	-	-
American Indian and Alaska Native	14,896	0.9%	261	2.88%	38	6	44	3.5%	-	-	-
Asian alone	21,931	1.3%	28	0.31%	0	0	0	0.0%	-	-	-
Native Hawaiian and Other Pacific Islander	836	0.0%	5	0.06%	0	0	0	0.0%	-	-	-
Some other race	47,845	2.8%	93	1.03%	10	1	11	0.9%	-	-	-
Two or more races	23,953	1.4%	143	1.58%	21	0	21	1.7%	-	-	-
Hispanic or Latino	94,425	5.5%	220	2.43%	22	3	25	2.0%	-	-	-
Percent below poverty level:	9.4%	-	17.1%	-	14.4%	-	-	-	21.3%	14.0%	8.3%

Source: Census 2000



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