CROW BUTTE RESOURCES, INC.

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July 13, 2009

Mr. Ronald Burrows, Project Manager
Uranium Recovery Licensing Branch
Decommissioning and Uranium Recovery Licensing Directorate
Division of Waste Management and Environmental Protection
Office of Federal and State Materials and Environmental Management Programs
U.S. Nuclear Regulatory Commission
Mail Stop T8-F5
Washington D.C. 20555-0001

Subject: Response to letter received April 18, 2009 (Dated April 15, 2009) – Request for Additional Information (Environmental), License Renewal Amendment Request, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

Dear Mr. Burrows:

By letter dated April 15, 2009, the U.S. Nuclear Regulatory Commission (NRC) staff, upon its environmental review of the license renewal application, requested additional information regarding several sections of the application. In response to that request, Crow Butte Resources, Inc. (CBR) is providing written responses to the NRC request for additional information and revised portions of CBR's application for a license renewal amendment for the current Crow Butte License Area (Application for 2007 License Renewal). This amendment requests that the NRC renew CBR's current license for a standard 10-year period. As described below, only the portions of the application that were revised are included with this submittal for replacement in either the original CBR amendment application or recently revised sections based on responses to NRC technical comments on the same document. In some cases, it was necessary to duplicate a number of pages without changes due to the addition of text and changes in page numbers. The changes to the application are identified in the response to comments document.

By letter dated May 12, 2009, CBR submitted responses to NRC technical comments along with applicable replacement pages to the 2007 License Renewal Application, Source Material License SUA-1534. Therefore, a number of replacement pages in this submittal pertaining to environmental comments have been provided to replace specific pages of the previous "technical" replacement sections of the application. This is being done to maintain an updated version of the single application document. In addition, replacement pages have also been provided for sections of the 2007 LRA that were not addressed in the previous technical responses. The attached document has clarifying language as to which of the two documents (original LRA application or technical responses document) that the replacement pages should be added to.

If you or your staff has any questions on the responses or revisions, please contact me at (720) 879-5518.

Sincerely,

Steve Collings

Steve Collings
President

Attachments: 3 copies with CDs
cc: Jim Stokey, General Manager
CBR File

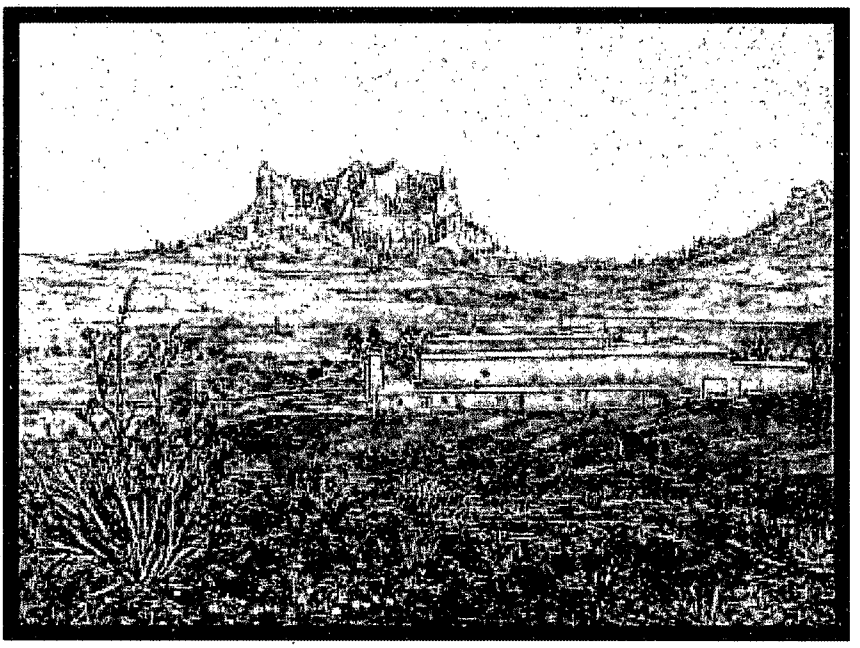
Crow Butte Resources, Inc.

Responses to NRC Request for Additional Information

Environmental Review

License Renewal Amendment Request

Source Material License SUA-1534



Prepared by

Crow Butte Resources, Inc.

86 Crow Butte Road

Crawford, Nebraska 69339

July 2009

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RESPONSES TO COMMENTS

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Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

NRC COMMENT #1 GENERAL SITE DESCRIPTION

To better understand the extent of the CBR operation, provide the following information:

1. Map showing the area of surface disturbance relative to the permitting area.

CBR RESPONSE:

Figure 1.3-3 *has been added to the License Renewal Application to show areas of existing and planned surface disturbance within the License Area. Please note that the former* ***Figure 1.3-3 (Crow Butte Project Property Land Ownership Map)*** *has been reassigned as* ***Figure 1.3-4*** *of the License Renewal Application.*

2. Map showing Mine Unit 11 relative to Nebraska State Lands and National Forest Lands.

CBR RESPONSE:

Figure 1.3-3 *has been created to illustrate the relationship between Mine Unit 11 and Nebraska State Lands and National Forest Lands.*

3. Proposed layout of Mine Unit 11 to determine the amount of disturbed surface.

CBR RESPONSE:

Disturbed surface area and the proposed wellfield layout of Mine Unit 11 are shown in ***Figure 1.3-3.*** *Please note that the mine units shown on* ***Figures 1.3-2, 1.7-2, and 2.1-2*** *represent preliminary (e.g., pre-development) boundaries, and that the surface disturbances depicted in* ***Figure 1.3-3*** *represent the actual extent of disturbances and includes the commercial monitor well ring and ancillary facilities such as ponds and storage areas. Prior to development of Mine Unit 11, the projected disturbed area was approximately 187.7 acres. Subsequent drilling of the Mine Unit 11 monitor well ring, resulted in an actual impacted area of approximately 125 acres. Within this area, approximately 79.6 acres of surface disturbances have occurred.*

4. Changes to the overall site plan that was presented in the original application and for initial license renewal.

CBR RESPONSE:

Changes to the overall site plan since the original application and license renewal in 1995 include:

1. *Maintenance, electrical, and storage buildings have been constructed in the SE ¼ Section 13 T31N R52W.*
2. *A drilling supply storage building has been constructed in the NE ¼ Section 13 T31N R52W.*

3. *At the Main (Central) Plant and Office: a new stand-alone office building adjacent to the existing process building, storage building, and extension on the northeast side of the main building have been constructed. Also, storage tanks for carbon dioxide, oxygen, and hydrogen peroxide have been relocated to make room for the expansion.*
4. *An addition to the R.O. Building has been constructed.*

In addition, CBR is licensed to construct and maintain 5 commercial ponds and 2 Research and Development ponds. However, at the present date, only 3 of the commercial ponds and the 2 Research and Development ponds have been constructed.

Changes to the overall site layout (Items 1 and 2 above) are shown in ***Figure 2.1-2****. The current layout of the Central Plant and Offices are shown in the revised* ***Figure 3.2-1****.*

NRC COMMENT #2 LAND USE

1. Gravel pits are mentioned in Sec. 2.2, Uses of Adjacent Lands and Waters. Are any of them used by CBR in the operation of the ISR site?

CBR RESPONSE:

Section 2.2 of the application has been modified by the addition of the following text to reflect the past, present, and probable future use of gravel pits in and near the License Area: "Gravel Pit #7 (GP-7) is located within the License Area and is currently being excavated by Crow Butte Resources for mine site road construction materials. Use of GP-4 and GP-5 by Crow Butte Resources has been discontinued due the limited availability of gravel or the presence of nearby piping infrastructure. It is possible that GP-5 may be re-opened for excavation in the future." In addition, ***Figure 2.2-2*** *has been modified to include a seventh gravel pit (GP-7).*

2. In Sec. 7.1, Land Use Impacts, potential development of additional satellite facilities is mentioned. Provide a map showing the locations of the potential facilities.

CBR RESPONSE:

Figure 7.1-1 *has been added to the License Renewal Application to illustrate the locations of potential satellite facilities at North Trend, Three Crow, and Marsland. These potential facilities are shown in relation to State of Nebraska and USFS-administered lands.*

NRC COMMENT #3 TRANSPORTATION

1. Provide a map showing the preferred ingress and egress routes to the CBR site.

CBR RESPONSE:

Figure 2.2-2 *has been revised to show the preferred access routes to the CBR site. Section 2.2.3.6 of the application has been updated to include the following information: "Private roads providing access to operational areas of the Crow Butte License Area exist and are demarcated by signage to prevent public access. Maintenance of state and county roads is performed by the Nebraska Department of Roads and Dawes County, respectively. Crow Butte Resources is responsible for maintenance and upgrades (i.e., grading, watering, and paving) of all private access roads within the License Area."*

2. Provide a description of the maintenance activities that CBR performs on these roads, or if the access roads to the site are maintained by others (state who).

CBR RESPONSE:

Nebraska State Highways 2/71 and 20 are maintained by the Nebraska Department of Roads. Squaw Creek and Ash Creek Roads are maintained by Dawes County. Private access roads are maintained by CBR. Section 2.2.3.6 of the application has been updated to include this information.

NRC COMMENT #4 GEOLOGY AND SOILS

1. Sec. 7.3, Geology and Soils Impacts, states a total of 1310 acres of surface have been disturbed at the CBR site. This is in contrast to the 1100 acres mentioned in Sec. 1.3. Please clarify this discrepancy.

CBR RESPONSE:

Recalculations of proposed surface disturbances within the license area yield a total disturbance of approximately 1,265 acres. This value has been incorporated throughout the License Renewal Application.

2. Sec. 7.3 also mentions that 30 acres is particularly vulnerable to erosion. Has the State required a reclamation or soil protection plan? What protective measures will be put in place as a result of such a plan or the analysis that demonstrates that erosion is a concern?

CBR RESPONSE:

No State or DEQ reclamation or soil protection plans have been specifically required for the 30 acres affected by construction of the Central Plant and related facilities. Standard construction best management practices (BMPs) were employed during facility construction to minimize erosion from the site. This area has been seeded with grass to stabilize soils and minimize future erosion.

Soil erosion mitigation and monitoring procedures for the License Area are described in the Storm Water Pollution Prevention Plan (SWPPP), which is included as an attachment to this

*document **(Attachment C)**. Practices proposed to minimize wind and water erosion and compaction are also described in **Section** 7.3 of the application.*

3. Is CBR planning to stockpile topsoil? How will it be protected from erosion?

CBR RESPONSE:

CBR currently stockpiles topsoil and will continue to do so in the future. Stockpiles in the pond and plant areas are seeded with grass to minimize erosion and are inspected monthly. These methods are described in Section 6.2.1.1 of the application.

Topsoil stockpiles associated with drill pit reclamation are discussed in the response to comment #12.3 below.

NRC COMMENT #5 SOCIOECONOMICS

1. Figure 2.3-1, Significant Population Centers Within 50 Kilometers, shows the center at the proposed North Trend Expansion site, not the CBR renewal site. This alters Table 2.3-4.

CBR RESPONSE:

***Figure** 2.3-1 has been corrected so that the population rose is centered within the License Area. Also, the delineations of statistical groups defined by different colors on **Figure** 2.3-1 have changed due to changes to the data set resulting from recentering of the population rose. The statistical groups are defined by a 10-class Jenks natural breaks algorithm in Arc Explorer. **Table** 2.3-4 has also been updated with the correct information based on the relocation of the population rose.*

NRC COMMENT #6 CULTURAL RESOURCES

Section 7.8, Historic and Cultural Resources Impacts, states identified resources would not be directly impacted by the CBR project, but are they in the area of potential effect? Provide a map that shows the area of potential effect and a table indicating the emplacement of the sites.

CBR RESPONSE:

***Figure** 2.4-1 has been modified to show identified cultural resources within and in proximity to the license area and their relationships to potential surface disturbances. Cultural resource site 25DW192, located in NE ¼ Section 30 T31N R51W, is the only significant site of potential archeological data recovery importance entirely located in an area of potential disturbance. CBR is protecting, and will continue to protect, this resource by maintaining fencing around the perimeter of the site to prevent unauthorized disturbance. Cultural resource sites 25DW194 and*

25DW0025 were evaluated by the licensee's safety and environmental review panel (SERP), which concluded that there would be no impact to either site resulting from CBR operations.

NRC COMMENT # 7 NOISE

Noise is dependent upon many factors: source, distance, terrain, atmospheric conditions, receptors, and others. Has CBR conducted a noise survey at the ISR site? If so, provide the results. If not, please provide information on how noise impacts as a result of the license renewal will be evaluated.

CBR RESPONSE:

CBR conducts noise surveys for the current operations to assess worker occupational exposure but has not conducted any noise surveys to assess public exposure. The reasons for this are discussed below.

Noise impacts to CBR workers during current operations at its uranium in situ leach facilities are considered to be minimal, largely because of compliance with Occupational Safety and Health Administration (OSHA) noise regulations. Noise surveys and measurements are taken as needed and required by OSHA regulations and CBR's health and safety procedures. According to the USNRC, the nature of uranium ISL operations are such that noise impacts to workers are considered SMALL, as defined by the NRC (NRC 2009). The NRC defines a SMALL impact as environmental effects that are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource considered (NRC 2009).

The current production facilities have been operated since 1986 without any public noise issues. Future operations at the current licensed facilities (production and wellfield activities) are not expected to change significantly, resulting in no significant increases in noise levels. The basis for the position that noise impacts to the public are not an issue of concern is due to the following: nature of operations, types of equipment used, duration of noise –producing activities, locations of facilities and activities in relation to the nearest residences, businesses or other public entities, and lack of noise complaints from the public for CBR activities. This position is supported by the findings in the NRC's recent publication of the final report entitled Generic Environmental Impact Statement (GEIS) for In-situ Leach Uranium Milling Facilities (USNRC 2009). In this GEIS the NRC reported that, within the Nebraska-South Dakota-Wyoming Uranium Milling Region, noise impacts to residences and other sensitive areas 300 meters (984 feet) or more from the facility would be small (USNRC 2009). The nearest resident to the current CBR production facility is approximately 805 meters (2,640 feet or 0.5 miles).

Likewise, drill rigs within the License Area will create local noise disturbances during wellfield development, but are not expected to contribute significantly to noise levels outside of the License Area. Although noise levels associated with a typical water well drilling rig may reach or exceed 100 dBA within 2 meters (6.6 feet) of the rig compressor, noise levels decrease to less than 90 dBA within 6 meters (20 feet) (USNRC 2009) and 55 dBA at 1,067 meters (3,500 feet) from the source (BLM 2005).

For the reasons stated above, CBR is of the opinion that a noise survey to evaluate noise emissions from the current facilities is not warranted. However, if the operational aspects ever change at the current facility that would suggest a significant increase in noise levels, or public complaints are received, then the appropriate surveys would be conducted and appropriate mitigation measures employed. Any increases in noise levels associated with satellite facilities are addressed in the associated application amendments, e.g., North Trend Expansion Area.

References:

U.S. Department of the Interior Bureau of Land Management (BLM). 2005. Jonah Infill Drilling Project Air Quality Impact Analysis Supplement, Draft Environmental Impact Statement. Pinedale and Rock Springs Field Offices. August 2005. DES-05-05.

United States Nuclear Regulatory Commission (USNRC). 2009. Generic Environmental Impact Statement on Uranium Milling NUREG – 1910. Washington, D.C.

NRC COMMENT #8 WATER RESOURCES

Surface Waters

1. White River tributaries are described in Section 2.2. Provide data (as available) on changes in water quality that may have occurred (if any) since Crow Butte began operating in 1991.

CBR RESPONSE:

CBR previously updated available surface water quality data for the White River in CBR's responses to NRC's Request for additional information (RAI) as part of the technical review of the 2007 LRA application (CBR 2009). Additional and more recent flow data and water quality data for the White River at Crawford gauging station was added to Sections 2.7.1.2 and 2.7.1.5 of the application.

*Recent discussions with a representative of the Nebraska Department of Natural Resources (NDNR) indicated that no recent flow or water quality data have been collected by the NDNR for Squaw Creek and English Creek (T. Hayden 2009). It was thought that the only available flow and water quality data were what CBR may have collected (see discussions below). The only flow data CBR has collected was during the baseline preoperational monitoring program in 1982 (**Table 2.9-11**). CBR has not collected any additional flow data for either of these creeks. Clarification as to the lack of availability of additional flow data was added to Section 2.9.5 of this application.*

*As part of the operational monitoring program, CBR collects water samples from each stream flowing through a wellfield area (one upstream and one downstream) and from any water impoundment in the wellfield area. CBR is only required to collect water samples to be analyzed for natural uranium and Ra-226 as per the operational monitoring program shown in **Table 5.8-5** of the application. Radiological water quality data (natural uranium and Radium-226) from March 1991 through June 2007for Squaw Creek and English Creek are presented in **Tables 5.8-14** and **5.8-15** of the application. In addition, sediment samples where each surface water sampling is performed, are also collected and analyzed for natural uranium, Ra-226 and Pb-210. Historical data for natural uranium, Radium-226 and PB-210 concentrations of sediment*

*samples collected from Squaw Creek and English Creek from 1991/1998 through 2006 are presented in **Tables 5.8-32** through **5.8-37** of the application. As discussed in Section 5.8.7.8, there were no apparent trends for any sample locations for any analyte.*

References:

Crow Butte Resources, Inc. (CBR). 2009. Responses to NRC Request for Additional Information, Technical Review, License Renewal Amendment Request, Source Material License SUA-1534. May 2009

Hayden, Tom. 2009. Personal Communication. [March 30 telephone conversation with Jack E. Cearley, ARCADIS U.S., Inc., Highlands Ranch, CO, RE: Flow data for Squaw Creek and English Creek]. Supervisor, Nebraska Department of Natural Resources, Bridgeport Field Office, Bridgeport, NE. 1 page.

2. Section 7.4.1 discloses that CBR submits an Annual Construction Plan for the coming year, and an authorization from the Nebraska Department of Environmental Quality (NDEQ) under the General National Pollutant Discharge Elimination Permit. To adequately assess the potential impacts to surface waters, please provide these documents.

CBR RESPONSE:

*Discharge authorization is provided under General National Pollutant Discharge Elimination System (NPDES) Permit Number NER110000, which is provided as **Attachment A** of this document.*

*Because Crow Butte operations require continual wellfield construction and operation, Cameco Resources submits NPDES Form CSW-NOI each year in fulfillment of requirements set by NPDES General Permit Number NER 110000. This Notice of Intent provides maps and schedules that describe planned construction work for the forthcoming year –including mitigation measures such as the construction of sediment/erosion controls. A copy of the CSW-NOI submittal of December 22, 2008 is attached as **Attachment B**.*

*The Storm Water Pollution Prevention Plan (SWPPP) provides a detailed description of the sediment and erosion controls, in addition to descriptions of potential pollutant sources, spill prevention and control measures, and outfall controls. The SWPPP is attached to this document as **Attachment C**.*

Groundwater

1. Sufficient information has not been provided on the uses of the Basal Chadron Sandstone (BCS) aquifer outside of the CBR permit area. Please provide data on uses of the aquifer outside of the permit area.

CBR RESPONSE:

Only two wells outside of the License Area are known to have been completed in the Basal Chadron Sandstone to produce potable water – Wells 61 and 114. Well 114 was decommissioned October 18, 2008. Quarterly monitoring is being conducted for the water well within 1 km of active mine units (Well 61). Other wells using the Basal Chadron Sandstone produce water for livestock or industrial uses only. Locations of the Basal Chadron wells are shown in ***Figure 2.7-4****. The native formation waters in the ore zones in the Basal Chadron aquifer are not recommended for human consumption because of naturally high levels of dissolved radioactive materials (uranium and Ra-226).*

2. In addition, sufficient information needs to be provided with regard to changes in uses resulting from changes in the water quality of the BCS since the CBR facility began operation in 1991.

CBR RESPONSES:

CBR is not aware of any wells that have been abandoned in the area as a result of changes to groundwater quality in the Basal Chadron Sandstone; therefore there are no known changes to use of water from this aquifer as a result of CBR operations. Section 7.3.4.2 and ***Table 7.4-1*** *describe excursions of degraded water from the wellfield. In all cases, excursions were detected and recovered. As stated in Section 7.3.4.2, "In no case did the excursions threaten the water quality of an underground source of drinking water since the monitor wells are located well within the aquifer exemption area approved by the USEPA and the NDEQ."*

Water quality has been monitored at private Well 61 since 1981 and has demonstrated no appreciable changes to radiological or nonradiological water quality parameters have occurred during this time period. These data are attached to this document as ***Attachment D****.*

NRC COMMENT #9 ECOLOGY

1. Sec. 2.8.1 states that "There have been no documented changes to ecological resources within the license area since the 1997 [Locked Rotor Accident] LRA."

CBR RESPONSE:

"LRA" in Section 2.8.1 stands for "License Renewal Application," not "Locked Rotor Accident." As stated, there have been no documented changes to ecological resources within the license area since the license renewal in 1997.

2. Table 2.8-3, License Area Habitat Types, indicates the total license area to be approximately 8,700 acres, while Sec. 1.3 states the license area to be only about 3,300 acres. Provide a justification of this discrepancy.

CBR RESPONSE:

*Section 2.8.6.4 and **Table 2.8-3** have been revised to correctly state that the approximately 8,700 acres referenced represents the Commercial Study Area, not the License Area. The License Area is approximately 2,875 acres in size, as stated in Section 1.3.*

3. Section 7.5.4, Surface Waters and Wetlands, states that approximately 3 percent of the license area is either wetlands or surface waters. Has this percentage changed since operations began in 1991, and by how much? What mitigation techniques have been used, if any have been needed?

CBR RESPONSE:

*As permitted by the United States Army Core of Engineers (USACE permit #NE 96-50561), 1.31 acres of new wetlands were created within the License Area. Mitigation techniques applied during this process included the construction and seeding of protective berms along English Creek. Descriptions of these wetlands impacts are provided in **Attachment E** of this document.*

With the aforementioned exception, the distribution of wetlands and surface waters has not changed and these ecological units represent the same proportion of the CSA and license area. No mitigation measures beyond those listed in the USACE permit have been deemed necessary

It is also noted that the text has been revised to correctly state that wetlands make up approximately 3 percent (273.92 acres) of the Commercial Study Area (CSA), not of the License Area. This correction has been made for all habitat types described in Section 2.8.6.4.

NRC COMMENT #10 FACILITY DESCRIPTION

In order to have a more complete understanding of CBR facility, provide the following proposed information that has occurred since the last license renewal.

1. Physical changes to buildings, storage areas, and other ancillary features (provide a map showing changes in the site plan).

CBR RESPONSE:

***Figure 2.1-2** of the License Renewal Application has been modified, in order to illustrate changes to existing buildings, and the construction of new buildings and storage facilities since the previous license renewal. These changes include new office, electrical, maintenance, and storage buildings, and an addition to the R.O. building.*

***Figures 3.2-1 and 5.8-5** depict the current, updated layout of the Central Plant. Changes to the Central Plant since the previous license renewal include office, office storage, and facility (Reverse Osmosis room) expansions and the repositioning of oxygen, carbon dioxide, and hydrogen peroxide tanks outside.*

2. Changes to process and other equipment, including any relocation of processes.
CBR RESPONSE: *Changes to equipment and equipment locations are shown in* ***Figure 5.8-5****. CO_2 and hydrogen peroxide storage tanks have been relocated. Additional Reverse Osmosis equipment has been added to the Central Plant. No changes to processes, nor to the location of said processes, have occurred. Changes to pore volumes that are displaced during groundwater reclamation and a recently-initiated bioremediation study are described below in the response to Comment #12.1.*
3. Changes to types, amounts, and storage of chemicals used in the ISR process.
CBR RESPONSE: *The list of process and non-process chemicals stored at the CBR Facility (Section 3.2.2.1) has been expanded to include some additional process-related chemicals. No changes to chemical types or volumes have occurred. Storage tanks for CO_2 and hydrogen peroxide have been relocated since the last license renewal, and their new locations are shown in* ***Figures 3.2-1 and 5.8-5****, which have been revised to account for these changes.*
4. Changes to the types of waste generated, as well as any change in disposal practices, including changes in disposal locations.
CBR RESPONSE: *No changes to the types of waste generated, disposal practices, nor disposal locations have occurred since the last license renewal.*
5. Changes to effluents generated (solid, liquid, gas), and any changes in treatment.
CBR RESPONSE: *No changes to generated effluents or treatments have occurred since the last license renewal.*
NRC COMMENT #11 OPERATIONS
Are there to be any changes in the number or type of personnel working at the facility during the next renewal period?
CBR RESPONSE: *Fluctuations in the types of jobs performed are anticipated as operations proceed through the various phases of construction, development, restoration, and decommissioning; however the total number of personnel working (contractors and those directly employed by CBR) are not*

anticipated to vary significantly under the renewed license.

Sections 7.10.2 and 9.2 discuss increases in personnel at proposed satellite facilities. These are expected to be Satellite Plant and Wellfield Operators and Maintenance positions.

NRC COMMENT #12 GROUNDWATER, SURFACE RECLAMATION, AND FACILITY DECOMMISSIONING

1. Have there been any changes to groundwater restoration procedures since the last license renewal?

CBR RESPONSE:

The only changes to the groundwater procedures used at the CBR operations since the last license renewal include a change in pore volumes and a bioremediation study that is underway.

The number of pore volumes that are displaced during groundwater restoration is now as follows: three pore volumes through the Ion Exchange (IX) columns; six pore volumes through the RO treatment; and two pore volumes of recirculation. There were nine pore volumes used for Mine Unit 1 at the current CBR operations. For the remainder of the mine units (Mine Units 2 through 11), 11 pore volumes will be used.

CBR is currently performing a bioremediation test in the north section of Mine Unit 4, Wellhouse 9. This test is evaluating the effectiveness of in situ bioremediation by applying it to a field scale test in a small well pattern consisting of six (6) wells. The system was installed in December, 2008, and will operate for one year. The nutrient being used is Emulsified Oil Substrate (EOS), a commercial product designed for enhancing groundwater bioremediation.

2. Is there a surface plan approved by both the NDEQ and the U.S. Department of Agriculture National Resources Conservation Service for reclaiming surface disturbances?

CBR RESPONSE:

No surface plan is required by the NRCS or NDEQ. The NDEQ has approved use of a permanent seed mixture recommended by the Natural Resources Conservation Service (NRCS) for use during reclamation. The approval letter from the NDEQ is attached to this document as Attachment F.

3. Would there be any reuse of surface facilities (buildings and other physical features) at other CAMECO facilities?

CBR RESPONSE:

No reuse of surface facilities is planned.

4. In addition to conducting post-reclamation radiological surveys, are there plans to conduct other post-reclamation surveys (e.g., ground and surface water quality, revegetation, erosion control)?

CBR RESPONSE:

CBR's Class III UIC authorization for underground injection and mineral production wells issued by the Nebraska Department of Environmental Quality (NE0122611) require a post-mining water quality monitoring for non-radiological groundwater parameters listed in ***Table 6.1.-1*** *of the application. Monitoring will be continued for designated restoration wells until the NDEQ deems restoration as satisfactory.*

With the exception of what may be required in final restoration and reclamation plans approved by the NRC and NDEQ, there are no plans to conduct "other" post-reclamation surveys for surface water, soils or vegetation. The potential for impacts due to surface waters, soils and vegetation associated with construction, operations, aquifer restoration and decommissioning of an in situ leach facility is considered "small" by the USNRC (NRC 2008).

For each drill site, the drill pits are reclaimed at the end of each drilling program, typically no longer than two (2) months. The pit is backfilled with subsoil and covered with the previously removed and stored topsoil. The NDEQ inspects the reclaimed drill pit after the vegetation has had time to reestablish, typically during a six (6) to twelve (12) month period. The NDEQ then notifies CBR whether the reclamation is considered satisfactory or if additional work is needed.

Reference:

United States Nuclear Regulatory Commission. (USNRC). 2009. Generic Environmental Impact Statement on Uranium Milling. NUREG-1910. Washington, D.C.

ATTACHMENTS

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Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

ATTACHMENTS TO

RESPONSES TO NRC COMMENTS
ON
CROW BUTTE RESOURCES, INC.
LICENSE RENEWAL APPLICATION

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Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

ATTACHMENT A

Authorization to Discharge Under the
National Pollutant Discharge Elimination System (NPDES)
General NPDES Permit Number NER110000
for Storm Water Discharges from
Construction Sites to Waters of the State of Nebraska

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Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES) General NPDES Permit Number NER110000 for Storm Water Discharges from Construction Sites to Waters of the State of Nebraska

This **NPDES** general permit is issued in compliance with the provisions of the Federal Water Pollution Control Act (33 U.S.C. Secs. 1251 *et. seq.* as amended to date), the Nebraska Environmental Protection Act (Neb. Rev. Stat. Secs. 81-1501 *et. seq.* as amended to date), and the Rules and Regulations promulgated pursuant to these Acts. Application may be made under this general permit for authorization to discharge **Storm Water** from construction sites. **Owners** or **Operators** issued a discharge authorization under this general permit are required to comply with the limits, requirements, prohibitions, and conditions set forth herein. The issuance of a discharge authorization under this general permit does not relieve **Permittees** of other duties and responsibilities under the Nebraska Environmental Protection Act, as amended, or established by regulations promulgated pursuant thereto.

NPDES Permit Number: **NER110000**

This permit shall become effective on **January 1, 2008**.

This permit and the authorization to discharge shall expire at midnight, **December 31, 2012**

Pursuant to a Delegation Memorandum dated January 12, 1999 and signed by the **Director**, the undersigned hereby executes this document on behalf of the **Director**.

Signed this _____ day of _____, _____

_____

Patrick W. Rice
Assistant Director

TABLE OF CONTENTS

ATTACHMENTS

Attachment # 1 Construction **Storm Water** Notice of Intent Form (CSW-**NOI**)

Attachment # 2 Construction **Storm Water** Transfer Form (CSW-TRANSFER)

Attachment # 3 Construction **Storm Water Notice of Termination** Form (CSW-**NOT**)

Terms written in **BOLDFACE** *in this permit are defined in the Definitions section of Part VII.*

PART I. COVERAGE UNDER THIS PERMIT

A. Introduction

This permit is required and shall apply to **storm water** discharges associated with **construction activity** that causes land disturbance of equal to or greater than one acre and less than one acre if part of a larger **common plan of development or sale**. All references in this permit to **construction activity** shall be read to include both **large construction activity** and **small construction activity**. This permit authorizes the discharge of storm water from **construction activity** entering **waters of the state**, a **municipal separate storm sewer system (MS4)** or a **combined sewer** within the State of Nebraska. Discharges are subject to the specific terms and conditions in this permit.

This permit also authorizes **storm water** discharges from any other **construction activity,** as designated by the **Director,** where the designation is made based on the potential for an excursion of a water quality standard or for significant contribution of pollutants to **waters of the state**. The goal of this permit is to reduce or eliminate **storm water** pollution from **construction activity** by requiring implementation of appropriate pollution control practices to protect water quality.

B. Permit Area

This permit provides **coverage** for **construction** and **support activity** throughout the State of Nebraska excluding tribal land within the State of Nebraska and as per limitations in Part I.C.3 of this permit.

C. Eligibility

Permit eligibility is limited to discharges from **construction activity** as defined in Part VII or as otherwise designated by the Director. This general permit contains eligibility restrictions, as well as permit conditions and requirements. In such cases, you must continue to satisfy those eligibility provisions to maintain permit authorization. If you do not meet the requirements that are a pre-condition to eligibility, then resulting discharges constitute unpermitted discharges. By contrast, if you do not comply with the requirements of the general permit, you may be in violation of the general permit for your otherwise eligible discharges.

1. Allowable Storm Water Discharges

Subject to compliance with the terms and conditions of this permit, you are authorized to discharge pollutants in:

a. **Storm water** associated with **large and small construction activity** as defined in Part VII;

b. **Storm water** discharges designated by the Director requiring a **storm water** permit under NDEQ Title 119, *Rules and Regulations Pertaining to the Issuance of Permits Under the* ***National Pollutant Discharge Elimination System (NPDES)*** *Chapter 2 002;*

c. Discharges composed of allowable discharges listed in Part I.C.1.a and Part I.C.1.b commingled with a discharge authorized by a different **NPDES** permit and/or a discharge that does not require **NPDES** permit authorization; and

d. **Storm water** discharges from **support activities** (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided:

1) The **support activity** is directly related to the construction site required to have **NPDES** permit **coverage** for discharges of **storm water** associated with **construction activity**;
2) The **support activity** is not a commercial operation serving multiple unrelated construction projects by different **operators**, and does not operate beyond the completion of the **construction activity** at the last construction project it supports; and
3) Appropriate controls and measures are identified in a **Storm Water Pollution Prevention Plan (SWPPP)** covering the discharges from the **support activity** areas;

2. Allowable Non-Storm Water Discharges

You are authorized for the following non-**storm water** discharges, *provided* the non-**storm water** component of the discharge is in compliance with Part III.D:

a. Discharges from fire-fighting activities;
b. Fire hydrant flushings;
c. Waters used to wash vehicles where detergents are not used;
d. Water used to control dust;
e. Potable water including uncontaminated water line flushings;
f. Routine external building wash down that does not use detergents;
g. Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
h. Uncontaminated air conditioning or compressor condensate;
i. Uncontaminated ground water or spring water;
j. Foundation or footing drains where flows are not contaminated with process materials such as solvents; and
k. Landscape irrigation.

3. Limitations on Coverage

This permit does not authorize the following **storm water** runoff conditions and may be the basis for denial or termination of authorization under this general permit. The **Department** shall be consulted prior to your submission of the **CSW-NOI** if any of the following conditions apply:

a. This permit does not authorize post-construction discharges that originate from the site after construction activities have been completed and the site has achieved **final stabilization**, including any temporary **support activity**. Post-construction **storm water** discharges from industrial sites may need to be covered by a separate **NPDES** permit.
b. This permit does not authorize discharges mixed with non-**storm water**. This exclusion does not apply to discharges identified in Part I.C.2 provided the discharges are in compliance with Part III.D.
c. This permit does not authorize **storm water** discharges associated with **construction activity** that have been covered under an individual NPDES permit or required to obtain **coverage** under an alternative general permit in accordance with Part IV.A.
d. This permit does not authorize discharges that the Director, prior to authorization under this permit, determines will cause, have the reasonable potential to cause, or contribute to an excursion above any applicable water quality or groundwater quality standards. Where such a determination is made prior to authorization, NDEQ may notify you that an individual permit application is necessary in accordance with Part IV.A. However, NDEQ may authorize your **coverage** under this permit after you have included appropriate controls and implementation procedures in your **SWPPP** designed to bring your discharge into compliance with water quality standards.
e. Storm water runoff from construction activity within the limits of any tribal lands under the jurisdiction of the United States Government, dependent tribal communities within the borders of the United States, or other tribal allotments;

f. Non-point source agricultural and silvicultural discharges;

g. Those storm water discharges for which storm water effluent guideline limitations apply;

h. Those from an operating landfill;

i. Storm water runoff from field activities or operations, including construction, associated with oil and gas exploration, production, processing or treatment operations or transmission facilities as dictated by NDEQ Title 119, Chapter 10.

j. Storm water runoff that may adversely impact critical habitat of aquatic related, threatened or endangered species as designated by Nebraska Game and Parks Commission (www.ngpc.state.ne.us) or the U.S. Fish and Wildlife Service (www.fws.gov).

k. Storm water runoff that may adversely affect properties listed or eligible for listing in the National Register of Historic Places (www.nebraskahistory.org) or affecting known or discovered archeological sites; or

l. Those that the Director determines would be more effectively regulated with a site specific, area specific, or a basin specific permit.

4. Period of Coverage

a. This permit is effective as of the issued date and is effective for five years.

b. Coverage shall commence at the time discharge authorization is granted and shall continue for a period lasting at least 180 days after final stabilization and **Notice of Termination** is received for the site.

c. The Director can extend coverage under the permit beyond the time period specified in this section if excessive erosion problems remain at the site.

PART II. AUTHORIZATION FOR DISCHARGES OF STORM WATER FROM CONSTRUCTION ACTIVITY

To obtain **coverage** under this general permit, you must prepare and submit a complete and accurate construction **storm water Notice of Intent (CSW-NOI)**, as described in this Part. Discharges are not authorized if your **CSW-NOI** is incomplete or inaccurate or if you were never eligible for permit **coverage**.

A. Authorization to discharge date

1. If you submit a **CSW-NOI** after the issuance date of this permit you are authorized to discharge **storm water** from construction activities under the terms and conditions of this permit seven (7) calendar days after submittal to NDEQ of a complete and accurate **CSW-NOI** (i.e., 7 days from date of postmark), except as noted in Part II.A.2. The Department will notify you of the permit authorization in writing.
2. The **Director** may delay your authorization based on eligibility considerations of Part I.C. In these instances, you are not authorized for **coverage** under this permit until you receive notice from NDEQ of your eligibility.

B. CSW Notice of Intent Contents

You must use the **CSW-NOI** form provided in *Attachment 1* (or a photocopy thereof or electronic **CSW-NOI** form that may become available during the term of this permit provided by NDEQ), You must provide the following information on the **CSW-NOI** form:

1. Project/Site name, address, county or similar governmental subdivision, and latitude/longitude of your construction project or site;
2. The **certifying official's** legal name, address and phone number;
3. The **SWPPP** designer name, company, address and phone number;
4. The location where the applicable **SWPPP** may be viewed;
5. A site map as described in Part III.B.1.d of this permit;

6. Name of the **water(s) of the state** into which your site discharges;
7. Estimated dates of commencement of **construction activity** and **final stabilization** (i.e., project start and completion dates);
8. Total acreage (to the nearest quarter acre) to be disturbed for which you are requesting permit **coverage**;
9. Any state or federally-listed threatened or endangered species, or state or federally-designated critical habitat are in your project area to be covered by this permit.
10. A certification statement, signed and dated by an **certifying official** as defined in Part VI.D.

C. Submission Deadlines

1. New Projects: To obtain **coverage** under this permit, you must submit a complete and accurate **CSW-NOI** and be authorized consistent with Part II.A.1 prior to commencement of construction activities.
2. Permitted Ongoing Projects (only applicable for first 90 days after this permit is issued): If you previously received authorization to discharge for your project under the 1997 Construction Storm Water General Permit (CSW-1997) and you wish to continue **coverage** under this permit:
   a. Submit an **CSW-NOI** within 90 days of the issuance date of this permit, and
   b. Until you are authorized under this permit consistent with Part II.A, comply with the terms and conditions of the CSW-1997 general permit under which you were previously authorized.
   c. If you meet the termination of **coverage** requirements in accordance with Part V.A within 90 days of the issuance date of this permit (e.g., construction will be finished and **final stabilization** achieved) you must:
      1) Submit an CSW-NOT using the form provided in Attachment #3, and
      2) Until coverage is no longer required, comply with the terms and conditions of the CSW-1997 general permit under which you were previously authorized.
3. Late Notifications:

   You are not prohibited from submitting a **CSW-NOI** after initiating clearing, grading, excavation activities, or other construction activities. When a late **CSW-NOI** is submitted, authorization for discharges occurs consistent with Part II.A. The **Department** reserves the right to take enforcement action for any unpermitted discharges that occur between the commencement of construction and discharge authorization.

D. Where to Submit

Original applications and forms (no photocopies or faxes) for **NPDES** General Permit NER110000 shall be submitted to the following address:

Water Quality Division
Storm Water
Suite 400, The Atrium
1200 'N' Street
PO Box 98922
Lincoln Nebraska 68509-8922

E. Additional Requirements

1. The Department may request additional information from the source:
   a. To facilitate the review of the **CSW-NOI**;
   b. To finalize a determination related to the granting of a discharge authorization; or
   c. To determine whether a site specific, area specific, or basin specific permit application may be required.

2. When **storm water** is discharged through **municipal separate storm sewer systems**, applicants shall concurrently submit a copy of **NPDES** form **CSW-NOI** to the **operator** of the **municipal separate storm sewer system** through which they discharge. Appendix B has a listing of those municipalities that are permitted under the **Municipal Separate Storm Sewer program**.
3. Other government agencies (e.g. US Army Corps of Engineers, Local City/County Government, or the local Natural Resource District) may have additional notification requirements. Submittal of the **NPDES** form **CSW-NOI** does not relieve the applicant of responsibility to comply with the requirements of other government agencies.

PART III. STORM WATER POLLUTION PREVENTION PLANS (SWPPP)

A. Storm Water Pollution Prevention Plan Framework

1. A **SWPPP** must be prepared prior to submission of a **CSW-NOI** as required in Part II.B. The **SWPPP** must be prepared by a qualified individual such as a Professional Engineer, Certified Landscape Architect, and /or Certified Professional in **Erosion** and **Sediment Control**.
2. The **SWPPP** must:
   a. Identify all potential sources of pollution which may reasonably be expected to affect the quality of **storm water** discharges from the construction site;
   b. Minimize erosion on disturbed areas and minimize the discharge of sediment and other pollutants in storm water runoff;
   c. Describe practices to be used to reduce pollutants in **storm water** discharges from the construction site; and
   d. Assure compliance with the terms and conditions of this permit.
3. Once a definable area has achieved **final stabilization**, you may mark this on your **SWPPP** and no further **SWPPP** or inspection requirements apply to that portion of the site (e.g., earth-disturbing activities around one of three buildings in a complex are done and the area is finally **stabilized**, one mile of a roadway or pipeline project is done and finally **stabilized**, etc).
4. You must implement the **SWPPP** as written from commencement of **construction activity** until **final stabilization** is complete.

B. Pollution Prevention Plan Contents: Site and Activity Description

1. The **SWPPP** must describe the nature of the **Construction Activity**, including:
   a. The function of the project (e.g., low density residential, shopping mall, highway, etc.);
   b. The intended sequence and timing of activities that disturb soils at the site;
   c. Estimates of the total area expected to be disturbed by excavation, grading, or other construction activities, including dedicated off-site borrow and fill areas; and
   d. A general location map (e.g., USGS quadrangle map, a portion of a city or county map, or other map) with enough detail to identify the location of the construction site and **waters of the state** within one mile of the site.
2. The **SWPPP** must contain legible site map(s) showing the entire site during grading, construction, and post-construction phases, identifying:
   a. Direction(s) of **storm water** flow and approximate slopes anticipated after major grading activities;
   b. Areas of soil disturbance and areas that will not be disturbed;
   c. Locations of major structural and nonstructural **Best Management Practices (BMPs)** identified in the **SWPPP**;
   d. Locations where stabilization practices are expected to occur;
   e. Locations of off-site material, waste, borrow or equipment storage areas;

f. Locations of all **Waters of the State** (including wetlands);

g. Locations where **storm water** discharges to a surface water; and

h. Areas where **final stabilization** has been accomplished and no further construction-phase permit requirements apply.

3. The **SWPPP** must describe and identify the location and description of any **storm water** discharge associated with industrial activity other than construction at the site. This includes **storm water** discharges from dedicated asphalt plants and dedicated concrete plants, which are covered by this permit.

C. Pollution Prevention Plan Contents: Controls to Reduce Pollutants

1. The **SWPPP** must include a description of all pollution control measures (i.e., **BMP**s) that will be implemented as part of the **Construction Activity** to control pollutants in **storm water** discharges. For each major activity identified in the project description the **SWPPP** must clearly describe appropriate control measures and the general sequence during the construction process in which the measures will be implemented.
2. The **SWPPP** must include a description of interim and permanent stabilization practices for the site including a schedule of when the practices will be implemented.
3. The following records must be maintained as part of the **SWPPP**:
   a. Dates when major grading activities occur;
   b. Dates when construction activities temporarily or permanently cease on a portion of the site; and
   c. Dates when stabilization measures are initiated.
4. The **SWPPP** must include a description of structural practices to divert flows from exposed soils, retain/detain flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site.
5. The **SWPPP** must include a description of all post-construction **storm water** management measures that will be installed during the construction process to control pollutants in **storm water** discharges after construction operations have been completed. Such measures must be designed and installed in compliance with applicable federal, state, and local requirements. Maintenance plans of permanent management measures must be included in the **SWPPP**.
6. The **SWPPP** must describe measures to prevent the discharge of solid materials, including building materials and cement truck washout to **waters of the state**, except as authorized by a permit issued under section 404 of the CWA.
7. The **SWPPP** must describe measures to minimize, to the extent practicable, off-site vehicle tracking of sediments onto paved surfaces and the generation of dust.
8. The **SWPPP** must include a description of construction and waste materials expected to be stored on-site with updates as appropriate. The **SWPPP** must also include a description of controls, including storage practices, to minimize exposure of the materials to **storm water**, and **spill prevention control and countermeasure** practices.
9. The **SWPPP** must include a description of pollutant sources from areas other than construction (including **storm water** discharges from dedicated asphalt plants and dedicated concrete plants), and a description of controls and measures that will be implemented at those sites to minimize pollutant discharges.

D. Non-Storm Water Discharge Management

The **SWPPP** must identify all allowable sources of non-**storm water** discharges listed in Part I.C.2 of this permit, except for flows from fire fighting activities that are combined with **storm water** discharges associated with **Construction Activity** at the site. Non-**storm water** discharges should be eliminated or reduced to the extent feasible. The **SWPPP** must identify and ensure the implementation of appropriate pollution prevention measures for the non-**storm water** component(s) of the discharge.

E. Maintenance of Controls

1. All erosion and **sediment control** measures and other protective measures identified in the **SWPPP** must be maintained in effective operating condition. If site inspections required by Part III.I identify **BMPs** that are not operating effectively, maintenance must be performed within seven days and before the next storm event whenever practicable to maintain the continued effectiveness of **storm water** controls.
2. If existing **BMPs** need to be modified or if additional **BMPs** are necessary for any reason, implementation must be completed before the next storm event whenever practicable. If implementation before the next storm event is impracticable, the situation must be documented in the **SWPPP** and alternative **BMPs** must be implemented as soon as possible.
3. Sediment from sediment traps or sedimentation ponds must be removed when design capacity has been reduced by 50 percent.

F. Permit Eligibility Related to Endangered Species

The **SWPPP** must include documentation supporting a determination of permit eligibility with regard to Endangered Species, including:

1. Information on whether state or federally-listed endangered or threatened species, or designated critical habitat may be in the project area;
2. Whether such species or critical habitat may be adversely affected by **storm water** discharges or **storm water** discharge-related activities from the project;
3. Any correspondence for any stage of project planning between the U.S. Fish and Wildlife Service (FWS), Nebraska Game and Parks Commission (NGPC), EPA, NDEQ or others and you regarding listed species and critical habitat, including any notification that delays your authorization to discharge under this permit;
4. A description of measures necessary to protect state- and federally-listed endangered or threatened species, or state and federally-designated critical habitat. The **permittee** must describe and implement such measures to maintain eligibility for **coverage** under this permit.

G. Copy of Permit Requirements

Copies of this permit and of the signed and certified **CSW-NOI** form that was submitted to NDEQ must be included in the **SWPPP**. Also, upon receipt, a copy of the letter from the NDEQ notifying you of their receipt of your administratively complete **CSW-NOI** must also be included as a component of the **SWPPP**.

H. Applicable State, or Local Requirements

The **SWPPP** must be consistent with all applicable federal, state, or local requirements for soil and erosion control and **storm water** management, including updates to the **SWPPP** as necessary to reflect any revisions to applicable federal, state, or local requirements for soil and erosion control.

I. Inspections

1. Inspections must be conducted at least once every fourteen (14) calendar days, and within 24 hours of the end of a storm event of 0.5 inches or greater. Any delay in the replacement or maintenance of non-functional **BMPs** beyond seven (7) calendar days shall be documented in the **SWPPP** with sufficient detail as to explain the reason for the delay.
2. Inspection frequency may be reduced to at least once every month if:
   a. The entire site is temporarily **stabilized**;
   b. Runoff is unlikely due to winter conditions (e.g., site is covered with snow, ice, or the ground is frozen);

c. Reduced inspection frequency does not relieve the permittee of the maintenance responsibilities during interim periods.

3. Inspections must be conducted by qualified personnel (provided by the **operator** or cooperatively by multiple **operators**). "Qualified personnel" means a person knowledgeable in the principles and practice of erosion and **sediment controls** who possesses the skills to assess conditions at the construction site that could impact **storm water** quality and to assess the effectiveness of any erosion and **sediment control** measures selected to control the quality of **storm water** discharges from the **construction activity**.

4. Inspections must include all areas of the site disturbed by **construction activity** and areas used for storage of materials that are exposed to precipitation. Inspectors must look for evidence of, or the potential for, pollutants entering the **storm water** conveyance system. Erosion and **sediment control** measures identified in the **SWPPP** must be observed to ensure proper operation. Discharge locations must be inspected to ascertain whether control measures are effective in preventing significant impacts to **waters of the state**, where accessible. Where discharge locations are inaccessible, nearby downstream locations must be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site must be inspected for evidence of off-site sediment tracking.

5. Utility line installation, pipeline construction, and other examples of long, narrow, linear construction activities may limit the access of inspection personnel to the areas described above. Inspection of these areas could require that vehicles compromise temporarily or even permanently **stabilized** areas, cause additional disturbance of soils, and increase the potential for erosion. In these circumstances, controls must be inspected on the same frequencies as other construction projects, but representative inspections may be performed. For representative inspections, personnel must inspect controls along the construction site for 0.25 mile above and below each access point where a roadway, undisturbed right-of-way, or other similar feature intersects the construction site and allows access to the areas described above. The conditions of the controls along each inspected 0.25 mile segment may be considered as representative of the condition of controls along that reach extending from the end of the 0.25 mile segment to either the end of the next 0.25 mile inspected segment, or to the end of the project, whichever occurs first.

6. For each inspection required above, you must complete an inspection report. At a minimum, the inspection report must include:
   a. The inspection time and date;
   b. Names, titles, and qualifications of personnel making the inspection;
   c. Weather information for the period since the last inspection (or since commencement of **construction activity** if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;
   d. Weather information and a description of any discharges occurring at the time of the inspection;
   e. Location(s) of discharges of sediment or other pollutants from the site;
   f. Location(s) of **BMPs** that need to be maintained;
   g. Location(s) of **BMPs** that failed to operate as designed or proved inadequate for a particular location;
   h. Monitoring results if requested;
   i. Records of the last grading activity;
   j. Location(s) where additional **BMPs** are needed that did not exist at the time of inspection; and
   k. Corrective action required including any changes to the **SWPPP** necessary and implementation dates.

A record of each inspection and of any actions taken must be retained as part of the **SWPPP** for at least three years from the date that permit **coverage** expires or is terminated. The inspection reports must identify any incidents of non-compliance with the permit conditions. Where a report does not identify any incidents of non-compliance, the report must contain a certification that the construction project or site is in compliance with the **SWPPP** and this permit. The report must be signed in accordance with Part VI.D.6 of this permit.

J. Maintaining an Updated Plan

1. The **SWPPP**, including the site map, must be amended whenever there is a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants to **waters of the state** that has not been previously addressed in the **SWPPP**.
2. The **SWPPP** must be amended if during inspections or investigations by site staff, or by local, state, or federal officials, it is determined that the **SWPPP** is ineffective in eliminating or significantly minimizing pollutants in **storm water** discharges from the construction site.
3. Based on the results of an inspection, the **SWPPP** must be modified as necessary to include additional or modified **BMPs** designed to correct problems identified. Revisions to the **SWPPP** must be completed within seven (7) calendar days following the inspection. Implementation of these additional or modified **BMPs** must be accomplished as described in Part III.E.

K. Signature, Plan Review and Making Plans Available

1. A copy of the **SWPPP** (including a copy of the permit), **CSW-NOI**, and the letter from **NDEQ** notifying you of the receipt of the complete and accurate **CSW-NOI** must be retained at the construction site or other location easily accessible during normal business hours. The **SWPPP** must be made available upon request to Federal, State, and local agencies, from the date of commencement of construction activities to the date of **final stabilization**.
2. A sign or other notice must be posted conspicuously near the main entrance of the construction site. If displaying near the main entrance is infeasible, the notice can be posted in a local public building such as the town hall or public library. The sign or other notice must contain the following information:
   a. A copy of the completed **CSW-NOI** as submitted to the NDEQ; and
   b. If the location of the **SWPPP** or the name and telephone number of the contact person for scheduling **SWPPP** viewing times has changed (i.e., is different than that submitted to NDEQ in the **CSW-NOI**), the current location of the **SWPPP** and name and telephone number of a contact person for scheduling viewing times. For linear projects, the sign or other notice must be posted at a publicly accessible location near the active part of the construction project (e.g., where a pipeline project crosses a public road).

L. Management Practices

1. All control measures must be properly selected, installed, and maintained in accordance with any relevant manufacturer specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately, or incorrectly, the **operator** must replace or modify the control for site situations as soon as practicable.
2. If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize off-site impacts. Sediment escaping the construction site indicates there may be insufficient **BMPs** to control runoff.
3. Litter, construction debris, and construction chemicals that could be exposed to **storm water** must be prevented from becoming a pollutant source in **storm water** discharges.
4. Except as provided below, stabilization measures must be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the **construction activity** in that portion of the site has temporarily or permanently ceased.
   a. Where stabilization by the 14th day is precluded by snow cover or frozen ground conditions, stabilization measures must be initiated as soon as practicable.
   b. Where **construction activity** on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 14 days, temporary stabilization measures do not have to be initiated on that portion of the site.

c. In semiarid and drought-stricken areas where initiating perennial vegetative stabilization measures is not possible within 14 days after **construction activity** has temporarily or permanently ceased, final vegetative stabilization measures must be initiated as soon as practicable.

5. Velocity dissipation devices must be placed at discharge locations and along the length of any **outfall** channel to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., no significant changes in the hydrological regime of the receiving water).

M. Final Stabilization

The **Permittee** shall be responsible for ensuring that **final stabilization** is accomplished on all non-**impervious surfaces** of the authorized construction site prior to submitting form **CSW-NOT**.

1. **Coverage** under this permit is normally terminated 180 calendar days after:
   a. All soil disturbing **construction activity** has been completed;
   b. A uniform perennial vegetative cover with a minimum density of 70 percent of the native background vegetative cover, has been established on all non-**impervious surfaces** and areas not covered by permanent structures unless equivalent permanent stabilization (such as riprap, gabions, and geotextiles) measures have been employed;
   c. All permanent drainages, constructed to drain water from the site, has been **stabilized** to prevent erosion;
   d. All **temporary erosion protection** and **sediment control BMPs** have been removed without compromising the permanent erosion protection and **sediment control BMPs**;
   e. All sediment build-up has been removed from conveyances and basins that are to be used as permanent water quality management **BMPs**. The cleanout of permanent basins used as temporary **BMPs** during construction shall be sufficient to return the basin to design capacity.
   f. Responsibility for long-term maintenance of permanent BMPs must be assigned.
   g. **Construction activity** conducted on or through agricultural or silvicultural land shall be considered finally **stabilized** upon return to the preexisting agriculture or silviculture use;
   h. **Construction activity** conducted at new industrial facilities that will operate the site in an exposed manner (such as limestone mining and solid waste landfills) shall be considered finally **stabilized** upon commencement of industrial activity consistent with the industrial use and **coverage** under the appropriate **NPDES** permit for industrial **storm water**.

PART IV. SPECIAL CONDITIONS, MANAGEMENT PRACTICES, OTHER NON-NUMERIC LIMITATIONS

A. Requiring an Individual Permit or an Alternative General Permit

1. NDEQ may require you to apply for and/or obtain either an individual **NPDES** permit or an alternative **NPDES** general permit. Any interested person may petition NDEQ to take action under this paragraph. If NDEQ requires you to apply for an individual **NPDES** permit, NDEQ will notify you in writing that a permit application is required. This notification will include a brief statement of the reasons for this decision and an application form. In addition, if you are an existing **permittee** covered under this permit, the notice will set a deadline to file the application, and will include a statement that on the effective date of issuance or denial of the individual **NPDES** permit or the alternative general permit as it applies to you, **coverage** under this general permit will automatically terminate. Applications must be submitted to NDEQ. NDEQ may grant additional time to submit the application upon your request. If you are covered under this permit and you fail to submit in a timely manner an individual **NPDES** permit application as required by NDEQ, then the applicability of this permit to you is automatically terminated at the end of the day specified by NDEQ as the deadline for application submittal.

2. You may request to be excluded from the **coverage** of this general permit by applying for an individual permit. In such a case, you must submit an individual application in accordance with the requirements of NDEQ Title 119, with reasons supporting the request to NDEQ. The request may be granted by issuance of an individual permit or an alternative general permit if your reasons are adequate to support the request.
3. When an individual **NPDES** permit is issued to you, who are otherwise subject to this permit, or you are authorized to discharge under an alternative **NPDES** general permit, the applicability of this permit to you is automatically terminated on the effective date of the individual permit or the date of authorization of **coverage** under the alternative general permit, whichever the case may be. If you, who are otherwise subject to this permit, are denied an individual **NPDES** permit or an alternative **NPDES** general permit, the applicability of this permit to you is automatically terminated on the date of such denial, unless otherwise specified by NDEQ.

B. Oil and Hazardous Substances/Spill Notification

The discharge of hazardous substances or oil in **storm water** discharges from the construction site must be prevented or minimized in accordance with the **SWPPP**. This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill. The **Permittee** shall conform to the provisions set forth in NDEQ Title 126, *Rules and Regulations Pertaining to the Management of Wastes* and federal reporting requirements of 40 CFR Part 110, 40 CFR Part 117 and 40 CFR Part 302 relating to spills or other releases of oil or hazardous substances.

If the **permittee** knows, or has reason to believe, that a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under NDEQ Title 126, 40 CFR Part 110, 40 CFR Part 117 and 40 CFR Part 302, occurs during a 24-hour period:

1. **Permittee** shall immediately notify the **Department** of a release of oil or hazardous substances. During office hours (i.e., 8:00 a.m. to 5:00 p.m., Monday through Friday, except holidays), notification shall be made to the **Department** at telephone numbers (402) 471-2186 or (877) 253-2603 (toll free).
2. When NDEQ cannot be contacted, the **Permittee** shall report to the Nebraska State Patrol for referral to the NDEQ Emergency Response Team at telephone number (402) 471-4545. It shall be the **Permittee's** responsibility to maintain current telephone numbers necessary to carry out the notification requirements set forth in this paragraph.
3. **Permittee** must modify the **SWPPP** as required under Part III.J within 7 calendar days of knowledge of the release to: provide a description of the release, the circumstances leading to the release, and the date of the release. Plans must identify measures to prevent the reoccurrence of such releases and to respond to such releases.

C. Attainment of Water Quality Standards After Authorization

1. You must select, install, implement and maintain **BMPs** at your construction site that minimize pollutants in the discharge as necessary to meet applicable water quality standards. In general, except in situations explained in this section, your **SWPPP** developed, implemented, and updated consistent with Part III is considered as stringent as necessary to ensure that your discharges do not cause or contribute to an excursion above any applicable water quality standard.
2. At any time after authorization NDEQ may determine that your **storm water** discharges may cause, have reasonable potential to cause, or contribute to an excursion above any applicable water quality standard. If such a determination is made, NDEQ will require you to:
   a. Develop a supplemental BMP action plan describing **SWPPP** modifications in accordance with Part III to address adequately the identified water quality concerns;
   b. Submit valid and verifiable data and information that are representative of ambient conditions and indicate that the receiving water is attaining water quality standards; or
   c. Cease discharges of pollutants from **Construction Activity** and submit an individual permit application according to Part IV.A.

All written responses required under this part must include a signed certification from the **certifying official**.

D. Discharges Affecting Endangered or Threatened Species

This permit does not replace or satisfy any review requirements for Endangered or Threatened species from new or expanded discharges that adversely impact or contribute to adverse impacts on a listed endangered or threatened species or adversely modify a designated critical habitat. The **owner** must conduct any required review and coordinate with appropriate agencies for any project with the potential of affecting threatened or endangered species, or their critical habitat.

E. Discharges Affecting Historical Places or Archeological Sites

This permit does not replace or satisfy any review requirements for Historic Places or Archeological Sites, from new or expanded discharges which adversely affect properties listed or eligible for listing in the National Register of Historic Places or affecting known or discovered Archeological Sites. The **owner** must be in compliance with National Historic Preservation Act and conduct all required review and coordination related to historic preservation, including significant anthropological sites and any burial sites, with the Nebraska Historic Preservation Officer. You must comply with all applicable state, and local laws concerning the protection of historic properties and places, your discharge authorization under this permit is contingent upon this compliance.

F. Activities/Discharges subject to other Applicable Regulations

This permit does not replace or satisfy any other applicable regulatory requirements that the applicant/**permittee** is subject to. The initiator of any controlled/regulated activity is the sole responsible party for obtaining authorization or permit **coverage** and for maintaining compliance with any applicable laws, regulations or rules that may apply to their activities.

G. Continuation of the Expired General Permit

If this permit is not reissued or replaced prior to the expiration date, it will be administratively continued in accordance with the Administrative Procedure Act and remain in force and effect. If you were granted permit coverage prior to the expiration date, you will automatically remain covered by the continued permit until reissuance or replacement of this permit, at which time you must comply with the conditions of Part II C.2; or

1. Submit of a Notice of Termination form; or
2. Apply for coverage under an individual permit for the project's discharges; or
3. If NDEQ determines a general permit will not be reissued, you must seek coverage under an alternative general permit or an individual permit.

PART V. TERMINATION, TRANSFER OR REASSIGNMENT OF PERMIT COVERAGE

A. Notice of Termination Requirements

You may only submit a **Notice of Termination** (**NOT**) after one or more of the following conditions have been met:

1. **Final stabilization** has been achieved on all portions of the site for which you are responsible;
2. Another **operator** has assumed control according to Part VI.D.6 over all areas of the site that have not been finally **stabilized**;
3. **Coverage** under an individual or alternative general **NPDES** permit has been obtained; or
4. For residential construction only, **temporary erosion protection** has been completed and the residence has been reassigned to the homeowner.

The **CSW-NOT** must be submitted within 30 days of one of the above conditions being met. Authorization to discharge terminates at midnight of the day the **CSW-NOT** is signed.

B. Submitting a Notice of Termination

It is your responsibility to submit a complete and accurate **Notice of Termination** (**CSW-NOT**) form *Attachment #3*. If NDEQ notifies dischargers (either directly, by public notice, or by making information available on the Internet) of other **CSW-NOT** form options (e.g., electronic submission), you may take advantage of those options to satisfy the requirements of Part V.

1. After one or more of the **Notice of Termination** Requirements in Part V.A has been met, submit the following information to the NDEQ:
   a. The **NPDES** permit authorization number for the **storm water** discharge;
   b. The basis for submission of the **CSW-NOT**, including: **final stabilization** has been achieved on all portions of the site for which the **permittee** is responsible; another **operators/permittee** has assumed control over all areas of the site that have not been finally **stabilized**; **coverage** under an alternative **NPDES** permit has been obtained; or, for residential construction only, **temporary erosion protection** has been completed and the residence has been transferred to the homeowner;
   c. The **Certifying Official's** legal name, address and phone number;
   d. The name of the project, address (or a description of location if no street address is available), and county of the construction site for which the notification is submitted; and
   e. A certification statement signed and dated by a **certifying official**.

C. Transfer of Permit

When responsibility for **storm water** discharges at a construction site changes from one entity to another, the **permittee** shall submit a completed Notice of Transfer, *Attachment #2,* that is signed in accordance with Part VI.D.6 of this permit.

1. The Notice of Transfer (CSW-Transfer), *Attachment # 2,* includes:
   a. Permit certification number;
   b. Name, location, and county for the construction site for which the CSW-Transfer is being submitted;
   c. Identifying information for the new **permittee**;
   d. Identifying information for the current **permittee**; and
   e. Effective date of transfer;
2. Other Requirements of a Permit Transfer:
   a. If the **storm water** discharge, associated with **construction activity**, is covered by this permit then the new **owner**(s) shall comply with all terms and conditions of this permit.
   b. A copy of the CSW-Transfer shall be included in the **SWPPP**.
   c. A **CSW-NOI** shall be submitted to NDEQ by the new owner(s).
   d. For **construction activity** which is part of a larger **common plan of development**, if the **permittee** transfers ownership of all or any part of property subject to this permit, both the **permittee** and transferee shall be responsible for compliance with this permit for that portion of the project which has been transferred including when the transferred property is less than one acre in area.
   e. If the new **owner**(s) agree in writing to be solely responsible for compliance with this permit for the property that has been transferred, then the existing **permittee**(s) authorization shall be terminated.

D. Where to Submit

All paperwork must be submitted to the following address:

Water Quality Division
Storm Water
Suite 400, The Atrium
1200 'N' Street
PO Box 98922
Lincoln, Nebraska 68509-8922

PART VI. STANDARD CONDITIONS AND REQUIREMENTS

These general conditions shall not preempt any more stringent requirements found elsewhere in this permit.

A. Other Conditions

1. Narrative Limits

   Discharges authorized under this permit;

   a. Shall not be toxic to aquatic life in surface **waters of the state;**

   b. Shall not contain pollutants at concentrations or levels that produce objectionable films, colors, turbidity, deposits, or noxious odors in the receiving stream or waterway; and

   c. Shall not contain pollutants at concentrations or levels that cause the occurrence of undesirable or nuisance aquatic life in the receiving stream.

2. Inspection and Entry

   The **permittee** shall allow the **Director** or his appointed representative, upon the presentation of his identification and at a reasonable time:

   a. To enter upon the **permittee's** premises where a regulated **construction activity** is located or conducted, or records are required to be kept under the terms and conditions of this permit;

   b. To have access to and copy any records required to be kept under the terms and conditions of this permit;

   c. To inspect any facilities, equipment (including monitoring and control), practices or operations regulated or required in this permit; and

   d. To sample or monitor any substances or parameters at any location.

3. Changes in Discharge

   Any revision in the size of **construction activity** (such as the addition of disturbed acres not previously identified under the original **CSW-NOI** form), which will result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants must be reported by the **permittee** seven (7) calendar days prior to the expansion, increases or modifications by submitting a modification of the original form **CSW-NOI** or by submitting a new form **CSW-NOI**. Permit authorization may be modified or revoked and reissued as a result of this notification to maintain compliance with applicable state or federal regulations.

B. Procedures for Modification or Revocation

Permit modification or revocation will be conducted according to Title 119, Chapter 24.
If there is evidence indicating that the **storm water** discharges authorized by this permit cause, have the reasonable potential to cause or contribute to an excursion above any applicable water quality standard, you may be required to obtain an individual permit in accordance with Part IV.A of this permit, or the permit may be modified to include different limitations and/or requirements.

C. Timing of Permit Modification

1. NDEQ may elect to modify the permit prior to its expiration (rather than waiting for the new permit cycle) to comply with any new statutory or regulatory requirements, such as for effluent limitation guidelines, that may be promulgated in the course of the current permit cycle.

D. Management Requirements

1. Duty to Comply

   All authorized discharges shall be consistent with the terms and conditions of this permit. The **Permittee** shall comply with all conditions of this permit. Failure to comply with these conditions may be grounds for administrative action or enforcement proceedings including injunctive relief and civil or criminal penalties. The filing of a request by the **Permittee** for a permit modification, revocation and re-issuance, termination or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

2. Duty to Mitigate

   The **Permittee** shall take all reasonable steps to minimize, prevent or correct any adverse impact to the environment resulting from noncompliance with this permit, including such accelerated or additional monitoring as required by the NDEQ to determine the nature and impact of the noncompliant discharge.

3. Duty to Provide Information

   The **Permittee** shall furnish to the **Department** within seven (7) calendar days, any information which the **Department** may request to determine whether cause exists for modifying, revoking and reissuing, or terminating permit **Coverage**; or to determine compliance with this permit. The **Permittee** shall also furnish to the **Department** upon request, copies of records retained as a requirement of this permit.

4. Reporting Requirements

   The **Permittee** shall be responsible for reporting any instance of non-compliance with the terms and conditions of this permit in accordance with NDEQ Title 119, Chapter 14. In most instances, initial notification shall be made as soon as the **Permittee** becomes aware of the non-compliance. A written follow-up shall be submitted within five (5) days of reporting the non-compliance. The submittal of a written noncompliance report does not relieve the **Permittee** of any liability from enforcement proceedings that may result from the violation of permit or regulatory requirements. The written notice shall include, at a minimum:

   a. A description of the discharge and cause of noncompliance;

   b. The period of noncompliance, including exact dates and times, or if not corrected, the anticipated time the noncompliance is expected to continue; and

   c. The steps taken to reduce, eliminate, and prevent the reoccurrence of the noncompliance.

5. Proper Operation and Maintenance

   The **Permittee** shall, at all times, maintain in good working order and operate as efficiently as possible, any facilities or systems of control installed by the **Permittee** in order to achieve compliance with the terms and conditions of this permit. This would include, but not be limited to, effective performance based on designed facility removals, effective management, adequate **Operator** staffing and training, adequate laboratory and process controls, and adequate funding that reflects proper user fee schedules.

6. Signatory Requirements

   All reports and applications required by this permit or submitted to maintain compliance with this permit shall be signed and certified as set forth in this section.

   a. Permit applications shall be signed by a **certifying official** who meets the following criteria:

      1) For a corporation: a **responsible corporate officer**;

      2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

      3) For a municipality, state, federal or other public facility: by either a principal executive officer or ranking elected official, chief executive officer of the agency, or a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

   b. The discharge monitoring reports and other information may be signed by the **certifying official.**

   c. The **certifying official** designates an **authorized representative.** The **authorized representative** is responsible for the overall implementation of the **SWPPP** (i.e., the general contractor).

d. Any change in the signatories shall be submitted to the **Department**, in writing, within seven (7) days after the change, but no later than with the submission of information required by the **Department** to be submitted while the new signatory has taken responsibility.

e. All applications, reports and information submitted as a requirement of this permit, shall contain the following certification statement:

"I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations."

E. Monitoring and Records Requirements

1. Routine periodic monitoring of storm water discharges is not required unless requested by the Department. Monitoring may be required by the Department for any of the following reasons:
   a. The identification of potential ground and / or surface water quality impacts to which the permittee may be contributing;
   b. The failure by the permittee to implement pollution prevention or pollution control procedures set forth in the SWPPP;
   c. The recognition of potential pollutant sources during site inspections or investigations; and/or
   d. To obtain information for watershed basin or industry group studies.

2. Retention of Records

   The **Permittee** shall retain records of all monitoring activities for a period of at least three years as set forth in NDEQ Titles 119, Chapter 14 001.02. The types of records that must be retained include, but are not limited to:
   a. Calibration and maintenance records;
   b. Original strip chart recordings;
   c. Copies of all reports required by this permit;
   d. Monitoring records and information; and
   e. Electronically readable data.

3. Record Contents

   As set forth in NDEQ Title 119, Chapter 14, records of sampling or monitoring information shall include:
   a. The date(s), exact place, time and methods of sampling or measurements;
   b. The name(s) of the individual(s) who performed the sampling or measurements;
   c. The date(s) the analyses were performed;
   d. The individual(s) who performed the analyses;
   e. The analytical techniques or methods used;
   f. The results of such analyses; and
   g. Laboratory data, bench sheets and other required information.

F. General Requirements

1. Permit Attachments

   The attachments to this permit (e.g., forms and guidance) may be modified without a formal modification of the permit.

2. Information Available

   All permit applications, fact sheets, permits, discharge data, monitoring reports, and any public comments concerning such shall be available to the public for inspection and copying, unless such information about methods or processes is entitled to protection as trade secrets of the **Owner** or **Operator** under Neb. Rev. Stat. §81-1527, (Cum. Supp. 1992) and NDEQ Title 115, Chapter 4.

3. Permit Actions

   This permit may be modified, suspended, revoked or reissued, in part or in whole, in accordance with the regulations set forth in NDEQ Titles 119, Chapter 24. In addition, this permit may be modified, revoked and reissued to incorporate standards or limitations issued pursuant to Sections 301(b)(b)(c), 301(b)(b)(d), 304(b)(b), 307(a)(b), or 405(d) of the Clean Water Act and Public Law 100-4.

4. Property Rights

   Coverage under this permit does not convey any property rights of any sort or any exclusive privileges nor does it authorize any damage to private property or any invasion of personal rights nor any infringement of federal, state or local laws or regulations.

5. Severability

   If any provision of this permit is held invalid, the remainder of this permit shall not be affected.

6. Other Rules and Regulations Liability

   The issuance of this permit in no way relieves the obligation of the **Permittee** to comply with other rules and regulations of the **Department**.

7. Penalties

   Nothing in this permit shall preclude the initiation of any legal action or relieve the **Permittee** from any responsibilities, liabilities or penalties under Section 311 of the Clean Water Act. Violations of the terms and conditions of this permit may result in the initiation of criminal and/or civil actions. Civil penalties can result in fines of up to $10,000.00 per day (Neb. Rev. Stat. §81-1508, as amended to date). Criminal penalties for willful or negligent violations of this permit may result in penalties of $10,000.00 per day or by imprisonment. Violations may also result in federal prosecution.

PART VII. DEFINITIONS

Authorized Representative: Individual or position designated the authorization to submit reports, notifications, or other information requested by the **Director** on behalf of the **Owner** under the circumstances that the authorization is made in writing by the **Owner**, the authorization specifies the individual or position who is duly authorized, and the authorization is submitted to the **Director**.

Best Management Practices (BMPs): Erosion and **Sediment Control** and water quality management practices that are the most effective and practicable means of controlling, preventing, and minimizing degradation of surface water, including avoidance of impacts, construction-phasing, minimizing the length of time soil areas are exposed, prohibitions, and other management practices published by state or designated area-wide planning agencies.

Certifying Official

- For a corporation. By a **Responsible Corporate Officer**, which means:
  - A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or
  - The manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
- For a partnership or sole proprietorship: By a general partner or proprietor, respectively.
- For a municipality, State, Federal, or other public agency:
  - By either a principal executive officer of the agency, or
  - A senior executive officer having responsibility for the operations of a principal geographic unit of the agency.

Combined Sewer System (CSO): Is defined as a collection system that collects both **Storm Water** and sanitary wastewater with **outfalls** discharging directly into the **Waters of the State.**

Common Plan of Development or Sale: A contiguous area where multiple separate and distinct land disturbing activities may be taking place at different times, on different schedules, but under one proposed plan. One plan is broadly defined to include design, permit application, advertisement or physical demarcation indicating that land-disturbing activities may occur.

Construction Activity: Includes **Large Construction Activity** and **Small Construction Activity**. This includes a disturbance to the land that results in a change in the topography, existing soil cover (both vegetative and non-vegetative), or the existing soil topography that may result in accelerated **Storm Water** runoff, leading to soil erosion and movement of sediment into **Waters of the State** or urban drainage systems. **Construction Activity** includes the disturbance of less than one acre of total land area that is a part of a larger **Common Plan of Development or Sale** if the larger common plan will ultimately disturb one (1) acre or more and includes all areas of **Support Activity**.

Coverage: A **Permittee** status of compliant operation under the terms and conditions of this general permit once a **Discharge Authorization Number** has been obtained until that authorization is terminated.

Department: Nebraska Department of Environmental Quality.

Director: The **Director** of the Nebraska Department of Environmental Quality.

Discharge Authorization Number: A specific authorization number (NER 1xx xxx) issued to a specific **Permittee** that meets the application requirements for **Coverage** under this general permit.

Erosion Prevention: Measures employed to prevent sediment from moving from its existing location including but not limited to: soil stabilization practices, limited grading, mulch, temporary or permanent cover, and construction phasing.

Final Stabilization: Condition where all soil disturbing activities at the site have been completed and a uniform perennial vegetative cover with a minimum density of 70 percent of the native background vegetative cover has been established on all non-**Impervious Surfaces** and areas not covered by permanent structures unless equivalent permanent stabilization (such as riprap, gabions, or geotextiles) measures have been employed.

Impervious Surface: A constructed hard surface that either prevents or retards the entry of water into the soil and causes water to flow off the surface in greater quantities and at an increased rate of flow than

prior to development (such as streets, sidewalks, parking lots, roofs, and in some cases highly compacted soil).

Large Construction Activity: Is the clearing, grading and excavating resulting in a land disturbance that will disturb equal to or greater than five acres of land or will disturb less than five acres of total land area but is part of a Larger **Common Plan of Development or Sale** that will ultimately disturb equal to or greater than five acres. Large Construction Activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the site.

Municipal Separate Storm Sewer System (MS4) is a separate **storm water** sewer system in urbanized cities and counties as having populations of 10,000 or greater as determined by the Bureau of Censes 1990 Decennial Censes.

National Pollutant Discharge Elimination System (NPDES): Program for issuing, modifying, revoking, reissuing, terminating, monitoring, and enforcing permits under the Clean Water Act (Sections 301, 318, 402, and 405) and C.F.R. Title 33, Sections 1317, 1328, 1342, and 1345.

Notice of Termination (CSW-NOT): Notice to terminate **Coverage** under this permit after construction is completed, the site has undergone **Final Stabilization**, and maintenance agreements for all permanent facilities have been established, in accordance with all applicable conditions of this permit.

Operator: Person (often the general contractor) designated by the **Owner**, who has day-to-day operational control and/or the ability to modify project plans and specifications related to the **SWPPP**. The person shall be knowledgeable in those areas of the permit for which the **Operator** is responsible.

Outfall: A discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, or container from which pollutants from **Construction Activity** are or may be discharged into **Waters of the State.**

Owner: Person or party possessing the title of the land on which the construction activities will occur; or if the **Construction Activity** is for a lease holder, the party or individual identified as the lease holder; or the contracting government agency responsible for the **Construction Activity**.

Permittee: Person(s), firm, or governmental agency or other institution that signs the application submitted to the **Department** and is responsible for compliance with the terms and conditions of this permit.

Receiving Waters: A general term used to describe all **Waters of the State. Responsible Corporate Officer**: means the **Owner** or **Operator** meeting either of the following conditions: A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental law as and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

Sediment Control: Methods employed to prevent sediment from leaving the construction site after it has eroded from its existing location. **Sediment Control** practices include silt fences, sediment traps, earth dikes, drainage swales, check dams, subsurface drains, pipe slope drains, storm drain inlet protection, and temporary or permanent sedimentation basins.

Silvicultural Discharges: "Silvicultural point source" means any discernible, confined, and discrete conveyance related to rock crushing, gravel washing, log sorting, or log storage facilities which are operated in connection with silvicultural activities and from which pollutants are discharged into **Waters of the State**. The term does not include nonpoint source silvicultural activities such as nursery operations, site preparation, reforestation and subsequent cultural treatment, thinning, prescribed burning, pest and fire control, harvesting operations, surface drainage, and road construction and maintenance from which there is natural runoff during precipitation events.

Small Construction Activity: Is the clearing, grading, and excavation that result in land disturbance of equal to or greater than one acre and less than five acres including disturbance of less than one acre of total land area that is part of a larger **Common Plan of Development or Sale** if the larger common plan will ultimately disturb equal to or greater than one and less than five acres. **Small Construction Activity** does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility.

Spill Prevention Control and Countermeasure (SPCC): Federal regulation set forth in 40 CFR 112 requiring a **SPCC** Plan to be developed for facilities that store fuels and hazardous substances that meet the following criteria:

- Above ground fuel storage with the capacity for at least 660 gallons.
- Two or more above ground fuel storage tanks with the capacity for at least 1,320 gallons.
- Below ground fuel storage tanks with the capacity for at least 42,000 gallons.

Stabilized: Exposed ground surface has been covered by appropriate materials such as mulch, staked sod, riprap, wood fiber blanket, established grass bed, or other material that prevents erosion from occurring.

Storm Water: **Storm Water** runoff, snow melt runoff, and surface runoff and drainage.

Storm Water Pollution Prevention Plan (SWPPP): A plan for **Storm Water** discharge that includes **Erosion Prevention** measures and **Sediment Controls** that, when implemented, will decrease soil erosion on a parcel of land and decrease off-site, non-point source pollution.

Support Activity: Associated **Construction Activity** that is directly related to the construction site (such as concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) required to have **NPDES** permit **Coverage** for discharges of **Storm Water** that may be located on site or in a remote location, but is not a commercial operation serving multiple unrelated construction projects by different **operators** nor operates beyond the completion of the **Construction Activity** at the last construction project it supports.

Temporary Erosion Protection: Methods employed to temporarily prevent erosion during the construction sequence or while **Final Stabilization** is being established. Examples of **Temporary Erosion Protection** include; straw, mulch, wood chips, and erosion netting.

Total Maximum Daily Load (TMDL): The sum of the individual wasteload allocations (WLAs) for point sources and load (Load Allocations) for nonpoint sources and natural background levels for a specific pollutant. The **Department** establishes **TMDLs** that are expressed in terms of either mass per unit of time, relative level of toxicity, or other appropriate measure.

Toxic Pollutant: Pollutants or combination of pollutants, including disease causing agents, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism, either directly from the environment or indirectly by ingestion through food chains will, on the basis of information available to the **Department**, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunction (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring.

Waters of the State: All waters within the jurisdiction of this state including all streams, lakes, ponds, impounding reservoirs, marshes, wetlands, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the state.

Appendix A: Abbreviations

BMP: Best Management Practice(s)

CFR: Code of Federal Regulations

CSO: Combined Sewer Overflow

CSW: Construction **Storm Water**

CSW-NOI: **Notice of Intent**

CSW-NOT: Notice of Termination

NDEQ: Nebraska Department of Environmental Quality

NDEQ Title 115: *Rules of Practice and Procedure*

NDEQ Title 117: *Nebraska Surface Water Quality Standards*

NDEQ Title 118: *Ground Water Quality Standards and Use Classification*

NDEQ Title 119: *Rules and Regulations Pertaining to the Issuance of Permits under the* ***National Pollutant Discharge Elimination System***

NDEQ Title 126: *Rules and Regulations Pertaining to the Management of Wastes*

NDEQ Title 132: *Integrated Solid Waste Management Regulations*

NPDES: National Pollutant Discharge Elimination System

SPCC: Spill Prevention, Control, and Countermeasures

SWPPP: Storm Water Pollution Prevention Plan

TMDL: Total Maximum Daily Load

Appendix B: Listing of the Nebraska Municipal Separate Storm Sewer System NPDES Permits

Cities
Beatrice
Bellevue
Boys Town
Columbus
Dakota City
Fremont
Grand Island
Hastings
Kearney
La Vista
Lexington
Norfolk
North Platte
Omaha
Papillion
Ralston
Scottsbluff
South Sioux City

Counties
Douglas
Dakota
Sarpy

Federal Facility
Offutt Air Force Base

State of Nebraska Facilities
Nebraska Department of Roads
University of Nebraska – Lincoln

Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

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Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

ATTACHMENT B

NPDES Form CSW-NOI for Construction Year 2009

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CAMECO RESOURCES
CROW BUTTE OPERATION

86 Crow Butte Road
P.O. Box 169
Crawford, Nebraska 69339-0169

(308) 665-2215
(308) 665-2341 – FAX

December 22, 2008

Ms. Mary Schroer
Stormwater Coordinator
Water Quality Division
Nebraska Department of Environmental Quality
P.O. Box 98922
Lincoln, Nebraska 68509-8922

Subject: Construction Stormwater NPDES Notice of Intent

Dear Ms. Schroer:

Enclosed please find the following document submitted by Cameco Resources – Crow Butte Operation as set forth in Part II, Sections C.1 and C.2 of NPDES General Permit Number NER 110000.

NPDES Form CSW-NOI is submitted to fulfill the requirements for a permit for discharges of Stormwater from construction areas at the Crow Butte Uranium Mine. The Notice of Intent provides maps and schedules that describe planned construction work during 2009. Please note that the nature of the Crow Butte operation requires continual well and wellfield construction activities. Based on our understanding of the construction Stormwater NPDES program, Crow Butte will file this form annually to apprise the Department of planned construction activities for the coming calendar year.

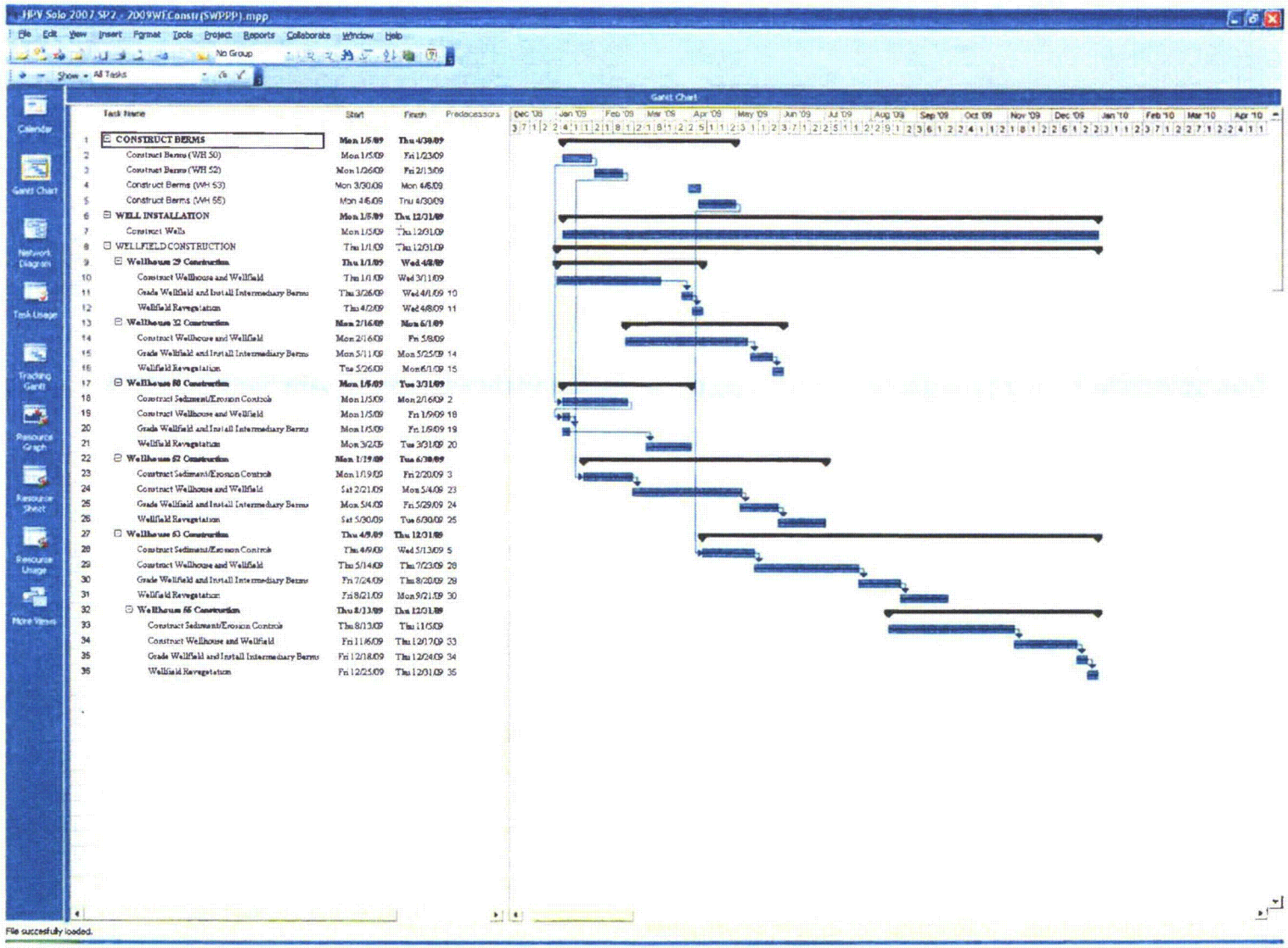
If you have any questions on the enclosed documents, please do not hesitate to call me at (308) 665-2215 ext 114.

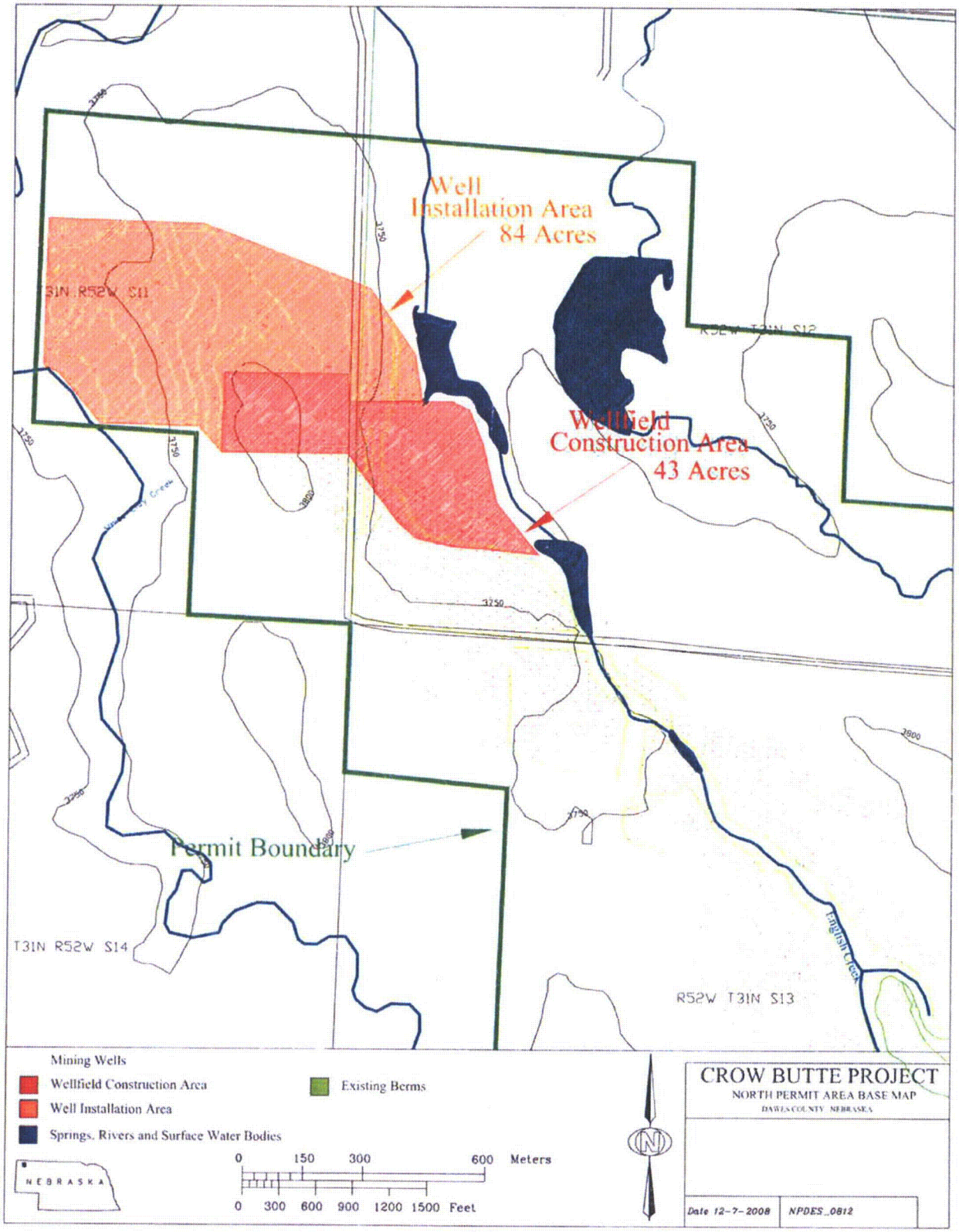
Sincerely,
Cameco Resources
Crow Butte Operation

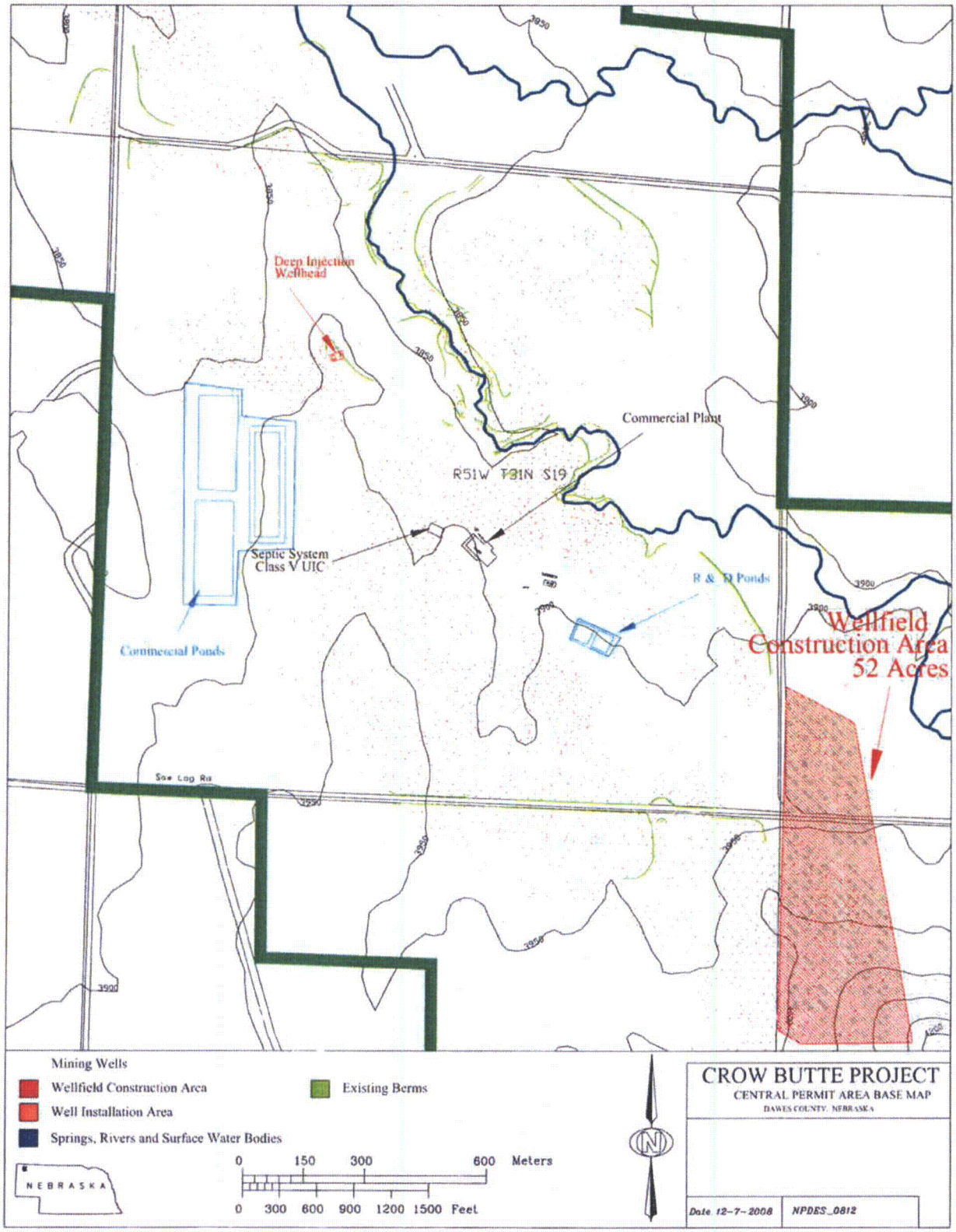
Larry Teahon
Manager Environmental, Health and Safety

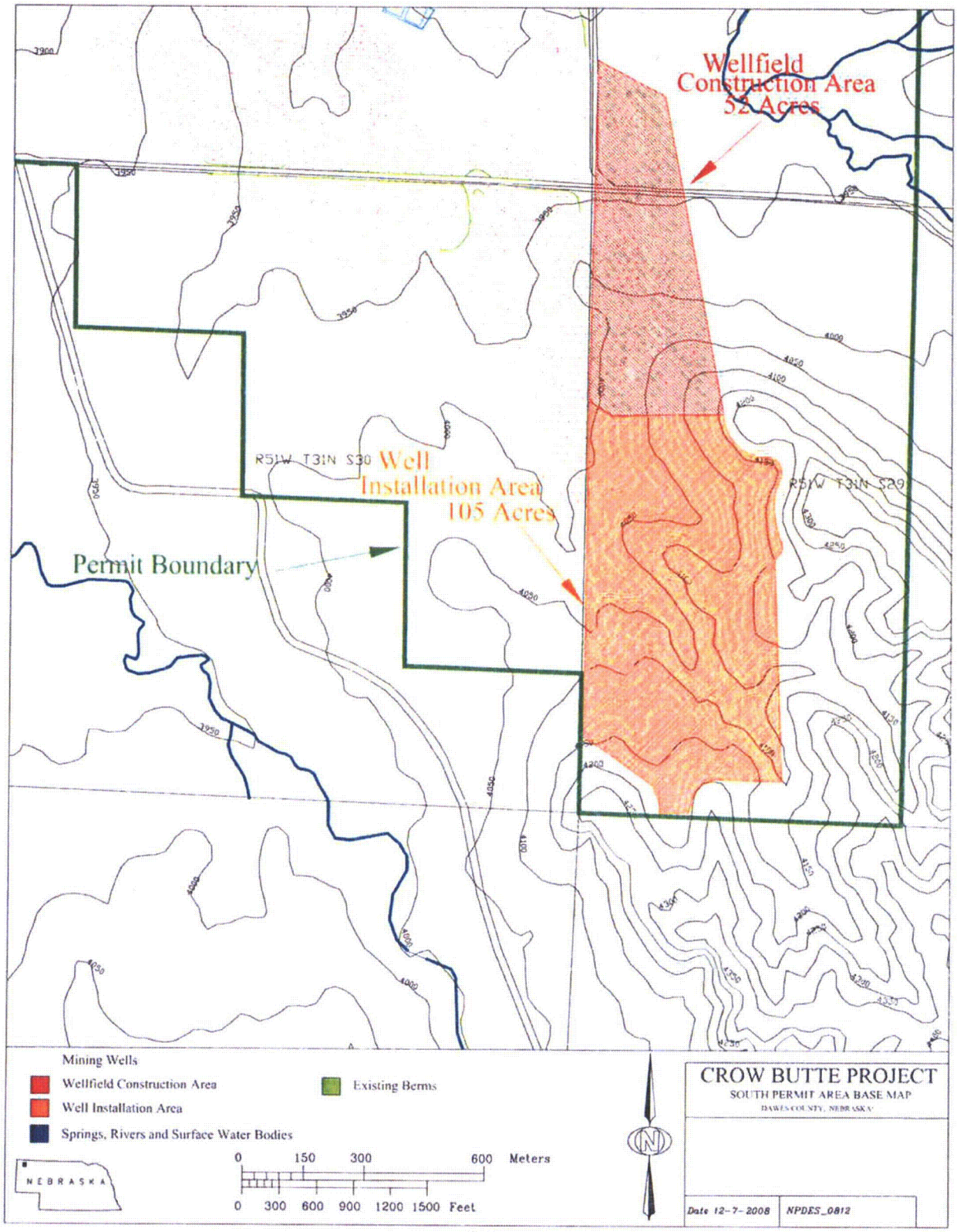
Enclosures: As Stated

2009 Construction Schedule




Well
Installation Area
84 Acres
Wellfield
Construction Area
43 Acres
Permit Boundary
T31N R52W S11
T31N R52W S14
R52W T31N S13
R52W T31N S12
English Creek
Mining Wells
Wellfield Construction Area
Well Installation Area
Springs, Rivers and Surface Water Bodies
Existing Berms
NEBRASKA
0 150 300 600 Meters
0 300 600 900 1200 1500 Feet
N
CROW BUTTE PROJECT
NORTH PERMIT AREA BASE MAP
DAWES COUNTY NEBRASKA
Date 12-7-2008
NPDES_0812


Deep Injection Wellhead
Commercial Plant
R51W T31N S19
Septic System Class V UIC
Commercial Ponds
R & D Ponds
Wellfield Construction Area 52 Acres
Saw Log Rd
Mining Wells
Wellfield Construction Area
Well Installation Area
Springs, Rivers and Surface Water Bodies
Existing Berms
NEBRASKA
0 150 300 600 Meters
0 300 600 900 1200 1500 Feet
N
CROW BUTTE PROJECT
CENTRAL PERMIT AREA BASE MAP
DAWES COUNTY, NEBRASKA
Date 12-7-2008
NPDES_0812


Wellfield Construction Area 52 Acres
R51W T31N S30
Well Installation Area 105 Acres
R51W T31N S29
Permit Boundary
Mining Wells
Wellfield Construction Area
Well Installation Area
Springs, Rivers and Surface Water Bodies
Existing Berms
NEBRASKA
0 150 300 600 Meters
0 300 600 900 1200 1500 Feet
N
CROW BUTTE PROJECT
SOUTH PERMIT AREA BASE MAP
DAWES COUNTY, NEBRASKA
Date 12-7-2008
NPDES_0812

Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

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Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

ATTACHMENT C

Storm Water Pollution Prevention Plan (SWPPP)

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CROW BUTTE RESOURCES, INC.

STORMWATER POLLUTION PREVENTION PLAN

November 9, 2004

Prepared By: _____

Manager of Health, Safety, and Environmental Affairs

Approved By: _____

Mine Manager

Approved By: Stephen P. Collings

Senior Vice President - Operations

TABLE OF CONTENTS

1 INTRODUCTION

Crow Butte Resources, Inc. (CBR) operates a commercial scale in-situ leach uranium mine (the Crow Butte Uranium Project) located in Dawes County, Nebraska. The facility is located 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 permit area, described in Radioactive Source Materials License SUA-1534 issued by the U.S. Nuclear Regulatory Commission (NRC) and Class III Underground Injection Control (UIC) Permit Number 0122611 issued by the Nebraska Department of Environmental Quality (NDEQ) encompasses approximately 2,800 acres. The surface area that CBR expects to be affected over the life of the project is approximately 1,100 acres. This Storm Water Pollution Prevention Plan (SWPPP) establishes and outlines the protocols to prevent and mitigate the impact of spills on storm water as required by Storm Water National Pollution Discharge Elimination System (NPDES) Permits issued by the NDEQ.

A map showing the location of the permit area is included in Attachment 1.

The NDEQ issued a NPDES Authorization to Discharge Permit (NE0130613) to CBR on September 30, 1994. The NPDES Permit authorizes land application of treated water for the purposes of irrigation. Part III, Section A of the NPDES Permit requires a Best Management Practices (BMP) Plan be developed and implemented by CBR to prevent the release of pollutants to waters of the State. The Permit also requires that CBR amend the plan whenever there is a change to the facility or change in the operation of the facility that could result in the potential for a release. In many respects, the BMP Plan mirrors the requirements of this SWPPP.

This SWPPP is intended to satisfy the requirements of the following permits

- NPDES Authorization to Discharge Permit Number NE0130613 for land application of treated effluent and Storm Water Discharges Associated with Industrial Activities.

- NPDES Permit Number NER100000 under the General Permit for Construction Storm Water Discharges.

The objectives of the SWPPP are to 1) identify sources of pollution potentially affecting the quality of storm water runoff from the Central Processing Plant (CPP) at the Crow Butte Uranium Project and 2) ensure implementation of practices to minimize and control pollutants in storm water runoff. This plan and the degree of pollution control devices do not have to be overly detailed for the following reasons:

- Storm water runoff in the area of the Crow Butte CPP drains to one of three Runoff Catchment Basins (see Figure 1);

- The climatic conditions at the site are such that runoff is limited (mean annual precipitation is approximately 16 inches per year); and

- In the unlikely event that runoff exceeded the capacity of the Runoff Catchment Basins, the runoff would be contained within the facility berm system that is designed to prevent discharges to any waters of the state.

1.1 Process Summary

The in-situ leach process for uranium recovery consists of an oxidation step and a dissolution step. Gaseous oxygen or hydrogen peroxide is used to oxidize the uranium. Sodium 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 is extracted in a process plant. The plant uses the following general steps:

- Loading of uranium complexes onto ion exchange resin;
- Reconstitution of the leach solution ("lixiviant") by addition of sodium bicarbonate and oxygen;
- Elution of the uranium complexes from the resin using sodium chloride/bicarbonate eluant and the precipitation of the uranium using hydrogen peroxide and pH adjustment;
- Drying and packaging of the uranium as "yellowcake".

2 PLAN ADMINISTRATION

The structure of the organization as relating to the SWPPP is shown in Figure 2.1. The responsibilities of the key personnel are as follows:

2.1 Senior Vice President – Operations

The overall responsibility for the radiation, environmental, and safety activities of the Crow Butte Facility rests with the Senior Vice President – Operations. In addition, the Senior Vice President -

Operations is responsible for all Crow Butte commercial production facilities.

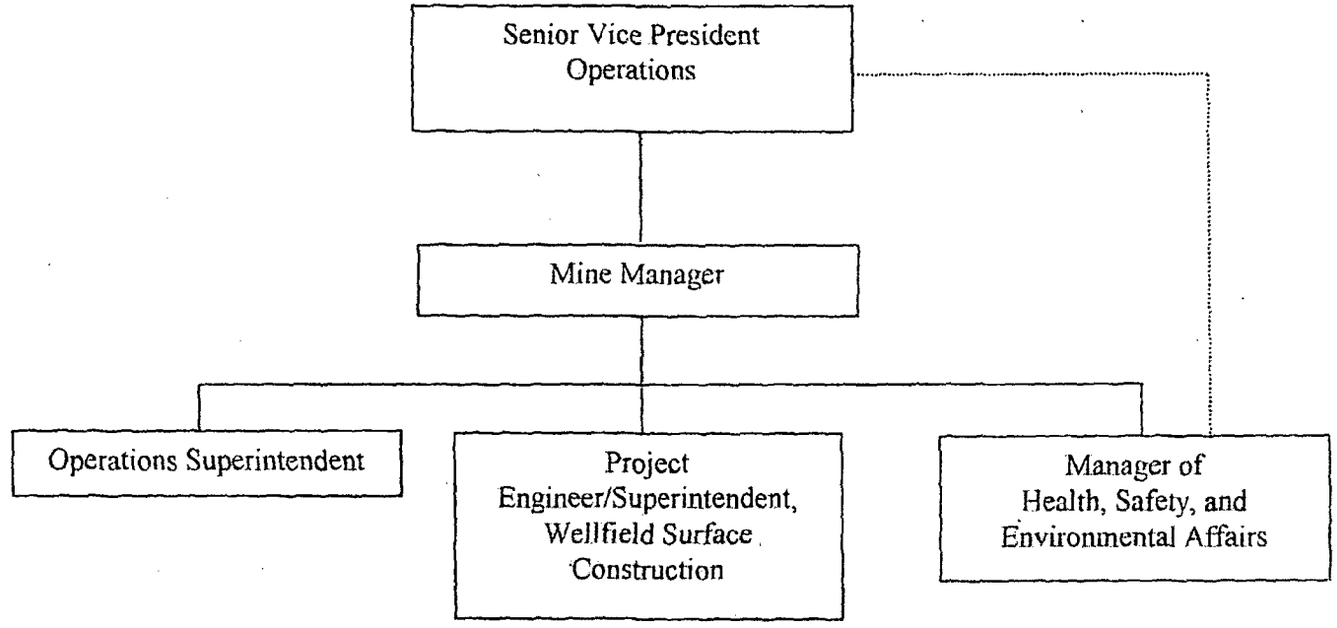
2.2 Mine Manager

The Mine Manager is responsible for all uranium production activity at the Crow Butte project. The Mine Manager is also responsible for implementing any safety and/or monitoring requirements associated with operations, including yellowcake-handling procedures. The Mine Manager reports directly to the Senior Vice President - Operations.

2.3 Manager of Health, Safety, and Environmental Affairs

The Manager of Health, Safety, and Environmental Affairs is responsible for ensuring that CBR complies with all applicable regulatory requirements including those involving environmental protection and radiation safety. The Manager of Health, Safety, and Environmental Affairs reports directly to the Mine Manager to ensure that the environmental monitoring and protection programs are conducted in a manner consistent with regulatory requirements. The Manager of Health, Safety, and Environmental Affairs has no production-related responsibilities. The Manager of Health, Safety, and Environmental Affairs is responsible for overall administration of the SWPPP and has the responsibility to implement changes and/or corrective actions involving environmental protection.

Figure 2.1: Crow Butte Resources SWPPP Organizational Chart



C-9

2.4 Operations Superintendent

The Operations Superintendent has direct oversight of the CPP facility and wellfield operations including yellowcake-handling procedures. The Operations Superintendent is responsible for carrying out the procedures or actions implemented by this SWPPP to control, correct, or prevent any environmental hazards associated with storm water discharges related to industrial activities. The Operations Superintendent reports directly to the Mine Manager.

2.5 Project Engineer/Superintendent, Wellfield Surface Construction

The Project Engineer/Superintendent, Wellfield Surface Construction has direct oversight of the field construction activities that are governed by this plan under the General Construction Storm Water (CSW) NPDES permit. The Project Engineer/Superintendent, Wellfield Surface Construction is responsible for carrying out the procedures or actions implemented by this SWPPP to control, correct, or prevent any environmental hazards associated with storm water discharges from CBR construction sites. The Project Engineer/Superintendent, Wellfield Surface Construction reports directly to the Mine Manager.

2.6 Plan Maintenance

The SWPPP shall be updated within 30 days of any SWPPP review that indicates changes are needed, inspections that discover deficiencies, or any change to the facility that necessitates a change to the plan. The SWPPP will be reviewed at least annually.

2.7 Inspections

In addition to the routine monitoring discussed in Section 7, the EHS Department shall perform pollution prevention inspections at least semi-annually including berm and dam inspections. Documentation of the inspection will include the following information: who conducted the inspection, when the inspection was performed, the findings of the inspection, any corrective actions taken, and when the corrective actions were implemented. Records of inspections shall be maintained for at least three years.

2.8 Annual Audit

The Manager of Health, Safety, and Environmental Affairs or designee shall audit the SWPPP on an annual basis to ensure its continued effectiveness in minimizing the discharge of pollutants. Documented results of the annual audit will be maintained for at least three years and will include who conducted the audit, findings, and any changes to the SWPPP.

3 POTENTIAL POLLUTANT SOURCES

There are a number of potential sources of pollution present at the Crow Butte facility. Existing regulatory requirements from the U.S. Nuclear Regulatory Commission (NRC) and the NDEQ have established a framework that significantly reduces or eliminates the possibility of such an occurrence. Pollution control measures are discussed in detail in Section 4.

Potential sources of pollution include the following:

3.1 Solar Evaporation Ponds

CBR currently maintains five (5) solar evaporation ponds for the purpose of storing liquid waste and reducing the quantity requiring ultimate disposal through evaporation. The solar evaporation ponds, which contain water-based brine solutions, could contribute to pollution in several ways. First, a pond could fail, either in a catastrophic fashion or as a slow leak. In addition, a pond could overflow due to excess wastewater flow or due to the addition of large quantities of storm water. The NRC has placed stringent regulations on the design, construction, and management of the ponds that significantly reduce the likelihood of a pond failure or overflow.

3.2 Wellfield Buildings and Process Piping

Wellfield buildings are an unlikely potential source of pollutants during normal operations since there are no process chemicals or effluents stored within them. The only instance in which a wellfield building could contribute to pollution event would be in the event of a release of injection or recovery solutions due to pipe failure. These water-based solutions contain low concentrations of mining solutions including dissolved uranium and radium-226.

Wellfield piping is a potential source of pollutants due to failures of piping or components, allowing a release of mining solutions.

3.3 Central Processing Plant

The central processing plant (CPP) serves as a central hub for most of the mining operations. Consequently, it has the greatest potential for spills or accidents resulting in the release of potential pollutants to surface water. Potential spill sources at the CPP include the bulk chemical storage tanks and associated piping which contain hydrochloric acid, soda ash, salt, caustic, and hydrogen peroxide, indoor process storage tanks, and uranyl peroxide.

- Hydrochloric acid is delivered as a liquid and is stored outdoors in a tank within a containment structure lined with high-density polyethylene (HDPE). The hydrochloric acid tank is protected from vehicular traffic by bollards and guardrails.
- It is unlikely that any spill of salt or would harm the environment since it is delivered as a solid and stored in the plant interior within a concrete berm of sufficient capacity to store the contents of the storage tank.
- Caustic is delivered as a liquid but is stored in the plant interior within a concrete berm sufficient to hold the contents of the caustic storage tank.
- Hydrogen peroxide is stored in a double-contained outdoor storage tank constructed of HDPE. The hydrogen peroxide tank is protected from vehicular traffic by bollards.
- The plant area is graded to prevent the runoff of smaller spills. To further insure the safe handling of these chemicals, CBR has developed procedures for safe handling during bulk delivery and transfer operations.
- The process storage tanks in the CPP contain various mixtures and solutions of the chemicals listed above as well as uranium compounds. All of these tanks are indoors and are within substantial concrete berms designed to contain at least the contents of the largest tank in the

plant. The process storage tanks in the CPP are monitored 24 hours per day, 365 days per year by employees and by a computerized monitoring and control system that alerts operators of potential problems.

- Uranyl Peroxide, often referred to as yellowcake due to its appearance, is the facilities' end product. Uranyl peroxide can be found in the CPP as a water-based solution or in the solid form. Security requirements require that yellowcake be stored in the CPP or under constant surveillance.

3.4 Fuel Storage Area

Spills or leaks of petroleum related products including gasoline, diesel, kerosene, and waste oil are managed within the fuel storage area located northwest of the CPP. The design, construction, and operation of this facility is governed under a Spill Prevention, Control, and Countermeasure (SPCC) Plan that meets the requirements of 40 CFR, Part 112.

3.5 Transportation Vehicles

Release of pollutants to the environment could occur due to accidents involving transportation vehicles. This could involve either vehicles delivering bulk chemical products, transport of radioactive contaminated waste from the site to an approved disposal site, or from vehicles carrying dried yellowcake. CBR has developed extensive engineering and administrative procedures to reduce the likelihood of such spills and to mitigate spills if they do occur.

3.6 Research and Development Plant

The Research and Development (R & D) Plant currently houses the reverse osmosis system and a sodium sulfide reductant tank. Like the CPP, the R & D Plant has a concrete berm that is large enough to capture and hold the contents of any spills.

3.7 NPDES Permit for Irrigation

The CBR Facility maintains an NPDES Permit for the purposes of discharging water by irrigation. This permit, number NE0130613, requires monitoring of flow rate, total Kjeldahl nitrogen, pH, nitrate as nitrogen, conductivity, chloride, sodium adsorption ratio, total arsenic, total cadmium, total chromium, total copper, total lead, total mercury, total selenium, total zinc, total fluoride, total sulfate, dissolved radium-226, total radium-226, and total uranium. CBR has not discharged water under this permit so monitoring procedures have not been developed.

3.8 EPA Effluent Limitations

EPA, in 40 CFR 440 Subpart C, has set effluent limitations at uranium in-situ facilities for total suspended solids, chemical oxygen demand, arsenic, ammonia, zinc, dissolved radium-226, total radium-226, uranium, and pH. Spills of mining solutions may contain concentrations of these chemicals that exceed the EPA limitations. However, the probability and size of spills are greatly diminished by the procedures outlined in this plan.

4 SPILL PREVENTION AND CONTROL

Spill prevention and control at CBR is a very critical aspect of the facility operation. Because of the regulatory requirements from the NRC and the NDEQ, spill control, containment, and reporting are integral aspects of the company culture.

4.1 General Spill Control Measures

4.1.1 Good Housekeeping

Good housekeeping practices are designed to maintain a clean and orderly work environment resulting in better management and control of areas and materials. Areas which will be addressed are reviewing equipment maintenance schedule to ensure proper operation of equipment, identify possible alternate material storage areas that will reduce or eliminate affected storm water runoff, maintain well organized and clean work areas, and train employees about good housekeeping practices.

4.1.2 Preventive Maintenance

To detect faulty equipment that may contribute to pollution, pertinent pollution prevention and management devices and routine facility operations are inspected as part of the CPP Daily Walkthrough and the Weekly Safety and Environmental Facility Inspection. Any equipment associated with pollution prevention requiring maintenance shall receive immediate attention to repair the condition/situation in a timely manner.

4.1.3 Spill Prevention and Response Procedures

Any significant spill or leak occurring within the Crow Butte Uranium Project boundary will be cleaned up immediately. Procedures are in place in the Environmental Management System (EMS) Program, Volume VIII, *Emergency Manual* to ensure that proper spill cleanup methods are employed. The Spill Prevention, Control and Countermeasures (SPCC) Plan addresses the prevention of, and response to, spills of petroleum related products.

4.1.4 Storm Water Exposure Control

Significant materials that could potentially cause a pollution concern are stored in containers (e.g., tanks, drums, lined bins) and within bermed areas to provide sufficient secondary containment in the event of a spill or leak. Most of these materials are stored within the confines of the facility structures. Those stored outside have appropriate secondary containment measures.

Spills that are of concern in this plan and are relevant to an in situ leach uranium recovery facility are primarily related to pond leaks and piping ruptures in which process chemicals may migrate or escape from their containment systems and result in a release of process solutions.

4.2 Solar Evaporation Ponds

All ponds have been built to NRC standards and are equipped with leak detection systems. Standard

operating procedures require periodic (i.e., weekly, monthly, quarterly, and annual) inspections of all ponds, liners, and berms. In the event of a leak, adequate freeboard must be maintained in each pond to allow the contents of the pond to be transferred to another pond while repairs are made. By maintaining adequate freeboard, the contents of one pond can be transferred to another in the event of a leak. Pond overflow due to storm water inflow is also prevented by these administrative procedures that require adequate freeboard. The commercial ponds are double-lined with a leak detection system between the liners. Professionally engineered diversion ditches were constructed on the upslope sides in order to divert storm water around the ponds. As per current NRC requirements, the ponds are inspected at daily, weekly, quarterly, and annual frequencies. A Professional Engineer licensed in the State of Nebraska with experience in pond design and maintenance performs the annual inspection.

4.3 Wellfield Houses and Process Piping

Engineering and administrative controls are in place to prevent or provide for early detection of surface releases to the environment and to mitigate the effects should an accident occur. The most probable form of surface spill from in situ mining operations occurs from breaks, leaks, or separations within the piping that transfers mining fluids from the process plant to the wellfield and back. Typically these are classified as small leaks. The EMS Program, Volume VIII, *Emergency Manual* details the actions that are instituted when a chemical or radioactive materials spill occurs.

The possibility of such an event is minimal due to a number of engineering and administrative controls. The controls include:

- In general, piping from the CPP to and within the wellfield is constructed of high-density

polyethylene pipe with butt-welded joints.

- All pipelines are pressure tested at maximum operating pressures upon installation. CBR maintains an SOP that details all the installation and testing criteria the process piping is built and tested to;
- All pipelines are buried. The only exposed process pipes are at the CPP, at the wellheads, and at the wellhouses;
- The flows through the pipe are at a relatively low pressure and spills can be stopped quickly due to high and low pressure warning systems. Trunk line pressures and wellhead flows are monitored continuously for pressure and flow parameters by a computerized monitoring system. Operators are notified by visual and audible alarms if any monitored parameters exceed set limits. The computer system provides alarm indications for parameters such as well-specific (injection or production) conditions, including high and low flow conditions, and high and low pressure conditions in trunklines;
- The wellhouses are equipped with moisture alarms in the basement to provide early warning of a wellhouse leak. The monitors alarm at the CPP control room and are immediately responded to by operators that provide 24-hour coverage.
- Containment berms and dams are in place along all surface water features to control discharges in the event of a wellfield spill. These containment berms will also eliminate storm water discharge to surface water features such as Squaw Creek, English Creek, and surface impoundments.

4.4 Central Processing Plant

The design of the CPP mitigates any release of liquid waste by containment within the structure. The

facility and its associated processing equipment, storage areas, loading area, and transfer processes are all enclosed or covered from the elements. The main plant has a concrete curb containment system built around the entire building. The pad is designed for a worst-case failure of the largest capacity tank (approximately 31,000 gal.) within the building should a rupture occur. In the event of a piping failure, the pump system can be immediately shut down, limiting any release. Process solutions from a spill or from wash down water are drained through a sump and sent to the evaporation ponds or deep well injection system.

4.5 Fuel Storage Area

The fuel storage area is constructed with a containment system that will contain at least 110 percent of the largest tank. The containment is lined with a liner system that is impervious to petroleum products. Management of these materials is performed under a Spill Prevention, Control, and Countermeasure (SPCC) Plan as required in 40 CFR Part 112.

4.6 Transportation Vehicles

All chemicals and products delivered to or transported from the site are carried in DOT approved packaging. Bulk materials are transferred to site storage tanks from delivery vehicles in closed loop systems thereby minimizing the potential for spills to the environment.

5 SEDIMENT AND EROSION CONTROL

Due to the nature of in situ leach mining, CBR is continually constructing new mine units to maintain production. In addition to construction of new mine units, reclamation activities are performed in mine units that have reached the end of their useful life following groundwater restoration. As a result, certain areas of the mine are always undergoing construction activities that could result in erosion and/or runoff resulting in deposition of sediment. CBR incorporates erosion and sediment control practices into this SWPPP and implements these practices at all locations within the mine that are undergoing construction activity.

The erosion and sediment control practices utilized consider site-specific variables including terrain and slope, soil types, the size of the project, the duration of construction activities, the proximity of perennial and seasonal streams, and the existence of impounded waters downstream of the project. The controls utilized may vary from construction site to site, but the controls used shall be effective in minimizing erosion and sediment release from the site, and in protecting the water quality in receiving stream or water body.

Erosion and sediment control practices utilized in the SWPPP will be continually monitored for effectiveness by CBR. Practices may be enhanced by the implementation of additional controls, if existing controls prove inadequate in minimizing erosion and sediment releases, or in protecting the water quality of the receiving stream or water body.

5.1 Sediment and Erosion Control Practices

All of the following practices shall be considered for inclusion in construction activities performed under the SWPPP.

5.1.1 Construction Practices and Structural Controls

Construction practices and structural controls may be implemented to slow storm water run off and minimize erosion from the site. Practices and controls that will generally be considered for implementation include, but are not limited to the following:

- Horizontal slope grading;
- Temporary placement terraces, berms, cuts or other physical structures placed horizontal to sloped surfaces;
- Silt fence, synthetic barriers, check dams or other physical barriers placed at intervals in drainage ways and on sloped surfaces;
- Geotextile mats, rock rip-rap or other methods to prevent erosion in drainage ways; and
- Construction of protective berms along perennial and seasonal streams.

Sediment basins and traps, berms, sediment barriers and other measurers intended to trap sediment and control runoff will be constructed as a first step in any land-disturbing activity and will be made functional before upslope land disturbance takes place.

5.1.2 Construction Activity Scheduling

The schedule of construction activities may be sequenced so as to minimize the extent and time that soils are left unstabilized. This may include, when possible, phased construction planning so as to minimize the area of the site that is not stabilized by vegetative cover or other temporary or permanent soil covers (e.g., mulch). The construction schedule will take into account areas within the construction site that may be available for reseeding before the completion of the overall project.

The schedule for construction activities will specify an appropriate time for initiating sediment retention and erosion controls. When possible, sediment retention controls will be installed before the initiation of clearing and grading activities and erosion controls will be implemented concurrent with the initiation of construction activity.

5.1.3 Use of Existing Vegetation and Revegetation.

When possible, existing vegetative covers will be left undisturbed. When possible, vegetative strips will be maintained on the down gradient perimeter of construction areas and adjacent to waterways and drainage ways that are within the site. Temporary or permanent seeding will be established as soon as possible after grading and clearing activities are completed, and during interim periods on areas that are not being actively worked.

5.1.4 Storm Detention Basins

The need for storm water detention basins is contingent upon the area disturbed and the slope of the site. In general, storm water basins need to be used in disturbed drainage areas of 5 acres or more in size. Where slopes are equal to or steeper than 3:1, storm basins may be required for smaller drainage areas. The use of storm water detention basins does not circumvent the need to implement the erosion and sediment control practices previously cited.

5.1.5 Post-Construction Monitoring

Cut and fill slopes will be designed and constructed in a manner that will minimize erosion. Slopes that are found to be eroding excessively within one year of permanent stabilization will be provided with additional slope stabilization measures until the problem is corrected. Concentrated runoff shall not flow down cut or fill slopes unless contained within an adequate temporary or permanent channel, flume or slope drain structure.

6 OUTFALLS

All storm water runoff from the facility is contained within a protective dam and berm system that protects all surface water features that may be impacted by active areas of the mine, including Squaw Creek and English Creek. As a result, there are no outfalls to surface water for storm water from the operating portions of the site.

6.1 Protective Dams

CBR has installed a system of dams in areas where overland runoff passes through the wellfields and reaches surface water features. These dams are constructed of the native soil in the area. The purpose of the dams is to retain any collected runoff from wellfields to allow controlled discharges. Any collected liquid is sampled for conductivity before release in accordance with the instructions contained in the CBR Environmental Management System (EMS) Program Volume VI, *Environmental Manual.*

Dam No. 1 is located northwest of Wellhouse 6. Two other dams identified together as Dam No. 2 are located west of Wellhouse 3. Dam No. 3 is located about 1200 feet Northwest of Wellhouse 15. Dam No. 4 is located south of English Creek between Wellhouses 35 and 36.

6.2 Protective Berms

CBR installs protective berms and dams around surface water features such as Squaw Creek and English Creek where their courses pass through an active wellfield. The purpose of the protective berms is to minimize the potential for a spill of mining, process, or restoration solutions from entering the local creeks and impoundments. These berms are constructed of native soil and are subject to erosion and damage from natural and manmade factors. Routine and special inspections are performed as a best management practice to identifying damage and implement repairs in a timely manner.

7 MONITORING PROCEDURES

CBR does not currently discharge water to the surface under the land application NPDES permit. Therefore, no surface effluent monitoring is required. Discharge of collected runoff from protective dams is monitored in the field for specific conductivity before release is allowed.

8 TRAINING

This plan applies to all employees at CBR. All employees will be briefed at least once a year as part of routine safety meetings. The primary groups responsible for implementing this plan are the plant operations group for discharges associated with industrial activity and the wellfield surface construction group for construction storm water discharges. Documented records will be maintained as to who attended and what the training program covered.

Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

ATTACHMENT D

Private Well #61 Water Quality Data 1981 – 2009

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Private Water Well (#610001) Water Quality 1981 - 2009

Sample Date	10/29/1981	04/27/1982	07/13/1982	10/04/1982	05/23/2002	12/18/2007	02/15/2008	06/06/2008	08/15/2008	11/21/2008	03/20/2009
Parameter											
Ammonium (mg/L)	-	0.44	-	-	0.7	-	-	-	-	-	-
Arsenic (mg/L)	-	<0.002	-	-	0.001	<0.001	-	-	-	-	-
Barium (mg/L)	-	<0.1	-	-	<0.1	<0.1	-	-	-	-	-
Cadmium (mg/L)	-	<0.001	-	-	<0.005	<0.005	-	-	-	-	-
Chloride (mg/L)	170	170	160	150	189	169	-	-	-	-	-
Copper (mg/L)	-	0.001	-	-	<0.01	<0.01	-	-	-	-	-
Fluoride (mg/L)	0.8	0.7	0.6	0.6	1.15	0.8	-	-	-	-	-
Iron (mg/L)	0.10	<0.05	-	-	<0.05	0.06	-	-	-	-	-
Mercury (mg/L)	-	0.013	-	-	<0.001	<0.001	-	-	-	-	-
Manganese (mg/L)	-	<0.1	-	-	0.02	<0.01	-	-	-	-	-
Molybdenum (mg/L)	-	<0.002	-	-	<0.1	<0.1	-	-	-	-	-
Nickel (mg/L)	-	<0.002	-	-	<0.05	<0.05	-	-	-	-	-
Nitrate (mg/L)	0.06	0.01	0.01	0.06	<0.1	<0.1	-	-	-	-	-
Lead (mg/L)	-	<0.005	-	-	<0.05	<0.001	-	-	-	-	-
Radium (pCi/L)	3.9 +/- 0.1	-	3.2 +/- 0.1	2.6 +/- 0.2	2.6 +/- 0.3	3.5 +/- 0.6	3.1 +/- 0.36	3.5 +/- 0.3	3.0 +/- 0.36	0.21 +/- 0.13	3.4 +/- 0.35
Selenium (mg/L)	-	<0.002	-	-	0.005	0.002	-	-	-	-	-
Sodium (mg/L)	400	390	380	410	310	399	-	-	-	-	-
Sulfate (mg/L)	400	-	390	400	404	354	-	-	-	-	-
Uranium (mg/L)	<0.002	-	0.002	<0.002	<0.0003	<0.0003	0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Vanadium (mg/L)	-	0.008	-	-	<0.1	<0.1	-	-	-	-	-
Zinc (mg/L)	-	0.008	-	-	<0.1	<0.01	-	-	-	-	-
pH (Std. Units)	8.2	8.2	8.0	8.1	8.21	8.10	-	-	- -	-	-
Calcium (mg/L)	14	15	15	15	13.8	13	-	-	-	-	-
Total Carbonate (mg/L)	-	700	690	740	697	732	-	-	-	-	-
Potassium (mg/L)	9.2	9.4	9.4	10	7.6	10	-	-	-	-	-
Magnesium (mg/L)	3.1	3.1	3.1	3.6	2.8	3	-	-	-	-	-
TDS (mg/L)	-	1200	1200	1100	1350	1090	-	-	-	-	-

(-) Indicates no sample was collected for this Parameter on this date.

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Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

ATTACHMENT E

Description and Update of Work Impacting Wetlands Near English Creek Authorized Under United States Army Corps of Engineers Permit Number NE 96-50561

Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

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DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
NEBRASKA REGULATORY OFFICE-KEARNEY
1430 CENTRAL AVENUE STREET, SUITE 4
KEARNEY, NEBRASKA 68847-6856

REPLY TO
ATTENTION OF:

November 24, 2000

Mr. Mike Griffin
Crow Butte Resources, Inc.
P.O. Box 169
Crawford, Nebraska 69339-0169

Dear Mr. Griffin:

I am writing back in response to your inquiry about the authorization letter dated September 24, 1996. The letter authorized wetland impacts for a uranium extraction project under Permit No. NE 96-50561. Based on our October 11, 2000 telephone conversation, the last sentence of special condition #3 will be deleted and the following sentence substituted:

Wetland monitoring reports will no longer be required after the created wetlands meet the definition of a wetland based on the Corps of Engineers Wetlands Delineation Manual.

This revision is effective with the letterhead date of this letter. If you have any questions, feel free to contact me at (308) 234-1403.

Sincerely,

Keith Tillotson
Senior Project Manager

MB

CROW BUTTE RESOURCES, INC.

86 Crow Butte Road
P.O. Box 169
Crawford, Nebraska 69339-0169

(308) 665-2215
(308) 665-2341 – FAX

October 4, 2000

Mr. Keith Tillotson
Department of the Army
Corps of Engineers, Regulatory Branch
1430 Central Avenue, Suite 4
Kearney, Nebraska 68847

Subject: Status of Permit NE96-50561

Dear Mr. Tillotson:

Crow Butte Resources, Inc. (CBR) is providing this letter as an update of the work performed under the referenced permit. This work was authorized by the Nationwide Permit (NWP) found at 33 CFR Part 330.6 Appendix A(B)(26).

Current Project Status

- Wetland Creation

Approximately 57,000 square feet (1.31 acres) of new wetland (creation site) was created in NE¼, Section 13, Township 31 North, Range 52 West. The location of the creation site is shown on the attached map. The creation site was seeded in early spring 1998 with a mixture of Wooly Sedge, Nebraska Sedge, Arctic Rush, and Prairie cordgrass. The material that was removed during creation of the new wetland was stockpiled and has been used for protective berms along the north side of English Creek. The berms were seeded in early spring 1999 with an upland grass mixture containing Tall wheatgrass, Paiute orchardgrass, Brome grass, Switchgrass, and Red Clover.

- Drill Pads

One drill pad (restoration site) was completed in 1998. The location of the complete drill pad is shown on the attached map. Well drilling has not been performed on this drill pad at this time. The total area of the one drill pad completed is approximately 4,000 square feet. No other activities affecting the delineated wetlands have been performed at this time.

Planned Project Activities

- Additional Drill Pads

An additional four drill pads are planned for the approximate areas denoted on the attached map. The total estimated a wetlands impact for these restoration sites is 1.25 acres. Construction of the additional drill pads will be as described in previous submittals to the Corps of Engineers (COE).

- Additional Wetlands Creation

At this time, CBR does not plan to construct any additional wetlands. The area constructed to date is in excess of the planned total area for existing and additional restoration sites.

- Project Schedule

The following tentative project schedule is based upon current mine plans.

English Creek Mining Plan

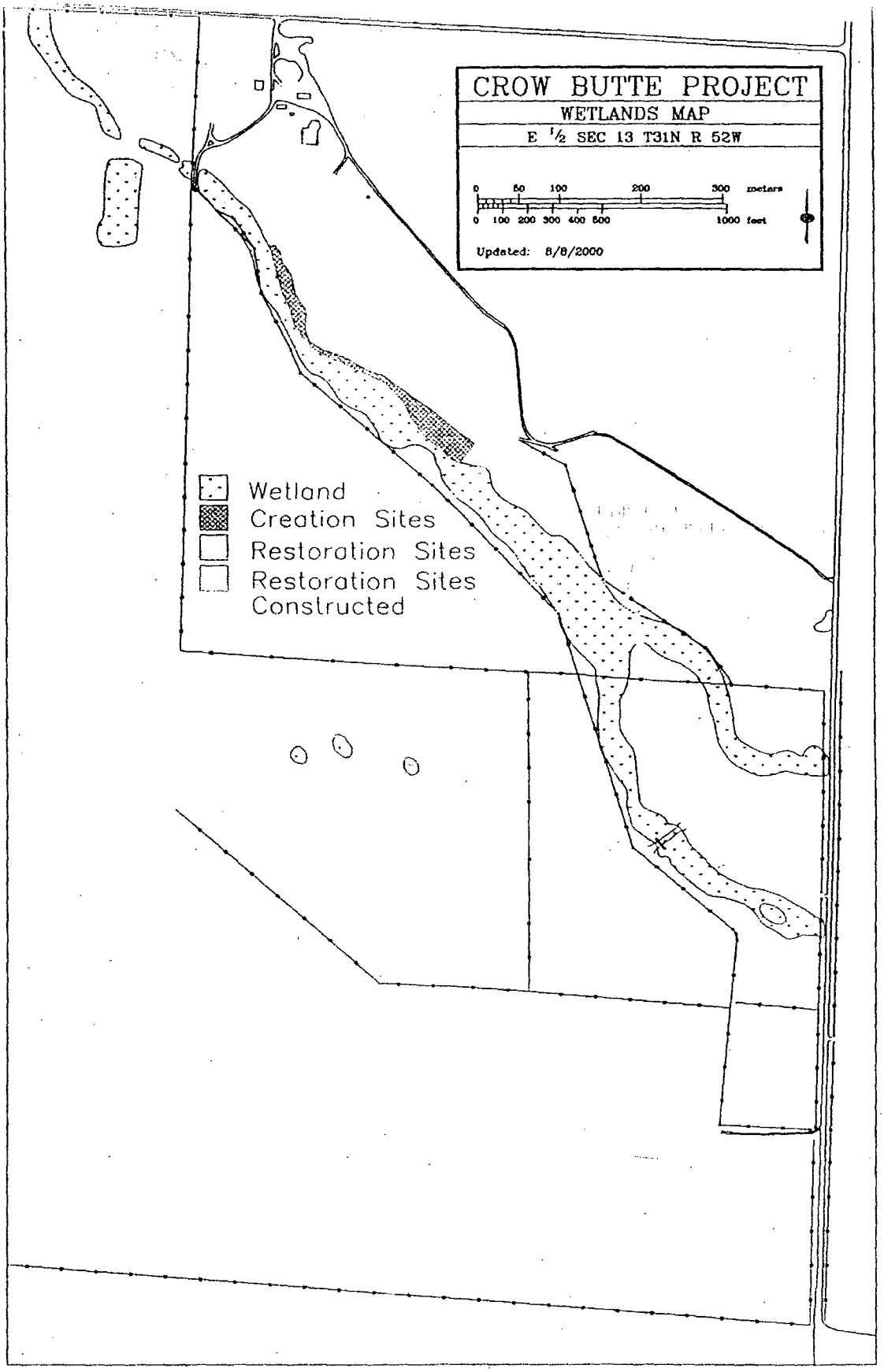
Task	Scheduled Completion
Construction of four additional drill pads in accordance with methods previously described	2001 - 2002
Mining well installation in drill pads	2002 – 2003
Active mining	2003 – 2009
Post-mining groundwater restoration	2010 – 2013
Reclamation of drill pads[1]	2016 - 2020

[1] Reclamation of drill pads will proceed following well abandonment activities. The schedule for these activities is contingent upon regulatory approval of groundwater restoration activities by the Nebraska Department of Environmental Quality (NDEQ) and the US Nuclear Regulatory Commission (NRC).

CBR understands that NWP 26 has been replaced with a new system of activity-specific NWPs and that no further filling is allowed under the referenced permit. Please provide information concerning whether it will be possible to reauthorize this project under one of the new NWPs or if an individual permit will be necessary.

Sincerely,
CROW BUTTE RESOURCES, INC.

Michael L. Griffin
Manager of Environmental and Regulatory Affairs


CROW BUTTE PROJECT
WETLANDS MAP
E ½ SEC 13 T31N R 52W
0 50 100 200 300 meters
0 100 200 300 400 500 1000 feet
Updated: 8/8/2000
Wetland
Creation Sites
Restoration Sites
Restoration Sites Constructed

Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

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Responses to NRC Request for Additional Information, License Renewal Amendment Request, Environmental Review, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555)

ATTACHMENT F

NDEQ Letter Authorizing Surface Reseeding Reclamation Plan

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For Mike Griffin

Dave Heineman
Governor

STATE OF NEBRASKA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Michael J. Linder
Director
Suite 400, The Atrium
1200 'N' Street
P.O. Box 98922
Lincoln, Nebraska 68509-8922
Phone (402) 471-2186
FAX (402) 471-2909
website: www.deq.state.ne.us

MAR 1 3 2006

Mr. Stephen Collings, President
Crow Butte Resources, Inc.
141 Union Blvd., Ste. 330
Lakewood, Colorado 80228

Dear Mr. Collings:

On February 16, 2006, the Nebraska Department of Environmental Quality received a submittal of information from Crow Butte Resources, Inc regarding surface reclamation efforts for Mine Unit #1. The submittal serves to notify the Department of proposed reseeding as directed through consultation with NRCS, as required in Part IV, Section C of the CBR UIC permit.

The Department has reviewed the information submitted and determined that it is adequate and complete, and concurs with the recommendations of the NRCS. The Department hereby approves the surface reseeding reclamation plan as proposed.

If you have any questions or comments, please contact Steve Fischbein of my staff at (402) 471-4290. Thank you.

Sincerely,

Michael J. Linder
Director

ML/saf
word/files/steve/cbr/letter/surface reclamation.doc

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REPLACEMENT PAGE SUMMARY TABLE

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REPLACEMENT PAGES FOR CBR 2007 LICENSE RENEWAL AMENDMENT FOR NRC ENVIRONMENTAL COMMENTS

Replacement Page No./Section	Revised Document	
	2007 Renewal Application	May 2009 Technical Updates
Table of Contents		X
Section 1		
Pages 1-1through 1-1/1-22 (Entire section)	X	
Page 1-7: Revised Figure 1.3-3	X	
Page 1-9: New Figure 1.3-4	X	
Section 2		
Page 2-1/2-2		X
Page 2-5/2-6 (Revised Figure 2.1-2)		X
Page 2-19/2-20		X
Page 2-21/2-22 (Revised Figure 2.2-2)		X
Page 2-23/2-24		X
Page 2-35/2-36 (Revised Figure 2.3-1)		X
Page 2-39/2-40		X
Page 2-41/2-42 (Revised Table 2.3-4)		X
Page 2-43/2-44		X
Page 2-49/2-50		X
Page 2-53/2-54 (Revised Figure 2.4-1)		X
Page 2-55/2-56		X
Page 2-241/2-242		X
Page 2-245/2-246		X
Section 3		
Page 3-29/3-30 (Revised Figure 3.2-1)		X
Section 5		
Page 5-49/5-50 (Revised Figure 5.8-5)		X
Section 6		
Page 6-27/6-28		X
Page 6-31/6-32		X
Page 6-33/6-34		X
Section 7		
Pages 7-1 through 7-68 (Entire section)	X	
Page 7-3: New Figure 7.1-1	X	
Section 8		
Page 8-1/8-2	X	
Section 9		
Page 9-3/9-4	X	

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2007 LRA REPLACEMENT PAGES

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SECTION 1

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Replacement Pages

For

Section 1

Replace Entire Section

Pages 1-1 through 1-22

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1 PROPOSED ACTIVITIES

1.1 LICENSING ACTION REQUESTED

Crow Butte Resources, Inc. (CBR) submits this combined Technical Report (TR) and Environmental Report (ER) in support of a license renewal application (LRA) of the Radioactive Source Materials License SUA-1534 for submittal to the United States Nuclear Regulatory Commission (USNRC). At the request of the USNRC, the ER and TR have been combined into one document, referred to from here on as the LRA, and incorporates applicable USNRC guidance regulations for both the TR and ER. This LRA concerns the continued commercial operation of uranium leach in-situ (ISL) mining resources located in Dawes County, Nebraska.

This LRA is prepared to supplement and update the information presented to the USNRC in support of issuance of Source Materials License SUA-1534 in 1989 and the subsequent renewal in 1997, and provides the supplemental information necessary to determine the environmental impacts of continuing uranium leach activities in the Crow Butte License Area under SUA-1534. This LRA is submitted in accordance with the licensing requirements contained in 10 Code of Federal Regulations (CFR) Part 40 and provides the USNRC staff with the necessary information to support the preparation of an Environmental Assessment (EA) as required in 10 CFR Part 51.

This LRA has been prepared using suggested guidelines and standard formats from both state and federal agencies. The application is presented primarily in the USNRC 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). USNRC 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 USNRC Staff to complete their review of this amendment application. NUREG-1748, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs* (August 2003) was also used to ensure information typically found in the ER was appropriately incorporated into this LRA.

1.2 CROW BUTTE PROJECT BACKGROUND

What is now the Crow Butte Project was originally developed by Wyoming Fuel Corporation, which constructed a R&D facility in 1986. The project was subsequently acquired and operated by Ferret of Nebraska, Inc. until May 1994, when the name was changed to Crow Butte Resources, Inc. Only the name of the company changed, not its ownership. CBR is the current owner and operator of the Crow Butte Project.

The R&D facility was located in the N1/2SE1/4 of Section 19, Township 31 North, Range 51 West, Dawes County, Nebraska. 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.

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.

1.3 SITE LOCATION AND DESCRIPTION

The location of the Crow Butte License Area (License 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 (**Figure 1.3-1**). The plant site is situated approximately 4.0 miles southeast of the City of Crawford. The current production and planned wellfields are located within the License Area as shown in **Figure 1.3-2**. The process plant is located in Section 19, Township 31 North, Range 51 West, Dawes County, Nebraska. The current License Area occupies approximately 2,875 acres, and the surface area affected over the estimated life of the project is approximately 1,265 acres (**Figure 1.3-3**).

Approximately 100 percent of the minerals leased in the License Area are on private lands. Surface landownership includes federal, state/local government, and private ownership as shown in **Table 1.3-1**. **Figure 1.3-4** shows the land ownership within the License Area.

Table 1.3-1: Land Ownership within the Crow Butte License Area

Owner	Percent Ownership
Federal Government	4
State/Local Government	9
Private	89

Note: Percent ownership rounded up to the nearest whole percent.

Figure 1.3-1: Current License Area Boundary & Proposed North Trend Boundary

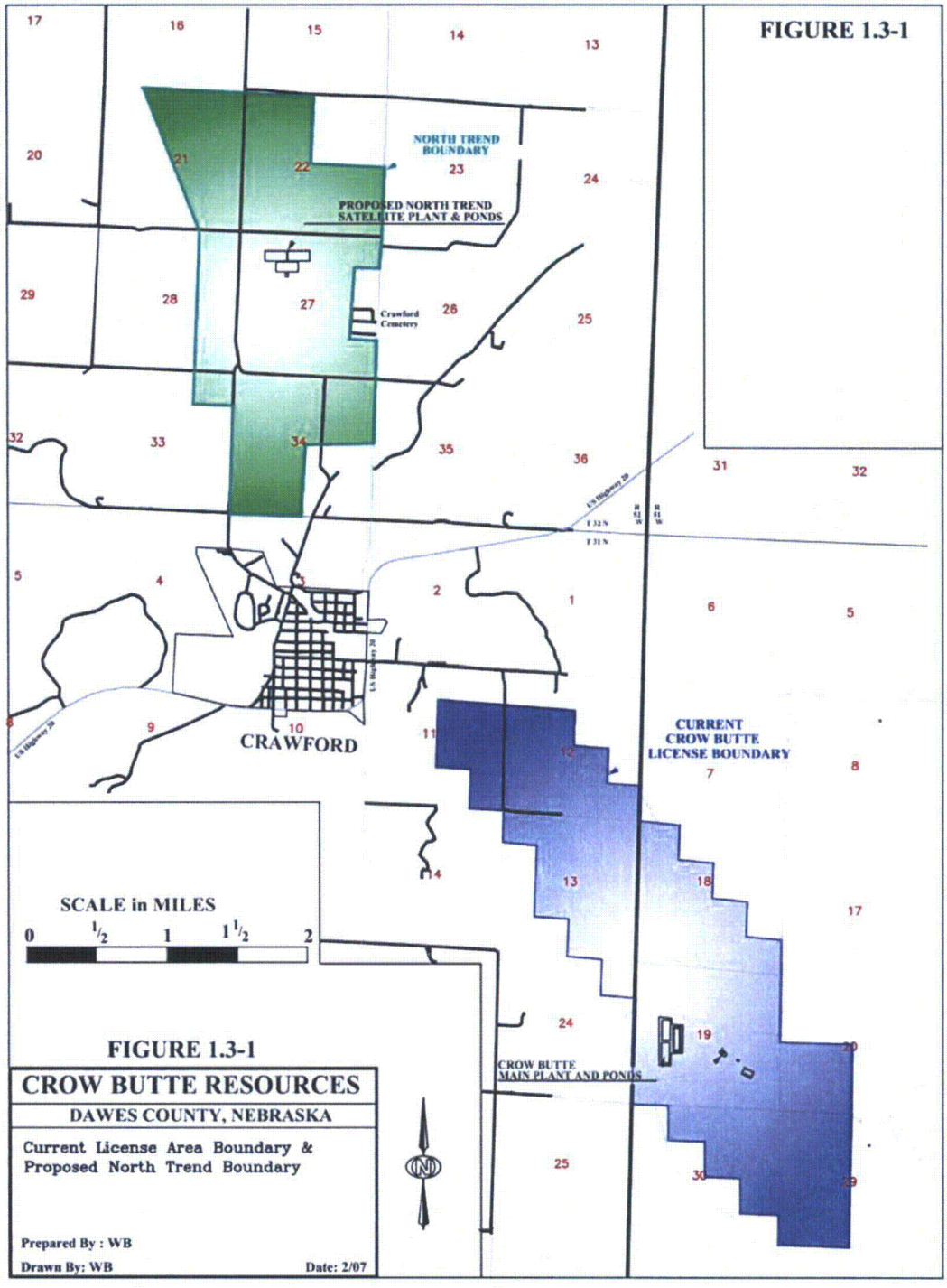

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Figure 1.3-2: Current License Area and Mine Units

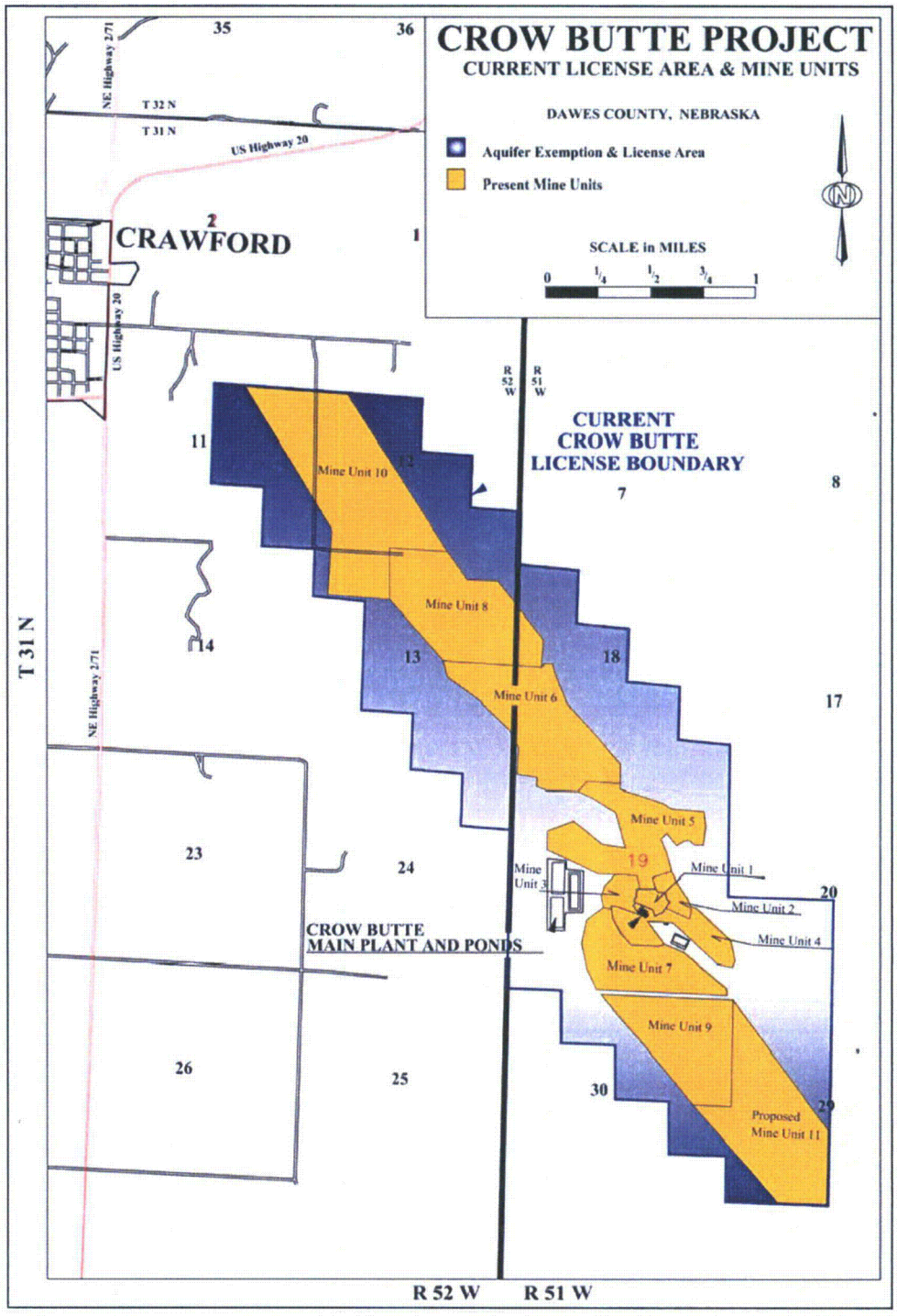

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Figure 1.3-3: Crow Butte Project Surface Disturbance Area and Acreage including Mine Unit 11

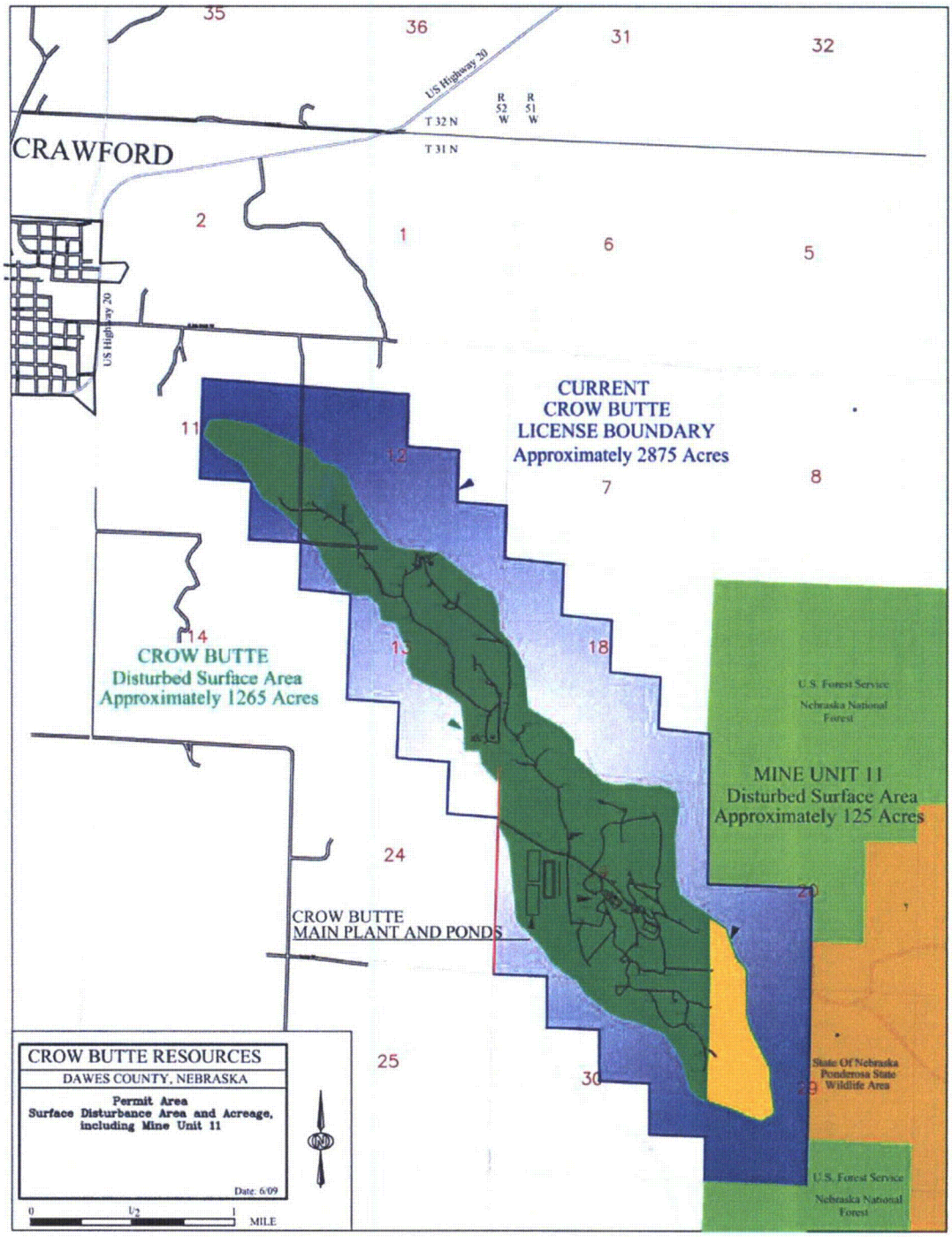

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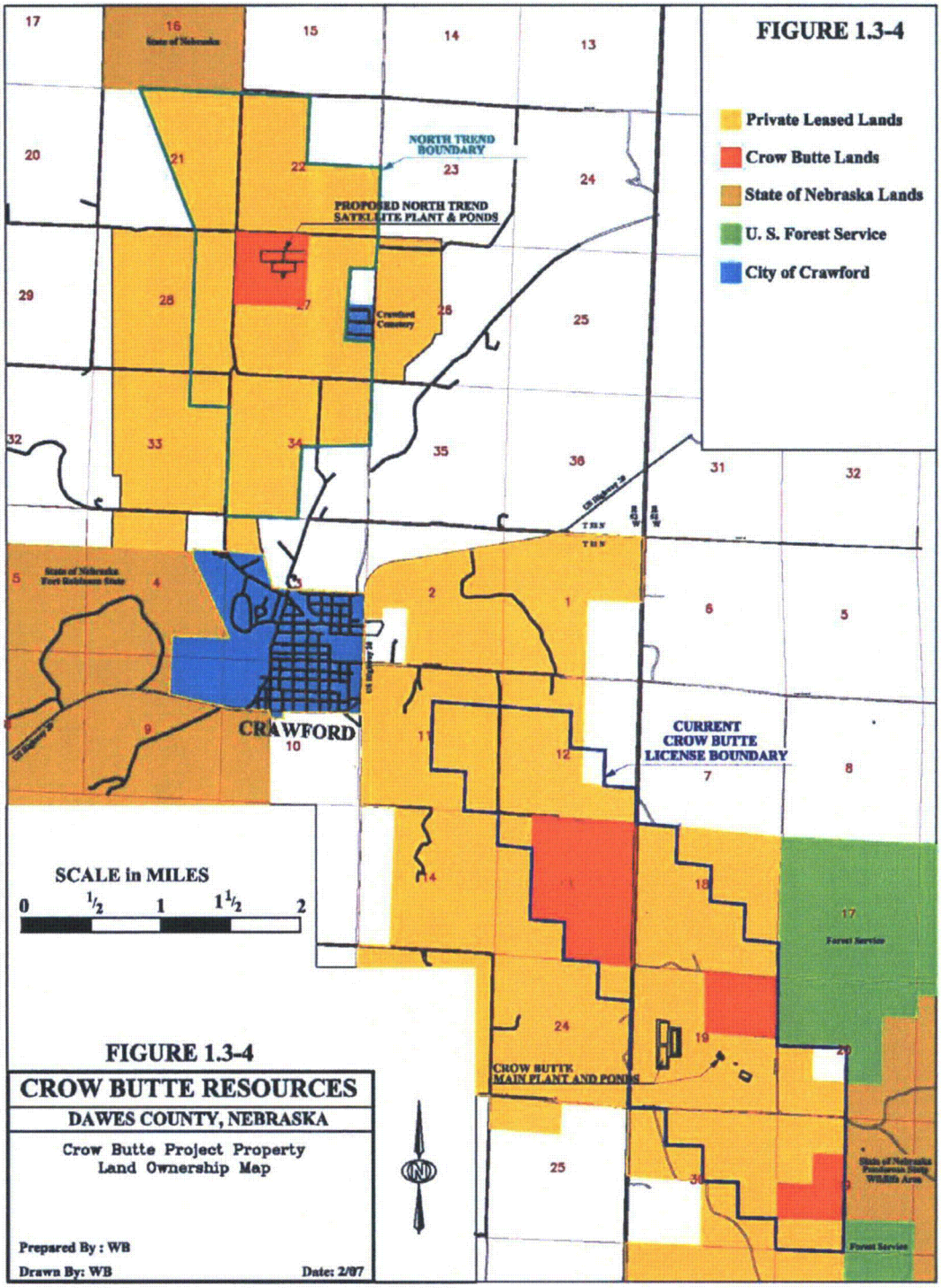
Figure 1.3-4: Crow Butte Project Property Land Ownership Map



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1.4 ORE BODY DESCRIPTION

In the current license area, uranium is recovered by ISL 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 from less than 0.05 percent to greater than 0.5 percent triuranium octoxide (U_3O_8), with an average grade estimated at 0.26 percent equivalent U_3O_8, with an estimated at 0.27 percent U_3O_8.

1.5 SOLUTION MINING METHOD AND RECOVERY PROCESS

The 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 carbonate and an oxidizer;
- Elution of the uranium complexes from the resin; and
- Drying and packaging of the uranium.

Section 3.0 (Description of Proposed Facility) provides a detailed description of the solution mining process and equipment.

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:

- ISL mining results in significantly less surface disturbance since mine pits, waste dumps, haul roads, and tailings ponds are not needed;
- 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;
- The lack of heavy equipment, haul roads, waste dumps, etc. result in very little air quality degradation at ISL mines;
- Fewer employees are needed at ISL mines, thereby reducing transportation and socioeconomic concerns;
- Aquifers are not excavated, but remain intact during and after ISL mining;

- 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
- 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 License 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 USNRC 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 Central Plant is licensed for a process flow rate of 5,000 gallons per minute (gpm), excluding restoration flow, under SUA-1534. Total annual production is limited to 2 million pounds of yellowcake. On October 16, 2006, CBR submitted a request to the USNRC for a license amendment to increase the plant throughput from 5,000 to 9,000 gpm. USNRC approval is pending.

The uranium-bearing solution extracted from the subsurface of the Crow Butte License Area is transported via pipeline to the Crow Butte Central Plant for elution, drying, and packaging. This cycle will continue until the ore zone is depleted or leach of the uranium is no longer economically viable.

1.7 PROPOSED OPERATING SCHEDULE

Based on current plans, mining schedules, and reserve estimates, CBR could continue production at the present annual level of approximately 800,000 pounds U_3O_8 until 2012, when reserves would begin to deplete. CBR estimates that by 2014, production in the current license area would decrease to the point where commercial operations would no longer be economical and would be discontinued. Groundwater restoration, surface

reclamation, and decommissioning would become the primary activities. Completion of groundwater restoration in the current License Area is scheduled for 2023.

Projected production and restoration schedules for the current production area are shown in **Figure 1.7-1**. Status of the current mine unit operations is shown in **Table 1.7-1**. The layout of the current and planned mine units in the License Area is shown in **Figure 1.7-2**.

Table 1.7-1: Current Crow Butte 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	Groundwater restoration
Mine Unit 6	March 1998	Production
Mine Unit 7	July 1999	Production
Mine Unit 8	July 2002	Production
Mine Unit 9	October 2003	Production
Mine Unit 10	August 2007	Production
Mine Unit 11	Pending	Under construction

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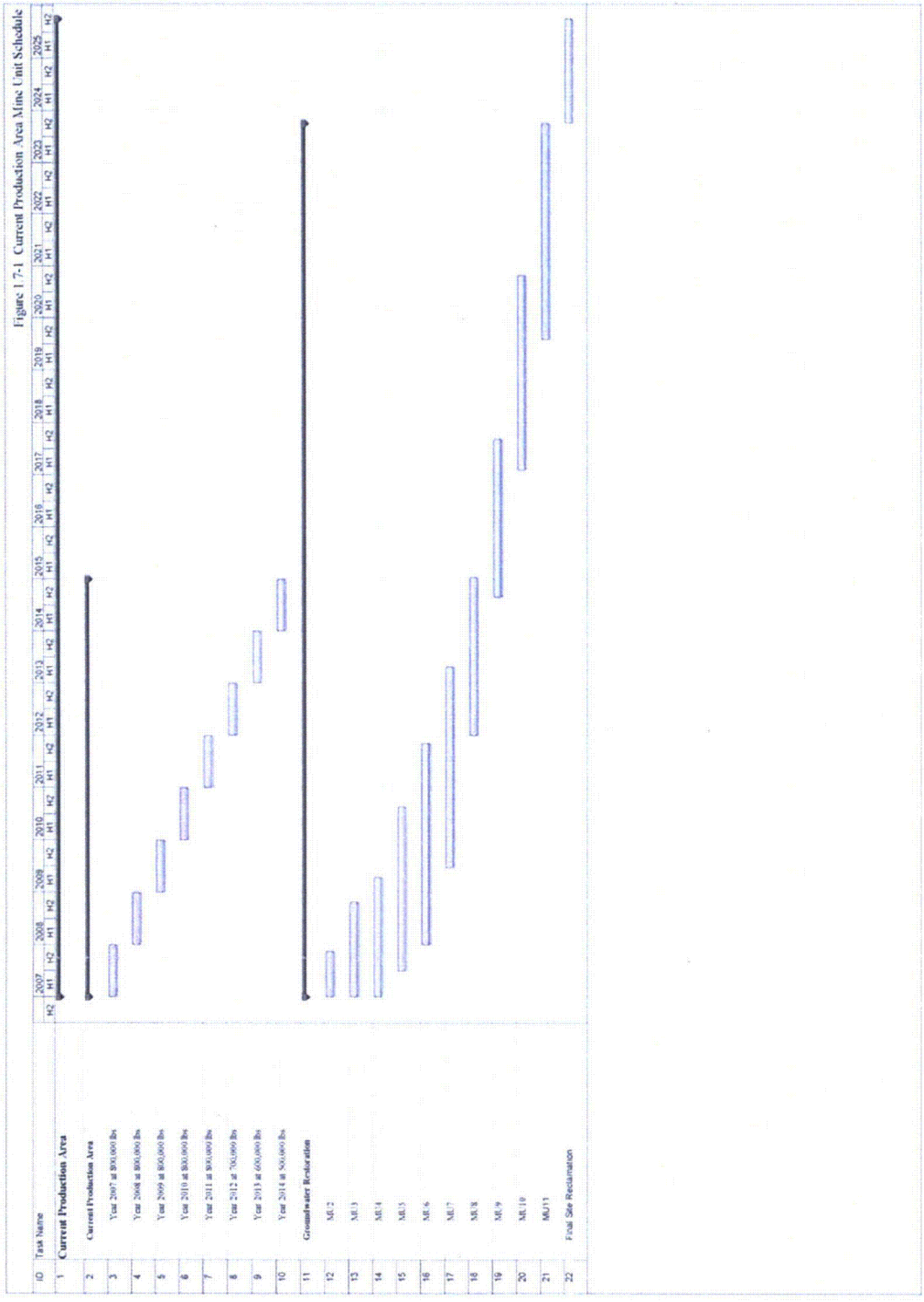
Figure 1 7-1 Current Production Area Mine Unit Schedule
ID
Task Name
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
H1
H2
1 Current Production Area
2 Current Production Area
3 Year 2007 at 850,000 lbs
4 Year 2008 at 800,000 lbs
5 Year 2009 at 850,000 lbs
6 Year 2010 at 850,000 lbs
7 Year 2011 at 850,000 lbs
8 Year 2012 at 700,000 lbs
9 Year 2013 at 650,000 lbs
10 Year 2014 at 500,000 lbs
11 Groundwater Restoration
12 MU 2
13 MU 3
14 MU 4
15 MU 5
16 MU 6
17 MU 7
18 MU 8
19 MU 9
20 MU 10
21 MU 11
22 Final Site Reclamation

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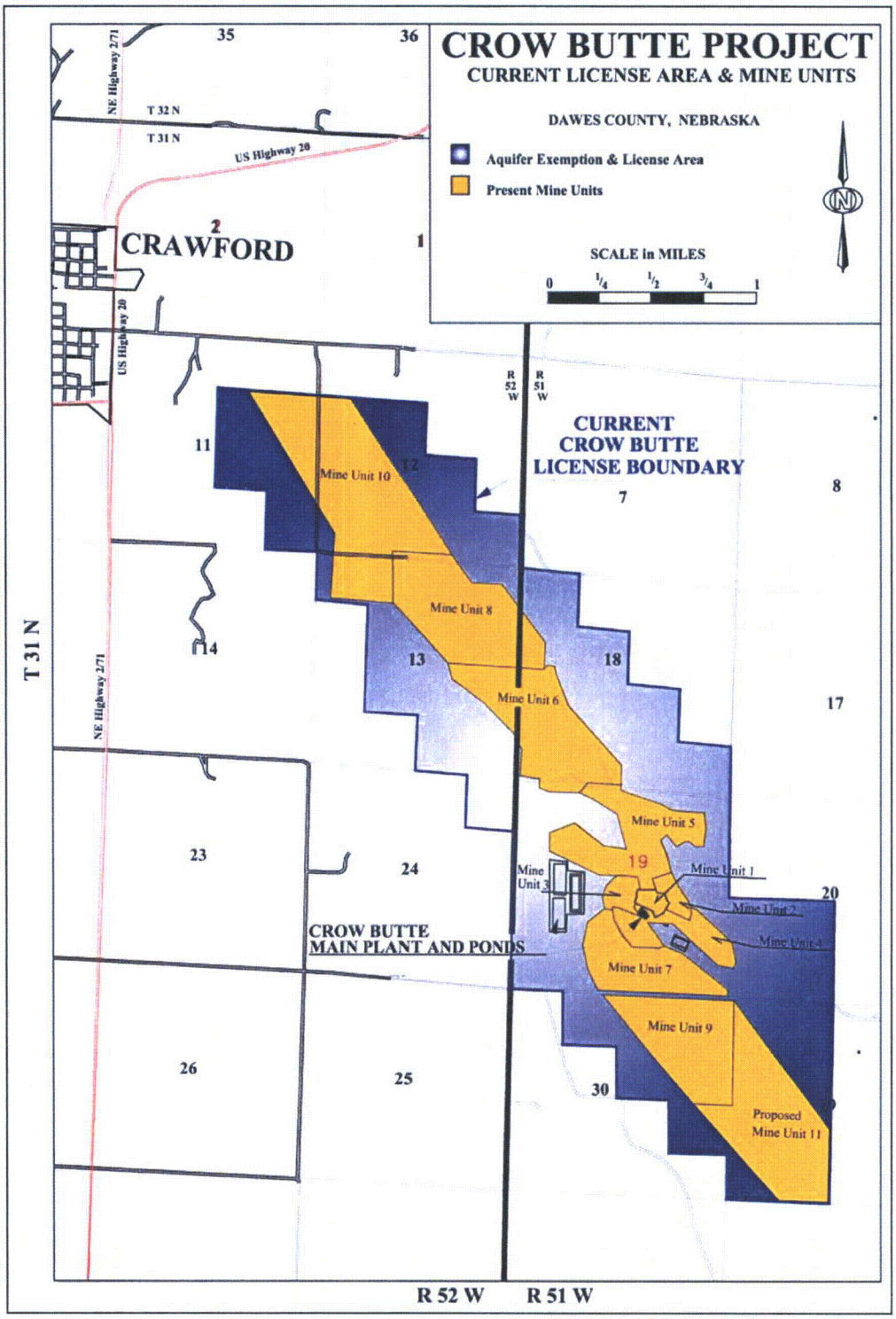
Figure 1.7-2: Current License Area and Mine Units



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1.8 WASTE MANAGEMENT AND DISPOSAL

1.8.1 Gaseous and Airborne Particulates

The only radioactive airborne effluent at the Crow Butte Project is radon-222 gas. As yellowcake drying and packaging is carried out using a vacuum dryer, there are no airborne effluents from that system.

The radon-222 is contained in the pregnant lixiviant that comes from the wellfield to the process plant. The majority of this radon is released in the ion exchange columns and process tanks. These vessels are covered and vented to a manifold, which are in turn exhausted to atmosphere outside the building through stacks. The manifolds are equipped with an exhausting fan.

1.8.2 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 characterization of the waste stream.

The operation of the 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 used in plant processing, disposed of in a deep disposal well, or land applied following treatment.
- **Liquid process waste** - The operation of the process plant results in two primary sources of liquid waste, an eluant bleed and a production bleed. This water is also routed to the evaporation ponds or injected into the deep disposal 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.

1.8.3 Solid Waste

Solid wastes generated at the site consist of spent resin, resin fines, filters, empty reagent containers, miscellaneous pipe and fittings, and domestic waste. These wastes are classified as contaminated or non-contaminated waste according to their 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. Domestic waste is disposed of in an approved septic system.

1.8.4 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.

Section 4.0 (Effluent Control Systems) presents a detailed discussion of the effluent control systems for the current CBR project operations.

1.9 GROUNDWATER RESTORATION

Restoration activities will be carried out at the License Area concurrent with mining activities. The restoration process will be similar to that used to restore Wellfield No. 2 at the Crow Butte R&D site and Mine Unit 1 of the current commercial production area, 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.
- **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 USNRC for approval. Groundwater restoration is described in more detail in

Section 6 (Groundwater Quality Restoration, Surface Reclamation and Facility Decommissioning).

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 plant disassembly and disposal, pond reclamation and land reclamation of all disturbed areas. Appropriate USNRC Regulatory Guidelines will be followed as required. Decommissioning and reclamation are discussed in more detail in **Section 6** (Groundwater Quality Restoration, Surface Reclamation and Facility Decommissioning).

1.11 SURETY ARRANGEMENTS

CBR maintains a USNRC-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 will be revised annually in accordance with the requirements of SUA-1534.

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SECTION 7

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Replacement Pages

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Section 7

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7 ENVIRONMENTAL IMPACTS

The objective of the mining and environmental monitoring program is to conduct an operation that is economically viable and environmentally responsible. The environmental monitoring programs that are used to ensure that the potential sources of land, water and air pollution are controlled and monitored are presented in **Section 5.8**, Radiation Safety Controls and Monitoring.

This section discusses and describes the degree of unavoidable environmental impacts, the short and long-term impacts associated with operations and the consequences of possible accidents at the Crow Butte project.

Environmental impacts that have occurred since the approval of the Crow Butte Project 1997 LRA are summarized for well excursions and effluent releases as measured at groundwater monitoring, stream monitoring, air monitoring, and stream sediment sampling stations,

7.1 LAND USE IMPACTS

7.1.1 Land Surface Impacts

The primary surface disturbances associated with solution mining are the sites containing the processing plants and associated facilities including satellite facilities and evaporation ponds. Surface disturbances also occur during the well drilling program, pipeline installation, and road construction. These more superficial disturbances, however, involve relatively small areas or have short-term impacts.

Due to the relatively minor nature of disturbances created by in-situ mining, there are only a few areas disturbed to the extent to which subsoil and geologic materials are removed, causing significant topographic changes that need backfilling and recontouring. Generally speaking, solar evaporation pond construction results in redistribution of sufficient amounts of subsurface materials, which requires replacement and contour blending during reclamation. The existing contours have only been interrupted in small, localized areas. Because approximate original contours will be achieved during final surface reclamation, no post-mining contour maps have been included in this application.

Major facilities have already been constructed at the Crow Butte site. The site layout for the commercial operation and ancillary facilities **(Figure 2.1-2)** currently includes:

- The original Research and Development Process building housing the Reverse Osmosis unit to be utilized for groundwater restoration activities. This area also includes two wellfields, two solar evaporation ponds and access roads.
- A nominal 120' by 300' process building which is used for uranium extraction, precipitation, drying and packaging, offices, laboratories and change rooms.
- An office complex (75' x 75').

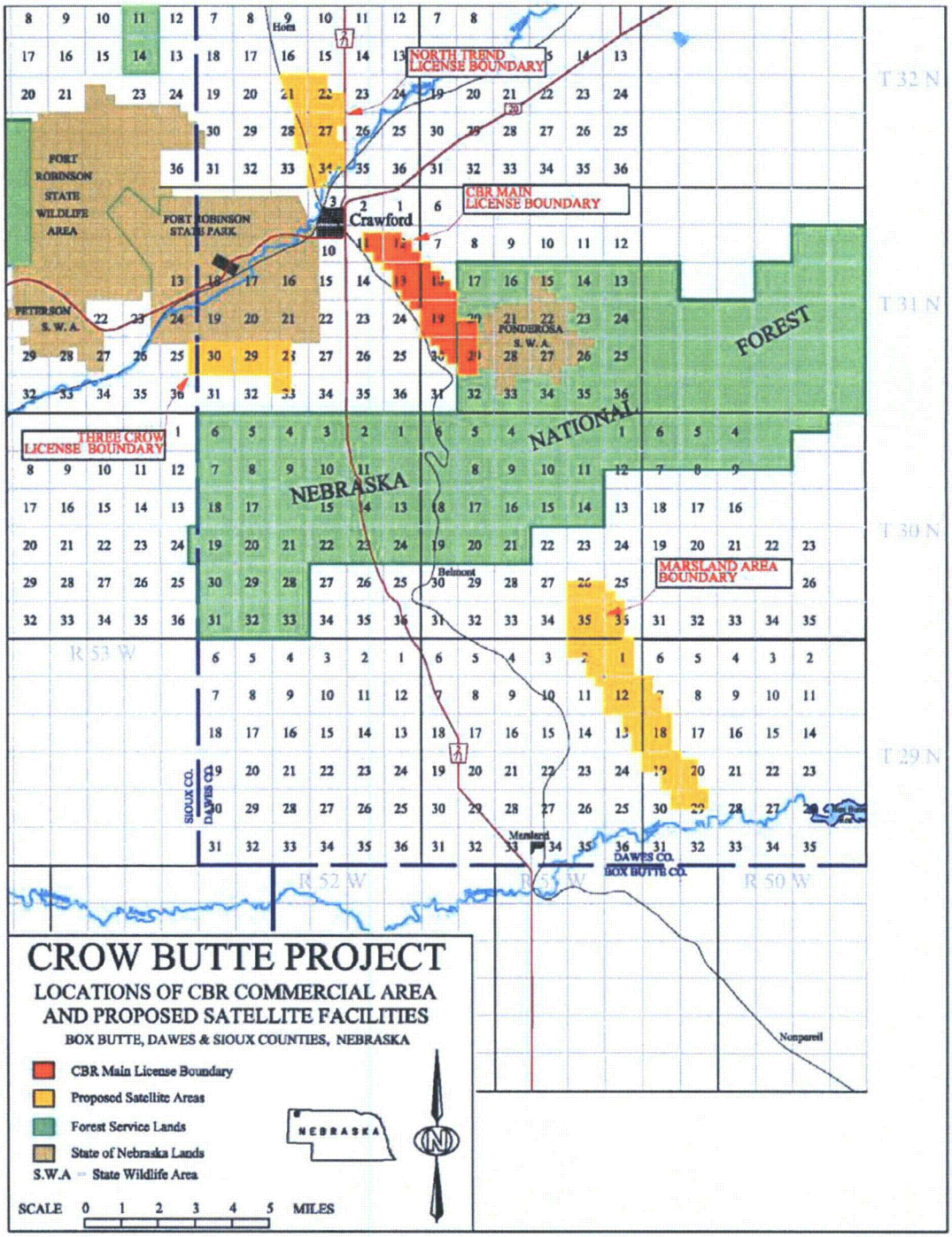
- A geology storage unit.
- Three commercial solar evaporation ponds.
- Deep well injection building located north of the main process facility.
- Maintenance, electrical and storage buildings located north of the main process facility.
- Drilling supply storage buildings.
- Commercial wellfields. Wellfield development includes a number of wellfield houses for each mine unit.
- Access roads.

CBR has identified three additional resource areas in the region near the Crow Butte Central Plant that could conceivably be developed as satellite facilities. CBR submitted a request on May 30, 2007, for an amendment to Source Material License SUA-1534 for the development of an additional uranium in-situ recovery mining resource referred to as the North Trend Expansion Area. Commercial production at the Crow Butte Project, including the proposed North Trend Expansion Area, is expected to extend over the next ten years with depletion of uranium reserves at both areas by 2017. Environmental impacts associated with the proposed North Trend Expansion Area are addressed in the above-referenced license amendment and are not addressed in this document.

A Notice of Intent dated March 4, 2009, was filed by CBR with the NRC advising of intent to file additional amendments to Source Material License SUA-1534 for the potential development of two additional development areas for use as satellite facilities to the current main CBR operating facilities. The proposed satellite facilities are referred to as the Three Crow Expansion Area (TCEA) and Marsland Expansion Area (MEA). Current plans are to submit a license amendment for the TCEA during the first quarter of 2010 and for the MEA during the third quarter 2012. CBR currently projects that development of these areas would be primarily intended to maintain production allowed under the current license as reserves in the current licensed area are depleted.

The proposed centerpoint of the NTEA satellite processing facilities would be located approximately 6 miles northwest of the centerpoint of the current license area processing facilities. The centerpoint of the TCEA satellite processing facilities would be located approximately 5 miles southwest of the centerpoint of the current license area processing facilities. The proposed centerpoint of the MEA satellite processing facility would be located approximately 12 miles southwest of the centerpoint of the current license area processing facilities The proposed satellite facilities locations in relation to the current license area and each other are shown in **Figure 7.1-1**.

Figure 7.1-1: Main Plant & Proposed Satellite Areas



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Future site construction of the current licensed resource area in the next one to two years, including the NTEA (subject to required NRC and NDEQ approvals) , may include the following:

- A satellite process facility and/or pumphouse that would be in the area of 5,000 square feet.
- Two solar evaporation ponds located in conjunction with the satellite facility.
- Additional access roads.

By License Amendment No. 22 dated November 30, 2007, expansion of the main process facility for an increase in production capacity from 5,000 gpm to 9,000 gpm was approved.

The total area impacted at any one time for the current License Area, not including access roads that will be reclaimed during the final stages of reclamation, is approximately 120 acres. All areas disturbed will be reclaimed either during the life of the mine or during final restoration and reclamation activities. Except for the wells, access roads, and possible satellite facility and/or pump houses scattered throughout the License Area, the facilities are confined to approximately 40 acres within Section 19, T31N, R51W, and Section 13, T31N, R52W, Dawes County, Nebraska.

Changes in the surface configuration caused by construction and installation of operating facilities will be only temporary, during the operating period. These changes are due to topsoil removal and storage along with the relocation of subsoil materials used for construction purposes.

These surface impacts are unavoidable and will last for the duration of the project until final decommissioning. Mitigation measures for land surface impacts are discussed in **Section 6.2**.

7.1.2 Land Use Impacts

The principal land use for the License Area and the 3.62 km (2.25 mile) review area is livestock grazing on rangeland. Rangeland accounted for 55.7 percent of the land use in the License Area and the review area as discussed in **Section 2.2**. The secondary land use within this area is cropland, primarily for wheat, although a small proportion is used for alfalfa. Cropland accounted for 29.9 percent of the land use in the Crow Butte License Area and the review.

Land use impacts have occurred from existing Crow Butte facilities such as site preparation and construction activities included topsoil salvaging, pond excavation, building erection, road construction and completion of injection, production and monitor wells.

The unavoidable impact of site preparation, construction, and operation are the exclusion of cattle and crop production from the areas that are under development. The exclusion of agricultural activities from active mining areas is an unavoidable impact that will last for the duration of the project. Pastureland accounts for 43 percent of the nearly 50,000-acre License Area and surrounding 3.6 km (2.25 mile buffer). Cropland accounts for 29 percent of the total area. **Figure 2.2-1** depicts the License Area containing existing permitted facilities, and the current land use types within the CSA, which includes the License Area and a surrounding 2-mile buffer area.

As a result of site preparation and construction, cattle production has been excluded from the areas that are under development. The total estimated area that has been impacted during the course of the project is the 120 acres associated with the plant and wellfields. As discussed in **Section 2.2**, livestock and livestock products had a value of $28.81 per acre, indicating that livestock production on rangeland within the impacted wellfield area has a potential value of more than $7,770.

As a result of site preparation and construction, crop production has been excluded from the areas that are under development. The total estimated cropland area that has been impacted during the course of the project is the 1,041.7 acres associated with the plant and wellfields. In 2001 Dawes County had 77,000 acres harvested for 123,800 tons of hay and 33,700 acres harvested for 1,198,700 bushels of winter wheat. These harvests resulted in yields of 1.6 tons of hay and 35.6 bushels of wheat per acre harvested. Based on these yields, the lost annual crop production in the License Area would be up to 1,666 tons of hay and up to 37,085 bushels of wheat.

These impacts are considered temporary and reversible by returning the land to its former grazing use through post-mining surface reclamation. Mitigation measures for the loss of agricultural production over the course of the project are discussed in **Section 6.2**.

7.2 TRANSPORTATION IMPACTS

7.2.1 Access Road Construction Impacts

As noted in **Section 2.2.3**, Nebraska Highway 2/71 and U.S. Highway 20 converge at Crawford. The Crow Butte Project site is about 4.0 miles southeast of the City of Crawford via the unpaved Squaw Creek Road. Nebraska Highway 2/71 provides access to the License Area from points north and south of Crawford. U.S. Highway 20 provides access to Crawford and the License Area from points east and west.

The Burlington Northern Santa Fe (BNSF) Railroad runs in a northwesterly direction approximately 0.75 miles west of the license area. The BNSF rail line along the western boundary is used for combining local "pusher" engines with southbound trains to assist them in climbing the Pine Ridge south of Crawford. This rail line accommodates a significant amount of rail traffic, primarily from the coal mines in northeastern Wyoming.

The DM&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.

The continued operations of the project will have no impact on railroad operations in the area.

Main access roads have been designed to allow safe access from public roads by employees, contractors, and delivery vehicles. The annual average traffic counts for 2004 ranged between 1,195 south of Crawford and 540 north of Crawford on Nebraska Highway 2, and 1,795 on U.S. Highway 20 north of the License Area (Nebraska Department of Roads 2007). Traffic associated with the operation of the current facility has not adversely impacted existing traffic, and this trend is expected to continue with future planned operations.

7.2.2 Transportation of Materials

Transportation of materials to and from the Crow Butte Central Plant is discussed in the following sections:

7.2.2.1 Shipments of Construction Materials, Process Chemicals, and Fuel from Suppliers to the Site

Shipments of maintenance materials, process chemicals, and fuel from suppliers will continue to be received at the Crow Butte Plant. These shipments will continue to generate some additional noise in the area as discussed in **Section 7.7**. Since the site access roads are surfaced with gravel, the shipments will continue to generate additional dust. Air quality impacts and mitigation are discussed in **Section 7.6**.

Based on the current production schedule and material balance, it is estimated that approximately 150 bulk chemical and fuel deliveries per year will be made to the Crow

Butte Main Plant. This averages about one truck per working day for delivery of fuel and chemicals throughout the operational life of the project. Types of deliveries include carbon dioxide, oxygen, soda ash, propane, hydrochloric acid, sodium hydroxide, hydrogen peroxide, and motor vehicle fuel.

Additionally, wellfield construction materials will be received periodically throughout the operational phase of the project. These shipments are expected to occur at a frequency of once per month.

7.2.2.2 Shipment of U_3O_3, Loaded Ion Exchange Resin and 11(e)2 By-Product Material, Yellowcake, Resin from the Site to a Licensed Disposal Facility

Low level radioactive waste or unusable equipment contaminated with 11(e)2 by-product material will continue to be generated during operations and will be transported to a licensed disposal site. Because of the low volume of radioactive 11(e)2 by-product material generated, these shipments will be infrequent (averaging two per year if using roll off containers).

Shipments of natural uranium (U_3O_3), Ion Exchange Resin loaded with U_3O_3 and 11(e)2 by-product material shipments will continue to be handled as Low Specific Activity (LSA) material. All shipments will comply with all applicable DOT and USNRC regulations governing the transportation of this material.

7.2.3 Impacts to Public Roads

The additional traffic generated by the continued operation of the proposed Crow Butte Project may result in degradation of public road surfaces. In particular, the additional traffic may adversely impact local gravel roads maintained by Dawes County. These impacts have been, and are expected to continue to be, minimal since the additional traffic is not significant in comparison with current traffic levels.

7.3 GEOLOGY AND SOILS IMPACTS

7.3.1 Geologic Impacts

Geological impacts associated with operations are expected to be minimal, if any. No significant matrix compression or ground subsidence is expected, as the net withdrawal of fluid from the Basal Chadron Sandstone will be on the order of 1 percent or less, and the anticipated drawdown over the life of the project is expected to be on the order of 10 percent of the available head, or less. Further, once mining and restoration operations are completed and restoration approved, groundwater levels will return to near original conditions under a natural gradient.

7.3.2 Soil Impacts

Effects to soils have been more significant on approximately 30 fenced acres of the 1,265 acres that have been disturbed by construction of the Crow Butte Central Plant and associated facilities. Much of the remaining disturbed area is devoted to wellfield production, which creates less significant impacts to soils.

The severity of soil impacts depend on the number of acres disturbed and the type of disturbance. Potential impacts include soil loss, sedimentation, compaction, salinity, loss of soil productivity, and soil contamination. Effects to soils at the Crow Butte site result from the clearing of vegetation, excavating, leveling, stockpiling, compacting, and redistributing soils during construction and reclamation. Disturbance related to the construction and operation of the Crow Butte site would be long-term, lasting for the duration of the project.

Wind erosion is a concern at the Crow Butte site. Various soils meet the criteria for severe wind erosion hazard (USDA 1977). These soils have one or more major constituents that are fine sand or sandy loam that can easily be picked up and spread by wind. Construction, as opposed to operation, presents the greatest threat to soils with potential for wind erosion. Wind erosion has been, and will continue to be, controlled by removing vegetation only where it has been necessary, avoiding clearing and grading on erosive areas, surfacing roads with gravel, and timely reclamation.

Water erosion is also a concern at the Crow Butte site. Various soils meet the criteria for severe water erosion hazard (USDA 1977). These soils have low permeability and high K-factors, making them susceptible to water erosion. The K-factor is used to describe a soil's erodibility; it represents both susceptibility of soil to erosion and the rate of runoff. It is calculated from soil texture, organic matter, and soil structure. Construction and operation increase soil loss through water erosion. Removal of vegetation for any activity exposes soils to increased erosion. Excavation could break down soil aggregates, increasing runoff and gully formation. Soil loss is reduced substantially by avoiding highly erosive areas such as badlands and steep drainages Roads will be located in areas where cuts and fills would not be required. Roads will be surfaced, drainage controls will

be installed, disturbed areas will be reseeded, and water bars will be installed across reclaimed areas to minimize soil loss where possible.

Sedimentation in streams and rivers at the Crow Butte site could result from soil loss. Sedimentation could alter water quality and the fluvial characteristics of drainages in the area. Installation of appropriate erosion control measures as required by CBR's Construction Stormwater NPDES authorization **(Section 7.4.1)** and avoidance of erosive soils have aided, and will continue to aid, in reducing sedimentation.

Activity on the site has the potential to compact soils. While soils sensitive to compaction, such as clay loams, do not exist on the site, the intense volume and degree of activity at the Crow Butte site could damage soil properties and cause compaction. Compaction of the soils could decrease infiltration, promoting high runoff. If compaction occurs, reduced infiltration capacity could persist for over 50 years in some soils. Soil disturbance and traffic will continue to be minimized where possible, and soils will be loosened for reseeding during reclamation to control the effects of soil compaction.

Any soil on the site can be saline depending on site-specific soil conditions, such as permeability, clay content, quality of nearby surface waters, plant species, and drainage characteristics. Saline soils are extremely susceptible to soil loss caused by development. Soil erosion in areas with high salt content would contribute to salinity in the White River Basin. Reclamation of saline soils can be difficult, and no method that works in all situations has yet been found.

Facility development displaces topsoil, which adversely affects the structure and microbial activity of the soil. Loss of vegetation exposes soils and result in a loss of organic matter in the soil. Excavation could cause mixing of soil layers and breakdown of the soil structure. Removal and stockpiling of soils for reclamation could result in mixing of soil profiles and loss of soil structure. Compaction of the soil could decrease pore space and cause a loss of soil structure as well. This would result in a reduction of natural soil productivity.

A number of erosion and productivity problems resulting from the Crow Butte site may cause a long-term declining trend in soil resources. Long-term impacts to soil productivity and stability would occur as a result of large-scale surface grading and leveling, until successful reclamation would be accomplished. Reduction in soil fertility levels and reduced productivity would affect diversity of reestablished vegetative communities. Moisture infiltration would be reduced, creating soil drought conditions. Vegetation would undergo physiological drought reactions.

Surface spillage of hazardous materials could occur at the Crow Butte site. If not remediated quickly, these materials have the potential to adversely impact soil resources. In order to minimize potential impacts from spills, a Spill Prevention, Control, and Countermeasure (SPCC) Plan has been implemented. The SPCC plan includes accidental discharge reporting procedures, spill response, and cleanup measures.

7.4 WATER RESOURCES IMPACTS

7.4.1 Surface Water Impacts of Construction and Decommissioning

When stormwater drains off a construction site, it typically carries sediment and other pollutants that can harm lakes, streams and wetlands. USEPA estimates that 20 to 150 tons of soil per acre is lost every year to stormwater runoff from construction sites. For this reason, stormwater runoff is controlled by National Pollutant Discharge Elimination System (NPDES) regulations.

Construction activities at the Crow Butte Project to date have had a minimal impact on the local hydrological system. CBR conducts construction activities under NDEQ permitting regulations for control of construction stormwater discharges contained in Title 119. CBR is required by NDEQ General Construction Stormwater NPDES Permit NER 100000 to implement procedures that control runoff and the deposition of sediment in surface water features during construction activities. These procedures are contained in EHSMS Volume VI, *Environmental Manual,* and require active engineering measures, such as berms, and administrative measures, such as work activity sequencing to control runoff and sedimentation of surface water features. CBR must annually submit a construction plan for the coming year and obtain authorization from the NDEQ under the general permit.

The results of stream sediment sampling for most semiannual periods between 1998 and 2007 fall within the expected ranges, as shown in **Table 5.8-11** and **Figures 5.8-32** through **5.8-37**. In the second half of 2005, the concentrations of natural uranium in several English Creek samples were well above regional background levels. CBR has noted these elevated concentrations in the English Creek drainage during preoperational monitoring, which indicates that these levels are anomalous natural background concentrations.

7.4.2 Surface Water Impacts of Operations

7.4.2.1 Surface Water Impacts from Sedimentation

Protection of surface water from stormwater runoff during on-going wellfield construction related to operations is regulated by the NDEQ as discussed in **Section 7.4.1.**

7.4.2.2 Potential Surface Water Impacts from Accidents

Surface water quality could potentially be impacted by accidents such as an evaporation pond leakage or failure or an uncontrolled release of process liquids due to a wellfield accident. **Section 7.4.3.3** discusses the operation of the ponds and measures to prevent and control wellfield spills. An additional measure to protect surface water is that wellfield areas are installed with dikes or berms to prevent spilled process solutions from entering surface water features. Process buildings are constructed with secondary containment, and a regular program of inspections and preventive maintenance is in

place. In addition to the administrative and engineering controls routinely implemented by CBR, it is expected that surface water impacts from potential accidents at the Crow Butte facilities will be minimal since there are no nearby surface water features.

7.4.3 Groundwater Impacts of Operations

Potential impacts to water resources from mining and restoration activities include the following.

7.4.3.1 Groundwater Consumption

As discussed in **Section 2.7**, a regional pump test has been conducted to assess the hydraulic characteristics of the Basal Chadron Sandstone, and overlying confining units. Pump tests are also performed for each mine unit to demonstrate hydraulic containment above the production zone, demonstrate communication between the production zone mining and exterior monitor wells, and to further evaluate the hydrologic properties of the Basal Chadron Sandstone.

A full and detailed analysis of the potential impacts of the mining operations at Crow Butte on surrounding water users have been provided in an Industrial Groundwater Use Permit application required by NDEQ. The permit application was submitted to NDEQ by Ferret of Nebraska, Inc. (predecessor to CBR) in 1991. The application states that water levels in the City of Crawford (approximately three miles northwest of the mining area) could potentially be impacted by approximately 20 feet by consumptive withdrawal of water from the Basal Chadron Sandstone during mining and restoration operations (based on a 20-year operational period).

A similar order of magnitude impact (drawdown) likely exists for the Crow Butte operations. No impact to other users of groundwater has been observed, nor is expected during future operations because: (1) there is no documented existing use of the Basal Chadron in the License Area; and, (2) the potentiometric head of the Basal Chadron Sandstone in the License Area ranges from approximately 40 to 200 feet below ground surface.

Because the Basal Chadron Sandstone (production zone) is a deep confined aquifer, no surface water impacts are expected. Further, the geologic and hydrologic data presented in **Sections 2.6** and **2.7**, respectively, demonstrate that (1) the occurrence of uranium mineralization is limited to the Basal Chadron Sandstone; and, (2) the Basal Chadron is isolated from underlying and overlying sands. Hence, the mining operations are expected to impact water quality only in the Basal Chadron Sandstone, and restoration operations will be conducted in the Basal Chadron following completion of mining.

Based on a bleed of 0.5 percent to 1.5 percent, which has been successfully applied in the current licensed area, the potential impact from consumptive use of groundwater is expected to be minimal. In this regard, the vast majority (e.g., on the order of 99 percent) of groundwater used in the mining process will be treated and re-injected. Potential

impacts on groundwater quality due to consumptive use outside the license area are expected to be negligible.

Because of the uncertainty regarding the impact of the White River structural feature on groundwater flow in the Basal Chadron Sandstone, strict quantification of the mining impacts is difficult until more detailed information related to this feature is available.

To generally quantify the potential impact of drawdown due to mining and restoration operations, the following assumptions were used:

- Mining/restoration life: 20 years
- Average net consumptive use: 5112 gpm
- Location of pumping centroid: Center of Section 19
- Observation radius: 4 miles radially from centroid of pumping
- Formation transmissivity 330 ft^2/d
- Formation thickness 40 feet
- Formation hydraulic conductivity 9.0 ft/d
- Formation storativity 9.0×10^{-5}

The data was evaluated using a Theis semi-steady state analytical solution, which includes the following assumptions:

- The aquifer is confined and has apparent infinite extent;
- The aquifer is homogeneous and isotropic, and of uniform effective thickness over the area influenced by pumping;
- The piezometric surface is horizontal prior to pumping;
- The well is pumped at a constant rate;
- No recharge to the aquifer occurs;
- The pumping well is fully penetrating; and,
- Well diameter is small, so well storage is negligible.

Based on these assumptions and results from pumping tests, drawdown after 20 years of operation at a 4 mile radial distance from the centroid of pumping was calculated to be 23.6 feet. This amount of drawdown is approximately 4.5 percent of the available drawdown in the Basal Chadron Sandstone.

As discussed in **Section 5.8**, an extensive water-sampling program will be conducted prior to, during and following mining operations at the Crow Butte facility to identify any potential impacts to water resources of the area.

Water level measurements will be routinely performed in the production zone and overlying aquifer. Sudden changes in water levels within the production zone may indicate that the wellfield flow system is out of balance. Flow rates would be adjusted to correct this situation. Increases in water levels in the overlying aquifer may be an indication of fluid migration from the production zone. Adjustments to well flow rates or

complete shut down of individual wells may be required to correct this situation. Increases in water levels in the overlying aquifer may also be an indication of casing failure in a production, injection or monitor well. Isolation and shut down of individual wells can be used to determine the well causing the water level increases.

To ensure the leach solutions are contained within the designated area of the aquifer being mined, the production zone and overlying aquifer monitor wells will be sampled once every two weeks as discussed in **Section 5.8.**

These impacts are unavoidable aspects of solution mining. No mitigative measures have been identified.

7.4.3.2 Impacts on Groundwater Quality

Solution mining of a mineral deposit is accomplished by reversing the natural processes that deposited the uranium. The native formation waters in the ore zones in the Basal Chadron aquifer are not recommended for human consumption because of naturally high levels of dissolved radioactive materials (uranium and Ra-226). In addition to uranium, other metals will mobilize by the mining process. This process affects the mining zone, which must be exempted from Clean Water Act protections by the NDEQ and the USEPA under the aquifer exemption provisions of the State and Federal UIC regulations.

Excursions represent a potential effect on the adjacent groundwater as a result of operations. During production, injection of the lixiviant into the wellfield results in a temporary degradation of water quality in the exempted aquifer compared to pre-mining conditions. Movement of this water out of the wellfield results in an excursion. Excursions of contaminated groundwater in a wellfield can result from an improper balance between injection and recovery rates, undetected high permeability strata or geologic faults, improperly abandoned exploration drill holes, discontinuity and unsuitability of the confining units which allow movement of the lixiviant out of the ore zone, poor well integrity, and hydrofracturing of the ore zone or surrounding units.

To date, there have been several confirmed horizontal excursions in the Chadron sandstone in the current license area. These excursions were quickly detected and recovered through overproduction in the immediate vicinity of the excursion. In all but one case, the reported vertical excursions were actually due to natural seasonal fluctuations in Brule groundwater quality and very stringent upper control limits (UCLs). In no case did the excursions threaten the water quality of an underground source of drinking water since the monitor wells are located well within the aquifer exemption area approved by the USEPA and the NDEQ. **Table 7.4-1** provides a summary of excursions reported for the License Area.

Table 7.4-1: Excursion Summary

Monitor Well ID	Date On Excursion	Date Off Excursion	Causal Factor(s)
CM6-6	July 1, 1999	September 23, 1999	Excursion of mining solutions
PR-15	January 13, 2000	March 23, 2000	Mine Unit 1 interior monitor well affected by adjacent groundwater restoration (unrelated to mining activities)
SM6-18	March 6, 2000	April 11, 2001	Natural fluctuation of shallow groundwater quality (unrelated to mining activities)
IJ-13	April 20, 2000		Mine Unit 1 interior monitor well affected by adjacent groundwater restoration (unrelated to mining activities)
SM7-23	April 27, 2000	January 13, 2004	Natural fluctuation of shallow groundwater quality (unrelated to mining activities)
SM6-28	May 25, 2000	June 22, 2000	Natural fluctuation of shallow groundwater quality (unrelated to mining activities)
SM6-13	May 25, 2000	July 20, 2000	Natural fluctuation of shallow groundwater quality (unrelated to mining activities)
SM6-12	September 8, 2000	November 20, 2000	Surface leak
SM6-13	March 1, 2001	April 12, 2001	Natural fluctuation of shallow groundwater quality (unrelated to mining activities)
CM5-11	September 10, 2002	May 6, 2003	Excursion of mining solutions
CM6-7	April 4, 2002	April 25, 2002	Excursion of mining solutions
PR-8	December 23, 2003		Mine Unit 1 interior monitor well affected by adjacent groundwater restoration (unrelated to mining activities)
CM5-19	May 2, 2005	July 26, 2005	Excursion of mining solutions
SM6-28	June 16, 2005	July 5, 2005	High water table due to heavy spring rains (unrelated to mining activities)
SM6-12	June 28, 2005	July 26, 2005	High water table due to heavy spring rains (unrelated to mining activities)
CM9-16	August 4, 2005	November 8, 2005	Excursion of mining solutions
CM8-21	January 18, 2006	April 7, 2006	Excursion of mining solutions
PR-15	September 26, 2006		See IJ-13 and PR-8

Notes:
Mitigative measures for impacts on groundwater quality are discussed in Section 5.3.

7.4.3.3 Potential Groundwater Impacts from Accidents

Groundwater quality could potentially be impacted during operations due to an accident such as evaporation pond leakage or failure, or an uncontrolled release of process liquids due to a wellfield accident. If there should be an uncontrolled pond leak or wellfield

accident, potential contamination of the shallow aquifer (Brule), as well as surrounding soil, could occur. This could occur as a result of a slow leak or a catastrophic failure, a shallow excursion, an overflow due to excess production or restoration flow, or due to the addition of excessive rainwater or runoff.

To mitigate the likelihood of pond failure, all ponds at Crow Butte have been designed and built to USNRC standards using impermeable synthetic liners. A leak detection system was also installed, and all ponds are inspected on a regular basis. In the event that a problem is detected, the contents of any given pond can be transferred to another pond while repairs are made. The pond design and operation is discussed in greater detail in **Section 4.2.**

Over the course of the current licensed operation, CBR has experienced several leaks associated with the inner pond liner on the commercial evaporation ponds. These small leaks are virtually unavoidable since the liners are exposed to the elements. In each case these leaks were quickly discovered during routine inspections, primarily due to a response in the underdrain system. Corrective actions included lowering the pond level and locating the leak to allow repairs. In none of these situations was the shallow groundwater affected since the outer pond liner functioned as designed and prevented a release of the pond contents. All pond leaks, causes, and corrective actions are reported to the USNRC and the NDEQ.

With respect to potential overflow of a pond, current SOPs require that pond levels be closely monitored as part of the daily inspection. Process flow to the ponds are minimal in comparison to the pond capacity, thus it can easily be diverted to another pond if necessary. In addition, sufficient freeboard is maintained on all ponds to allow for a significant addition of rainwater with no threat of overflow. Finally, the dikes and berms around the ponds channel runoff away from the ponds.

Another potential cause of groundwater impacts from accidents could be releases as a result of a spill of injection or production solutions from a wellfield building or associated piping. In order to control these types of releases, all piping is either PVC, high density polyethylene with butt welded joints, or equivalent. All piping is leak tested prior to production flow and following repairs or maintenance.

7.5 ECOLOGICAL RESOURCES IMPACTS

7.5.1 Effects of the Current Commercial Operation

Adverse impacts associated with development of the R&D operation and the current commercial operation included ground disturbing activities resulting from the construction of access roads, processing facility, active wells, and other project related needs. These disturbances have been less than 100 acres at any one time.

These disturbances have not significantly affected ecological resources because, as discussed in the baseline section, there is no critical habitat for any species within the CSA. Additionally, the small amount of project-disturbed land compared to the amount of similar habitat surrounding the area should not have affected populations of any species occurring there.

7.5.2 Impact Significance Criteria

The following criteria were used to determine the significance of construction and operation of the proposed project on wildlife and vegetation resources within the project area. These criteria were developed based on professional judgment, involvement in other USEPA projects throughout the West, and state and federal regulations.

- Removal of vegetation such that following reclamation, the disturbed area(s) would not have adequate cover (density) and species composition (diversity) to support pre-existing land uses, including wildlife habitat;
- Unauthorized discharge of dredged or fill materials into, or excavation of, waters of the U.S., including special aquatic sites, wetlands, and other areas subject to the Section 404 of the Clean Water Act, Executive Order 11988-flood plains, and Executive Order 11990 - wetlands and riparian zones;
- Reclamation is not accomplished in compliance with Executive Order 13112 (Invasive Species);
- Introduction and establishment of noxious or other undesirable invasive, non-native plant species to the degree that such establishment results in listed invasive, non-native species occupying any undisturbed rangeland outside of established disturbance areas or hampers successful revegetation of desirable species in disturbed areas;
- Whether or not a substantial increase in direct mortality of wildlife caused by road kills, harassment, or other causes would occur;
- Incidental take of a special-status species to the extent that such impact would threaten the viability of the local population;
- Whether or not an officially-designated critical wildlife habitat was eliminated, sustained a permanent reduction in size, or was otherwise rendered unsuitable;

- Whether or not any effect, direct or indirect, results in a long-term decline in recruitment and/or survival of a wildlife population; and
- Construction disturbance during the breeding season or impacts to reproductive success which could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment in accordance with regulations prescribed by the Migratory Bird Treaty Act.

7.5.3 Vegetation

Direct impacts associated with project development and operations include the short-term loss of vegetation (modification of structure, species composition, and areal extent of cover types) from soil disturbance and grading. Potential indirect impacts include the short-term and long-term increased potential for non-native species invasion, establishment, and expansion; exposure of soils to accelerated erosion; shifts in species composition or changes in vegetative density; reduction of wildlife habitat; and changes in visual aesthetics. Vegetation removal and soil handling associated with the construction and installation of wellfields, pipelines, access roads, and satellite facilities would affect vegetation resources both directly and indirectly. However, because most project-related infrastructure will be constructed within cultivated agricultural fields, vegetation impacts will be negligible. If the mixed-grass prairie vegetation community were to be developed, direct impacts would include the short-term loss of vegetation (modification of structure, species composition, and areal extent of cover types). Indirect impacts would include the short-term and long-term increased potential for non-native species invasion, establishment, and expansion; exposure of soils to accelerated erosion; shifts in species composition or changes in vegetative density; reduction of wildlife habitat; reduction in livestock forage; and changes in visual aesthetics.

During the anticipated life of the project (15 to 18 years), an estimated 1,041.7 acres of cultivated agricultural fields would be affected by surface-disturbing production facilities. The likelihood of impact is greatest for the primary vegetation cover types of cultivated fields, which occupies 62 percent of the total impacted area. As stated above, clearing of mixed-grass prairie vegetation community types is not anticipated.

Construction activities, increased soil disturbance, and higher traffic volumes could stimulate the introduction and spread of undesirable and invasive, non-native species within the project area. Non-native species invasion and establishment has become an increasingly important result of previous and current disturbance in western states. These species often out-compete desirable species, including special-status species, rendering an area less productive as a source of forage for livestock and wildlife. Additionally, sites dominated by invasive, non-native species often have a different visual character that may negatively contrast with surrounding undisturbed vegetation. Currently, the project area is relatively free of noxious and other unwanted invasive, non-native species.

In general, the duration of effects on cultivated agricultural land and mixed-grass prairie vegetation are significantly different. Cropland areas can be readily returned to

production through fertilizer treatments and compaction relief. However, disturbed native prairie tracts require reclamation treatments and natural succession to return to predisturbance conditions of diversity (both species and structural). Reestablishment of mixed-grass prairie to predisturbance conditions would be influenced by climate (growing season, temperature, and precipitation patterns) and edaphic (physical, chemical, and biological) conditions in the soil.

Previously planted agricultural fields would be recontoured to approximate precontours and ripped to depths of 12 to 18 inches to relieve compaction. If mixed-grass prairie tracts were disturbed by surface activities, these areas would be completely reclaimed. Reclamation of mixed-grass prairie would generally include: (1) completing cleanup of the disturbed areas (wellfields and access roads); (2) restoring the disturbed areas to the approximate ground contour that existed before construction; (3) replacing topsoil, if removed, over all disturbed areas; (4) ripping disturbed areas to a depth of 12 to 18 inches; and (5) seeding recontoured areas with a locally adapted, certified weed-free seed mixture.

7.5.4 Surface Waters and Wetlands

Surface disturbances associated with the proposed facilities would not affect either Spring Creek or the White River. In addition, no wetlands have been identified within the project area. Therefore, impacts to wetlands and surface waters are not anticipated.

The Crow Butte License Area lies within the watershed of Squaw Creek and English Creek which are small tributaries to the major regional water course, the White River. Construction and operation impacts have had a minimal impact on the local hydrological system. Some additional sediment entered Squaw Creek from adjacent unnamed tributaries during construction earth moving activities of the Central Plant; however, this condition was temporary without any long-term impacts. The increased sediment load as a result of precipitation during construction, operations or reclamation should not significantly affect the quality of Squaw Creek since the more sensitive areas of the stream are located upstream from the point of entry of the tributary.

Although normal construction activities within the wellfields, process plant and along pipeline courses and roads may slightly increase the sediment yield of the areas disturbed, the relative size of such disturbances is minor compared to the size of the permitted areas and to the size of the watersheds. As wellfield decommissioning and reclamation activities will be on going throughout the life of the project, the area to be reclaimed at the conclusion of operations will be reduced, although a slight increase in sediment yields and total runoff can still be expected.

The results of stream sediment sampling for Squaw and English Creeks indicate that measured concentrations of radiological parameters (e.g., uranium) between 1998 and 2207 are consistent with preoperational monitoring, which indicates that these levels are anomalous natural background concentrations.

Wetlands and/or waterbodies (i.e., wet meadow, mixed prairie – riparian, wet meadow-riparian, deep marsh-riparian, riverine, and impoundment) make up only 3.17 percent (273.92 acres) of the habitat within the CSA. Although the potential for impacting such ecological systems is minor, efforts are made to avoid impacting such environments.

7.5.5 Wildlife and Fisheries

The effects on wildlife are associated with construction and operation of project facilities, which include displacement of some individuals of some wildlife species, loss of wildlife habitats, and an increase in the potential for collisions between wildlife and motor vehicles. Other potential effects include a rise in the potential for illegal kill, harassment, and disturbance of wildlife because of increased human presence primarily associated with increased vehicle traffic. The magnitude of impacts to wildlife resources would depend on a number of factors, including the time of year, type and duration of disturbance, and species of wildlife present.

7.5.6 Small Mammals and Birds

The direct disturbance of wildlife habitat in the project area likely would reduce the availability and effectiveness of habitat for a variety of common small mammals, birds, and their predators. The initial phases of surface disturbance and increased noise would result in some direct mortality to small mammals and would displace some bird species from disturbed areas. In addition, a slight increase in mortality from increased vehicle use of roads in the project area would be expected.

The temporary disturbances that occur during the construction period would tend to favor generalist wildlife species such as ground squirrels and horned larks, and would have more impact on specialist species such as western meadowlarks, lark buntings, and grasshopper sparrows. Overall, the long-term disturbance of 1,265 acres would have a low effect on common wildlife species. Songbirds that may be affected by the reduction in cultivated fields would be horned larks, sage sparrows, sage thrashers, and vesper sparrows. Although there is no way to accurately quantify these changes, the impact is likely to be low in the short term and be reduced over time as reclaimed areas begin to provide suitable habitats.

Because of the high reproductive potential of these species, they would rapidly repopulate reclaimed areas as habitats become suitable. Birds are highly mobile and would disperse into surrounding areas and utilize suitable habitats to the extent that they are available. The primary small mammals found on the project area include, but are not limited to, eastern cottontail, deer mice, thirteen-lined ground squirrel, white-footed mouse, meadow jumping mouse, and northern pocket mouse. The initial phases of surface disturbance would result in some direct mortality and displacement of small mammals from construction sites. Quantifying these changes is not possible because population data are lacking. However, the impact is likely to be low, and the high reproductive potential of these small mammals would enable populations to quickly repopulate the area once reclamation efforts are initiated.

7.5.7 Big Game Mammals

The principal wildlife impacts likely to be associated within the project area include: (1) a direct loss of certain wildlife habitat; (2) the displacement of some wildlife species; (3) an increase in the potential for collisions between wildlife and motor vehicles; and, (4) an increase in the potential for the illegal kill and harassment of wildlife.

In general, direct removal of habitat used by big game mammals is expected to be minimal, as the project area is predominantly used for agricultural production. Because a substantial proportion of the project area is used for seasonal crop production, only a small proportion of the available wildlife habitat in the project area would be affected. The capacity of the project area to support big game populations should remain essentially unchanged from current conditions.

In addition to the direct removal of habitat because of the development of wells and associated satellite facilities, disturbances from drilling activities and traffic would affect utilization of the habitat immediately adjacent to these areas; however, big game mammals are adaptable and may adjust to non-threatening, predictable human activity. It is envisioned that most big game mammal responses will consist of avoidance of areas proximal to the operational facilities, with most individuals carrying out normal activities of feeding and bedding within adjacent suitable habitats. In addition, the magnitude of displacement would decrease over time as: (1) the animals have more time to adjust to the operational circumstances; and, (2) the extent of the most intense activities such as drilling and road building diminishes and the wellfields are put into production. By the time the wellfields are under full production, construction will have ceased, and traffic and human activities in general would be greatly reduced. As a result, this impact would be minimal and it is unlikely that big game mammals would be significantly displaced under full field development. The level of big game mammal use of the project area is more likely to be determined by the quantity and quality of forage available.

The potential for vehicle collisions with big game mammals would increase as a result of increased vehicular traffic associated with the presence of construction crews and would continue (although at a reduced rate) throughout all phases of the wellfield operations. Development of new roads would allow greater access to more areas and may lead to an increased potential for poaching of big game animals; however, because of the proximity to Crawford and locations of farm residences in the project area, the incidence of vehicle collision impacts to big game mammals is anticipated to occur infrequently and no long-term adverse effects are expected.

Based on the foregoing, long-term adverse effects are not expected for any local big game mammal populations.

7.5.8 Upland Game Birds

The potential effects of the operation and maintenance of project facilities on upland game birds may include nest abandonment and reproductive failure caused by project-

related disturbance and increased noise. Other potential effects involve increased public access and subsequent human disturbance that could result from new construction and production activities.

7.5.8.1 Sharp-tailed Grouse

No sharp-tailed grouse leks are known to occur within the project area. However, noise related to drilling and production activities may affect sharp-tailed grouse utilization of leks or reproductive success. Reduction of noise levels in areas near leks would minimize this potential impact. If leks are found, surface disturbance should be avoided within 0.25 miles of leks. If disturbance within the buffer areas is avoided, no impacts are expected.

Areas with large tracts of mixed-grass prairie would provide the best quality nesting habitat. To protect sharp-tailed grouse nesting habitats, construction should be limited within a 1-mile radius of an active lek between March 1 and June 30. Significant impacts to leks and subsequent reproductive success are not expected if these guidelines are implemented.

7.5.9 Raptors

Potential impacts to raptors within the project area include: (1) nest desertions or reproductive failure as a result of project activities and increased public access; (2) temporary reductions in prey populations; and, (3) mortality associated with roads.

The primary potential impact to raptors from project activities is disturbance during nesting that might result in reproductive failure. To minimize this potential, construction would not be allowed during the critical nesting season (Feb. 1 - July 31, depending on species) within 0.5 mile of an active nest of listed or sensitive raptor species, and 0.25 mile (depending on species or line of sight) of an active nest of other raptor species. The nature of the restrictions, exclusion dates, and the protection radii would vary, depending on activity status of nests, species involved, and natural topographic barriers, and line-of-sight distances should be developed in coordination within the Nebraska Game and Parks Commission (NGPC) or the U.S. Fish and Wildlife Service (USFWS).

Nests not used in 1 year, may potentially be used in subsequent years. Subsequent development within close proximity to these nests may preclude use of the nest in following years. Therefore, protection of nests that may potentially be used in the future may require limiting construction within 300 meters (depending on species or line of sight) to minimize impacts. If "take" of an inactive nest were unavoidable, development of artificial nesting structures would mitigate for the loss of the nest. In some instances, during the production phase when human activity is reduced, raptors may actually nest on artificial above-ground structures. Based on the foregoing, significant impacts to raptor nesting activities are not expected.

The development of proposed wellfield and satellite facilities would disturb an estimated 1,265 acres of potential habitat for several species of small mammals that serve as prey

for raptors. This short-term impact would affect approximately 62 percent of the proposed license area, although this is not likely to limit raptor use within the project area. The small amount of short-term change in prey base populations created by construction is minimal in comparison to the overall status of the rodent and lagomorph populations. While prey populations on the project area would likely sustain some impact during the initial phase of the project, prey numbers would be expected to soon rebound to pre-disturbance levels following reclamation or active agricultural uses. Once reclaimed or in active agricultural uses, these areas would likely promote an increased density and biomass of small mammals that is comparable to those of undisturbed areas. For these reasons, implementation of the project is not expected to produce any appreciable long-term negative changes to the raptor prey base within the project area.

The creation of new roads would increase public access to areas within the project area. As use of the project area increases, the potential for encounters between raptors and humans would increase and could result in increased disturbance to nests and foraging areas. Closure of roads located near active raptor nests to public vehicle use would offset this potential impact. Some raptor species feed on road-killed carrion on and along the roads, while others (owls) may attempt to capture small rodents and insects that are illuminated in headlights. These raptor behaviors put them in the path of oncoming vehicles where they are in danger of being struck and killed. The potential for such collisions can be reduced by requiring drivers to follow all posted speed limits.

7.5.10 Fish and Macroinvertebrates

Suitable habitat for fish and macroinvertebrates exists within portions of Spring Creek and the White River. However, the construction, operation, and maintenance of the project are not expected to affect either of these habitats.

7.5.11 Threatened, Endangered and Candidate Species

The USFWS and NGPC have identified the following threatened, endangered and candidate species with the potential to occur in Dawes County: swift fox (state endangered), the bald eagle (state endangered), black-footed ferret (state/federal endangered), and whooping crane (state/federal endangered). However, as discussed in **Section 2.8**, the species with a reasonable possibility of occurring on or near the project site are the bald eagle and swift fox. The whooping crane, black-footed ferret and black-tailed prairie dog have not been observed on the project site.

7.5.11.1 Swift Fox (State Endangered)

The swift fox is closely associated with lagomorph populations, prairie dog colonies, ground squirrels, and other small mammals, which exist in varying densities and abundance throughout the License Area. High quality swift fox habitat is present in a grassland area immediately northwest of the project area, which would be expected to be a preferred habitat area over the existing License Area. Based on our analysis, the implementation of the project may affect the swift fox due to disturbance to habitats that

may support preferred swift fox prey species. This minor indirect effect is not expected to affect the individual health of the swift fox or the status of the local swift fox population because of the availability and suitability of other undisturbed habitats in the License Area and adjacent areas.

7.5.11.2 Bald Eagle (State Threatened)

Based on our analysis of the effects of project implementation and the current and potential status of this species in northwestern Nebraska, we conclude that the proposed alternative will have no adverse effect on the bald eagle. This analysis is based on lack of observed bald eagle nests in the project area, no documentation of winter concentration areas or winter nighttime roosts (Fritz 2004), and lack of open water in which most bald eagle populations tend to maintain a close association

7.5.11.3 Black-footed Ferret (Federal and State Endangered)

There have been no observations or reports of the black-footed ferret in the project area, nor have there been any confirmed populations of the ferret observed in the state of Nebraska since 1959 (USFWS 1978). Black-footed ferret populations coincide closely with colonies of prairie dogs on which the ferret depends for food and habitat. Prairie dog colonies required for a successful ferret population are not found within the License Area. Based on our analysis of the effects of project implementation and the current and potential status of this species in northwestern Nebraska, we conclude that the proposed alternative will have no adverse effect on the black-footed ferret.

7.5.11.4 Whooping Crane (Federal and State Endangered)

There is a limited availability of highly suitable whooping crane habitat within the License Area, with the majority of sitings within Nebraska occurring in the Platte Valley that is located a considerable distance away in central Nebraska. Therefore, any presence of whooping cranes within the License Area and surrounding area would be expected to be infrequent and transient. Based on our analysis of the effects of project implementation and the current and potential status of this species in northwestern Nebraska, we conclude that the proposed alternative will have no adverse effect on the whooping crane.

7.5.11.5 Reptiles, Amphibians, and Fish

No threatened or endangered reptiles, amphibians, or fish species have been recorded in the project area, and none are expected to occur.

7.5.12 Cumulative Impacts

Cumulative impacts to ecological resources are not anticipated, as no substantive impairment of ecological stability or diminishing of biological diversity is expected within the project area.

7.6 AIR QUALITY IMPACTS

Any construction activities (e.g., new wellfields and Central Plant improvements) at the Crow Butte Project would cause minimal effects on local air quality. Effects to air quality would be increased suspended particulates from vehicular traffic on unpaved roads, in addition to existing fugitive dust caused by wind erosion, and diesel emissions from heavy equipment. As needed, the application of water to unpaved roads reduces the amount of fugitive dust to levels equal to or less than the existing condition. Diesel emissions from heavy equipment during operations (e.g., maintenance and new wellfield construction/development) are expected to be short term only.

Although there are no ambient air quality monitoring data for these non-radiological pollutants in the License Area, PM_{10} concentrations have been measured in Rapid City, South Dakota and Badlands National Park in South Dakota. Both locations are geographically similar to the License Area.

The Rapid City data were collected at the National Guard Camp Armory site about 2 miles west of the city. This area is classified as suburban. The Badlands data were collected in an area classified as rural. Because of the degree of urbanization, the air quality at the License Area would probably fall somewhere between the air quality at these two locations. These data were obtained from the USEPA air quality monitoring database (USEPA 2007), and are presented in **Table 7.6-1**.

Table 7.6-1: PM_{10} Monitoring Summary (micrograms per cubic meter)

Year	Maximum 24-hr Average		Annual Average	
	Black Hills, SD	Rapid City, SD	Black Hills, SD	Rapid City, SD
1998	-	87.4	-	30.7
1999	-	116.9	-	28.2
2000	38.5	97.4	12.0	31.3
2001	47.9	81.5	12.6	34.6
2002	26.0	104.7	9.9	34.9
2003	74.4	91.8	16.3	36.2
2004	24.0	72.0	10.0	30.0
2005	40.0	94.00	9.0	27.0
2006	30.0	124.0	10.0	29.0

The National Ambient Air Quality Standards (NAAQS) for PM_{10} are 150 micrograms per cubic meter (24-hour average), and 50 micrograms per cubic meter (annual average). All counties within the 80-km radius of the project are in attainment of NAAQS.

There will be an increase in the total suspended particulates (TSP) in the region as a result of the License Area. This increase in TSP will be greatest during the site preparation phase of the satellite facility. Revegetation will be performed where possible to mitigate the problems associated with the resuspension of dust and dirt from disturbed

areas. All areas disturbed during construction are revegetated with the exception of plant pad areas, roads, and areas covered by the pond liners. Of these, the only significant source of TSP is dust emissions from unpaved roads. The amount of dust can be estimated from the following equation taken from "Supplement No. 8 For Compilation of Air Pollutant Emission Factors" (USEPA 1978).

$$E = (0.81s)\frac{S}{30}\frac{365 - w}{360}$$

Where:

E	=	emission factor, lb per vehicle-mile
s	=	silt content of road surface material, 40%
S	=	average vehicle speed
w	=	mean number of days with 0.01 inches or more of rainfall, 85

Using the values stated above, the emission factor is equal to 0.25 lb/vehicle-mile. The distance from the facility to Highway 71 is 3 miles away traveling due west and 4.5 miles through Crawford. Assuming 35 employees, a five workday week and a 33 percent increase to allow for additional traffic (deliveries, etc.), the total mileage on dirt roads is 1000 miles/week. This corresponds to a dust emission of 6.5 tons/year as a result of the increased traffic on dirt roads. Traffic counts made by the Nebraska Department of Roads in 1987 indicated that there were 119 daily trips on the County Road that employees would take to Crawford (4.5 miles) from the plant. This results in over 2,000 miles per week at the present time. If the increased dust should present a problem, either due to current operations or due to possible future expansions, the emissions can be reduced through appropriate control procedures such as the use of dust control chemicals on the road surface.

All of the airborne emissions presented above will have a minimal impact of the environment. At no time during the life of the project it is anticipated that the ambient air quality standard of the State of Nebraska will be exceeded.

Other operational activities may have impacts on surrounding air quality. The only atmospheric emission from the production and process facilities will be radon gas, which is discussed at length in **Section 7.12.2**.

7.7 NOISE IMPACTS

The main noise impacts of the current Crow Butte uranium in-situ operation were during construction of the main processing plant. Noise impacts at a distance of 2880 feet, the approximate location of the closest receptor from construction equipment located at the License Area, was calculated to be 49 dBA. Noise impacts were addressed in the 1998 LRA. The project area is bounded on the west by the Burlington Northern Santa Fe (BNSF) rail line. Therefore, the existing ambient noise in the immediate vicinity of the Project area is dominated by the trains on the BNSF rail line.

If a new satellite facility (e.g., North Trend Expansion Area) is constructed, then noise impacts would be comparable to those of the Central Plant construction. Noise impacts associated with the North Trend Satellite Plant are addressed in the North Trend application.

Construction associated with the current License Area has been, and will continue to be, minimal, e.g., heavy equipment used for periodic maintenance and construction of new wellfields. Such activities involve minimal equipment at any one time and are short-term impacts.

Noise sources during operation in the License Area have increased due to increased vehicle travel as increased numbers of employees traveling to and from Crawford for work at the Central Plant. In addition, there is some additional noise due to periodic truck deliveries an shipments associated with operations. Train usage has not increased as a result of operations. Processing equipment at the proposed satellite site would be minimal and is not expected to add to existing noise sources. Increases in noise levels due to operation are less than noise levels generated during construction. Therefore, noise levels during operation are expected to continue to be barely perceptible over the existing ambient noise that is dominated by vehicle noise from SH 2/71 and the BNSF railroad.

7.8 HISTORIC AND CULTURAL RESOURCES IMPACTS

As discussed in **Section 2.4**, an archaeological review area was surveyed for the presence of cultural resources that may be impacted by the Crow Butte Project. Field investigation in 1982 and 1987 identified twenty-one new archeological resource locations. These sites are represented by eight Native American components, twelve Euro-American locations and a buried deposit of undetermined cultural association. Six of these sites are considered to be potentially eligible for the NRHP and would warrant further investigation if they were ever to be directly impacted. These resources however, have been avoided and not directly impacted as a result of construction activities. Any further construction activities will avoid these identified resources and coordination will be maintained with the Nebraska State Historical Society.

7.9 VISUAL/SCENIC RESOURCES IMPACTS

7.9.1 Environmental Consequences

The visible surface structures constructed in the Crow Butte License Area include the processing plant, office buildings, wellhead covers, wellhouses, and electrical distribution lines.

Each wellhead cover consists of a weatherproof structure placed over each well. Each structure is approximately 3 feet high and 2 feet in diameter. Each well house consists of a small shed. The plant building is approximately 100 feet by 130 feet in size. Electric distribution lines connect wellhouses to existing electric distribution lines. The distribution poles are approximately 20 feet high. The poles are wooden so that their natural color harmonizes with the landscape.

7.9.1.1 Short-term Effects

Temporary and short-term effects to the rural character of the landscape occurred from well construction, well drilling, and associated construction of ancillary facilities, such as access roads and electric distribution lines. Once installation of facilities was complete, temporary disturbance areas were reclaimed to pre-construction conditions. Only permanent disturbances associated with operations and maintenance of the facilities have remained following post-construction restoration.

7.9.1.2 Long-term Effects

Long-term effects for the project have resulted from the addition of structures to the landscape, such as the plant, wellhouses, wellhead covers, and associated access roads and electric distribution lines. Effects from long-term activities occur over the production life of the project.

Project development has altered the physical setting and visual quality of portions of the landscape, which would affect the overall landscape to some degree. However, these effects have been subordinate in scale to the existing landscape as viewed from sensitive viewing areas, which consist primarily of a small number of residences located outside of the License Area. The existing rural/agricultural landscape has been retained, but has been modified with a noticeable, but minor, industrial component. Line and textural contrasts of the well houses, the plant, administration buildings, and associated access roads and distribution lines are not visible from sensitive viewing areas. This is due to the License Area being isolated from locations where there are viewers with a concern for scenic landscapes, including recreation areas, major transportation routes, and residential areas.

7.10 SOCIOECONOMIC IMPACTS

Monetary benefits accrue to the community from the presence of the Crow Butte Project. Against these monetary benefits are the monetary costs to the communities involved, such as those for new or expanded schools and other community services. While it is not possible to arrive at an exact numerical balance between these benefits and costs for any one community or for the project, because of the ability of the community and possibly the project to alter the benefits and costs, this section summarizes the expected incremental economic impacts from the continued operation of the Crow Butte Project.

7.10.1 Tax Revenues

Future tax revenues are dependent on uranium prices, which cannot be forecast with any accuracy; however, these taxes are also somewhat dependent on the number of pounds of uranium produced by CBR. To the extent that uranium prices remain at current levels (spot market of around $80 per pound U_3O_8 in mid-August 2007), the increased production from the satellite plants should contribute to higher tax revenues as well.

The present taxes are based on a relatively consistent production rate of 800,000 pounds per year. The additional production from the satellite plants should be about 600,000 pounds per year. This additional production will eventually be offset by declining production from the original plant; however, the incremental contribution to taxes would be on the order of $1.0 million to $1.2 million per year in combined taxes.

7.10.2 Temporary and Permanent Jobs

7.10.2.1 Projected Short-Term and Long-Term Staffing Levels

CBR expects that construction of future satellite plant(s) will provide approximately ten to fifteen temporary construction jobs for a period of up to one year for each satellite. It is likely that the majority of these jobs will be filled by skilled construction labor brought into the area by a construction contractor, although some positions could be filled by local hires. Permanent CBR employees will perform all other facility construction (e.g., wells and wellfields).

CBR actively pursues a policy of hiring and training local residents to fill all possible positions. Due to the technical skills required for some positions, a small percentage of the current mine staff (less than five percent) has been hired elsewhere and relocated to the area. Because of the small number of people who have needed to move into the area to support this project, the impact on the community in terms of expanded services has been minimal. CBR expects that the types of positions created by any future expansion will be filled with individuals from the local workforce and that there will be no significant impact on services and resources such as housing, schools, hospitals, recreational facilities, or other public facilities. In 2006, total unemployment in Dawes County was 137 individuals, or 2.9 percent of the total work force of 4,799. CBR expects that any new positions will be filled from this pool of available labor.

CBR projects that the current staffing level will increase by ten to twelve full-time CBR employees for each active satellite plant. These new employees will be needed for satellite plant and wellfield operator and maintenance positions. Contractor employees (i.e., drilling rigs) may also increase by four to seven employees depending on the desired production rate. The majority if not all of these new positions will be filled with local hires.

These additional positions should increase payroll by about $40,000 per month, or $400,000 to $480,000 per year.

7.10.3 Impact on the Local Economy

CBR actively supports the local economies through purchasing procedures that emphasize obtaining all possible supplies and services that are available in the local area. In 2006, these local purchases were estimated at $5,000,000. This level of business is expected to continue and should increase somewhat with the addition of expanded production from the satellite plant, although not in strict proportion to production. While there are some savings due to some fixed costs (Central Plant utilities for instance), there are additional expenses that are expected to be higher (wellfield development for the satellites is expected to be more expensive). Therefore, it can be estimated that the overall effect on local purchases will be proportional to the number of pounds produced. In addition, mineral royalty payments accrue to local landowners. This should translate to additional purchases of $3.65 to $4.35 million per year.

7.10.4 Economic Impact Summary

As discussed in this section, approval of this LRA would have a positive impact on the local economy as summarized in **Table 7.10-1**.

Table 7.10-1: Projected Economic Impact from Crow Butte License Area

	Estimated Economic Impact due to Crow Butte License Area
Employment	
Full Time Employees	+ 10 to 12
Full Time Contractor employees	+ 4 to 7
Part Time Employees and Short Term Contractors	+ 10 to 15 (Satellite Construction)
CBR Payroll	+ $400,000 to $480,000
Taxes	
Property Taxes	-
Sales and Use Taxes	-
Severance Taxes	-
Total Taxes	+ $1,000,000 to $1,200,000
Local Purchases	
Local Purchases, 2006	+ $3,650,000 to $4,350,000
Total Direct Economic Impacts	
	+ $5,050,000 to $6,030,000

7.11 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 review area 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 2.25-mile review area; 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 3.62-km (2.25-mile) review area. The population with an annual income below the poverty level was determined from block group characteristics.

According to the 2000 Census, which is summarized in **Table 7.11-1**, the combined population of the city of Crawford and the surrounding census blocks within the review area 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 review area are compared with Nebraska population characteristics to determine whether there are concentrations of minority or low-income populations in the review area relative to the state.

The data in **Table 7.11-1** shows that minority populations in the affected blocks account for considerably smaller proportion of the total review area 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 Crow Butte License Area are rural populations, while most of the minority population lives in Crawford. There has been no disproportionate impact to minority population from the construction and implementation of the Crow Butte Project.

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 review area from proposed project activities; therefore there would be no disproportionate adverse impact to populations living below the poverty level in these block groups.

Approval of this LRA may have a positive economic impact on the lower income and minority groups since the project will generate additional employment opportunities with compensation that compares favorably with other employment opportunities in the area.

Table 7.11-1: Race and Poverty Level Characteristics of the Population in the State of Nebraska, Dawes County, and the 2.25-mile Review Area

	Nebraska	Percent of Nebraska Pop.	Dawes County	Percent of Dawes County Pop.	Crawford City	Total Block Pop.	Crawford & Block Pop. (review area)	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		N/A	N/A
Black or African American	68,541	4.0	73	0.81	1	0	1	0.1	N/A	N/A	N/A
American Indian and Alaska Native	14,896	0.9	261	2.88	38	6	44	3.5	N/A	N/A	N/A
Asian alone	21,931	1.3	28	0.31	0	0	0	0.0	N/A	N/A	N/A
Native Hawaiian and Other Pacific Islander	836	0.0	5	0.06	0	0	0	0.0	N/A	N/A	N/A
Some other race	47,845	2.8	93	1.03	10	1	11	0.9	N/A	N/A	N/A
Two or more races	23,953	1.4	143	1.58	21	0	21	1.7	N/A	N/A	N/A
Hispanic or Latino	94,425	5.5	220	2.43	22	3	25	2.0	N/A	N/A	N/A
Percent below poverty level	9.4	N/A	17.1	N/A	14.4	N/A	N/A	N/A	21.3	14.0	8.3

N/A = Not Applicable
Source: Census 2000

7.12 PUBLIC AND OCCUPATIONAL HEALTH IMPACTS

7.12.1 Nonradiological Impacts

The in-situ solution mine is by design a self-contained mining circuit. Wastes generated by the facility are contained and eventually removed to disposal elsewhere. The potential non-radiological effects of the operation include the possibility of lixiviant excursion, evaporation pond leakage, and temporary disturbance of the land during site preparation, construction and operations. The effects of these possible occurrences are considered small as discussed in **Section 7**. The environmental monitoring programs given in **Section 5.8** are designed to quickly identify any adverse conditions that may result during operations. No long-term irreversible effects are anticipated.

7.12.1.1 Airborne Emissions

Hydrochloric acid is the main gaseous nonradiological effluent at Crow Butte. Hydrochloric acid that is kept on-site is stored in a tank twelve feet in diameter and ten feet tall. This tank is vented into a process tank to remove hydrogen chloride gas from the air passing from the vent. The only other possible gaseous effluent is carbon dioxide, which is also located on-site in a fifty-four ton tank. Very minor amounts of CO_2 could escape into the atmosphere when the tanks are charged.

To predict the concentration of hydrogen chloride in the region around the process facility, its rate of release must be estimated. The following assumptions were used in the estimate:

- Hydrogen chloride gas is emitted from the scrubber only during the process of filling the tank.
- The acid concentration is 32 percent with a temperature of 10° C (50° F) and a partial pressure of 11.8 mm Hg.
- One tank truck delivery is 1,497 kg (3,300 pounds) of acid and it requires one hour to fill the tank.
- The scrubber efficiency is 99 percent.
- Emissions occur from a scrubber vent 3.0 meters (9.8 feet) above the facility foundation. The vent has a diameter of 0.20 meters (8.0 inches) and a flow velocity of 0.2 meters/second (0.66 feet/second).

The estimate of hydrogen chloride gas released during tank filling process is 3.2 grams. Using this source term, atmospheric dispersion calculations, and the average meteorological condition, the highest concentration of hydrogen chloride is anticipated to be 2.5×10^{-2} $\mu g/m^3$ in the vicinity of the facility. The threshold limit for hydrogen chloride is 7,000 $\mu g/m^3$. This predicted concentration is very low and only occurs during the one hour required to fill the tank. It is estimated that this tank needs to be filled approximately 43 times per year. Even if the satellite process facility is built with a tank of similar

capacity, the effect of this emission on the region surrounding the Crow Butte site will be insignificant.

There will be an increase in the total suspended particulates (TSP) in the region as a result of the Crow Butte project. This increase in TSP was greatest during the site preparation phase of the commercial facility. Revegetation has been performed where possible to mitigate the problems associated with the resuspension of dust and dirt from disturbed areas. Should new facilities be built, another transient increase in TSP can be expected, but it will not be as great as that experienced during the original construction phase. All areas disturbed during construction are revegetated with the exception of plant pad areas, roads, and areas covered by the pond liners. Of these, the only significant source of TSP is dust emissions from unpaved roads. The amount of dust can be estimated from the following equation taken from *Supplement No. 8 For Compilation of Air Pollutant Emission Factors* (USEPA 1978).

$$E = (0.81s)\frac{S}{30}\frac{365 - w}{365}$$

Where:

E	=	emission factor, lb per vehicle-mile
s	=	silt content of road surface material, 40%
S	=	average vehicle speed
w	=	mean number of days with 0.01 inches or more of rainfall, 85

Using the values stated above, the emission factor is equal to 0.25 lb/vehicle-mile. The distance from the facility to Highway 71 is 3 miles away traveling due west and 4.5 miles through Crawford. Assuming 35 employees, a five workday week and a 33 percent increase to allow for additional traffic (deliveries, etc.), the total mileage on dirt roads is 1000 miles/week. This corresponds to a dust emission of 6.5 tons/year as a result of the increased traffic on dirt roads. Traffic counts made by the Nebraska Department of Roads in 1987 indicated that there were 119 daily trips on the County Road that employees would take to Crawford (4.5 miles) from the plant. This results in over 2,000 miles per week at the present time. If the increased dust should present a problem, either due to current operations or due to possible future expansions, the emissions can be reduced through appropriate control procedures such as the use of dust control chemicals on the road surface.

All of the airborne emissions presented above will have a minimal impact of the environment. At no time during the life of the project it is anticipated that the ambient air quality standard of the State of Nebraska will be exceeded.

7.12.1.2 Sediment Load

At the present time, there is little chance that the sediment load may increase due to precipitation and runoff, as erosion control and revegetation has occurred where possible.

Should additional construction take place, there is a possibility that sediment load may increase in Squaw Creek. If rain, producing runoff, occurs during construction a small amount of the fill may be carried into the creek. In addition, site reclamation with backfilling of the ponds, grading the plant site, and replacing topsoil will also expose unsecured soil for suspension in runoff waters. The increased sediment load as a result of precipitation during construction or reclamation should not significantly affect the quality of Squaw Creek since the more sensitive areas of the stream are located upstream from the point of entry of the tributary.

7.12.1.3 Water Levels

The effects of the production and restoration phases of the project on water levels in the Chadron aquifers has been evaluated, both at current production levels as well as the proposed 9,000 gpm production level. The potential impact of the mining operations on water users of the Chadron Aquifer near the project site relates only to a decrease in formation pressure (drawdown) of the aquifer. The in-situ leach operations will not impact the quality of the groundwater available to the well user. It should be noted that private wells completed in the Chadron Aquifer are relatively rare and only a few are regularly used for domestic purposes. To assess the pressure decrease associated with the Crow Butte project, it is necessary to establish the total consumptive water use of the mining operations from the primary leaching to the groundwater restoration phase. The method of calculation will then incorporate individual flow rates, along with the timing and spatial position of those flow rates.

Since groundwater is injected as well as extracted in the ISL process, the flow rates of interest in gauging the impact are the net flows, or extraction minus injection. These net withdrawals and their timing were estimated from the generalized production schedule shown in **Table 7.12-1**. The net groundwater loss from the Chadron Aquifer will be around 105 gpm by year three. However, this overall net loss is small and is comparable to an industrial well or irrigation well pumping at this same rate.

Three years was used as a representative length of time for production, and then restoration, of a typical wellfield unit. Since distance weakens the effects of pressure transients (caused by water production) dramatically, it is important to allocate withdrawal points, for calculation purposes, throughout the expected production area, especially as the area increases in size. As a result, withdrawal points were considered centered in multiple wellfield units across the Crow Butte License Area (**Figure 7.12-1**). The base of this figure has been updated to reflect the withdrawal points discussed above and the water wells completed in the Chadron Aquifer nearest to the Crow Butte ISL project. Withdrawal points are noted with letters (A, B, C, etc.) and correlate to the same letters shown in **Table 7.12-1**. Since the density of the Chadron Aquifer wells increase northwest from the Crow Butte project area toward Crawford, the tentative wellfield production schedule shown in **Table 7.12-1** provides an early and separate progression of the wellfield production away from the Crow Butte Central Plant area toward the Crawford area. This will maximize the effect of withdrawals on the Crawford area wells and provide a more conservative estimate of impact.

Table 7.12-1: Production Restoration Schedule Flow Projections

Year	Production			Restoration			Total Net Withdrawal
	Flow	Withdrawal Point	Net Withdrawal	Flow	Withdrawal Point	Net Withdrawal	
1	4000	B	20.0	450	A	36	56.0
2	4500	B	22.5	500	A	40	62.5
3	5000	B	25.0	1000	A	80	105.0
4	5000	C,D	25.0	1000	A	80	105.0
5	5000	C,D	25.0	1000	B	80	105.0
6	5000	C,D	25.0	1000	B	80	105.0
7	5000	D,E	25.0	1000	B	80	105.0
8	5000	E,F	25.0	1000	C,D	80	105.0
9	5000	E,F	25.0	1000	C,D	80	105.0
10	5000	F,G	25.0	1000	C,D	80	105.0
11-20+	5000		25.0	1000		80	105.0
+1	0	0	0	1000		80	80.0
+2	0	0	0	1000		80	80.0
+3	0	0	0	1000		80	80.0
+4	0	0	0	1000		80	80.0

Note:
A, B, etc. refer to wellfield withdrawal points, see **Figure 7.12-1** (Revised). All flow rates are in gpm.

The pressure drawdown calculations were made using the unsteady state solution to the exponential integral describing radial flow in a confined aquifer. The Principal of Superposition was used in the calculations to allow flow rates to a particular location to vary, as they normally would during production and restoration (start, stop, restart, etc.). The formation flow parameters employed in the computer model were 2725 gpd/ft for transmissivity and 1.04×10^{-4} for storage coefficient and are considered representative of the pumping tests conducted at the Crow Butte License Area.

Figures 7.12-2 through **Figure 7.12-5** show the estimated drawdowns over time for each of the Chadron Aquifer water wells (ww) outside of the Crow Butte License Area shown on **Figure 7.12-1**. As shown, the changes in formation pressures vary according to timing and location of water well withdrawals, with maximum drawdowns in this case of 26-27 feet reached at different times depending upon the location of the water well. After this, the formation water pressures will rise again as consumptive water use is decreased, then altogether stopped. Recharge of the Chadron Aquifer was ignored in these calculations, which resulted in larger, more conservative drawdowns. However, it can be expected that sometime during the mining operation, the cone of influence resulting from the net withdrawals will reach equilibrium as a result of recharge of the surrounding aquifer.

Table 7.12-2 shows the maximum projected drawdowns, without formation recharge, caused by Crow Butte mining operations to the surrounding Chadron water wells. It also includes an estimated maximum drawdown available in those water wells, assuming the wells were drilled to the bottom of the Chadron Aquifer, a sand thickness of 60 feet, and drawdown to the top of the Chadron. The ratio of maximum drawdown to available drawdown is then shown as a percentage. That ratio varies from 4.4 percent to 16.7 percent with an average of 9.0 percent. Generally, the relative impact of the Crow Butte project on the Chadron water well users is small. Chadron water has limited use as a groundwater supply because of its generally poor quality and high radionuclide content. If a user has his pump set just below the level, he may have to lower the pump by up to 25 feet to accommodate the drawdown.

In the Crawford area, several Chadron Aquifer water wells flow at the surface as a result of the elevation represented by the formation water pressure being higher than the ground-surface elevation. These wells are noted as having a positive Static Water Level in **Table 7.12-2**. Comparing the predicted drawdowns in the Crawford area to the static levels of **Table 7.12-2** indicates that some of the wells may no longer be flowing after some time. However, the water level will remain near the ground surface and submersible pumps can be installed to accommodate the well user. Later, as consumptive water use from mining operations is stopped, the formation pressures should recover so that these wells will again be flowing.

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Figure 7.12-1: Location of Wellfield Withdrawal Points – Dawes County, Nebraska

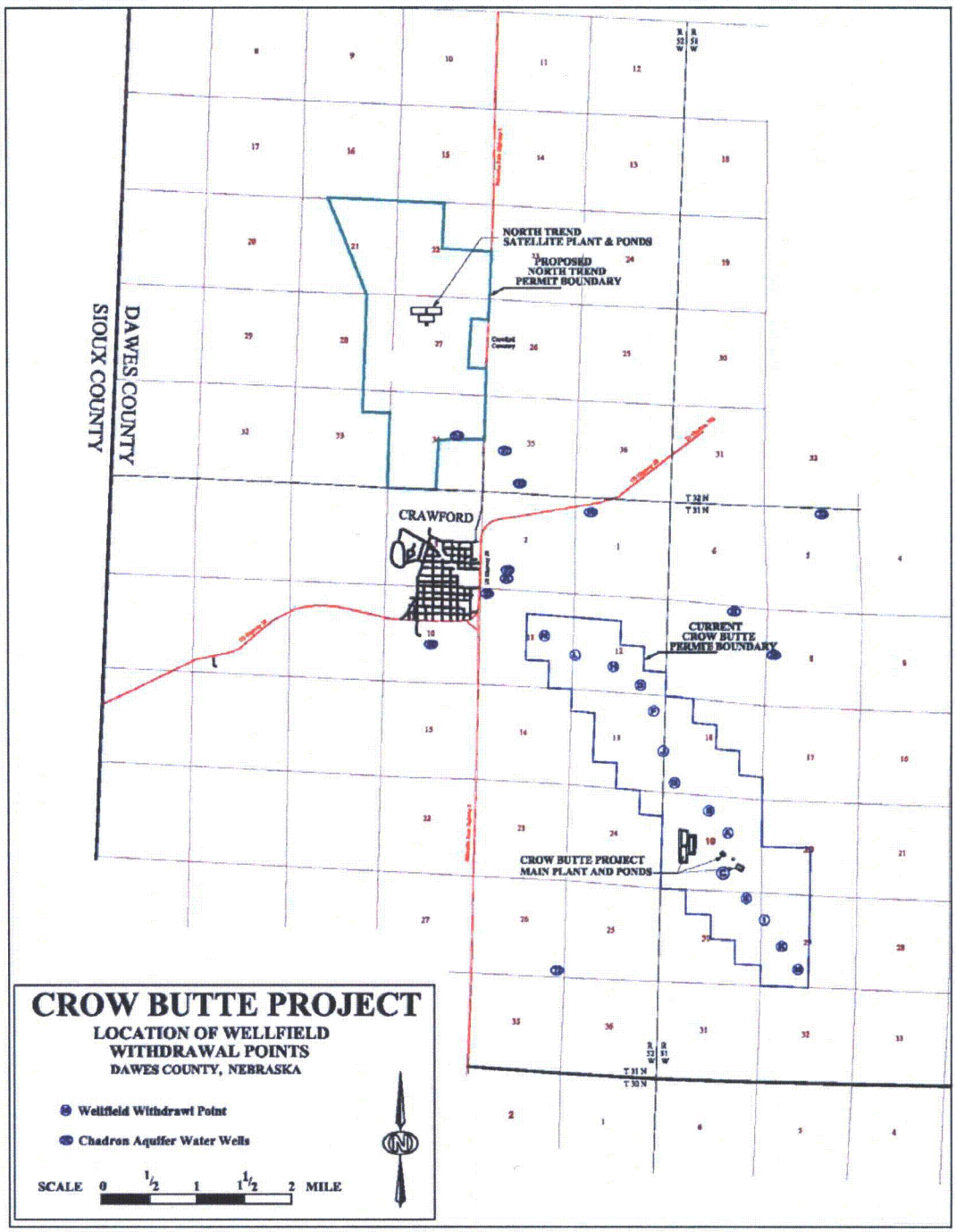

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Figure 7.12-2: Crow Butte Project Impact of Water Withdrawals

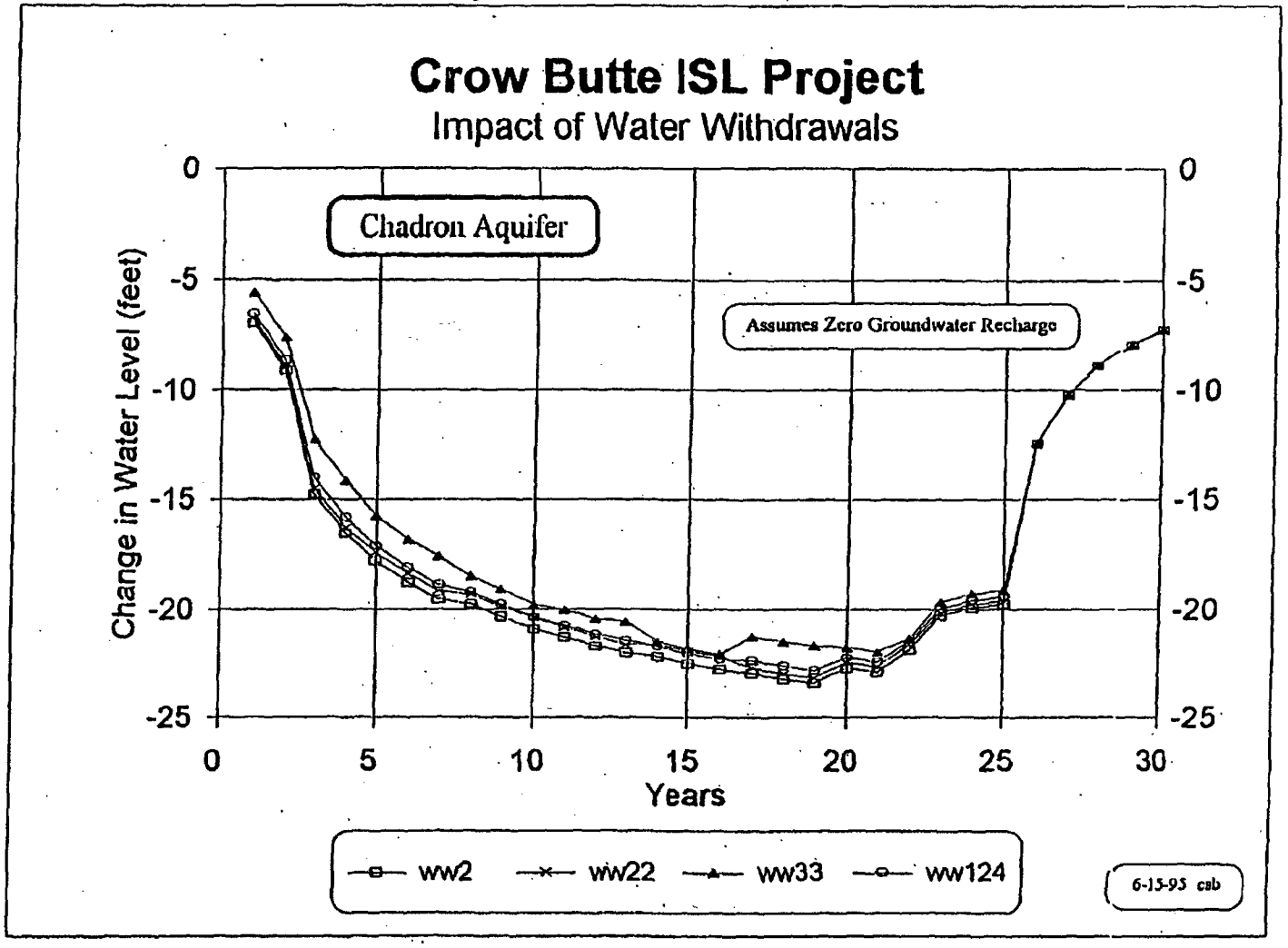


Figure 7.12-3: Crow Butte Project Impact of Water Withdrawals

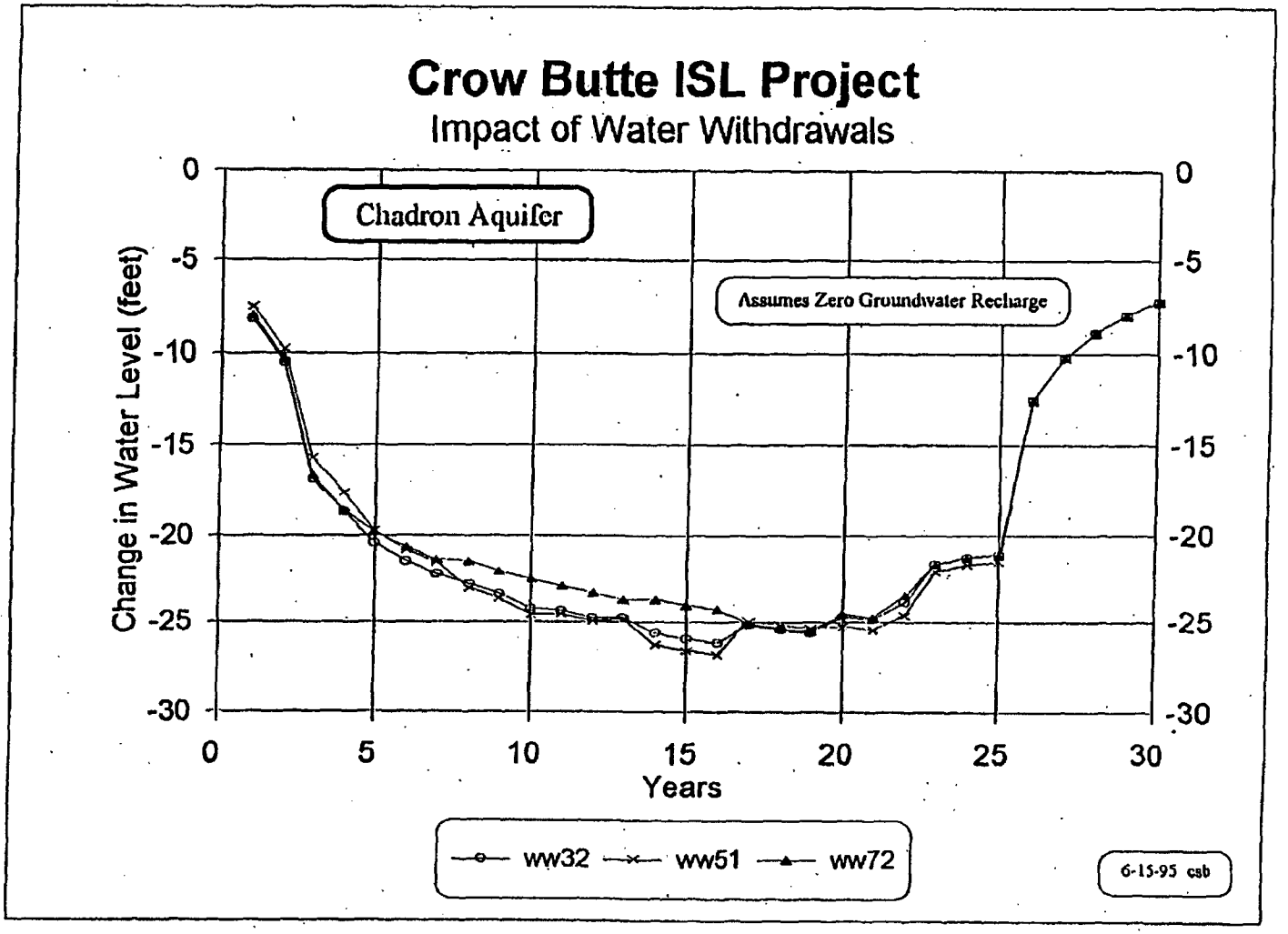


Figure 7.12-4: Crow Butte Project Impact of Water Withdrawals

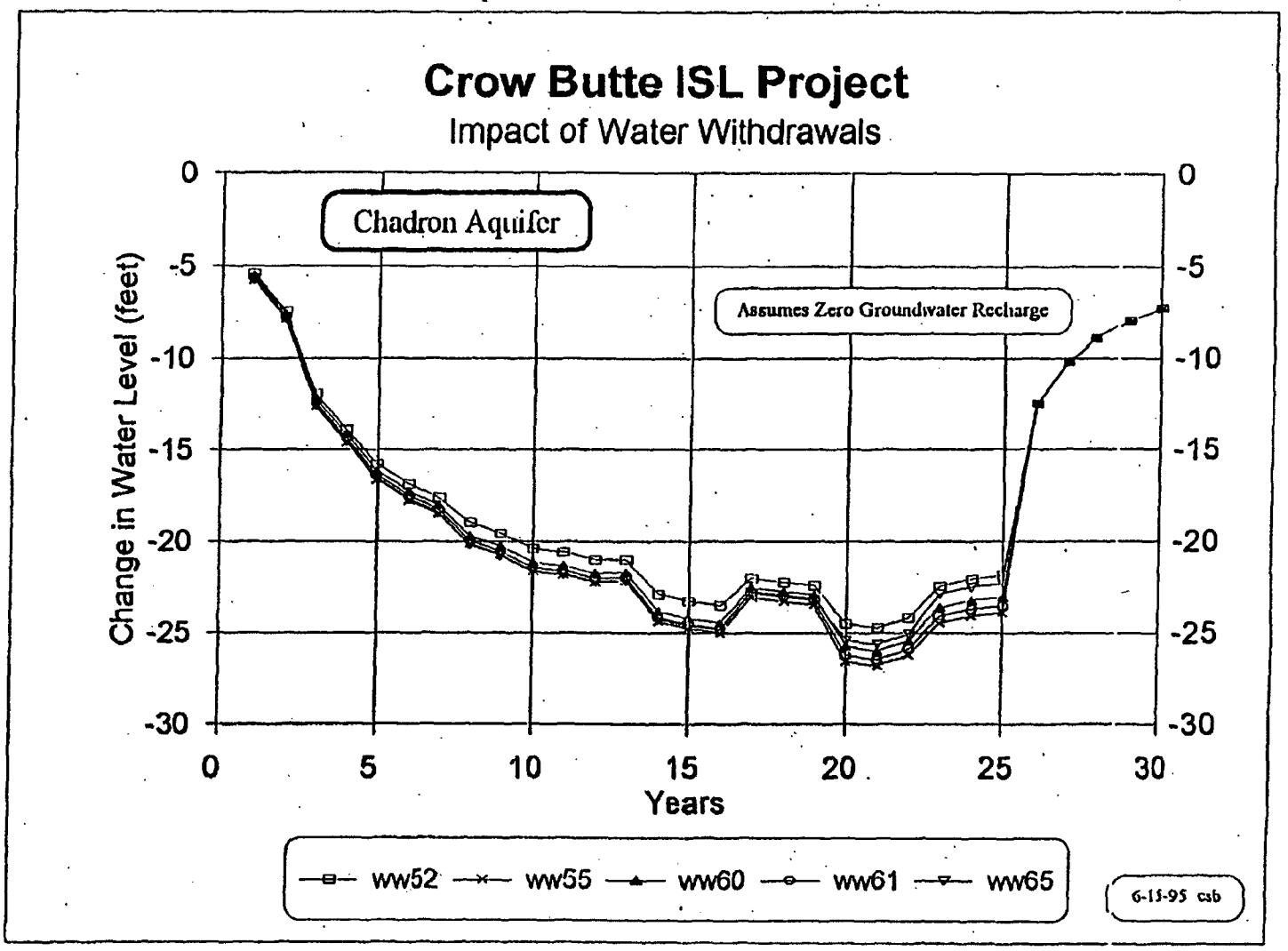


Figure 7.12-5: Crow Butte Project Impact of Water Withdrawals

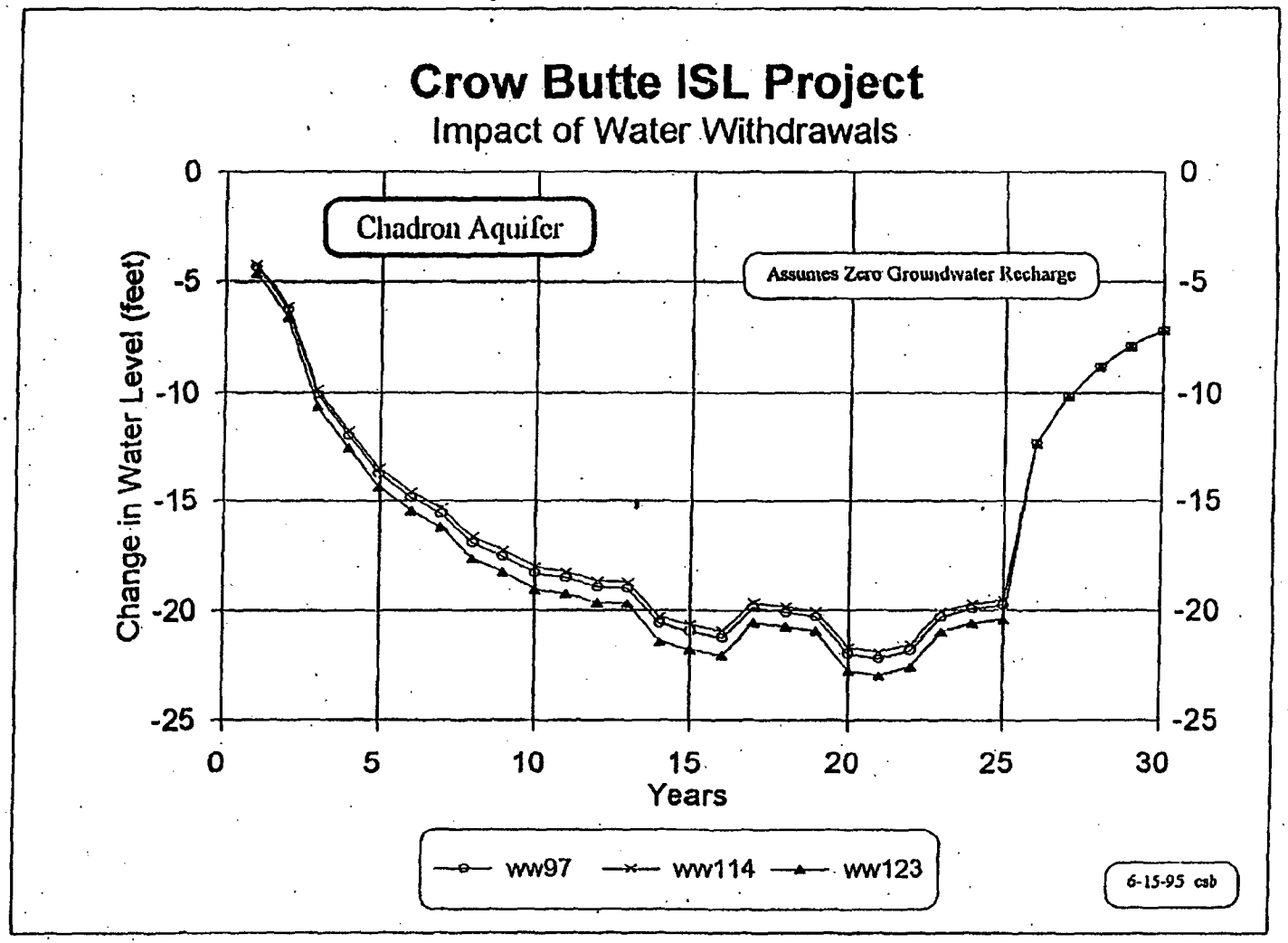


Table 7.12-2: Estimated Percent Reduction in Available Drawdown in Chadron Aquifer Water Wells as a Result of the Crow Butte ISL Operations

Water Well Number	Static Water Level (feet)[1]	Total Depth of Well (feet)	Figure Number: Drawdown vs. Time	Projected Maximum Drawdown (feet)	Maximum Available Drawdown (feet)[2]	Reduction of Available Drawdown (percent)
2	-60 est.	650	4.12-2	-23.4	530	-4.4
22	-70 est.	400	4.12-2	-23.2	270	-8.6
33	-20 est.	212	4.12-2	-22.1	132	-16.7
124	-50 est.	520	4.12-2	-22.8	410	-5.6
32	-39.8	400	4.12-3	-26.2	300	-8.7
51	-30 est.	300	4.12-3	-26.8	210	-12.8
72	-82.2	450	4.12-3	.25.5	308	-8.3
52	4.62[3]	420	4.12-4	-24.7	365	-6.8
55	-6.25[3]	320	4.12-4	-26.8	254	-10.5
60	20 est.	312	4.12-4	-25.9	272	-9.5
61	19.64[3]	280	4.12-4	-26.4	240	-11.0
65	22.52[3]	260	4.12-4	-25.6	223	-11.5
97	57.75[3]	380	4.12-5	-22.2	378	-5.9
114	60 est.	470	4.12-5	-21.9	470	-4.7
123	21.37[3]	280	4.12-5	-23.0	241	-9.5
					Average =	-9.0

1 + = Above Ground Level; - = Below Ground Level

2 To the Top of the Chadron Sandstone; assumes 60 feet sand thickness

3 Measured 11/83

7.12.2 Radiological Impacts

An assessment of the radiological effects of the Crow Butte Project must consider the types of emissions, the potential pathways present, and an evaluation of the potential radiological hazards associated with the emission and pathways. Since the project is an in-situ operation, most of the particulate emission sources normally associated with a conventional mill will not be present. A vacuum dryer is in use at the commercial operation. The vacuum dryer works on the principle that gases or particulates released into the system are collected in a liquid condenser and there is no release of particulates. The effluent collection efficiency for this dryer system is, therefore 100 percent. The routine radioactive emission will therefore, be radon-222 (radon) gas.

For purposes of this section, the proposed Crow Butte North Trend Expansion Area (new satellite facility), is included in the assessment of the total project radiological impacts. Radiological impacts associated with the proposed satellite facility are discussed in detail in a separate license amendment submitted to the USNRC In June, 2007. The satellite facility will not have precipitation equipment, with the loaded ion exchange resin being transported to the Crow Butte Main Plant for regeneration and stripping. The only source of planned radioactive emissions from the satellite will be radon gas, which is dissolved in the leaching solution.

Radon is present in the ore body and is formed from the decay of radium-226. The radon dissolves in the lixiviant as it travels through the ore body to a production well, when the solution is brought to the surface, the radon is released.

In order to assess the radiological effect of radon on the environment, an estimate of the quantity released during the operation must be made. Meteorological data and MILDOS-Area (Yuan et al. 1989) are used to predict the ground level air concentration at various points in the environment. The ingrowth of radon daughters is important and their concentration in the soil, vegetation and animals must be calculated. Finally, the impact on man from these concentrations of radionuclides in the environment must be determined.

In the following sections, the assumptions and methods used to arrive at an estimate of the radiological effects of the current Crow Butte Central Facility (average production flow rate of 9000 gpm) and the proposed North Trend Satellite Facility (average production flow rate of 4500 gpm) will be discussed briefly. The anticipated effects will be compared to naturally occurring background levels. This background radiation, arising from cosmic and terrestrial sources, as well as naturally occurring Radon, comprises the primary radiological impact to the environment in the region surrounding the Central Plant and proposed satellite facility.

7.12.3 Exposure Pathways

7.12.3.1 Crow Butte Main Plant

The Crow Butte Project is an in-situ facility with a vacuum dryer and the only source of radioactive emissions from the facility is radon gas. Radon gas is dissolved in the leaching solution and may be released as the solution is brought to the surface and processed in the plant. Unplanned emissions from the site are possible as a result of accidents and engineered structure failure but are not addressed in the MILDOS-Area modeling. A human exposure pathway diagram addressing planned and unplanned radiological emissions is presented in **Figure 7.12-6.**

Currently, CBR has a license amendment request pending to increase the annual plant throughput from 5,000 gpm, exclusive of restoration flow to 9,000 gpm exclusive of restoration flow (i.e., 1000 gpm). The license amendment was submitted on October 17, 2006 and the MILDOS-Area simulation included in this license amendment application reflects the requested flow increase. Approval of this increase in the annual plant throughout is expected in the near-term.

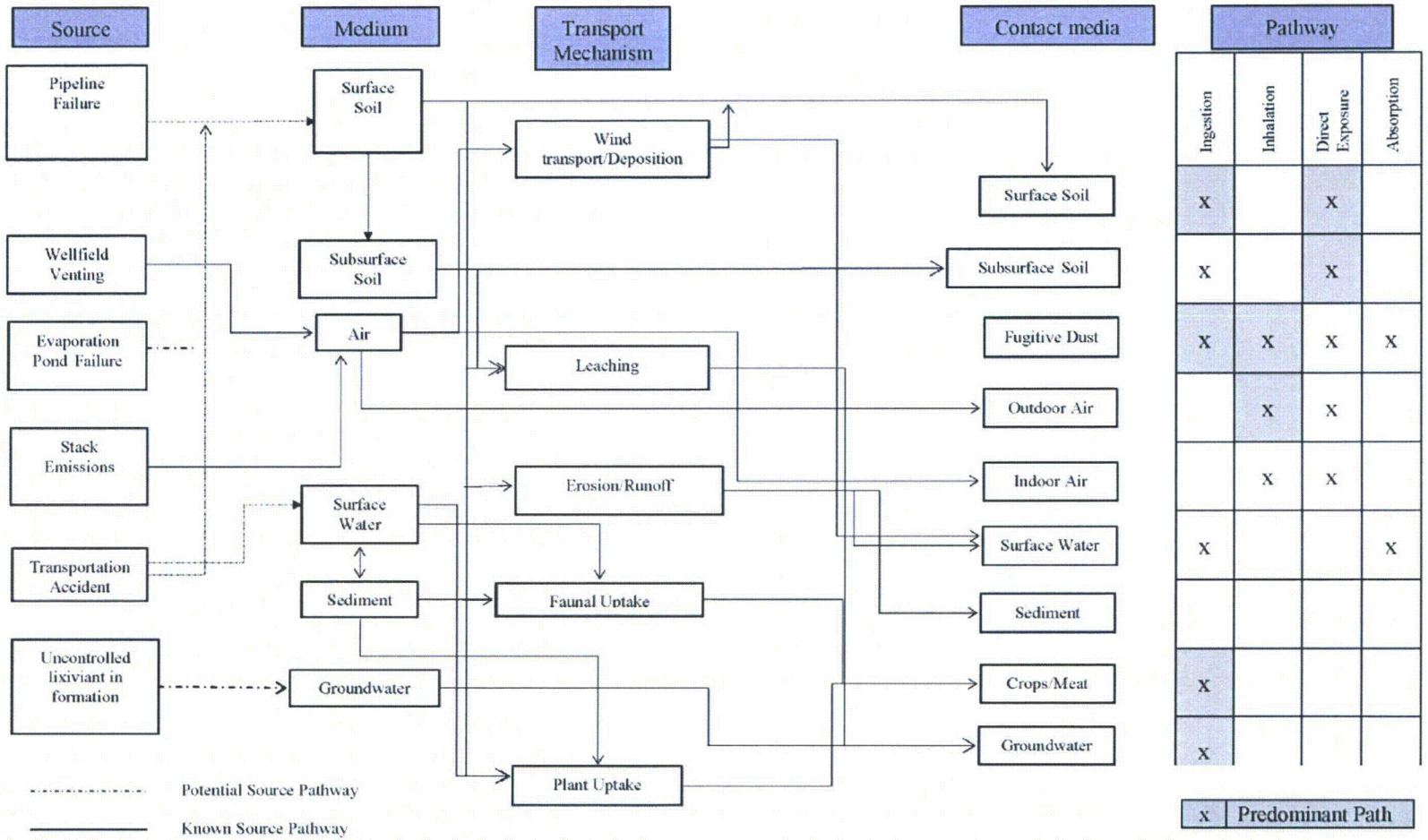
Approximately 5000 gpm of the process solution will be passed through upflow ion exchange columns which will vent the majority of the Radon into the exhaust manifold. From these columns, the solution will be transferred to an injection surge tank, where it will be refortified with chemicals before being pumped to the wellfield. This tank will be vented in a manner similar to the IX column and if any additional radon leaves the solution, it would be vented at this location.

Pressurized fixed bed downflow ion exchange columns will be used to process 4000 gpm of flow. The flow capacity of the existing facility is nominally 5000 gpm and it will require these additional downflow columns to increase the average production flow rate to 9000

With pressurized columns the radon will remain in solution and be returned to the formation and will not be released to the atmosphere. There will be minor releases of radon during the air blowdown prior to elution and during the filling of the columns after elution has been completed. The air blowdown and the gas released from the vent during column filling will be vented into the exhaust manifold and will be discharged via the main exhaust stack along with the radon from the upflow columns. It is estimated that less than 10 percent of the radon contained in the process solutions will be vented to atmosphere.

In the source term calculation CBR has adjusted the Radon release value to show that all of the contained Radon in the 5000 gpm flow processed by upflow IX will be released to the environment and that 10 percent of the contained Radon found in the 4000 gpm flow processed by pressurized downflow IX columns will be released to the environment during regeneration and venting.

Figure 7.12-6: Human Exposure Pathways for Known and Potential Sources from the Crow Butte License Area



7.12.3.2 Satellite Plant

The satellite plant would have 4500 gpm of production flow that would be processed by pressurized downflow ion exchange columns. The proposed satellite plant would consist of 8 to 10 pressurized downflow columns that would be operated with 2 columns in series and with either 4 or 5 sets of two operating in parallel. The columns will be nominally 8 feet in diameter and can process 500 to 750 gpm per set of two columns in series. Operation of these columns would only release a small fraction of the contained radon to the environment, with approximately 10 percent of the contained radon being released during resin transfer and venting.

After the IX resin is loaded the resin or eluate will be transferred to a trailer. It is anticipated that two resin or eluate shipments will be made per day. The trailer will transfer the resin or eluate to the main process facility for additional processing. The stripped and regenerated resin will be transferred to the trailer and returned to the satellite plant and be transferred into a process column.

The injection wells at the Central Plant and the proposed satellite facility will generally be closed and pressurized, but will be periodically vented. It was estimated that 25 percent of the radon will be released in the wellfields. The 25 percent released from the wellfields was assumed to be released from MU-4, MU-5, and the Raben Wellfield for mining with releases from MU-1, MU-2 and MU-3 for restoration.

In addition to releases from the wellfields, plant releases of radon will be from the main process facility through the plant vent and from the satellite facility (e.g., during resin transfer and venting) located in the McDowell Wellfield. The locations of the sources and receptors are in **Figure 7.12-7**. The height of the vent at the plant is 15.9 meters above the foundation of the facility.

The atmospheric emission of radon will lead to its presence in all quadrants of the region surrounding the current License Area and the proposed North Trend Satellite Facility. Due to the relatively short half-life of radon, the ingrowth of radon daughters during wind blown transportation must be considered. There exists an inhalation pathway as a result of the emission of radon gas. As the radon daughters' ingrow, deposition on the ground surface increases. A pathway also exists due to external radiation exposure arising from two sources. One source is radon and its daughters in the air, which is considered the cloud contribution. The other source is from radon daughters deposited on the ground, this source being termed the ground contribution.

A third pathway exists, which is the ingestion pathway. This results from direct foliar deposition and radionuclides in the soil being assimilated by the vegetation. The vegetation may represent a direct ingestion pathway to man if consumed, and a secondary pathway if fed to animals that are in turn consumed by man.

All of the above pathways are evaluated by MILDOS-Area.

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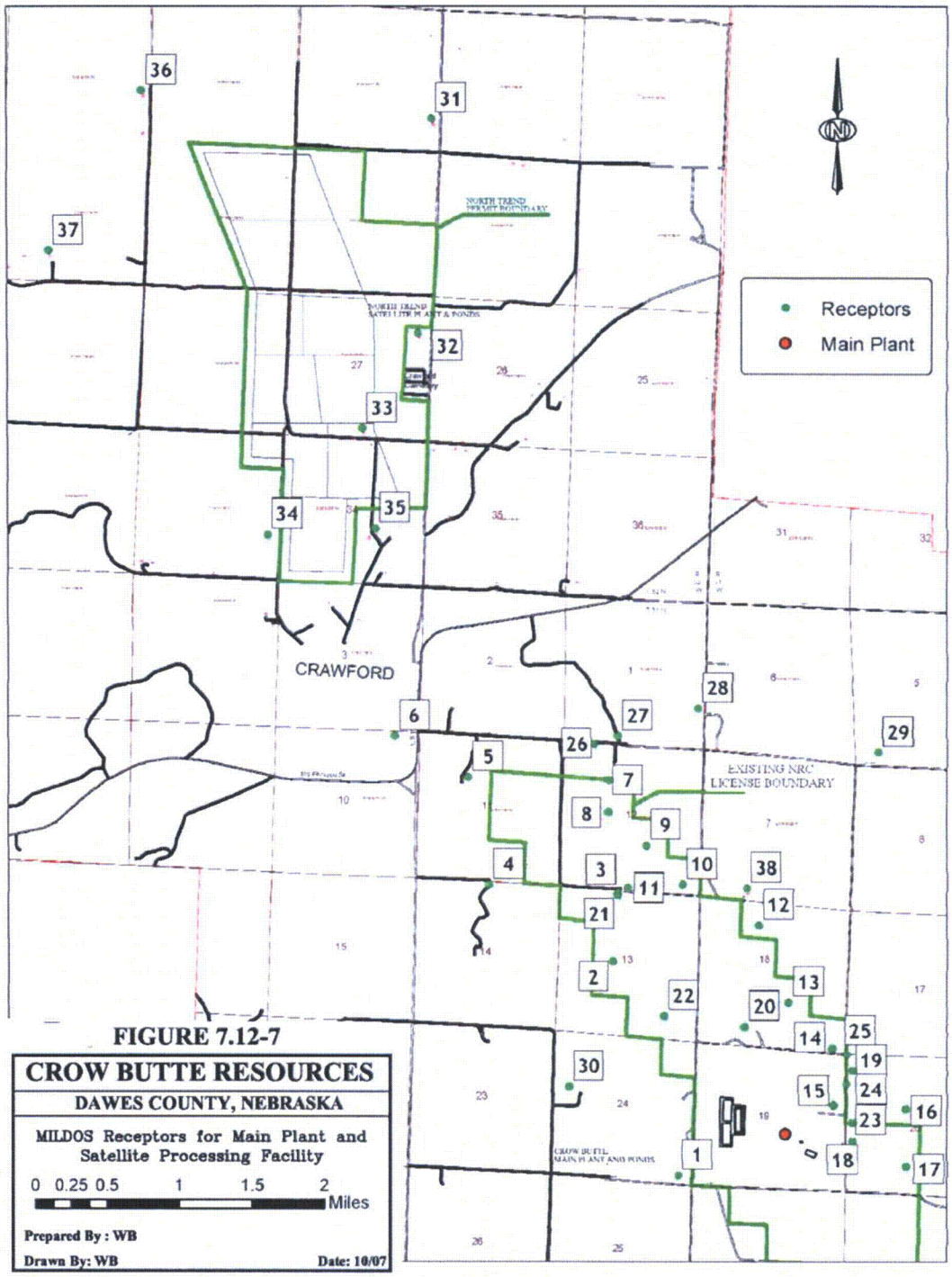
Figure 7.12-7: MILDOS Receptors for Main Plant and Satellite Processing Facility



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7.12.4 Exposures from Water Pathways

7.12.4.1 Main Plant

The solutions in the zone to be mined are controlled and adequately monitored to insure that migration does not occur. The overlying aquifers are also be monitored.

Three commercial evaporation ponds located approximately 2000 feet from the plant building have been constructed for commercial operation. There are also two R&D evaporation ponds located approximately 1,000 feet from the plant building. The R&D ponds have a 34-mil Hypalon liner and a leak detection system. The commercial evaporation ponds are lined with double impermeable synthetic liners. The ponds, therefore, are not considered a source of liquid radioactive effluents. There is a leak detection system installed to provide a warning if the liner develops a leak. The ponds, therefore, are not considered a source of liquid radioactive effluents. The use of ponds to manage liquid waste was discussed in further detail in **Section 4.**

The Crow Butte Plant is located on a curbed concrete pad to prevent any liquids from entering the environment. Solutions used to wash down equipment drain to a sump and are pumped to the ponds. The pad is of sufficient size to contain the contents of the largest tank in the event of its rupture.

The primary method of waste disposal at the Main Plant is by deep disposal well injection. The deep disposal well is completed at an approximate depth of 3,500 to 4,000 ft, isolated from any underground source of drinking water by approximately 2,500 feet of shale (Pierre and Graneros Shales). The well has been constructed under a Class I Underground Injection Control (UIC) Permit issued by the NDEQ and meets all requirements of the NDEQ UIC program. The use of a deep disposal well to manage liquid waste was discussed in further detail in **Section 4.**

Since there are no routine liquid discharges of process water from the Crow Butte Plant, there are no definable water related pathways.

7.12.4.2 Satellite Facility

The solutions in the zone to be mined will be controlled and adequately monitored to ensure that migration does not occur. The overlying aquifers will also be monitored.

The North Trend Satellite Facility will have evaporation ponds used to store waste solutions prior to deep well injection. The ponds will be double-lined with impermeable synthetic liners. A leak detection system will be installed to provide a warning if the liner develops a leak. The ponds, therefore, are not considered a source of liquid radioactive effluents. The use of ponds to manage liquid waste was discussed in further detail in **Section 4.**

The primary method of waste disposal at the North Trend Satellite Facility will be by deep disposal well injection. The deep disposal well will be completed at an approximate

depth of 3,500 to 4,000 ft, isolated from any underground source of drinking water by approximately 2,500 feet of shale (Pierre and Graneros Shales). The well will be constructed under a Class I Underground Injection Control (UIC) Permit issued by the NDEQ and will meet all requirements of the NDEQ UIC program. The use of a deep disposal well to manage liquid waste was discussed in further detail in **Section 4.**

The North Trend Satellite Facility will be located on a curbed concrete pad to prevent any liquids from entering the environment. Solutions used to wash down equipment will drain to a sump and be pumped to the ponds. The pad will be of sufficient size to contain the contents of the largest tank if it ruptures.

Since no routine liquid discharges of process water are expected from the North Trend Satellite Facility, there are no definable water-related pathways.

7.12.5 Exposures from Air Pathways

The only source of radioactive emissions is radon released into the atmosphere through a vent system or from the wellfields. As shown in **Figure 7.12-6**, atmospheric releases of radon can result in radiation exposure via three pathways; inhalation, ingestion, and external exposure. The total effective dose equivalent (TEDE) to nearby residents in the region around the main processing plant and satellite facility was estimated by using the computer simulation, MILDOS-Area. The joint frequency data compiled from a site-specific meteorological station were used to define the atmospheric conditions in the project area.

Currently, CBR has a license amendment request pending to increase the annual plant throughput from 5,000 gpm, exclusive of restoration flow to 9,000 gpm, exclusive of restoration flow. The license amendment was submitted on October 17, 2006 and the MILDOS-Area simulation included in this license amendment application reflects the requested flow increase. To show compliance with the annual dose limit found in 10 CFR § 20.1301, CBR has demonstrated by calculation that the TEDE to the individual most likely to receive the highest dose from the mining processing plant and the North Trend Satellite operation is less than 100 mREM/yr. The results of the MILDOS-Area simulation are presented in **Table 7.12-3**, which shows the estimated TEDE from operation of the main Crow Butte Plant and the North Trend Satellite Plant. The coordinates of all receptors are listed in **Table 7.12-4**. The source values and the locations of the sources are presented in **Table 7.12-5**. Receptor locations and appropriate identifiers are shown on **Figure 7.12-7**.

No TEDE limits were exceeded. An evaluation of the TEDE follows:

- The maximum TEDE was 31.7 mREM/yr at Receptor #15, which is located approximately 0.25 mile northeast of the Central Plant site.
- Receptor #31 (NT-1) is the closest resident in the downwind direction for the North Trend Satellite Plant. The estimated TEDE at this location was 5.8 mREM/yr.

Table 7.12-3: Estimated Total Effective Dose Equivalent (TEDE) to Receptors Near the Crow Butte Uranium Processing Facility

Receptor #	Description	Distance from Main Plant (km)	TEDE* (mREM/y)
1	R1	1.29	6.64
2	R2	2.76	4.82
3	R3	3.30	6.14
4	R4	4.36	1.92
5	R5	5.35	1.98
6	Crawford	6.25	1.65
7	R7	4.43	4.87
8	R8	4.11	5.16
9	R9	3.59	8.12
10	R10	3.03	16.0
11	R11	3.29	7.34
12	R12	2.37	17.7
13	R13	1.49	28.1
14	R14	1.10	28.3
15	R15	0.62	31.7
16	R16	1.34	9.48
17	R17	1.35	6.06
18	Ehlers	0.73	15.5
19	Gibbons	1.03	24.9
20	Stetson	1.30	19.9
21	Knode	3.28	6.09
22	Brott	1.92	16.2
23	SP1	0.75	18.1
24	SP2	0.89	26.2
25	SP3	1.13	24.8
26	McDowell	4.87	4.24
27	Taggart	4.83	4.87
28	Franey	4.86	6.55
29	Bunch	4.39	7.54
30	Dyer	2.50	3.27
31	NT-1	12.01	5.84
32	NT-2	9.83	3.41
33	NT-3	9.19	3.09
34	NT-4	8.87	2.14
35	NT-5	8.18	2.42
36	NT-6	13.7	1.63
37	NT-7	12.86	1.04
38	NT-8	2.79	15.9

*No differences in TEDE between age classes were observed.

Table 7.12-4: Individual Receptor Location Data

Location	X (km)	Y (km)	Distance (km)
1. R1	-1.21	-0.44	1.29
2. R2	-1.95	1.95	2.76
3. R3	-1.89	2.71	3.30
4. R4	-3.34	2.80	4.36
5. R5	-3.57	3.99	5.35
6. CRAWFORD	-4.39	4.45	6.25
7. R7	-1.99	3.96	4.43
8. R8	-1.99	3.60	4.11
9. R9	-1.57	3.23	3.59
10. R10	-1.16	2.80	3.03
11. R11	-1.78	2.77	3.29
12. R12	-0.30	2.35	2.35
13. R13	0.03	1.49	1.49
14. R14	0.51	0.98	1.10
15. R15	0.52	0.34	0.62
16. R16	1.31	0.30	1.34
17. R17	1.31	-0.34	1.35
18. EHLERS	0.73	-0.06	0.73
19. GIBBONS	0.73	0.73	1.03
20. STETSON	-0.46	1.22	1.30
21. KNODE	-1.89	2.68	3.28
22. BROTT	-1.37	1.34	1.92
23. SP 1	0.73	0.15	0.75
24. SP 2	0.67	0.58	0.89
25. SP 3	0.67	0.91	1.13
26. McDOWELL	-2.16	4.36	4.87
27. TAGGART	-1.89	4.45	4.83
28. FRANEY	-0.98	4.76	4.86
29. BUNCH	1.01	4.27	4.39
30. DYER	-2.44	0.55	2.50
31. NT-1	-3.97	11.33	12.01
32. NT-2	-4.12	8.93	9.83
33. NT-3	-4.75	7.87	9.19
34. NT-4	-5.82	6.69	8.87
35. NT-5	-4.61	6.76	8.18
36. NT-6	-7.20	11.65	13.70
37. NT-7	-8.25	9.86	12.86
38. NT-8	-0.44	2.76	2.79

Table 7.12-5: Source Coordinates for Crow Butte Project and North Trend Satellite

Source	East (km)	North (km)	Rn-222 (Curies)
1. Plant Vent	0.00	0.00	4603
2. Satellite Plant Vent	-5.30	9.60	342
3. MU-2-4 (restoration)	-0.30	0.16	350
4. MU-5	0.0	0.74	454
5. MU-6&8	1.92	-1.20	908
6. MU 7&9	0.00	-0.74	908
7. North Trend Wellfield	-5.30	9.60	1320

- The estimated TEDE at Receptor # 6, located on the east side of the town of Crawford, was 1.65 mREM/yr.
- The effect of the North Trend Satellite operation on the nearby residents of the existing Crow Butte facility is less than 1 mREM/yr.
- Since radon-222 is the only radionuclide emitted, public dose limits in 40 CFR 190 and the 10 mREM/yr constraint rule in 10 CFR §20.1101 are not applicable to the CBR facility.

Based on the site specific data (**Table 7.12-6**) and method of estimation of the source term presented in **Appendix A**, the modeled emission rate of Radon from the Crow Butte Project will be 7178 Ci/yr which consists of a flow of 5000 gpm in the upflow ion exchange columns in the existing plant along with the proposed 4000 gpm of flow treated in the pressurized downflow ion exchange columns.

Based on the site specific data (**Table 7.12-6**) and the method of estimation of the source term presented in **Appendix A**, the modeled annual emission rate of radon from the North Trend Satellite Facility is 1482 Ci/yr, which includes releases from ion exchange, production and restoration activities.

Additional discussions as to radon emissions from operations and restoration activities at the Central Plant and satellite facility are presented in **Section 5.8**.

Seven air monitoring stations are used to monitor radon gas effluent to the environment around the Crow Butte Plant. The applicant reviewed the Radon monitoring data obtained at these locations from 1991 through June of 2007 and these data are found in **Table 5.8-6** and **Figures 5.8-10** through **5.8-16.**

Sources 2 and 7 are from the proposed North Trend Satellite Facility operating at 4500 gpm using upflow IX columns and 500 gpm restoration flow using downflow IX and reverse osmosis. Resin from the North Trend Satellite is transferred to the Crow Butte processing facility for elution and precipitation.

All other sources are from the existing Crow Butte processing facility operating at 5000 gpm production flow using downflow IX columns, 4000 gpm production flow using pressurized upflow IX columns, and a 1000 gpm restoration flow using downflow IX and reverse osmosis.

Table 7.12-6: Site Specific Information Crow Butte Project and North Trend Expansion Area

Parameter	Value
Average ore quality, U_3O_8, in ore body	0.27 percent
Ore radon activity, assuming equilibrium with U-238	761 pCi/g
Operating days per year (plant factor)	365 days
Dimensions of ore body	
Area per year to be mined	20 acres
Average thickness of body	5 ft
Average screened interval	15.1 ft
Average production flow rate (Satellite Facility)	4500 gpm
Average production flow rate (Main Facility)	9000 gpm
Formation porosity	29 percent
Process recovery	95 percent
Leaching efficiency	60 percent
Rock density	1.89 g/cm^3
Restoration flow rate (Satellite Facility)	500 gpm
Restoration flow rate (Main Facility)	1000 gpm
Restoration Residence time	35 days
Production cell parameters	
Residence time	7 days
Type of cell pattern	variable
Average cell area	10,000 ft^2
Average cell flow rate	121 lpm
Source stack description (Main)	
Stack height	15.9 m
Stack diameter	0.30 m
Stack velocity	11 m/sec
Source stack description (Satellite)	
Stack height	10 m
Stack diameter	0.2
Stack velocity	10 m/sec

ft/ft^2 = feet/square feet
g/cm^3 = grams per cubic centimeter
gpm = gallons per minute
lpm = liters per minute
m = meter
m2/sce = meters squared per second
pCi/g = picoCuries per gram

The results of the area ambient radon 222 concentrations and radionuclide concentrations for each monitoring site, and for TLD monitors at each site, fall within the expected

ranges for all semi-annual reporting periods between the second half of 1998 through the first half of 2007 with the exception of results for the periods summarized below.

For the second half of 2003, the radon-222 results from three stations (AM-1, AM-2, and AM-8) were elevated above concentrations that are normally present. These sample locations are located along the eastern and northern boundaries of the License Area and Section 19. The cause of the elevated radon-222 concentrations is not known. Radon release levels from the Crow Butte project for the period are consistent with those since increased process flows were approved in 1998, so it does not appear that project releases are the source. CBR noted that there was no identifiable cause for these elevated concentrations from licensed operations. One possible cause for the anomalous results is sampling or analytical error. In order to monitor this possibility, CBR deployed duplicate monitors at the three stations for the second half of 2004 for comparison of results. Even those these spikes in 2003 were above normal concentrations at the environmental monitoring stations (generally less than 10 percent), the levels were well below levels considered protective of the public.

In the initial analytical results, the results from several stations were elevated and did not correlate well to the results from the duplicate monitors; therefore all monitors were reanalyzed. The results of the reanalysis resulted in changes in reported values ranging from 0 percent to over 120 percent. The variance in the reported values was likely due to a routine quarterly update of the background track density for manufacturing lots. The repeat analysis was performed after the background update and in all cases where the reanalysis resulted in a change, the reported values were lower and were consistent with historical concentrations. It is possible that a similar situation was the cause of the higher concentrations noted in the second half of 2003. CBR will continue to place duplicate monitors at six stations through 2005 to determine the accuracy of the monitoring method.

7.12.6 Population Dose

The annual population dose commitment to the population in the region within 80 km of the Crow Butte Project is also predicted by the MILDOS-Area code. The results are listed in **Table 7.12-7**, where the dose to the bronchial epithelium is expressed in person-rem. For comparison, the dose to the population within 80 km of the facility due to natural background radiation is included in the table. These figures are based on the 1980 population and average radiation doses reported for the Western Great Plains.

The atmospheric release of radon also results in a dose to the population on the North American continent. This continental dose is calculated by comparison with a previous calculation based on a 1 kilocurie release near Casper, Wyoming, during the year 1978. The results of these calculations are included in **Table 7.12-7** and also combined with dose to the region within 80 km of the facility to arrive at the total radiological effects of one year of operation at the Crow Butte Project.

For comparison of the values listed in **Table 7.12-7**, the dose to the continental population as a result of natural background radiation has been estimated. This estimate is

based on a North American population of 346 million and a dose to each person of 500 mREM/yr to the bronchial epithelium. The maximum radiological effect of the combined operation of the North Trend Satellite Plant and the Crow Butte Project would be to increase the dose to the bronchial epithelium of the continental population by 0.0023 percent.

Table 7.12-7: Dose to the Population Bronchial Epithelium and Increased Continental Dose from One Year's Operation at the Crow Butte Facility

Criteria	Dose (person-rem/yr)
Dose received by population within 80 km of the facility	171
Natural background by population within 80 km of the facility	24025
Dose received by population beyond 80 km of the facility	224
Total continental dose	394
Natural background for the continental population	$1.73 \times 10^{+8}$
Fraction increase in continental dose	2.27×10^{-6}

7.12.7 Exposure to Flora and Fauna

The exposure to flora and fauna was evaluated in Environmental Reports submitted in September of 1987 for the Central Plant, and in 2007 for the North Trend Satellite Plant, and the doses were found to be negligible. The proposed increase in process flow to 9,000 gpm at the Central Plant, and the addition of the North Trend Satellite Facility, is not expected to have any measurable impact on dose to flora and fauna.

7.13 WASTE MANAGEMENT IMPACTS

Liquid wastes generated from production and restoration activities are handled by one of three methods: solar evaporation ponds, deep well injection, or land application. All three methods are currently being employed at Crow Butte.

Alternative pond design and locations have been considered. The sites selected represent the best location considering proximity to the plant, size of drainage and suitable soils. The design is such that any seepage of toxic materials into the subsurface soils or hydrologic system would be prevented or minimized. The ponds have also been designed to protect the down-gradient are from surface flows and subsurface seepage in the event of dam failure.

All solid wastes are transported from the site for disposal. Non-contaminated waste is shipped to an approved sanitary landfill. Contaminated wastes are shipped to a USNRC approved facility for disposal. Should a USNRC licensed disposal facility not be available to CBR at the time of decommissioning, the alternative of on-site burial may be necessary. This alternative could incur long term monitoring requirements and more expensive reclamation costs; however, it may be the only alternative available to Crow Butte at that time.

7.14 EFFECTS OF ACCIDENTS

Accidents involving human safety associated with the in-situ uranium mining technology typically have far less severe consequences that accidents associated with underground and open pit mining methods. In-situ mining provides a higher level of safety for personnel and neighboring communities when compared to conventional mining methods or other energy related industries. Accidents that may occur would generally be quite minor when compared to other industries, such as an explosion at an oil refinery or chemical plant. Radiological accidents that might occur would typically manifest themselves slowly and are therefore easily detected and mitigated. The remote location of the facility and the low level of radioactivity associated with the process both decrease the potential hazard of an accident to the general public.

7.14.1 Tank Failure

Process fluids are contained in vessels and piping circuits within the process plant or in bermed outside storage tanks. The process plant has been designed to control and confine liquid spills should they occur. The plant building structure and concrete curb will contain the liquid spills from the leakage or rupture of a process vessel and will direct any spilled solution to a floor sump. The floor sump then pumps any spilled solutions back into the plant process circuit or to the waste disposal system.

All tanks inside the plant are constructed of fiberglass or steel. Instantaneous failure is thus highly unlikely. Tank failure would more likely occur as a small leak in the tank. In this case, the tank would be emptied to at least a level below the leaking area and repairs or replacement made as necessary. SOPs are in place to respond to any spill that may occur.

7.14.2 Pipe Failure

The rupture of a pipeline within the process plant is easily visible and can be repaired quickly. Spilled solution is contained and removed in the same fashion as for a tank failure.

The rupture of an injection or recovery line in a wellfield, or a trunkline between a wellfield and the process plant would result in either a release of barren or pregnant lixiviant solution that would contaminate the ground in the area of the break.

All piping from the plant, to and within the wellfield is buried for frost protection. Pipelines are constructed of PVC, high-density polyethylene with butt-welded joints or equivalent. All pipelines are pressure tested at operating pressures prior to final burial and production flow. As no additional stress is placed on a pipeline following burial, catastrophic failures are unlikely. The section of trunkline that flows under Squaw Creek has been double contained for additional safety.

Each wellfield has a number of wellfield houses, where injection and recovery lines are continuously monitored. Individual lines can each have high and low flow alarm limits

set. All set points and alarms are monitored in the control room via the computer system. In addition, each wellfield building has a "wet" alarm to detect the presence of any liquids that may be present.

Small occasional leaks at pipe joints and fittings in the wellfield house or at the wellheads may occur from time to time. Until remedied, these leaks may drip some solution into the underlying soil. After repair, the soil will be surveyed for contamination and removed as appropriate. Preventative maintenance programs are in place to preclude this type of spill to the extent possible. In the event of a catastrophic pipe failure, solutions released would still be minimal as the pressure in the lines is not that great. In addition, all drainage to Squaw Creek has been diked and bermed to protect this water source.

7.14.3 Pond Failure

An accident involving a leak in a solar evaporation pond is detectable either from the regular visual inspections or via the leak detection system. The inspection program consists of daily, weekly, monthly and quarterly inspections in conjunction with an annual technical evaluation of the pond system. Any time six inches or more of fluid is detected in the standpipes, it is analyzed for specific conductance. If the water quality is degraded beyond the action level, it is sampled again and analyzed for chloride, alkalinity, sodium, and sulfate.

In the event of a leak, the contents of any one pond can be transferred to the other ponds while repairs are made. Freeboard requirements may be waived during this period. Catastrophic failure of a berm is also unlikely given the design requirements of the pond and the freeboard that is maintained. The pond soil foundation is compacted and has low ambient moisture, thus leaking solutions would not tend to migrate. Contingency plans are in place to address situations that may occur.

7.14.4 Lixiviant Excursion

Mining fluids are normally maintained in the production aquifer within the immediate vicinity of the wellfield. The function of the encircling monitor well ring, which is installed prior to any production activity, is to detect any lixiviant that may migrate away from the production area due to fluid pressure imbalance. This system has been proven to function satisfactorily over many years of operating experience with in-situ mining.

For the Crow Butte Project, monitor wells are located no further than 300 feet from the wellfields and screened in the ore-bearing Chadron Aquifer. Additionally, monitor wells are placed in the first overlaying aquifer above each wellfield segment. Sampling on these wells occurs on a regular basis as described in **Section 5.8**. The total effect of close proximity of the monitor wells, low flow rate from the well patterns, and over-production of leach fluids (production bleed) makes the likelihood of an undetected excursion remote.

7.14.5 Transportation Accidents

Transportation of materials to and from Crow Butte can be classified as follows:

- Shipments of yellowcake
- Shipments of process chemicals or fuel from suppliers to the site.
- Shipment of radioactive waste from the site to a licensed disposal facility.
- If the satellite plant is built, shipments of uranium-laden resin from the satellite plant to the main process facility.
- If the satellite plant is built, shipments of barren eluted resin or eluate from the main processing facility back to the satellite plant.

Accidents involving these transportation occurrences are discussed below. It is assumed that all transports will be made with contracted vehicles and licensed drivers, with the exception of the on-site transfers between the satellite plant and main facility should the satellite be built. In all likelihood, these transfer vehicles would be operated by a Crow Butte employee.

7.14.5.1 Accidents Involving Yellowcake Shipments

Accidents involving yellowcake shipment can take two forms. The first would involve a shipment of dried yellowcake product being shipped from the Crow Butte facility after processing. The second would involve the shipment of uranium oxide or yellowcake slurry. The slurry could be enroute from Crow Butte to another facility for processing, or it could be a shipment being sent to Crow Butte for processing. Slurry would generally be shipped from Crow Butte only if the dryer were not operational. Regarding slurry shipments to Crow Butte, there are currently no contracts or plans that would anticipate such a situation.

The dried yellowcake that is produced at Crow Butte is generally packaged in fifty-five gallon 18 gauge drums holding an average of 364.kg (800 pounds), classified by the Department of Transportation as Type A packaging (49 CFR Parts 171-189 and 10 CFR Part 71). An average truck shipment contains approximately 55 drums, or 17.5 tons of yellowcake. At the current production levels, approximately two shipments per month are made. At the proposed production level, it is expected that approximately three to four shipments per month would be necessary. If it becomes necessary to transport slurry, it will be transported in either a trailer-mounted tank vessel or in lined drums.

All vehicles and shipments are surveyed prior to leaving the site. The driver is provided with copies of all documents in the shipping packet. The shipping packet contains current copies of the shipping papers containing an exclusive use statement, the bill of lading, the Form 741, the contamination survey results, copies of the emergency telephone numbers, the emergency procedures, a list of materials in the spill control kit, and the driver responsibility statement.

In the accident analysis of the Sand Rock Mill Project, a transportation accident involving yellowcake was assumed for which an environmental release fraction of 9×10^{-3} of fractional probability of occurrence was calculated. This represents the initial airborne material released at an accident site carried by a five meter/second (10 mph) wind for a twenty-four hour period. Assuming a population density of sixty-two people per square kilometer, a fifty-year dose commitment to the lungs in the general population was estimated at between 0.9 and 13 man-rem, depending upon the severity of the spill. This value was considered small when compared with the estimated fifty year integrated lung dose of 1427 man-rem from natural background (USNRC, 1982). The relatively low activity of the product combined with the low population density in Northwest Nebraska and Wyoming would produce even lower dose commitments than the above estimates in the event of an accident.

7.14.5.2 Accidents Involving Shipments of Process Chemicals

Based on the current production schedule and material balance, it is estimated that approximately 272 bulk chemical deliveries per year will be made to the site. This averages about one truck per working day for delivery of chemicals throughout the life of the project. The proposed increase in production capacity would increase this number somewhat. Types of deliveries include carbon dioxide, hydrochloric acid, sodium chloride, hydrogen peroxide, oxygen, and soda ash. Since no unusual or hazardous driving conditions are known to exist in the northwest part of Nebraska, the accident rate should be that of the overall chemical trucking industry. Based on published accident statistics the probability of a truck accident is in the range of 1.0 to 1.6×10^{-6}/km. (1.6 to 2.6×10^{-6}/mile). Truck accident statistics include three categories of events:

- **Collisions-** between the transport vehicle and other objects, whether moving vehicles or fixed objects.
- **Noncollisions-** accidents involving only one vehicle, such as when it leaves the road and rolls over.
- **Other events-** include personal injuries suffered on the vehicle, persons falling from or being thrown against a standing vehicle, cases of stolen vehicles, and fires occurring in a standing vehicle.

The likelihood of a truck shipment of chemicals or product from the Crow Butte Project being involved in an accident of any type in the Crawford area during a one-year period is approximately 1 percent.

7.14.5.3 Accidents Involving Radioactive Wastes

Low level radioactive solid byproduct material or unusable contaminated equipment generated during operations are transported to a licensed disposal site as needed. Because of the low levels of radioactive concentration involved, these shipments are considered to have minimal potential impact in the event of an accident. Emergency response procedures are the same as for yellowcake shipments.

7.14.5.4 Accidents Involving Resin Transfers

One of the potential impacts of a satellite plant is the transfer of the uranium-loaded resin or eluate from the satellite to the main process facility.

Resin will be transported to and from the Crow Butte satellite plant in a specially designed, low-profile, 400 cubic foot (3,000 gallon) capacity tanker trailer. It is currently anticipated that two loads of uranium laden resin will be transported to the Crow Butte recovery facility for elution, and two loads of barren eluted resin will be returned to the Crow Butte satellite plant on a daily basis. The transfer of resin between the two sites will occur on county and private roads within the License Area.

Resin or eluate shipments shall be treated similarly to yellowcake shipments in regards to Department of Transportation (DOT) and USNRC regulations. Shipments will be handled as Low Specific Activity (LSA) material, for both uranium laden and barren eluted resin. Pertinent procedures, which Crow Butte will follow for a resin shipment, including emergency procedures in the event of an accident, are discussed n detail in the North Trend Amendment Expansion Area Technical Report

Currently, CBR intends to treat the eluted resin the same as the uranium loaded resin. It is possible that the eluted resin may be clean enough to be transported as non-radioactive material, as defined by DOT regulations. Operating experience will aid in the determination of the most practical and efficient way of dealing with the shipment of barren resin. Regardless, compliance with all applicable DOT and USNRC regulations will be the primary determining factor.

7.14.6 Other Accidents

Other potential accidents involving non-radiological materials are associated with the various chemical and fuel storage tanks maintained outside the process facilities. Each of the liquid chemical storage tanks is located on curbed concrete pads to contain any spills. The oxygen and carbon dioxide, which are stored as liquefied gases, do not require a curbed concrete pad for containment since these chemicals will convert to gaseous form and vent to the atmosphere if a leak occurred. These tanks are stored away from the processing building and yellowcake storage area.

Accidents involving personnel are also a possibility, although with a small work force, not considered to be likely. Personnel are trained in safety and emergency procedures in accordance with Mine Safety and Health Administration regulations. Initial and refresher training include occupational safety, first aid, radiation safety and fire procedures.

SECTION 8

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8 ALTERNATIVES TO PROPOSED ACTION

8.1 NO-ACTION ALTERNATIVE

8.1.1 Summary of Current Activity

CBR currently operates the Crow Butte Project; a commercial ISL uranium mining operation located approximately 4.0 miles southeast of Crawford in Dawes County, Nebraska. Operation is allowed under USNRC Source Materials License SUA-1534.

An R&D facility was operated on the property in 1986 and 1987. Construction of the commercial process facility began in 1988, with production beginning in April of 1991. The total current License Area occupies 2,875 acres, and the surface area to be affected by the current commercial project will be approximately 1,265 acres. Facilities include the R&D facility, the commercial process facility and office building, solar evaporation ponds, parking, access roads, and wellfields.

In the current License Area, uranium is recovered by ISL from the Chadron Sandstone at a depth that varies from 400 feet to 800 feet. The overall width of the mineralized area varies from 1,000 feet to 5,000 feet. The ore body ranges in grade from less than 0.05 percent to greater than 0.5 percent U_3O_8, with an average grade estimated at 0.27 percent U_3O_8. Production is currently in progress in Mine Units 10 and 11. Groundwater restoration has been completed and received regulatory approval in Mine Unit 1. Groundwater restoration is currently underway in Mine Units 2 through 4.

The current extraction plant is operating with a licensed process flow rate of 5,000 gpm exclusive of restoration flow. Maximum allowable throughput from the plant under SUA-1534 is currently 2,000,000 pounds (lb) of U_3O_8 per year. On October 16, 2006, CBR submitted a request to the USNRC for a license amendment to increase the plant throughput from 5,000 to 9,000 gpm. USNRC approval is pending.

8.1.2 Impacts of the No-Action Alternative

The no-action alternative would allow CBR to continue mining operations in the current License Area until the USNRC formally denied the renewal of the license application. As long as CBR submits a source material renewal application to the USNRC at least thirty days before the expiration date of the existing license (February 28, 2008), the license would not expire until the USNRC determined the final disposition of the renewal application and advised CBR of its decision. If the license renewal was not approved by the USNRC, restoration and reclamation activities would then become the primary activities.

If renewal of the current source material license was not approved, all activities at the Crow Butte site that are not associated with groundwater restoration and decommissioning would be completed, resulting in the loss of a significant portion of the

total employment at the site. At the completion of decommissioning activities, all employment opportunities at the mine would be terminated.

In addition to the loss of significant employment opportunities in Crawford and Dawes Counties, the premature closing of the Crow Butte Project before commercially viable resources had been recovered would adversely affect the economic base of Dawes County. As discussed in further detail in **Section 7.10** and shown in **Table 8.1-1**, the Crow Butte Project currently provides a significant economic impact to the local Dawes County economy.

Table 8.1-1: Current Economic Impact of Crow Butte Project

	Current Crow Butte Operation Annual Economic Impact
Employment	
Full-Time Employees	52
Full-Time Contractor Employees	20
Part-Time Employees and Short Term Contractors	7
CBR Payroll, 2006	$3,400,000
Taxes	
Property Taxes	$627,000
Sales and Use Taxes	$238,000
Severance Taxes	$545,000
Total Taxes	$1,410,000
Local Purchases	
Local Purchases, 2006	$6,800,000
Total Direct Economic Impacts	
	$11,610,000

A decision to not renew SUA-1534 for mining in the Crow Butte License Area would leave a large resource unavailable for energy production supplies. In 2006, total domestic U.S. uranium production was approximately 4 million pounds U_3O_8, of which more than 700,000 pounds (or approximately 18 percent) were produced at the Crow Butte Project. During the same year, domestic U.S. uranium consumption was approximately 67 million pounds of U_3O_8 with approximately 16 percent supplied by domestic producers (EIA 2007). The Crow Butte Project represents an important source of domestic uranium supplies that are essential in providing a continuing source of fuel to power generation facilities. The current limited supplies of fuel for nuclear power plants may negatively impact the renewed and growing interest in nuclear energy in the U.S. and other nations (MIT 2007).

In addition to leaving a large deposit of valuable mineral resources untapped, a denial of this license renewal would result in the loss of a large investment in time and money made by CBR for the rights to and development of these valuable deposits. Denial of this license renewal would also have an adverse economic impact on the individuals who have surface leases with CBR and own the mineral rights within the License Area.

SECTION 9

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Section 9

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Total CBR payroll for the past four years was:

2003:	$2,102,000
2004:	$2,213,000
2005:	$2,382,000
2006:	$2,543,000

The average annual wage for all workers in Dawes County was $22,350 for 2006. By way of comparison, the average wage for CBR was about $51,000. Entry-level workers for CBR earn a minimum of $15.53 per hour or $32,300 per year, not including bonus or benefits.

9.2.2.2 Projected Short-Term and Long-Term Staffing Levels

CBR expects that construction of future satellite plant(s) will provide approximately ten to fifteen temporary construction jobs for a period of up to one year for each satellite. It is likely that the majority of these jobs will be filled by skilled construction labor brought into the area by a construction contractor, although some positions could be filled by local hires. Permanent CBR employees will perform all other facility construction (e.g., wells and wellfields).

CBR actively pursues a policy of hiring and training local residents to fill all possible positions. Due to the technical skills required for some positions, a small percentage of the current mine staff (less than five percent) have been hired elsewhere and relocated to the area. Because of the small number of people who have needed to move into the area to support this project, the impact on the community in terms of expanded services has been minimal. CBR expects that the types of positions required at the current facility and those that will be created by any future expansion will be filled with individuals from the local workforce and that there will be no significant impact on services and resources such as housing, schools, hospitals, recreational facilities, or other public facilities. In 2006, total unemployment in Dawes County was 137 individuals, or 2.9 percent of the total work force of 4,799. CBR expects that many new positions will be filled from this pool of available labor.

CBR projects that the current staffing level will increase by ten to twelve full-time CBR employees for each active satellite plant. These new employees will be needed for satellite plant and wellfield operator and maintenance positions. Contractor employees (i.e., drilling rigs) may also increase by four to seven employees depending on the desired production rate. The majority, if not all, of these new positions will be filled with local hires.

These additional positions should increase payroll by about $40,000 per month, or $400,000 to $480,000 per year.

9.2.3 Impact on the Local Economy

In addition to providing a significant number of well-paid jobs in the local communities of Crawford, Harrison, and Chadron, Nebraska, CBR actively supports the local economies through purchasing procedures that emphasize obtaining all possible supplies and services that are available in the local area.

Total CBR payments made to Nebraska businesses for the past four years were:

2003:	$3,602,000
2004:	$3,597,000
2005:	$4,570,000
2006:	$6,800,000

The vast majority of these purchases were made in Crawford and Dawes County.

This level of business is expected to continue and should increase somewhat with the addition of expanded production from the satellite plant, although not in strict proportion to production. While there are some savings due to some fixed costs (Central Plant utilities for instance), there are additional expenses that are expected to be higher (well-field development for the satellites is expected to be more expensive). Therefore, it can be assumed that the overall effect on local purchases will be proportional to the number of pounds produced. In addition, mineral royalty payments accrue to local landowners. This should translate to additional purchases of $3.65 to $4.35 million per year.

9.2.4 Economic Impact Summary

The Crow Butte Project currently provides a significant economic impact to the local Dawes County economy. Approval of this LRA would have a positive impact on the local economy as summarized in **Table 9.2-2.**

Table 9.2-2: Current Economic Impact of Crow Butte Project

	Current Crow Butte Operation
Employment	
Full Time Employees	60
Full Time Contractor employees	15
Part Time Employees and Short Term Contractors	7
CBR Payroll, 2006	$3,400,000
Taxes	
Property Taxes	$627,000
Sales and Use Taxes	$238,000
Severance Taxes	$545,000
Total Taxes	$1,410,000
Local Purchases	
Local Purchases, 2006	$6,800,000
TOTAL	**$11,610,000**

TECHNICAL RESPONSE REPLACEMENT PAGES

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TABLE OF CONTENTS

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Table of Contents

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FIGURES

TABLES

APPENDIX

ACRONYMS

ALARA	as low as reasonably achievable
Amsl	above mean sea level
bgs	below ground surface
BLM	Bureau of Land Management
BNSF	Burlington Northern Santa Fe
BPT	Best Practicable Technology
CAD	computer aided design
CBR	Crow Butte Resources, Inc.
CDP	Census Designated Places
CESQG	Conditionally Exempt Small Quantity Generator
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	Centimeter
cm/sec	centimeter per second
CO_2	carbon dioxide
cpm	counts per minute
CSA	Commercial Study Area
DAC	derived air concentration
dBA	A-weighted decibel
DDE	Deep Dose Equivalent
DEM	digital elevation model
DLG	Digital line graphic
DOT	Department of Transportation
DQO	Data Quality Objective
EA	Environmental Assessment
EDR	electro dialysis reversal
EHSMS	Environmental, Health and Safety Management System
EMS	Environmental Management System
ER	Environmental Report
ESRI	Environmental System Research Institute
FEMA	Federal Emergency Management Act
GIS	Geographic Information System
GNIS	Geographical Names Information System
gpd	gallons per day
gpdpp	gallons per day per person
gpm	gallons per minute
GPS	Geographic Positioning System
HP	horse power
HPRCC	High Plains Regional Climatic Center
HSMS	Health and Safety Management Systems
ISL	in-situ leach
km	kilometer
LLD	lower limit of detection
LRA	license renewal application
m/s	meters per second
MARLAP	multi-Agency Radiological Laboratory Analytical Protocols Manual

MCL	maximum contaminant level
MeV	mega electronvolt
$\mu g/m^3$	micrograms per cubic meter
mg/L	milligrams per liter
MIT	mechanical integrity test
mph	miles per hour
mREM	miliroentgen equivalent, man
MSDS	material data safety sheet
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NASS	National Agricultural Statistics Service
NDED	Nebraska Department of Economic Development
NDEQ	Nebraska Department of Environmental Quality
NDNR	Nebraska Department of Natural Resources
NGPC	Nebraska Game and Parks Commission
NGS	National Geodetic Survey
NOAA	National Oceanic Atmospheric Association
NOI	Notice of Intent
NOU	Nebraska Ornithologists' Union's
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTEA	North Trend Expansion Area
NUREG-1569	Standard Review Plan for In-situ Leach Uranium Extraction License Application
pCi/g	pico curies per gram
PPE	personal protective equipment
ppm	parts per million
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
QAM	Quality Assurance Manual
R&D	research and development
RCRA	Resource Conservation and Recovery Act
RMP	Risk Management Program
RO	reverse osmosis
ROI	radius of influence
RWP	Radiation Work Permit
SERP	Safety and Environmental Review Panel
SH	State Highway
SHPO	State Historic Preservation Office
SOP	standard operating procedure
SPCC	Spill Prevention, Control, and Countermeasure
SSC	Structure, System, or Component
S.U.	Standard nits
SWPPP	Stormwater Pollution Prevention Plan
SRWP	standing radiation work permits
TDS	total dissolved solids

TEDE	Total Effective Dose Equivalent
TER	Technical Evaluation Report
TR	Technical Report
TSP	total suspended particulates
U_3O_8	triuranium octoxide
UCL	Upper Control Limits
UIC	Underground Injection Control
UMTRCA	Uranium Mill Tailings Radiation Control Act
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USDW	Underground source of drinking water
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
USFWS	United States Fish and Wildlife Service
USNRC	United States Nuclear Regulatory Commission
VRM	Visual Resource Management
WFC	Wyoming Fuel Company
WL	working levels
ww	Water well

SECTION 2

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Replacement Pages

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Section 2

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2-1/2-2	
2-5/2-6	(Revised Figure 2-1-2)
2-19/2-20	
2-21/2-22	(Revised Figure 2.2-2)
2-23/2-24	
2-35/2-36	(Revised Figure 2.3-1)
2-39/2-40	
2-41/2-42	(Revised Table 2.3-4)
2-43/2-44	
2-49/2-50	
2-53/2-54	(Revised Figure 2.4-1)
2-55/2-56	
2-241/2-242	
2-245-2-246	

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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, 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 maps used in this section and other sections of this amendment application are Vector 7.5 minute quad maps. These are computer-aided design (CAD) and geographic information systems (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, United States Geological Survey (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 License Area. **Figure 2.1-1** also shows the original Commercial Study Area (CSA) and the 3.2-kilometer (km) (2.0-mile) review area.

Figure 2.1-2 shows the general project site layout and Restricted Areas for the 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. Buildings and storage areas that have been constructed since the most recent license renewal, (maintenance, electrical, storage and drilling supply buildings, are illustrated along with the expansions of the Main Plant offices and R.O. building area.

Figure 2.1-3 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.

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Figure 2.1-2: Current Project and Operation Site Layout

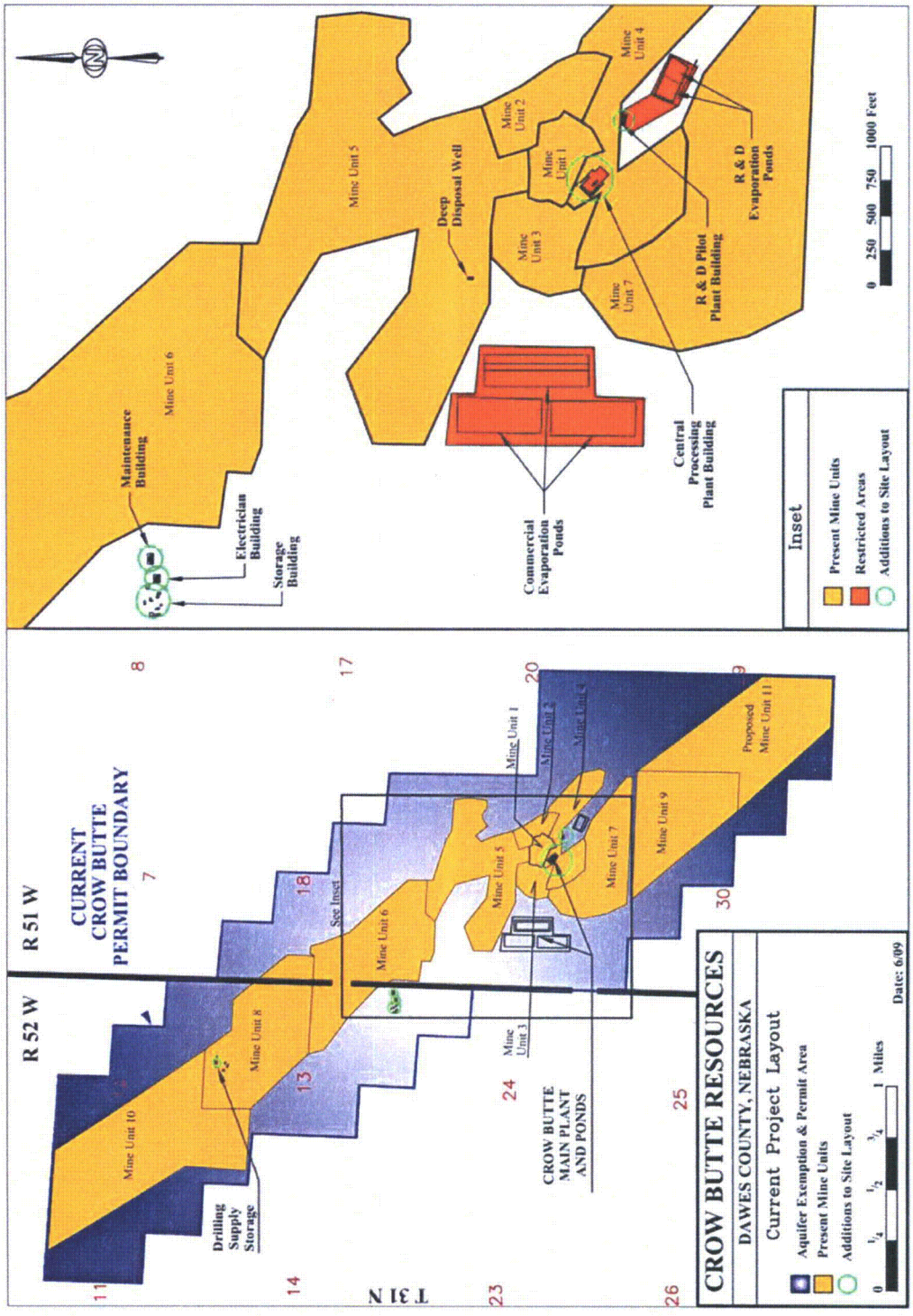

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Table 2.2-7: Residence Count and Distance within the 8-km (5-mile) Radius of License Area Center Point

Sector [c]	Structure Count [a]	Nearest Residence (km)	Nearest Vegetable Garden (km)	Nearest Project Boundary (km)
North	2	5.7	--	2.4
North-Northeast	1	4.0	--	2.0
Northeast	3	4.3	--	2.5
East-Northeast	6	0.6	0.6	2.1
East	0	--	--	2.1
East-Southeast	5	0.6	--	1.4
Southeast	1	4.5	--	2.9
South-Southeast	1	4.5	--	2.9
South	3	3.8	--	4.0
South-Southwest	2	5.0	--	2.3
Southwest	3	1.6	--	1.5
West-Southwest	3	3.1	--	1.3
West	3	2.5	--	1.3
West-Northwest	27[b]	4.4	--	1.3
Northwest	510[b]	3.1	--	5.4
North-Northwest	10	1.1	1.1	2.4

Notes:

[a] Residences.

[b] U.S. Census 2000 reported 537 housing units within the City of Crawford. As with the sectorial population, housing units for Crawford are allocated as 5 percent for the WNW sector and 95 percent for the NW sector.

[c] 22 1/2 ° sectors centered on each of the 16 compass points.

-- Not present

Sources: USDA FSA 2006; U.S. Bureau of the Census 2000.

2.2.3.5 Industrial and Mining

There are seven gravel pits within the 8-km (5-mile) radius of the License Area (**Figure 2.2-2**). Most of the pits are inactive, although a few are mined periodically for local road construction purposes. Gravel Pit #7 (GP-7) is located within the License Area and is currently being excavated by Crow Butte Resources for mine site road construction. Use of GP-4 and GP-5 by Crow Butte Resources has been discontinued due the limitied availability of gravel or the presence of nearby piping infrastructure. It is possible that GP-5 may be re-opened for excavation in the future.

Besides Crow Butte Resources, Conoco, Amoco Minerals, Sante Fe Mining, and Union Carbide have also drilled exploratory testing holes in the area for a variety of natural resources. Other industrial facilities within the 8-km (5-mile) radius include the railroad station and maintenance yard at the City of Crawford.

There are no other industrial or mining uses within the License Area. 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.

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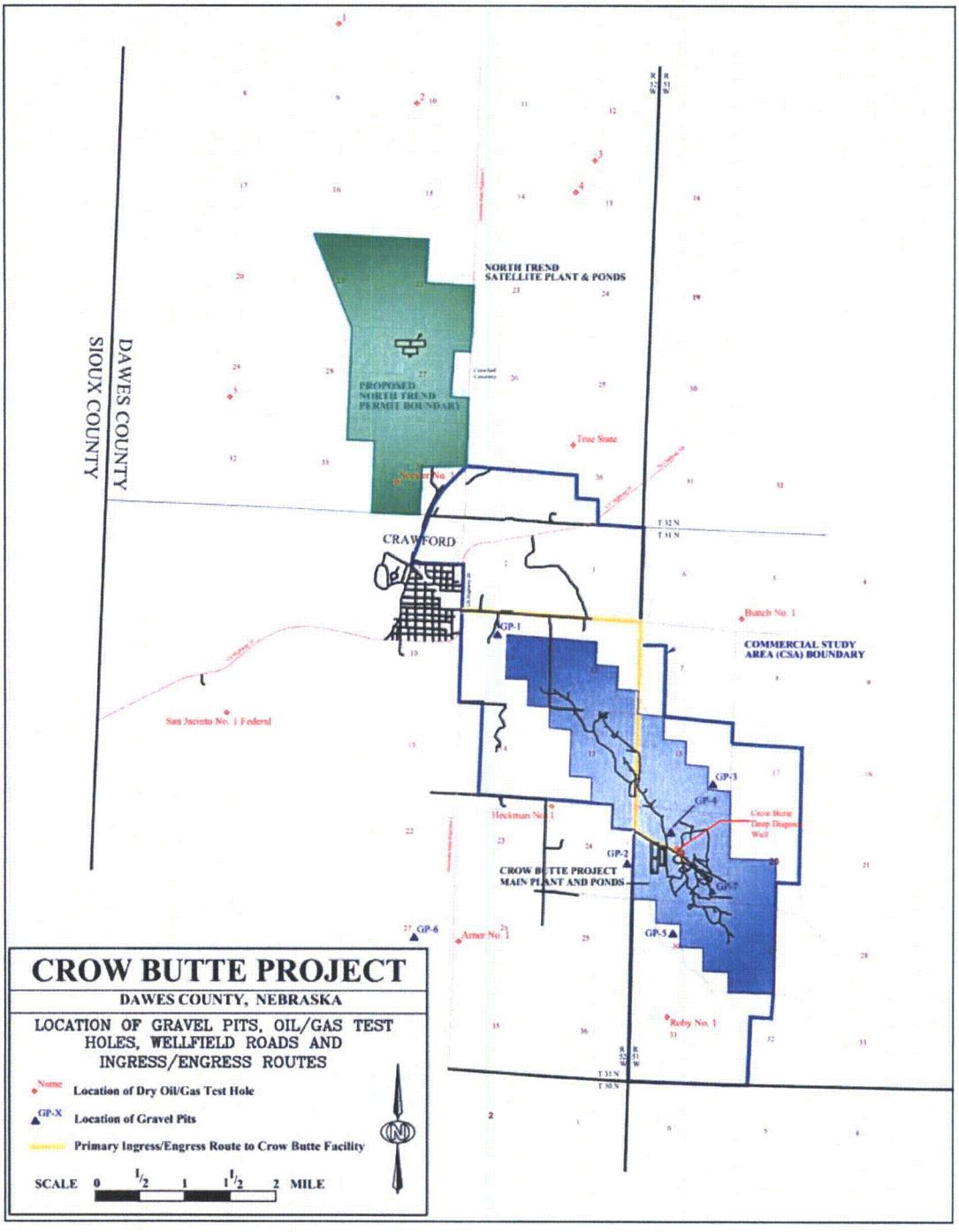
Figure 2.2-2: Crow Butte Location of Gravel Pits, Oil/Gas Test Holes, Wellfield Roads and Ingress/Egress Routes



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2.2.3.6 Transportation

Nebraska Highway 2/71 and U.S. Highway 20 converge in Crawford. The annual average daily traffic counts for 2004 range between 1,195 south of Crawford and 540 north of Crawford on Nebraska Highway 2, and 1,795 on U.S. Highway 20 north of the License Area (Nebraska Department of Roads 2007). Although unpaved, Squaw Creek Road provides access to the License Area. Preferred ingress and egress routes are indicated on **Figure 2.2-2**. Private roads providing access to operational areas of the Crow Butte License Area exist and are demarcated by signage to prevent public access.

Maintenance of state and county roads is performed by the Nebraska Department of Roads and Dawes County, respectively. Crow Butte Resources is responsible for maintenance and upgrades (i.e., grading, watering, and paving) of all private access roads within the License Area.

A Burlington Northern Santa Fe (BNSF) Railroad runs in a northwesterly direction approximately 0.75 miles west of the site. Several transmission lines traverse the License Area, including one less than 1 km west of the designated center point.

2.2.4 Water Use

The Crow Butte License Area is drained by Squaw Creek and is within the White River Watershed. Squaw Creek is used by local landowners for irrigation, livestock watering, and domestic purposes, and by fish and wildlife habitat. Warm-water fishing and hunting also occur downstream from the Crow Butte project.

The White River supports agricultural production, wildlife habitat, and both warm- and cold-water fish. Within 6.2 miles upstream of the License Area, the White River supplies drinking water to the citizens of Crawford. In 1981, average daily usage ranged from a low of 199 gallons per day per person (gpdpp) in February to a high of 508 gpdpp in July. The maximum recorded daily water usage in Crawford was nearly 1 million gallons.

Lake Crawford, as well as approximately 20 unnamed reservoirs ranging from 1 to 17 acres of surface area, is also located within a 10-km (6.2-mile) radius.

Groundwater within the 8-km (5-mile) License Area is supplied by either the Brule or Chadron Formations (Williams 1982). A water well survey conducted by Wyoming Fuel Company (WFC) indicates that most of the groundwater pumped from 123 wells surveyed within the 3.6-km (2.25-miles) radius of the proposed commercial License Area is used either to water livestock or for domestic purposes. A spring, located in Fort Robinson State Park, produces an average of 972,000 gallons per day (gpd) (Storbeck 1987).

Eight surface water impoundments are located within or adjacent to the License Area (**Figure 2.2-3**). These eight impoundments are identified as I-1 through I-8. Impoundments I-1, I-2, I-7, and I-8 are located outside the License Area, while impoundments I-3 through I-6 are located inside the License Area.

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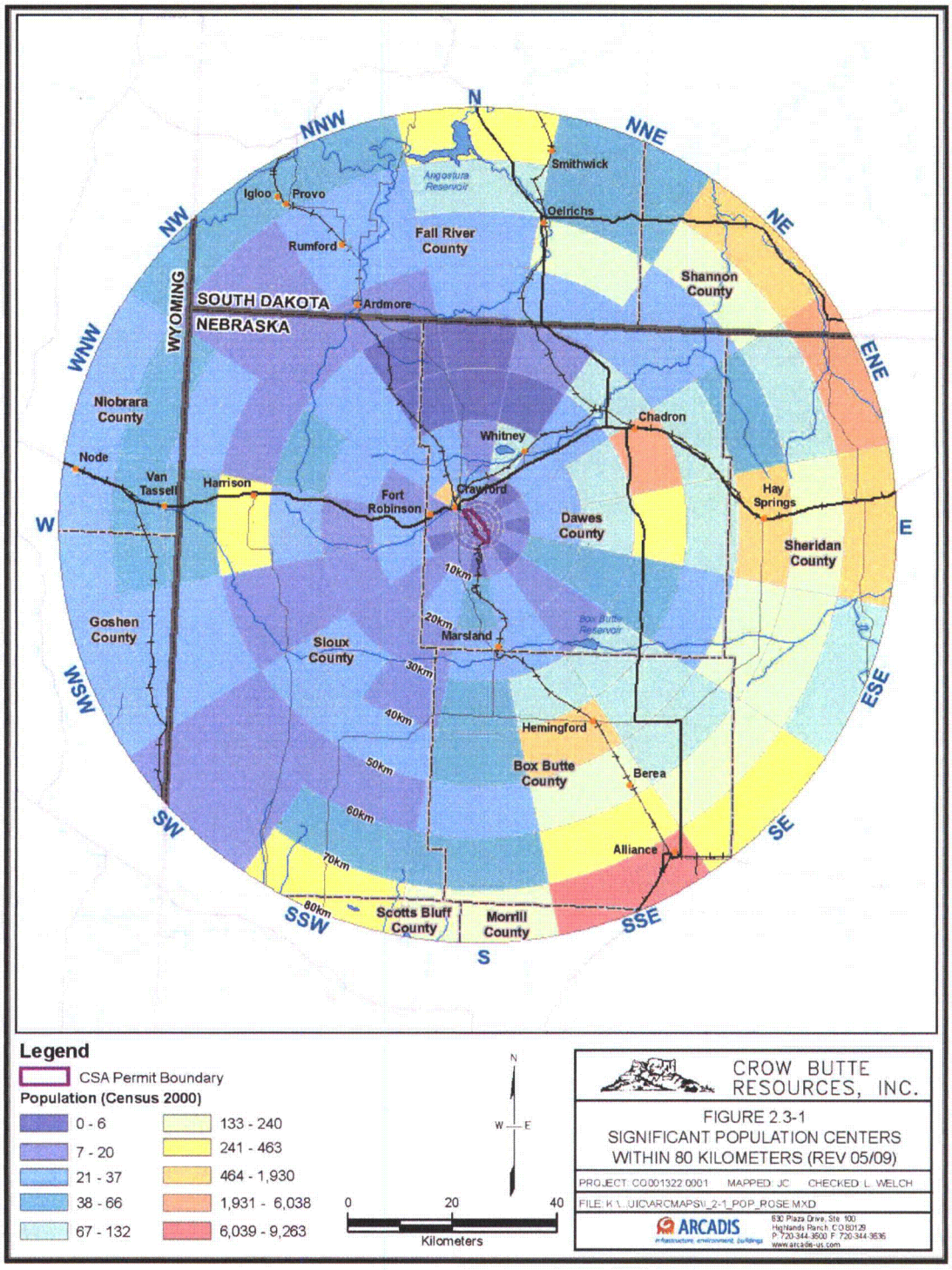
Figure 2.3-1: Significant Population Centers within 80 Kilometers



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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.

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 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 Crow Butte Project 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 (50-mile) radius, centered on the License Area, 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 this LRA 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**.

Table 2.3-4: 2000 Population within an 80-km (50-mile) Radius of the License 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	0	24	12	0	4	29	31	78	463	641
NNE	0	0	0	0	4	18	131	1	16	22	168	40	38	438
NE	0	0	0	0	0	0	36	34	132	37	32	219	1,930	2,420
ENE	0	0	0	0	0	15	28	91	6,038	104	66	102	4,217	10,661
E	0	0	0	0	0	1	26	130	340	114	902	150	1,201	2,864
ESE	0	0	0	0	0	15	41	42	42	30	176	177	78	601
SE	0	0	1	0	0	0	14	12	77	115	124	225	313	881
SSE	0	0	0	0	0	12	32	29	88	1,173	240	299	9,263	11,136
S	0	0	0	0	0	0	41	29	60	40	25	49	177	421
SSW	0	0	2	0	0	11	24	14	17	22	10	64	323	487
SW	0	0	0	11	0	9	17	13	24	22	15	13	17	141
WSW	0	3	0	0	0	0	27	20	8	15	29	35	34	171
W	0	0	0	0	8	16	25	18	26	292	48	52	32	517
WNW	0	0	4	0	15	15	12	25	42	18	24	39	35	229
NW	0	1	0	0	45	1,091	27	26	24	8	15	15	38	1,290
NNW	0	0	0	0	2	29	33	3	6	13	24	35	55	200
Total	0	4	7	11	74	1,256	526	487	6,944	2,054	1929	1,592	18,214	33,098

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.

Population within the 80-km (50-mile) radius was estimated using the following techniques:

- U.S. Census 2000 data were used to estimate the total population within an 80-km (50-mile) radius, measured from the center of the License Area site. The data were created by Geographic Data Technology, Inc., a division of Environmental System Research Institute (ESRI) Inc., from Census 2000 boundary and demographic information for block groups within the United States.
- ArcInfo GIS was used to extract data from U.S. Census 2000 population estimates for 40 Census Tract Block Groups located wholly or partially within the 80-km (50-mile) radius from the approximate center of the License Area. 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.

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 License 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.

Table 2.3-5: Annual Average Labor Force and Employment Economic Sectors* for Dawes and Box Butte Counties, 1994 and 2002

Employment Economic Sectors	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

Table 2.3-5: Annual Average Labor Force and Employment Economic Sectors* for Dawes and Box Butte Counties, 1994 and 2002

Employment Economic Sectors	Dawes		Box Butte	
	1994	2002	1994	2002
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

The major economic sectors in the License 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 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).

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 25 miles of the License Area, experienced a 25 percent increase in housing stock between 1970 and 1980, and a 5 percent increase between 1990 and 2000. In 1990, Crawford housing stock decreased by nearly 7 percent from 576 units. 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 License Area) 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 (USCB 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 (USCB 2004), compared with rental vacancy rates in 1990, which were 12.6 percent in Dawes County and 14.9 percent in Box Butte County (USCB 1990a).

High interest rates and tax rates were the major deterrents for potential homebuyers in the License 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

2.4 REGIONAL HISTORIC, ARCHEOLOGICAL, ARCHITECTURAL, SCENIC AND NATURAL LANDMARKS

2.4.1 Historic, Archeological, and Cultural Resources

Identification and assessment of cultural resources within the Crow Butte License Area have involved two separate field investigations. The R&D stage of cultural resources investigation within the project was carried out during March and April 1982 by the University of Nebraska. Further investigations were completed for the remaining CSA lands during April and May 1987 by the Nebraska State Historical Society.

This section summarizes the results and recommendations of both studies. For detailed descriptions of each identified resource, please refer to the original 1987 license application.

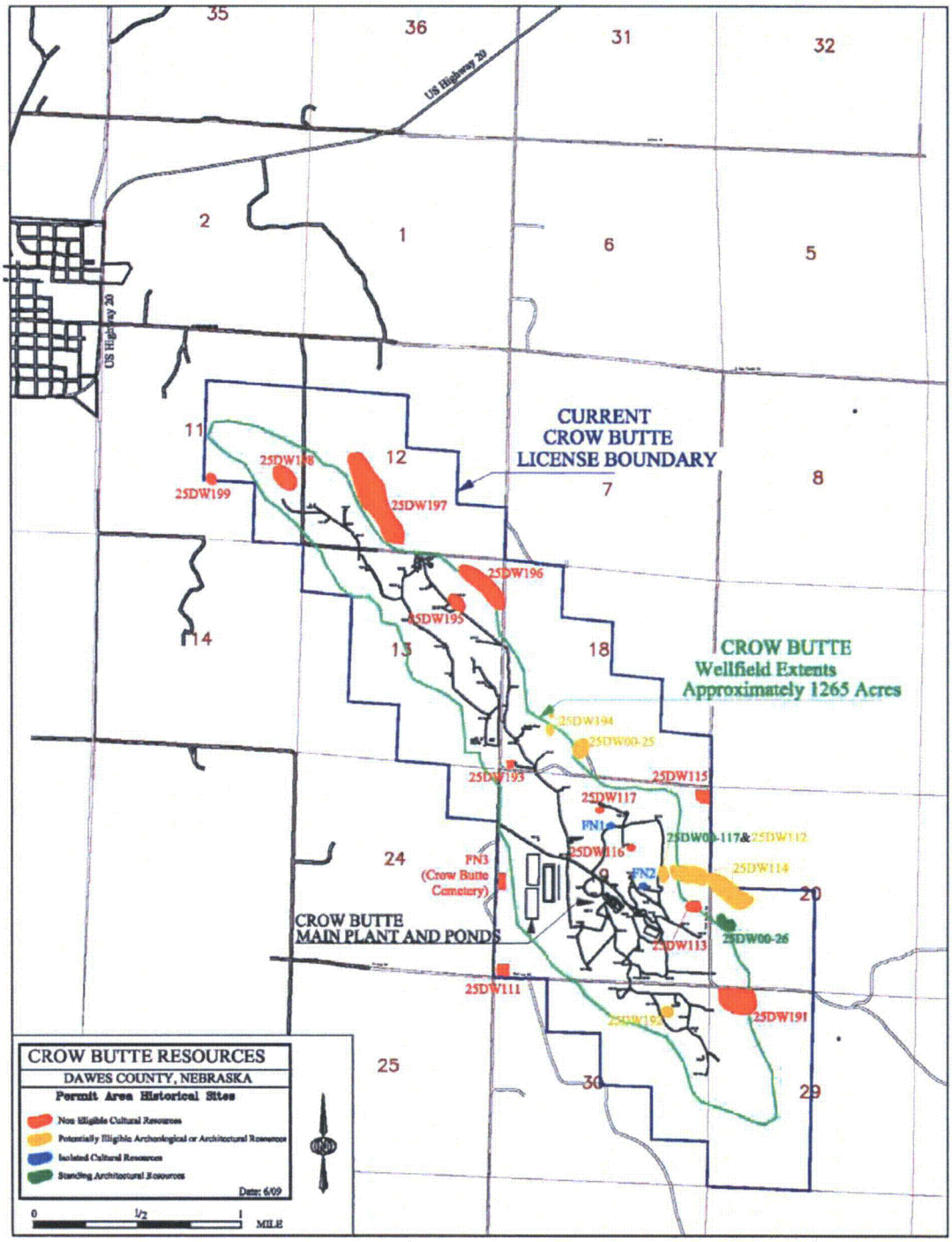
Preliminary background and archival research were initiated in conjunction with intensive field surveys to obtain data required for preparation of both R&D and commercial applications. This work established a basis for addressing potential effects of the project on identified cultural resources. Preliminary literature and records research indicated that systematic investigations had not been previously conducted within the CSA and that no National Register of Historic Places (NRHP) eligible properties had been recorded within or immediately adjacent to the survey unit.

Limited previous studies in surrounding areas provided evidence that a wide range of paleontological, prehistoric and historic resources of potential significance to regional studies are present in the near vicinity and could likely be encountered within the CSA. Registered National Historic Landmarks representing military and Native American reservation period use of the CSA are located near the Crow Butte License Area.

Intensive (100 percent coverage) pedestrian inspection of the R&D area (in 1982) and the full CSA survey unit (in 1987) resulted in identification of 21 newly recorded resource locations (**Table 2.4-1** and **Figure 2.4-1**), including eight sites representing Native American components, 12 Euro-American locations, and a buried bone deposit of undetermined cultural association.

Fifteen of these newly identified resources contained limited observed evidence of scientifically important cultural remains or were not determined to be of significant historic value based on the archival research. These sites do not warrant further National Register consideration. One site (25DW198) was originally considered eligible for listing with the National Historic Register, but was redefined and dropped from consideration in 2003 (Greystone 2003).

Figure 2.4-1: Historical Sites – Dawes County, Nebraska



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The remaining five sites are of potential archeological data recovery importance (25DW114, 25DW192, and 25DW194) or possible architectural interest (25DW112 and 25DW00-25). These five sites are potentially eligible for the National Register; however, fully assessing the eligibility of these sites was not within the scope of this work.

Field observation in August of 1995 confirmed that the current commercial operation has not directly affected any of the five potentially significant sites. CBR has constructed fencing around site 25DW192 to prevent unauthorized disturbance. Additionally, there are no properties within the CSA listed in the National Register or registered as natural or historic landmarks. Project development staff has detailed location maps of these properties, and there is coordination with the Nebraska State Historical Society before any development occurs in the immediate vicinity of the six potentially eligible sites.

2.4.2 Visual/Scenic Resources

2.4.2.1 Introduction

The Crow Butte License Area is on private land that is not managed to protect scenic quality by any public agency. However, it is located in scenic landscape of the Pine Ridge area of northwestern Nebraska and is visible from sensitive viewing areas. The existing landscape and the visual effect of the facilities have been inventoried and assessed for the License Area using the United States Department of Interior (USDOI), Bureau of Land Management (BLM) Visual Resource Management (VRM) system.

2.4.2.2 Methods

The VRM system is the basic tool used by the BLM to inventory and manage visual resources on public lands and is used in this analysis. The VRM inventory process involves rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points.

The scenic quality inventory was based on methods provided in BLM Manual 8410 – *Visual Resource Inventory* (BLM 1986). The key factors of landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modifications were evaluated according to the rating criteria and provided with a score for each key factor. The criteria for each key factor ranged from high to moderate to low quality based on the variety of line, form, color, texture, and scale of the factor within the landscape. A score was associated with each rating criteria, with a higher score applied to greater complexity and variety for each factor in the landscape. The results of the inventory and the associated score for each key factor are summarized in **Table 2.4-2**. According to NUREG-1569, 2.4.3(7), if the visual resource evaluation rating is 19 or lower, no further evaluation is required. The total score of the scenic quality inventory is 14; therefore, the visual effect of the Crow Butte Project on the local visual resources was not further analyzed.

Table 2.4-2: Scenic Quality Inventory and Evaluation for the Crow Butte License Area

Key Factor	Rating Criteria	Score
Landform	Flat to rolling terrain with no interesting landscape features	1
Vegetation	Some variety of vegetation; cropland, range, riparian	3
Water	Water is present, but not evident as viewed from residences and roads	0
Color	Some variety in colors and contrasts with vegetation and soil	3
Influence of adjacent scenery	Adjacent scenery is very similar to Crow Butte License Area and provides little contrast	1
Scarcity	Landscape is common for the region	1
Cultural modifications	Existing modifications consist of Crow Butte Project facilities.	5
Total Score		**14**

2.4.3 References

Greystone Environmental Consultants (Greystone). 2003. Crow Butte Resources Evaluative Testing of Site 25DW198, Dawes County, Nebraska. June 2003.

U.S.D.I. Bureau of Land Management (BLM). 1986. Visual Resource Inventory. BLM Manual Handbook 8410-1.

Table 2.8-2: Habitat Classification System

Habitat Classification
012 - Talus Slope, Scree
013 - Caves
014 - Marl Formation ("Badlands")
050 - Riverine Habitats (Open Basin and Drainage Features)
050 - Complex Riparian
051 - Mixed Grass Prairie Riparian
052 - Wet Meadow Riparian
053 - Shallow Marsh Riparian
054 - Deep Marsh Riparian
055 - Permanent Water - Streams and Rivers
056 - Alkaline Streambank
057 - Streamside Bog
058 - Stream Dugout
059 - Impoundments - Lakes and Ponds
100 - Woodlands
110 - Deciduous Streambank Forest
111 - Deciduous Basin Forest
120 - Deciduous "Wooded Draw" - Intermittent Drainages
130 - Tree Plantings - Orchards, Shelterbelts, Plantations
140 - Ponderosa Pine Forest
141 - Ponderosa Pine/Juniper
142 - Ponderosa Pine/Deciduous Woodland
143 - Ponderosa Pine/Grassland
144 - Ponderosa Pine/Shrubland
150 - Juniper
160 - Aspen
200 - Xerophytic Shrublands
211 - Big Sagebrush
212 - Big Sagebrush/Grassland
221 - Sand Sagebrush
222 - Sand Sagebrush/Grassland
231 - Sumac/Grassland
240 - Mixed Shrub/Half Shrub
300 - Mesophytic Shrublands
311 - Upland Drainage Seep
320 - Chionophilous Copse
330 - Flood Plain/Mud Flat Shrubland
400 - Grasslands
405 - Shortgrass Prairie
410 - Mixed Grass Prairie
420 - Range Rehabilitation
500 - Cultivated
510 - Grains
520 - Hay
530 - Root Crops

Table 2.8-2: Habitat Classification System

Habitat Classification	
540 -	Vegetables
550 -	Fallow
	551 - Bare Ground/Summer Fallow
	552 - Annual Weed Complex
600 - Structure Biotopes	
610 -	Surface Disturbance Unreclaimed
611 -	Surface Disturbance Reclaimed
630 -	Human Biotopes - Towns, Buildings, Farmyards
640 -	Cemeteries, Parks
650 -	Roads and Roadside/Fencerow Complex

Sixteen habitat types were originally identified in the License Area as described in the 1983 report. These have remained relatively unchanged and include; wet meadow, mixed prairie–riparian, wet meadow–riparian, deep marsh–riparian, riverine, impoundment, deciduous streambank forest, shelterbelts and tree plantings, ponderosa pine, mixed grass prairie, range rehabilitation, cultivated, surface disturbance, human biotopes, cemeteries, and roads and roadside complex (**Figure 2.8-2**). These broad categories often represent several vegetation community types that are generally defined by both species composition and relative abundance. The acres of occurrence and relative distribution of habitat types within the CSA (**Figure 2.8-1**) are presented in **Table 2.8-3**. Detailed descriptions of each habitat classification are given in the 1983 WFC.

Table 2.8-3: CSA Habitat Types

Habitat Classification		Acreage	Hectares	Percent
002	Wet Meadow	4.07	1.65	0.05
051	Mixed Prairie - Riparian	119.65	48.42	1.38
052	Wet Meadow - Riparian	47.27	19.13	0.55
054	Deep Marsh - Riparian	23.50	9.51	0.27
055	Riverine	32.86	13.34	0.38
059	Impoundment	46.57	18.84	0.54
110	Deciduous Streambank Forest	510.43	206.56	5.89
130	Shelterbelts, Tree Plantings	27.27	11.04	0.31
140	Ponderosa Pine	325.85	131.86	3.76
410	Mixed Grass Prairie	2840.18	1149.42	32.74
420	Range Rehabilitation	1370.77	554.74	15.80
500	Cultivated	2856.08	1155.86	32.92
610	Surface Disturbance	2.58	1.04	0.03
630	Human Biotopes	105.05	42.51	1.21
640	Cemeteries	5.02	2.03	0.06
650	Roads and Roadside Complex	356.55	144.30	4.11
Totals		**8,673.70**	**3,510.25**	**100.00**

Source: WFC 1983

Wetlands perform many important hydrologic functions such as floodwater storage, regulating stream flows, streambank stabilization, nutrient removal and uptake, and groundwater recharge. Wetlands and/or waterbodies (classification numbers 002, 051, 052, 054, 055, and 059) make up only 3.17 percent (273.92 acres) of the habitat within the CSA.

Woodlands are generally defined as vegetation communities that contain structure dominated by trees where canopy foliage covers 10 to 30 percent of the ground area (Butler et al. 1997). Forested habitat (classification numbers 110, 130, and 140) makes up 9.96 percent (863.55 acres) of the CSA.

Grasslands are characterized by grasses and other erect herbs, usually without trees or shrubs (Butler et al. 1997). The mixed-grass prairie vegetation community is dominated by cool- and warm-season midgrasses, short-grasses, and sedges. Mixed grass prairie (classification number 410) is a large habitat component of the CSA and accounts for 32.74 percent (2,840.18 acres).

Range rehabilitation areas (classification number 420) are previously cultivated fields subjected to intensive grazing or seasonal haying and account for 15.80 percent (1,370.77 acres) of habitat. Cultivated areas (classification number 500) consist mostly of domesticated cereal crops such as spring wheat, oats, and barley, making up 32.92 percent (2,856.08 acres) of the CSA, the largest component at the site.

The remaining land uses within the CSA (classification numbers 610, 630, 640, and 650) includes farmsteads and associated buildings, gravel and dirt roads, and highways and associated rights-of-way. Urban or developed land includes areas of intensive use with much of the land covered by structures (e.g., houses and farm outbuildings). Human disturbed lands account for only 5.41 percent (189.88 acres) of the land use within the CSA.

2.8.6.5 Mammals

Thirty-six species of wild mammals were documented during the 1982 baseline study, and another 28 species, mostly bats, insectivores, and small rodents, were deemed likely to occur in the region (**Table 2.8-4**).

Table 2.8-4: Mammal Species List

Order/Common Name	Scientific Name	Documented Status[1]
CARNIVORES		
Carnivora		
Raccoon	*Procyon lotor*	D
Long-tailed weasel	*Mustela frenata*	D
Mink	*Mustela vison*	D
Black-footed ferret	*Mustela nigripes*	E
Badger	*Taxidea taxus*	D
Spotted skunk	*Spilogale putorius*	E

Table 2.8-4: Mammal Species List

Order/Common Name	Scientific Name	Documented Status[1]
Striped skunk	*Mephitis mephitis*	D
Coyote	*Canis latrans*	D
Swift fox	*Vulpes velox*	R
Red fox	*Vulpes fulva*	D
Bobcat	*Lynx rufus*	D
Mountain lion	*Felis concolor*	R
BIG GAME MAMMALS		
Artiodactyla		
Mule deer	*Odocoileus hemionus*	D
White-tailed deer	*Odocoileus virginianus*	D
Pronghorn	*Antilocapra americana*	D
Elk	*Cervus elaphus*	D
Bighorn sheep	*Ovis canadensis*	D
Bison	*Bison bison*	D
Moose	*Alces alces*	R
Mule deer/White-tailed deer hybrid	*O. hemionus x virginianus*	D
SMALL MAMMALS		
Chiroptera		
Keen myotis	*Myotis keeni*	E
Little brown myotis	*Myotis lucifugus*	E
Fringed myotis	*Myotis thysanodes*	E
Long-eared myotis	*Myotis evotis*	E
Long-legged myotis	*Myotis volans*	E
Small-footed myotis	*Myotis subulatus*	E
Silver-haired bat	*Lasionycteris noctivagans*	E
Red bat	*Lasiurus borealis*	E
Big brown bat	*Eptesicus fuscus*	E
Hoary bat	*Lasiurus cinereus*	E
Western big-eared bat	*Plecotus townsendi*	E
Insectivora		
Masked shrew	*Sorex cinereus*	E
Dwarf shrew	*Sorex nanus*	E
Merriam shrew	*Sorex merriami*	E
Least shrew	*Cryptotis parva*	E
Eastern mole	*Scalopus aquaticus*	D
Lagomorpha		
White-tailed jackrabbit	*Lepus townsendi*	D
Black-tailed jackrabbit	*Lepus californicus*	D
Eastern cottontail	*Sylvilagus floridanus*	D
Desert cottontail	*Sylvilagus auduboni*	D
Rodentia		
Black-tailed prairie dog	*Cynomys ludovicianus*	D
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*	D
Spotted ground squirrel	*Citellus spilosoma*	D
Least chipmunk	*Eutamias minimus*	D

SECTION 3

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Section 3

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3-29/3-30 (Revised Figure 3.2-1)

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3.2 CENTRAL PLANT, SATELLITE PLANT, WELLFIELDS, AND CHEMICAL STORAGE FACILITIES – EQUIPMENT USED AND MATERIAL PROCESSED

3.2.1 Process Plant Equipment

A general arrangement for the current main processing facility is presented in **Figure 3.2-1**. The recovery plant equipment can be placed in one of the following unit operations:

- Ion Exchange
- Filtration
- Lixiviant injection
- Elution/precipitation
- Dewatering/drying

The ion exchange system consists of eight up-flow and six down-flow ion exchange columns. The uranium loading process is continuous but the elution process is operated on a batch process. The loaded up-flow columns are eluted in place; the down-flow loaded resin is moved across a screen deck for washing before being eluted in a separate elution column.

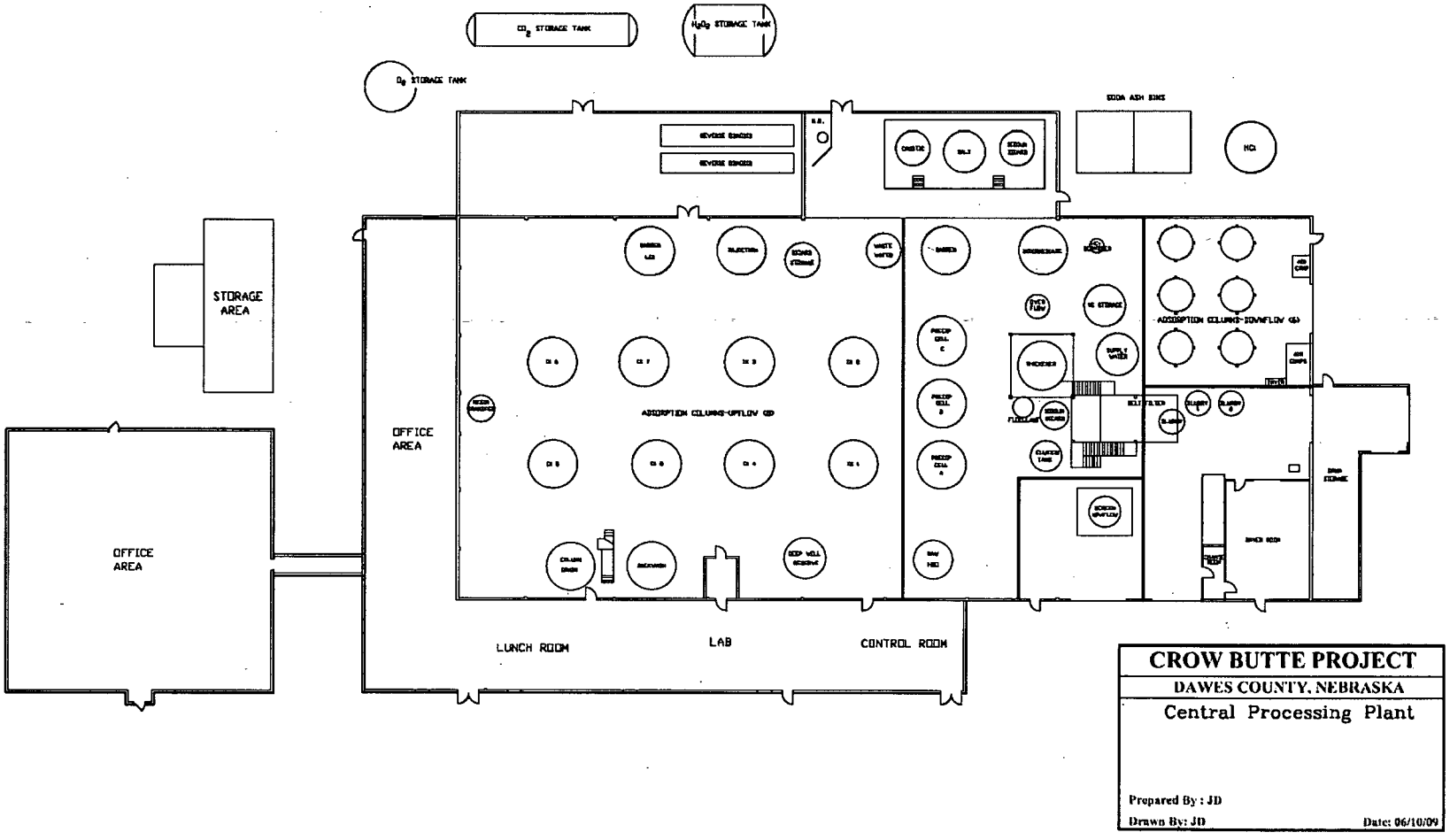
The up-flow injection filtration system consists of backwashable filters, with an option of installing polishing filters downstream. The down-flow system utilizes screens to prevent resin loss, and the resin itself acts as an injection filter, with an option of installing polishing filters downstream.

The up-flow lixiviant injection system consists of the injection surge tanks and the injection pumps. The tanks are fabricated out of FRP, and the injection pumps are centrifugal. The down-flow injection system depends on the down-hole submersible pumps to push through the sealed down-flow system and reinject the lixiviant. There is an option for in-line centrifugal booster pumps as needed to maintain pressures.

The elution/precipitation circuit consists of the barren eluant tanks and the acidizer/precipitator tanks. The barren eluant tanks and the precipitation tanks are constructed of FRP. The eluant is pumped from the barren eluant tanks to the ion exchange column that is in the elution mode. After the resin is eluted, the pregnant eluant is transferred to the acidizer/precipitator where the uranium is precipitated.

The areas in the processing plant where fumes or gases are generated are discussed in **Section 5.8**. Process tanks are vented for radon, O_2 and CO_2 removal. Building ventilation in the process equipment area is accomplished by the use of an exhaust system. This exhaust system draws fresh air in from ventilators and helps sweep radon, which can accumulate near the floor of the building, out to the atmosphere.

Figure 3.2-1: Central Processing Plant



SECTION 5

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Section 5

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5-49/5-50 (Revised Figure 5.8-5)

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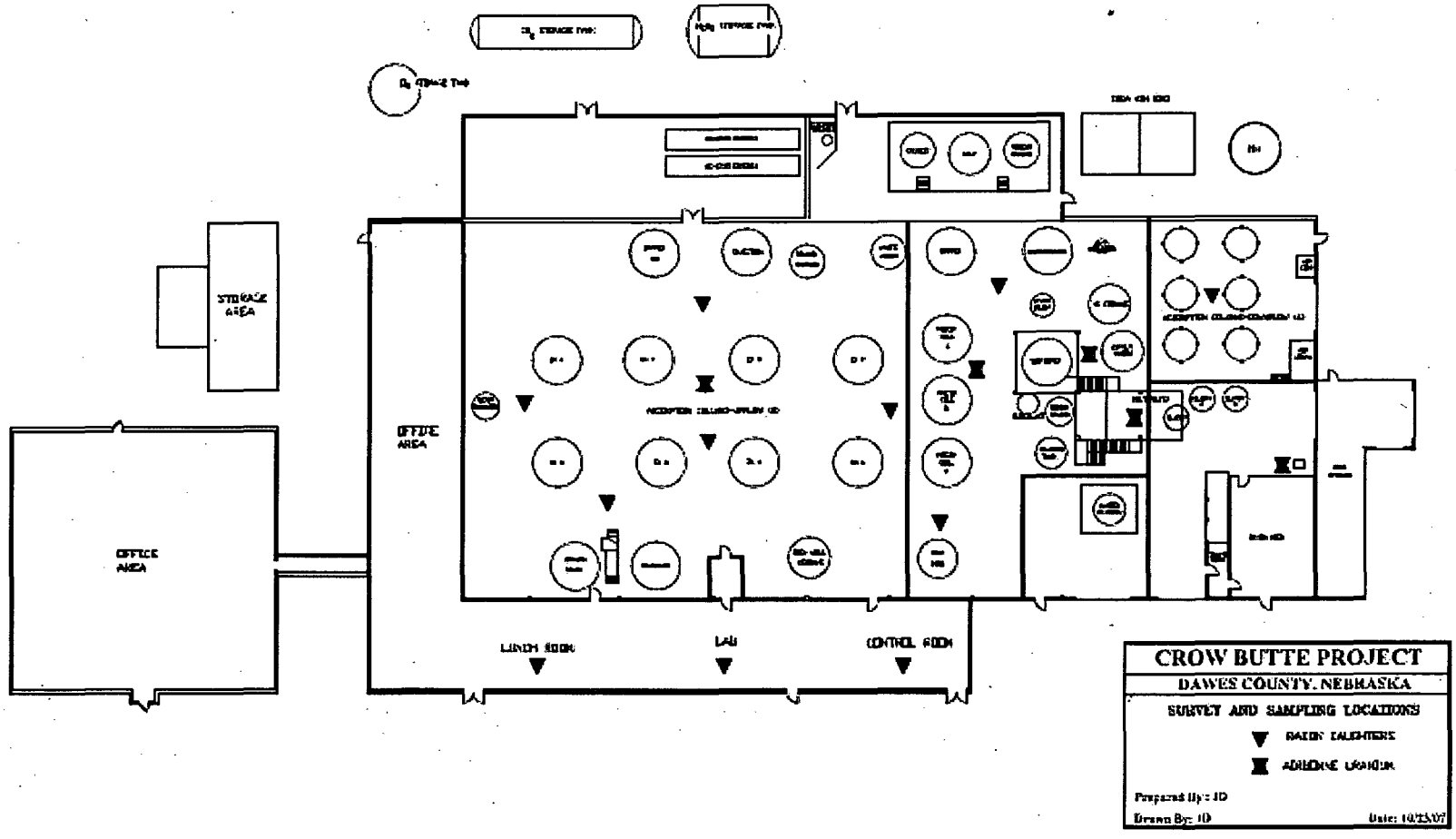
Figure 5.8-5: In-Plant Airborne Uranium Air Sampling Locations



Exposure calculations for radon daughters are based on the results of radon daughter sampling discussed below. Routine exposure is based on the monthly average of the plant radon daughter sampling. For personnel assigned full-time to the plant, a conservative occupancy time of 100 percent is used to determine exposure. For all other personnel, actual time in the plant is used for exposure calculations. Exposure received from work performed under a RWP is based on the results of monitoring performed during the work and the actual exposure times.

Samples are collected with a low-volume air pump and then analyzed with an alpha scaler using the Modified Kusnetz method described in ANSI-N13.8-1973. Air samplers are calibrated before each day's use.

Results of radon daughter sampling are expressed in WL where one WL is defined as any combination of short-lived radon-222 daughters in 1 liter of air without regard to equilibrium that emit 1.3 x 10^5 mega-electronvolt (MeV) of alpha energy. The DAC limit from Appendix B to 10 CFR §§ 20.1 - 20.601, as well as the current DAC limit from Appendix B to 10 CFR §§ 20.1001 - 20.2402, for radon-222 with daughters present is 0.33 WL. CBR has established an action level of 25 percent of the DAC or 0.08 WL. The LLD for radon measures is 0.033 WL, which is 10% of the DAC limit. Radon daughter results in excess of the action level trigger an investigation of the cause and an increase in the sampling frequency to weekly until the radon daughter levels do not exceed the action level for 4 consecutive weeks.

Historical Program Results

Radon Daughter Monitoring - Main Plant

Table 5.8-2 provides the results of monitoring for radon daughters from the period of 1995 through 2006. The annual average and maximum values are presented. The data show that the average radon daughter activity concentration at Crow Butte Uranium Project was consistently less than 25 percent of the regulatory limit.

The monthly plant average radon daughter concentrations from 1994 through 2006 averaged 0.030 WL (9 percent of DAC of 0.33 WL) with a range of 0.015 to 0.048. The average for the same period of the maximum monthly average radon concentrations was 0.049 WL (15 percent of DAC) with a range of 0.026 to 0.070 WL (8 percent and 21 percent of DAC). In 2005 and 2006, the average radon daughter concentrations were 0.015 WL (4.5 percent of DAC) and 0.020 WL (8.0 percent of DAC), respectively, with a maximum value of 0.026 WL.

SECTION 6

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The concentration of reductant injected into the formation is determined by the concentration and type of trace elements encountered. The goal of reductant addition is to reduce those minerals that are solubilized by carbonate complexes to prevent the buildup of dissolved solids, which would increase the time for restoration to be completed.

A portion of the restoration recovery water can be sent to the reverse osmosis (RO) unit. The use of a RO unit 1) reduces the total dissolved solids in the contaminated groundwater, 2) reduces the quantity of water that must be removed from the aquifer to meet restoration limits, 3) concentrates the dissolved contaminates in a smaller volume of brine to facilitate waste disposal, and 4) enhances the exchange of ions from the formation due to the large difference in ion concentration.

Before the water can be processed by the RO, soluble uranium can be removed by the IX system. The RO unit contains membranes that pass about 60 to 75 percent of the water through, leaving 60 to 90 percent of the dissolved salts in the water that will not pass the membranes. **Table 6.1-13** shows typical RO manufacturers specification data for removal of ion constituents. The clean water, called "permeate", will be re-injected, sent to storage for use in the mining process, or to the wastewater disposal system. The 25 to 40 percent of water that is rejected, called "brine", contains the majority of dissolved salts that contaminate the groundwater and is sent for disposal in the waste system. Make-up water may be added to the wellfield injection stream to control the amount of "bleed" in the restoration areas.

The reductant (either biological or chemical) added to the injection stream during the groundwater treatment stage will scavenge any oxygen and reduce the oxidation-reduction potential (Eh) of the aquifer. During mining operations, certain trace elements are oxidized. By adding a reductant, the Eh of the aquifer is lowered, thereby decreasing the solubility of these elements. Hydrogen sulfide (H_2S), sodium sulfide (Na_2S), or a similar compound will be added as a reductant. CBR typically uses sodium sulfide due to the chemical safety issues associated with proper handling of hydrogen sulfide. A comprehensive safety plan regarding reductant use is implemented.

The number of pore volumes treated and re-injected during the groundwater treatment stage will depend on the efficiency of the RO in removing TDS and the reductant in lowering the uranium and trace element concentrations. Pore volumes being used at the current CBR site are discussed at the beginning of this section.

Another potential method for groundwater treatment within the wellfield is through bioremediation. Bioremediation entails adding an organic electron donor, such as cheese whey, to the aquifer to stimulate native bacteria. As the bacteria feed on the organic media they generate a reducing environment which in turn causes most metals in solution to precipitate back to their original state. The concentration of native bacteria colonies returns to normal levels once the organic media is consumed. Crow Butte Resources, Inc. will seek approval before initiating bioremediation. CBR is currently performing a bioremediation test in the north section of Mine Unit 4, Wellhouse 9. This test is

evaluating the effectiveness of in situ bioremediation by applying it to a field scale test in a small well pattern consisting of six (6) wells. The system was installed in December, 2008, and will operate for one year and then be evaluated. The nutrient being used is Emulsified Oil Substrate (EOS), a commercial product designed for enhancing groundwater bioremediation.

Table 6.1-13: Typical Reverse Osmosis Membrane Rejection

Name	Symbol	Percent Rejection
Cations		
Aluminum	Al^{+3}	99+
Ammonium	NH_4^{+1}	88-95
Cadmium	Cd^{+2}	96-98
Calcium	Ca^{+2}	96-98
Copper	Cu^{+2}	98-99
Hardness	Ca and Mg	96-98
Iron	Fe^{+2}	98-99
Magnesium	Mg^{+2}	96-98
Manganese	Mn^{+2}	98-99
Mercury	Hg^{+2}	96-98
Nickel	Ni^{+2}	98-99
Potassium	K^{+1}	94-96
Silver	Ag^{+1}	94-96
Sodium	Na^{+}	94-96
Strontium	Sr^{+2}	96-99
Zinc	Zn^{+2}	98-99
Anions		
Bicarbonate	HCO_3^{-1}	95-96
Borate	$B_4O_7^{-2}$	35-70
Bromide	Br^{-1}	94-96
Chloride	Cl^{-1}	94-95
Chromate	CrO_4^{-2}	90-98
Cyanide	CN^{-1}	90-95
Ferrocyanide	$Fe(CN)_6^{-3}$	99+
Fluoride	F^{-1}	94-96
Nitrate	NO_3^{-1}	95
Phosphate	PO_4^{-3}	99+
Silicate	SiO_2^{-1}	80-95
Sulfate	SO_4^{-2}	99+
Sulfite	SO_3^{-2}	98-99
Thiosulfate	$S_7O_3^{-2}$	99+

Source: Osmonics, Inc.

6.2 PLANS FOR RECLAIMING DISTURBED LANDS

The following section addresses the final decommissioning methods of disturbed lands including wellfields, plant areas, evaporation ponds, and diversion ditches that will be used on the Crow Butte project sites. The section discusses general procedures to be used during final decommissioning as well as the decommissioning of a particular phase or production unit area.

Decommissioning of wellfields and process facilities, once their usefulness has been completed in an area, will be scheduled after agency approval of groundwater restoration and stability. Decommissioning will be accomplished in accordance with an approved decommissioning plan and the most current applicable NDEQ and USNRC rules and regulations, permit and license stipulations and amendments in effect at the time of the decommissioning activity.

The following is a list of general decommissioning activities:

- Plug and abandon all wells as detailed in **Section 6.2.4.**
- Determination of appropriate cleanup criteria for structures (**Section 6.3**) and soils (**Section 6.4**).
- Radiological surveys and sampling of all facilities, process related equipment and materials on site to determine their degree of contamination and identify the potential for personnel exposure during decommissioning.
- Removal from the site of all contaminated equipment and materials to an approved licensed facility for disposal or reuse, or relocation to an operational portion of the mining operation as discussed in **Section 6.3.**
- Decontamination of items to be released for unrestricted use to levels consistent with the requirements of USNRC.
- Survey excavated areas for contamination and remove contaminated materials to a licensed disposal facility.
- Perform final site soil radiation surveys.
- Backfill and recontour all disturbed areas.
- Establish permanent revegetation on all disturbed areas.

The following sections describe in general terms the planned decommissioning activities and procedures for the Crow Butte facilities. CBR will submit to the USNRC and NDEQ a detailed Decommissioning Plan for their review and approval at least 12 months before planned commencement of final decommissioning. As required by 10 CFR 40.36 (f), records of information important to decommissioning will be maintained in the office of the on-site RSO. Such information shall meet the criteria of 10 CFR 40.42 (g) (4) and (5).

6.2.1 General Surface Reclamation Procedures

The primary surface disturbances associated with solution mining are the sites containing the Central Processing Plant and associated facilities, Satellite Facilities, and evaporation ponds. Surface disturbances also occur during the well drilling program, pipeline installation, and road construction. These more superficial disturbances, however, involve relatively small areas or have short-term impacts.

The principal objective of the surface reclamation plan is to return disturbed lands to production compatible with the post mining land use of equal or better quality than the premining condition. For the License Area, the reclaimed lands should be capable of supporting livestock grazing and providing stable habitat for native wildlife species. Soils, vegetation, wildlife and radiological baseline data will be used as guidelines for the design, completion and evaluation of surface reclamation. Final surface reclamation will blend affected areas with adjacent undisturbed lands so as to re-establish original slope and topography and present a natural appearance. Surface reclamation efforts will strive to limit soil erosion by wind and water, sedimentation and re-establish natural trough drainage patterns.

The following sections provide procedural techniques for surface reclamation of all disturbances contained in the CBR mine plan. Provided are reclamation procedures for the facility sites, wellfield production units, evaporation ponds, and access and haul roads. Reclamation schedules for wellfield production units will be discussed separately because they are dependent upon the progress of mining and the successful completion of groundwater restoration. Cost estimates for bonding calculations are discussed in **Section 6.6** and include all activities that are anticipated to complete groundwater restoration, decontamination, decommissioning, and surface reclamation of wellfield and satellite plant facilities installed. These cost estimates are updated annually to cover work projected for the next year of mining activity.

6.2.1.1 Topsoil Handling and Replacement

In accordance with NDEQ requirements, topsoil is salvaged from building sites (including Satellite buildings) and pond areas. Conventional rubber-tired, scraper-type earth moving equipment is typically used to accomplish such topsoil salvage operations. The exact location of topsoil salvage operations is determined by wellfield pattern emplacement and designated wellfield access roads within the wellfields, which are determined during final wellfield construction activities.

As described in **Section 2.6**, topsoil thickness varies within the current License Area. Topsoil thickness is usually greatest in and along drainages where material has been deposited and deep soils have developed. Therefore, topsoil stripping depths may vary in depth, depending on location and the type of structure being constructed. In cases where it is necessary to strip topsoil in relatively large areas, such as a major road or building site, field mapping and Soil Conservation Service Soil Surveys will be utilized to determine approximate topsoil depths.

Salvaged topsoil is stored in designated topsoil stockpiles. These stockpiles are generally located on the leeward side of hills to minimize wind erosion. Stockpiles are not located in drainage channels. The perimeter of large topsoil stockpiles may be bermed to control sediment runoff. Topsoil stockpiles are seeded as soon as possible after construction with the permanent seed mix to promote stability and minimize erosion.

During mud pit excavation associated with well construction, exploration drilling and delineation drilling activities, topsoil is separated from subsoil with a backhoe. When use of the mud pit is complete, all subsoil is replaced and topsoil is applied. Mud pits generally remain open a short time. The success of revegetation efforts at the current site show that these procedures adequately protect topsoil and result in vigorous vegetation growth.

6.2.1.2 Contouring of Affected Areas

Due to the relatively minor nature of disturbances created by in-situ mining, there are only a few areas disturbed to the extent to which subsoil and geologic materials are removed, causing significant topographic changes that need backfilling and recontouring. Generally speaking, solar evaporation pond construction results in redistribution of sufficient amounts of subsurface materials, which requires replacement and contour blending during reclamation. The existing contours will only be interrupted in small, localized areas. Because approximate original contours will be achieved during final surface reclamation, no post mining contour maps have been included in this application.

Changes in the surface configuration caused by construction and installation of operating facilities will be only temporary, during the operating period. These changes will be caused by topsoil removal and storage along with the relocation of subsoil materials used for construction purposes. Restoration of the original land surface, which is consistent with the pre- and post-mining land use, the blending of affected areas with adjacent topography to approximate original contours and the reestablishment of drainage patterns will be accomplished by returning the earthen materials moved during construction to their approximate original locations.

Drainage channels that have been modified by the mine plan for operational purposes such as road crossings will be reestablished by removing fill materials, culverts and reshaping to as close to pre-operational conditions as practical. Surface drainage of disturbed areas that have been located on terrain with varying degrees of slope will be accomplished by final grading and contouring appropriate to each location so as to allow for controlled surface run off and eliminate depressions where water could accumulate.

6.2.1.3 Revegetation Practices

Revegetation practices are conducted in accordance with NDEQ requirements. During mining operations the topsoil stockpiles, and as much as practical of the disturbed wellfield and pond areas, will be seeded with vegetation to minimize wind and water erosion. After placement of topsoil and contouring for final reclamation, an area will

normally be seeded with a seed mixture developed in consultation with the Natural Resource Conservation Service as required by the NDEQ.

6.2.2 Process Facility Site Reclamation

Following removal of structures as discussed in **Section 6.3**, subsoil and stockpiled topsoil will be replaced on the disturbances from which they were removed during construction, within practical limits. Areas to be backfilled will be scarified or ripped prior to backfilling to create an uneven surface for application of backfill. This will provide a more cohesive surface to eliminate slipping and slumping. The less suitable subsoil and unsuitable topsoil, if any, will be backfilled first so as to place them in the deepest part of the excavation to be covered with more suitable reclamation materials. Subsoils will be replaced using paddle wheel scrapers, bulldozers or other appropriate equipment to transfer the earth from stockpile locations or areas of use and to spread it evenly on the ripped disturbances. Grader blades may be used to even the spread of backfill materials. Topsoil replacement will commence as soon as practical after a given disturbed surface has been prepared. Topsoil will be picked up from storage locations by paddle wheel scrapers or other appropriate equipment and distributed evenly over the disturbed areas. The final grading of topsoil materials will be done so as to establish adequate drainage and the final prepared surface will be left in a roughened condition.

6.2.3 Evaporation Pond Decommissioning

6.2.3.1 Disposal of Pond Water

The volume of water remaining in the lined evaporation ponds after restoration as well as its chemical and radiological characteristics will be considered to determine the most practical disposal program. Disposal options for the pond liquid include evaporation sprays, treatment and disposal in the deep well, or transportation to another licensed facility or disposal site. Currently, there are no plans for treating and discharging the pond water under an NPDES permit.

6.2.3.2 Pond Sludge and Sediments

Pond sludges and sediments will contain mining process chemicals and radionuclides. Wind blown sand grains and dust blown into the ponds during their active life also add to the bulk of sludges. This material will be contained within the pond bottom and kept in a dampened condition at all times, especially during handling and removal operation to prevent the spread of airborne contamination and potential worker exposure through inhalation. Dust abatement techniques will be used as necessary. The sludge will be removed from the ponds and loaded into roll off containers, dump trucks or drums and transported to a USNRC licensed disposal facility.

6.2.3.3 Disposal of Pond Liners and Leak Detection Systems

Pond liners will be kept washed down and intact as much as practical during sludge removal so as to confine sludges and sediments to the pond bottom. Pond liners will be