

CROW BUTTE RESOURCES, INC.

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September 12, 2000

U.S. Nuclear Regulatory Commission
Mr. Philip Ting, Chief
Fuel Cycle Licensing Branch
Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety and Safeguards
Mail Stop T8A-33
Washington, D.C. 20555-0001

Re: Source Materials License SUA-1534
Docket No. 40-8943
Request to Amend License Condition 10.7

Dear Mr. Ting:

Crow Butte Resources, Inc. (CBR) is providing this letter to request an amendment to Source Materials License SUA-1534 for the Crow Butte Uranium Project. Specifically, License Condition 10.7 states the following:

"All liquid effluents from process buildings and other process waste streams, with the exception of sanitary wastes, shall be returned to the process circuit; discharged to the solar evaporation ponds; disposed by land irrigation in accordance with the licensee's proposal submitted on August 3, 1988 as modified by its submittal on June 7, 1993; or deep well injected in accordance with the licensee's report submitted on August 24, 1993, as modified by submittals dated December 7, 1995 and April 3, 1996"

CBR has requested a modification to the Class I Underground Injection Control (UIC) permit issued by the Nebraska Department of Environmental Quality (NDEQ) concerning operation of the deep disposal well. Enclosed please find a copy of a report prepared that summarizes the requested changes to the Class I UIC permit. The report also contains a copy of the NDEQ public notice, Fact Sheet, Frequently Asked Question sheet, and the draft Class I UIC permit.

NDEQ is currently in the process of providing public notice on the proposed modifications to the permit. When this process is complete (within the next 60 days), the

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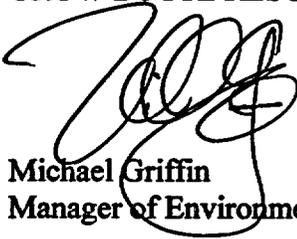


Mr. Philip Ting
September 12, 2000
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final modified permit will be issued. At that time, amendment to License Condition 10.7 will be necessary to allow CBR to meet the provisions of the new permit.

If you have any questions concerning this amendment request, please do not hesitate to contact me at (308) 665-2215.

Sincerely,
CROW BUTTE RESOURCES, INC.



Michael Griffin
Manager of Environmental and Regulatory Affairs

Attachments: As Stated

cc: Mr. Steve Collings – CBR, Denver, Colorado
Mr. David Miesbach –UIC Program Coordinator, NDEQ, Lincoln, Nebraska
Mr. William Ford – NRC Project Manager
Mr. Hal Demuth – Harlan and Associates, Inc., Denver, Colorado

CROW BUTTE RESOURCES, INC.



**CROW BUTTE URANIUM PROJECT
DEEP DISPOSAL WELL
UNDERGROUND INJECTION CONTROL PERMIT
MODIFICATION REPORT**

Prepared in Support of NRC License Amendment Request

Source Materials License SUA-1534

September 12, 2000

**Prepared By: Crow Butte Resources, Inc.
P.O. Box 169
Crawford, Nebraska 69339**

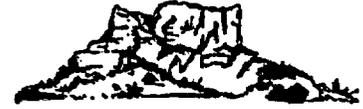


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Number NE0206369**



1 INTRODUCTION

This report has been prepared in support of a request submitted to the U.S. Nuclear Regulatory Commission (NRC) by Crow Butte Resources, Inc. (CBR) for an amendment to Source Materials License SUA-1534. This amendment is necessary due to a planned modification to the existing Class I Underground Injection Control (UIC) permit issued by the Nebraska Department of Environmental Quality (NDEQ). The permit (number NE0206369) authorizes the operation of a non-hazardous Class I deep disposal well (DDW) to dispose of process and restoration waste water (hereafter referred to as "process water") from CBR's Crow Butte Uranium Project into the Morrison and Sundance Formations. The original permit issued in June 1995 has been modified twice in the past (April 1996, and October 1997). SUA-1534, License Condition 10.7 specifies that liquid effluents be disposed in approved manners including *"...deep well injected in accordance with the licensee's report submitted on August 24, 1993, as modified by submittals dated December 7, 1995 and April 3, 1996"*. In order for CBR to comply with the proposed NDEQ permit when it is issued, an amendment to License Condition 10.7 is necessary.

The permit modifications requested by CBR and proposed in the Draft Class I UIC Permit (contained in Appendix A) are summarized below.

- Removal of the injection flow rate and volume limitations. The draft permit will allow CBR to operate the well at any flow rate that can be achieved without exceeding the maximum surface injection pressure limitation. The current injection pressure limit of 650 psi will remain a condition of the permit.
- Modify the operational parameters and limitations contained in Part II of Permit NE0206369. The draft permit will change the sampling frequency, limitations and analytical requirements for certain monitoring parameters. The draft permit will also add certain parameters to ensure that the waste stream is not a hazardous waste. Other proposed changes to Part II would create more consistent analysis and data reporting requirements.
- Modify the construction requirements for the Class I injection well contained in Part VII of Permit NE0206369. The draft permit will provide general specifications to allow the use of different size and manufacturer of completion materials (e.g., the injection tubing and packer), rather than the specific construction information currently contained in Part VII of the permit.

The requested modifications to the permit will not affect CBR's compliance with federal or state regulations. Further, the requested modifications are consistent with the protection of Underground Sources of Drinking Water (USDW) as specified under the Safe Drinking Water Act (SDWA).



2 BACKGROUND

2.1 DESCRIPTION OF THE FACILITY AND CURRENT OPERATIONS

The Crow Butte Project is an in-situ leach (ISL) solution mining operation to recover uranium from the basal sandstone of the Chadron Formation. The Crow Butte Uranium Mine is located in Dawes County in northwestern Nebraska, 4.2 miles southeast of the City of Crawford. Existing facilities at the mine include in-situ injection and production wells, a water treatment plant to recover uranium and pre-treat the mining water prior to injection in the mining zone, three commercial evaporation ponds, a research and development plant (now used for wellfield restoration) with two associated evaporation ponds, and the DDW. In-situ mining operations are conducted in accordance with Source Materials License SUA-1534 issued by the NRC and a Class III UIC permit (number NE0122611) issued by the NDEQ.

The Class I DDW is used to dispose of excess process water from mining operations. The waters requiring disposal originate from multiple process streams that are summarized here and described in detail in Section 2.4. On-site treatment and subsequent re-injection of the fluids produced during normal in-situ operations results in a minimal consumptive use or "bleed" from the mining operation. This small bleed stream is typically injected in the DDW. Excursion control efforts can require significantly higher bleed rates. A larger bleed volume is also generated during the aquifer restoration phase for each mining unit due to groundwater sweep efforts. An additional volume of wastewater is generated from the brine stream produced by the reverse osmosis units that are used for groundwater treatment during restoration. As noted, the majority of these bleed and brine streams are currently injected in the DDW. Any remaining wastewater, above the current permitted capacity of the DDW, is placed in the commercial evaporation ponds located within the permit area.

Commercial mining operations, including on-going groundwater restoration, are anticipated to last for 24 years followed by four years of aquifer restoration, resulting in an estimated project life of 28 years. As shown in Table 1, commercial mining operations started in April 1991, and aquifer restoration activities commenced in 1994. Since the deep well injection operations began in the fourth year (August 1995), the estimated remaining life of the DDW is 20 years.



**TABLE 1
MINING AND RESTORATION SCHEDULE
CROW BUTTE URANIUM PROJECT**

Calendar Year	Operational Year	Average Mining Flow ² (gpm)	Average Restoration Flow (gpm)
1991 ¹	1	1150	0
1992	2	1950	0
1993	3	2740	0
1994	4	3170	250
1995	5	3500	450
1996	6	3600	425
1997	7	3842	420
1998	8	4375	450
1999	9	4378	180
2000	10	4830	670
2001	11	4830	670
2002	12	4830	670
2003	13	4830	670
2004	14	4830	670
2005 – 2015	15 – 25	4830	670
2016	26	0	670
2017	27	0	670
2018	28	0	670

Notes:

- ¹ Commercial mining operations began in April 1991.
- ² Mining and restoration flowrates for 1991 through 1999 are actual flowrates; 2000 through 2018 flow rates are projected based upon permitted flows and current mining plans.



2.2 HISTORY OF THE CLASS I DEEP DISPOSAL WELL

CBR received final approval to operate the Class I DDW from NDEQ in June 1995. The initial permit allowed for disposal to the Jurassic Sundance Formation (HAI, 1995a). Subsequently, CBR submitted a permit modification request to add the Morrison Formation as a disposal zone (HAI, 1995b). That request was approved by NDEQ in April 1996 and incorporated in SUA-1534 by NRC in July 1996.

During the re-completion operations, a bridge plug was placed above of the Sundance Formation perforations to isolate the Morrison Formation and allow testing of that zone. Because (1) sand produced from the Morrison Formation fell on top of the bridge plug, and (2) the Morrison appeared to have a disposal capacity greatly in excess of the underlying Sundance, the bridge plug was left in the well. As such, the Sundance Formation is isolated from the Morrison, and all the injected fluids are received by the Morrison Formation completion (HAI, 1996).

2.3 REGULATORY BASIS FOR THE AMENDMENT REQUEST

Disposal by deep well injection must meet applicable federal and state regulatory requirements. In particular, disposal must satisfy the United States Environmental Protection Agency (EPA) provisions in 40 CFR Part 146, Underground Injection Control (UIC) Program Criteria and Standards and must be in accordance with necessary permits from EPA and/or States authorized by EPA to enforce these provisions. Deep well injection is regulated in Nebraska under Title 122, Rules and Regulations for Underground Injection and Mineral Production Wells (NDEQ, 1990). The draft permit will continue to meet the requirements of the UIC Program promulgated by the NDEQ.

Deep well injection of effluents containing licensed materials at the Crow Butte project was originally approved by NRC in Amendment 24 to SUA-1534 issued on October 4, 1994. Approval was subject to issuance of the required Class I UIC Permit, which was issued by the State of Nebraska on June 20, 1995. The permit was issued based upon a finding by the NDEQ that the potential for contamination of other usable aquifers by deep well injection was minimal. Based upon these findings by the NDEQ, the NRC staff considered the potential impacts to members of the public from license material to be minimal (NRC, 1997). NRC confirmed these findings at the time that SUA-1534 was renewed in 1998 (NRC, 1998).

Disposal by deep well injection must meet the regulatory requirements of 10 CFR Part 20, Subpart K. Specifically, 10 CFR §20.2002 requires that the licensee provide a description of the waste, the proposed manner and conditions of disposal, an analysis and evaluation of the nature of the environment, information on the location and nature of other potentially affected facilities, and a demonstration that doses are as low as reasonably achievable (ALARA) and within the dose limits



of 10 CFR §20.1301. NRC guidance in meeting these requirements is contained in NRC's *Staff Technical Position on Effluent Discharge at Licensed Uranium Recovery Facilities*.

All of the technical information required by 10 CFR §20.2002 is identical to that previously submitted to NRC. The principle modification to the permit will allow disposal of greater volumes of wastewater than currently allowed. The proposed modifications will not change the general composition of the injected fluid or the focus of the DDW monitoring program required under the Class I UIC permit. The proposed changes are supportable due to the level of confidence with regard to the superior characteristics of the Morrison Formation. That level of confidence is greater because the DDW has been operated in the Morrison Formation for over three years. As such, CBR does not anticipate any operational, design, or regulatory problems associated with the requested amendment.

2.4 STATEMENT OF NEED FOR REMOVAL OF INJECTION RATE LIMITATION

The draft permit will remove the injection rate and volume limitations from the Class I permit because the projected future disposal requirements exceed the existing permit limitation. The origin and projected volumes (rates) of the wastewater that require disposal are discussed below.

As mentioned previously, the majority of the wastewater from CBR's current operations is disposed to the DDW. The composite disposal stream consists of fluid from three different processes:

- The production bleed waste stream is the fraction of the total production flow that is removed from the mining circuit and sent to the disposal system. The purpose of the production bleed is to maintain a slight overproduction to contain mining solutions within the mining zone. The production bleed is routinely maintained at approximately 0.5 to 1.0 percent of the total production flow. However, production bleed rates of up to 5 percent may be necessary for short periods for excursion control purposes. As shown in Table 1, the projected production flowrate for operational years 10 through 25 is based upon the permitted production flowrate of 4,830 gpm¹. With this total production flow, the production bleed would routinely range from 24 to 48 gpm. During cases where excursion recovery efforts were necessary, production bleed flowrates of up to 5 percent of total flow could exceed 200 gpm.
- The groundwater sweep step of restoration involves recovery of affected groundwater within and around the mining zones. During groundwater sweep, water is pumped without injection from the wellfield, causing an influx of baseline quality water from the perimeter of the mining unit that sweeps the affected portion of the aquifer. The plume of affected water near

¹ Note that SUA-1534 allows a maximum flow of 5,000 gpm, exclusive of restoration flow. However, Class III UIC Permit NE0122611 limits total production flow to 4,830 gpm.



the edge patterns of the wellfield is also drawn into the boundaries of the mine unit. The volume and flowrate of groundwater sweep depends on the size and shape of the mine unit in restoration. Since the number of production pumps that are placed in service at a given time controls the groundwater sweep flowrate, the disposal stream may be varied to remain within disposal capacities. However, the total volume of groundwater sweep is dependent upon the pore volume of the affected aquifer. Therefore, the amount of time required to complete groundwater sweep is inversely related to the flowrate.

- The reverse osmosis brine waste stream is a portion of the restoration recovery water that is sent to the reverse osmosis unit for treatment. The reverse osmosis system concentrates the dissolved constituents from the affected aquifer in a smaller volume of brine to facilitate disposal. The reverse osmosis unit passes about 75 percent of the water through the membranes. This “permeate” is reinjected in the wellfield under restoration. The waste stream, referred to as “brine”, contains the majority of the dissolved salts that affect the groundwater in the mining zone and is sent for disposal to the wastewater system. As shown in Table 1, the projected restoration flowrate for operational years 10 through 25 is based upon the permitted restoration flowrate of 670 gpm². Based upon this total restoration flowrate, the reverse osmosis bleed at 25 percent of the total flow could range up to 168 gpm.

At full production and restoration flowrates, as allowed in the Class III UIC Permit, the required waste disposal capacity for production bleed and reverse osmosis brine is over 210 gpm. At times when excursion control efforts are necessary, an additional 175 gpm of disposal capacity could be necessary.

Historically, CBR has maintained the DDW flowrates within the current average and maximum flowrate limits from the Class I UIC Permit (75 and 100 gpm, respectively) through a variety of operational methods. The principal operational methods used to control the waste flowrate to the DDW include the following:

- The production bleed is maintained at the lowest possible flowrate to minimize the volume of this waste stream while maintaining control of mining solutions. The bleed has been typically maintained at approximately 0.5 percent of the production flowrate.
- The reverse osmosis system, as currently operated, is rated at 300 gpm with a potential brine stream flowrate of 75 gpm. An additional 100 gpm of reverse osmosis capacity is available and could be added to the total unit capacity by the installation of the membranes, increasing available total reverse osmosis capacity to 400 gpm, which would result in a potential brine stream flowrate of 100 gpm. However, the system is currently operated at flows below the rated capacity to remain below the existing disposal rate limit in the Class I permit.

² Note that Class III UIC Permit NE0122611 allows a maximum restoration flow of 670 gpm. SUA-1534 provides no limitation for restoration flow.



- Sequencing the mining patterns in active restoration is used to remain within the Class I injection rate limit by controlling the groundwater sweep and groundwater treatment (i.e., reverse osmosis brine) waste stream flowrate. The groundwater sweep volume is also limited by using groundwater transfer whenever possible. This method of restoration involves transferring groundwater from an area in restoration to a new mining area. When groundwater transfer cannot be employed, the waste stream produced during groundwater sweep must be disposed in the DDW.
- Excess excursion control flows have been used in the past to displace native groundwater in new mining areas.
- Remaining waste disposal flows that cannot be sent to the DDW due to flow limitations are sent to the commercial evaporation ponds.

The efforts described above have been successful in maintaining the total disposal flowrate sent to the DDW below the rate and volume limitations in the Class I permit. However, as production and restoration flows have increased, the disposal flowrates have also increased. The disposal flow control efforts discussed above negatively affect the pace of restoration efforts and limit the actions that are available to CBR for wellfield balancing and excursion control.

Mine Units 2 and 3 are currently under active restoration. As restoration activities progress in the future to Mine Units that are currently in operation, the size and shape of these Mine Units will result in larger volumes of groundwater sweep and reverse osmosis brine waste streams that must be handled. To facilitate mining and aquifer restoration activities in the future, CBR believes that the waste stream requiring disposal in the DDW will range from average flowrates of 200 to 400 gpm.

Based upon the experience gained with the DDW since completion in the Morrison Formation, the disposal well can accept 300 gpm, or more, with the installation of larger injection tubing. This level of disposal capacity would meet the current waste disposal needs generated by the activities permitted in the Class III UIC permit and Source Materials License SUA-1534. The availability of this additional disposal capacity would allow CBR to efficiently proceed with restoration efforts and have more flexibility to control mining solutions in the active Mine Units. Since the remaining capacity in the current evaporation ponds is ultimately limited, an alternative to DDW disposal of higher waste stream flowrates would be the construction of additional evaporation ponds. However, the construction of additional evaporation capacity is not cost effective or desirable from an environmental standpoint.

The UIC Program requires that the DDW be operated in a manner that will prevent fractures in the confining zones and ensure that injected fluids do not migrate into a USDW. The draft modifications to the Class I UIC permit would prevent fractures in the underlying and overlying confining zones by retaining the current injection pressure limitation.



The focus of the NDEQ UIC regulations is to prevent injected fluids or the fluids in the disposal zone from migrating to a USDW. Since the Morrison Formation is not a USDW, neither the amount (volume) of fluid disposed to the Morrison, or the rate at which the fluid is injected, affects the degree to which a USDW is protected. For these reasons, the draft permit will remove the injection rate (volume) limitation from the permit. Since the injection pressure can affect the integrity of the disposal zone and/or the confining zones, a maximum injection pressure is specified in the Class I permit. The current maximum pressure limit of 650 psi will remain as a limitation in the modified permit. The DDW will be operated based on this pressure limitation. These issues are discussed in more detail in Section 3.1.



3 MODIFICATIONS TO PERMIT REQUIREMENTS

3.1 FLOW LIMITATION MODIFICATIONS

The draft permit will remove limitations on the maximum daily volume of waste injected as well as the average and maximum injection flow rates. These limitations are intended to protect the formation from fracture and prevent injected solutions from affecting a USDW. The draft permit will continue to meet these requirements by retaining the limitation on surface injection pressure.

In support of the removal of the flow limitations, CBR submitted to NDEQ a detailed analysis of the impact of a potential wastewater flowrate of 400 gpm. The results of annual falloff tests performed on the well in accordance with the UIC permit indicate that the formation permeability is approximately 1,000 md (4.84 ft/d). Using the Theis Equation the injection capacity of the Morrison Formation was estimated to be approximately 300 gpm. The pressure response in the Morrison Formation after 20 years of injection at 300 gpm was calculated using the Theis equation for increasing radial distances from the injection well. The calculations indicate that the pressure increase due to injection is only 75 psi (172 feet of head) at a distance of 1 mile from the injection well.

The Zone of Endangering Influence (ZOEI) is defined as that radial distance from the well where the increase in Morrison Formation pressure could cause migration of injection fluids to a USDW, namely, the Brule or Chadron Formations. Data from current CBR mining operations in the Chadron Sandstone indicate that the total potentiometric head (e.g., the sum of the pressure and elevation head values) in the Chadron is 3750 feet AMSL; historical testing data indicate that the head in the Morrison Formation is 2420 feet AMSL. As such, a head (or pressure) increase due to injection of 1330 feet (580 psi using the Morrison gradient of 0.437 psi/ft), would be required for injection fluids to migrate to the Chadron Sandstone. Based on these data and the pressure response calculations (300 gpm for 20 years), a maximum pressure increase of only 251 psi (576 feet of head) will occur at the well. Thus, fluid migration from the injection zone to the USDW cannot occur at the well, or any distance from the well. Hence, for an average injection rate of 300 gpm, the ZOEI is zero. For an injection rate of 400 gpm, the pressure increase at the well is calculated to be 335 psi (768 feet). As such, the ZOEI for 400 gpm is also zero.

The maximum allowable surface injection pressure (MSIP) is determined as follows:

$$MSIP = \text{fracture pressure} + \text{friction loss} - \text{hydrostatic head}$$

The friction loss in the injection tubing (assumed to be a new string of 3 ½" tubing) at 300 gpm was calculated to be 312 psi. The hydrostatic head is represented by the current injection stream



(e.g., 30,000 mg/l TDS fluid with a corresponding density of 8.4 pounds per gallon). The fracture pressure in the Morrison Formation was estimated, based on regional information and pressures induced during the 7-inch casing cement job, to be 2148 psi. As shown below, the resulting MSIP at 300 gpm is 896 psig.

$$MSIP = 2148 + 312 - 1564 = 896 \text{ psig}$$

Note that due to the friction loss at 300 gpm (312 psi), the calculated MSIP (896 psig) is greater than the maximum surface pressure allowed under the permit (650 psi). The well will continue to be operated in accordance with the existing permit limit of 650 psi. This is a conservative approach, considering the existing needs for disposal and the well capacity.

3.2 MONITORING MODIFICATIONS

Part II of the Class I permit contains monitoring, reporting, and testing requirements. The permit currently requires the analysis of a list of twelve water quality parameters. Each of these parameters (with the exception of temperature) currently has a corresponding injection limitation. The draft permit will remove temperature from the list of monitored parameters. Six new monitored parameters will be added. Other changes to the monitoring program in the draft permit will provide more consistent and representative monitoring results and remove some requirements to prevent reporting duplicate data.

3.2.1 Water Quality Parameters and Limitations

Permit NE0206369 currently requires that CBR monitor the injected solutions for twelve parameters (chloride, sulfate, sodium, alkalinity, pH, temperature, arsenic, barium, radium, selenium, uranium, and vanadium). The required frequency for the general water quality monitoring is weekly with reporting of a monthly average or composite value for each specific parameter.

The draft permit will make the following changes to the monitoring program:

- The requirement for analysis for temperature will be removed;
- The limitations for pH will be modified;
- Monitoring for calcium, cadmium, chromium, lead, mercury, and silver will be added as a permit condition;
- Limitations for the eight "RCRA Metals" will be set at the toxicity concentration limit; and



- Analysis type for water quality parameters (with the exception of pH) will change from a monthly average to a monthly composite of weekly samples.

The reasons for the proposed changes are discussed in the following sections.

3.2.1.1 Elimination of Monitoring for Temperature

Monitoring for temperature is removed because it is not a meaningful parameter to characterize the injected solutions.

3.2.1.2 Modification of pH Limitation

The regulatory basis for the pH limitation is to ensure that the injected solutions do not constitute a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) in 40 CFR §261.3 and in Nebraska's implementing regulations contained in Title 128, Rules and Regulations Governing Hazardous Waste Management in Nebraska. One classification of a RCRA hazardous waste is a waste that exhibits the characteristic of corrosivity as defined by a pH of less than 2.0 standard units (S.U.) or greater than 12.5 S.U. The current pH limitation is 5.0 to 8.5 S.U. CBR is permitted to operate a Class I (i.e., non-hazardous) disposal well. Therefore, the pH of the injected solutions must be greater than 2.0 and less than 12.5 S.U. to be classified as a non-hazardous waste. In this regard, a new pH injection limitation of 5.0 to 9.5 S.U. will provide adequate assurance that the injection stream is not a hazardous waste due to the characteristic of corrosivity while providing CBR with additional operational flexibility based upon the operating characteristics of the process plant.

3.2.1.3 Parameter and Limitation Additions to Monitoring List

The draft permit will require monitoring for calcium as an additional operational parameter. Calcium will not have an operational limitation associated with it since it is monitored for well operational information purposes only.

The draft permit will require monitoring of cadmium, chromium, lead, mercury, and silver in addition to the current parameters. The purpose for adding these five metals is to ensure that the waste stream does not constitute a hazardous waste. Title 128 in part defines a hazardous waste as a waste exhibiting the characteristic of toxicity if it contains specified contaminants in excess of regulatory levels (Title 128, Chapter 3, Section 010). These specified contaminants include eight metals. Of these eight metals, CBR currently monitors three (i.e., arsenic, barium, and selenium). The draft permit will add the other five "RCRA metals" to the monitored parameter list.



In order to ensure that the waste injected by CBR is not a hazardous waste for the contaminants that exhibit toxicity, the limitations set in the permit will correspond to those set in Title 128. To accomplish this, the limits for the three metals currently contained in the permit will be modified to match the RCRA toxicity concentrations from Table 3 of Title 128, Chapter 3. The limitations for the five additional metals will be set at their respective RCRA toxicity concentrations. Specifically, the draft permit sets the following limitations for the eight RCRA metals:

<u>RCRA Metal</u>	<u>Limitation (mg/l)</u>
Arsenic	5.0
Barium	100
Cadmium	1.0
Chromium	5.0
Lead	5.0
Mercury	0.2
Selenium	1.0
Silver	5.0

The implementation of these limitations from Title 128 for the toxicity contaminants will ensure that CBR does not inject a hazardous waste without the appropriate permit.

3.3 CONSTRUCTION MODIFICATIONS

Part VII of the Class I permit contains well construction requirements. The permit currently lists construction information based upon the as-built condition of the well. The draft permit has been modified to allow use of different tubing materials. This change will allow CBR to change the size of the tubing string in the future, if desired.



4 REQUESTED ACTION

CBR requests that NRC amend License Condition 10.7 of SUA-1534 to incorporate the draft Class I UIC Permit as an approved method of disposal for liquid effluents. As required under NDEQ UIC regulations, CBR has shown that the increased volume of liquid effluent that may potentially be disposed under the draft permit will not endanger a USDW. All other information required under 10 CFR §20.2002 remains unchanged by the draft permit.

The alternative to amendment of SUA-1534 to incorporate the draft permit would be denial of the amendment request. CBR would be required to continue to operate under the current permit conditions. As a result, CBR would find it necessary to continue to limit discharge rates to the DDW. Since the production bleed is determined by wellfield operational requirements, continued restrictions on the pace of wellfield restoration would be required to continue to meet the current flow limitations. Alternatively, CBR would have the option to build additional evaporation capacity. CBR does not believe that slowing the pace of restoration efforts and/or building additional evaporation capacity are desirable from an environmental standpoint.



5 REFERENCES

Harlan & Associates, Inc., 1995a; *Completion of Construction Report, Crow Butte Resources UIC Well*, April 11, 1995.

Harlan & Associates, Inc., 1995b; *Engineering Report in Support of the Request for Modification of Class I UIC Permit*, December 6, 1995.

Harlan & Associates, Inc., 1996; *Completion of Construction Report, Crow Butte Resources UIC Well*, June 6, 1996.

US Nuclear Regulatory Commission, 1997; *Supplemental Environmental Assessment for Crow Butte Resources, Inc.'s Crow Butte In-Situ Leach Mining Project, Dawes County, Nebraska*.

US Nuclear Regulatory Commission, 1998; *Environmental Assessment for Renewal of Source Materials License SUA-1534, Crow Butte Resources, Inc., Crow Butte Uranium Project, Dawes County, Nebraska*, February 1998.

CROW BUTTE RESOURCES, INC.



APPENDIX A

**Draft Modification to Class I
Underground Injection Control Permit
Number NE0206369**

PUBLIC NOTICE OF PERMIT MODIFICATION
Nebraska Department of Environmental Quality
Water Quality Division

Pursuant to Title 122, Rules and Regulations for Underground Injection and Mineral Production Wells, Chapter 27, 31,32, and 33, the Nebraska Department of Environmental Quality is proposing to modify permit number NE0206369 to Crow Butte Resources, Inc. (CBR). CBR operates a deep injection well designed to accept waste fluids generated at its in-situ uranium mining operation. The injection well is located in the Northwest Quarter of Section 19, Township 31 North, Range 51 West, Dawes County, Nebraska.

The Department is proposing to modify the existing permit by removing the injection limitations on flow rate. The limitation for pH is proposed to be changed from 5.0 – 8.5 to 5.0 – 9.5. Reporting for the temperature of the waste stream is proposed to be removed. The limitations for arsenic, barium, and selenium are proposed to be changed from 1 mg/l to 5 mg/l, 20 mg/l to 100 mg/l, and 2 mg/l to 1 mg/l, respectively. Testing for calcium is proposed to be added to the injection parameters with no injection limitation. Testing for cadmium, chromium, lead, mercury, and silver is proposed to be added with limitations of 1 mg/l, 5 mg/l, 5 mg/l, 0.2 mg/l, and 5 mg/l respectively.

In addition, the permit is proposed to be modified to incorporate several well construction changes, which will allow more flexibility for CBR during routine well maintenance activities.

The formations receiving injected waste fluids are restricted to the Morrison and Sundance Formations, which have been demonstrated to be located below the lowermost underground source of drinking water. In addition, the Morrison and the Sundance Formations exhibit water quality that is considered unacceptable under State and Federal Regulations as underground sources of drinking water due to naturally high concentrations of total dissolved solids. The Department believes that the proposed permit modifications will fully protect the injection zone against formation fractures.

The permit requires the operator to monitor concentrations of specific parameters in the injection fluids to insure that only non-hazardous wastes are being injected. In addition, the injection well will be monitored on a continuous basis to record the injection process and ensure compliance with permit conditions.

Persons may request a fact sheet, may comment upon or object to permit modification, or may request a public hearing by writing to Michael J. Linder, Director, Nebraska Department of Environmental Quality, P.O. Box 98922, Lincoln, Nebraska 68509-8922, prior to October 13, 2000. A request for public hearing shall state the nature of the issues proposed to be raised at a hearing. All comments shall be considered by the Director prior to making a decision regarding a public hearing. If the Department receives substantive comments regarding these proposed modifications, a public hearing may be scheduled.

Copies of the fact sheet and all information pertaining to the permit modification will be available for viewing and copying at the Department of Environmental Quality, Suite 400, 1200 N Street, The Atrium, in Lincoln between 8:00 a.m. and 5:00 p.m. weekdays, or mailed upon request. Further information may be obtained by contacting David Miesbach, UIC Program Coordinator, (402) 471-0096.

Individuals requiring special accommodations or alternate formats of materials should notify the Department by calling (402) 471-2186. TDD users should call (800) 833-7352 and ask the relay operator to call the Department at (402) 471-2186.

Fact Sheet

For proposed permit modification for Underground Injection Control Permit Number NE0206369 to inject wastewater into the subsurface. This proposal does not involve discharges to the land surface or surface waters of the State of Nebraska.

Issuing Office: Nebraska Department of Environmental Quality (NDEQ).
Suite 400, The Atrium
1200 N Street, P.O. Box 98922
Lincoln, Nebraska 68509-8922

Applicant: Crow Butte Resources, Inc. (CBR)
P.O. Box 169
Crawford, Nebraska 69339-0169

1. CBR operates a commercial in-situ uranium mine (SIC Number 1094). The specific operations involve extracting uranium using the in-situ mining process at the Crow Butte Uranium Facility owned by CBR.
2. As described in the application, the Crow Butte Uranium Facility is located near Crawford in Dawes County, Nebraska. CBR currently utilizes complete retention, lined evaporation ponds and a Class I injection well for discharges of process wastewater. There is no discharge to surface waters of the State of Nebraska. Land application of treated wastewater may be conducted under a separate permit within the authority of the National Pollution Discharge Elimination System (NPDES) program.
3. The following is a table containing the composition of the injection stream as reported by the applicant. The average values are calculated from monthly reports submitted to the Department by CBR from March 1999 to March 2000.

Parameter	Units	Average	Estimated Range
Flow Rate	gallons/minute	50	20 - 400
Uranium (U ₃ O ₈)	milligrams/liter	10	1 - 50
Radium 226	picocuries/liter	1,500	25 - 9,000
Sodium	milligrams/liter	7,000	25 - 80,000
pH	standard units	8	3 - 9
Sulfate	milligrams/liter	2,000	25 - 8,000
Chloride	milligrams/liter	8,200	25 - 80,000
Vanadium	milligrams/liter	21	10 - 200
Alkalinity	milligrams/liter	1,800	25 - 5,000

The proposed permit modification includes injection limitations and specific monitoring requirements for the parameters listed above, and other parameters associated with the injection procedure and in-situ mining process, including the restoration process.

4. On the basis of preliminary staff review, the NDEQ has made a tentative determination to modify the permit for injection, which will be regulated as stated in the draft permit.
5. The proposed operating limitation and effluent parameter limitations are included in the draft permit.
6. The following is a brief explanation of the statutory and regulatory provisions on which permit requirements and operational limitations are based. Included are appropriate supporting references used during the permit formulation process.
 - a. Application for permit modification received April 3, 2000.
 - b. Original Permit Application and \$25,000.00 filing fee received October 6, 1993.
 - c. Nebraska Environmental Protection Act and related laws.
 - d. NDEQ Title 122 - Rules and Regulations for Underground Injection and Mineral Production Wells.
 - e. 40 CFR Parts 144 – 147, Underground Injection Control Program, State UIC Program Requirements, UIC program: Criteria and Standards, State Underground Injection Control Programs.
 - f. 10 CFR Part 20, Standards for Protection Against Radiation.
 - g. Title 42 United States Code, Public Health and Welfare, sections 2011-2114.
 - h. Memorandum of Understanding Between the Nebraska Department of Environmental Quality (NDEQ) and the U.S. Nuclear Regulatory Commission for In-Situ Uranium Mining. Date November 8, 10, 1982.
7. The following is an explanation of the calculations and derivations of the specific Operational Parameters and Limitations set forth in the draft permit, and the reasons why they are applicable to the injection proposal:
 - A. Reason for the Permit Modification
The modification draft permit has been prepared in accordance with specific regulations contained within Nebraska Title 122 - Rules and Regulations for Underground Injection and Mineral Production Wells. The applicant (CBR) has fulfilled the minimum requirements necessary to process a permit modification. The application for permit modification was received on April 3, 2000.
 - B. Water Quality Considerations
The proposed injection activity will, by definition, emplace process wastewater into subsurface aquifers, which are not considered to be Underground Sources of Drinking Water (USDW) under State and Federal regulations. Drinking Water Quality effluent limitations, therefore, do not apply to the proposed discharge.

C. Draft Permit Effluent Limitations and Conditions

i. General

The draft permit establishes Operational Parameters and Limitations for process wastewater discharged to the injection well system. The injection well will receive wastewater from the extraction/elution process, the Reverse Osmosis process, and well development wastewater. Treatment processes include uranium removal by Ion Exchange, pH adjustment, filtering, neutralization through addition of reductant, and reverse osmosis. The draft permit utilizes effluent parameters and limitations to characterize the wastewater discharged to the injection well.

ii. Injection Pressure, Injection Volume, Injection Rate, and Minimum Allowable Operating Annulus Pressure

The draft permit requires continuous recording devices or gauges to be utilized to measure injection pressure, volume and rates, as well as the Minimum Allowable Operating Annulus Pressure of the injection well system. These operational limitations are based on the knowledge of the construction of the well, and the past history of the operation and maintenance of the injection system.

iii. pH and Temperature

The draft permit establishes a pH range for the effluent limitation of 5.0 – 9.5. This limitation is based on the knowledge of the treatment process, and the discharge history. Temperature has been removed completely from the monitoring parameters, based on the consistency of the sampling history.

iv. Calcium

There is no limitation for this parameter in the draft permit. The applicant asked that it be added to the list of parameters to establish the character of the wastewater discharged to the injection well. There are currently no State or Federal limitations on calcium. Also, the applicant has demonstrated the ability to ensure integrity of the injection system during its expected operational life. Mechanical Integrity is required by Nebraska Title 122 Rules and Regulations for Underground Injection and Mineral Production Wells, Chapter 16.

v. Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, and Silver

The draft permit adds cadmium, chromium, lead, mercury, and silver to the list of parameters. The limitations for these metals and arsenic barium, and selenium are based on Title 128 Rules and Regulations Governing Hazardous Waste Management in Nebraska, Chapter 3.

8. Variances

The applicant has not requested any variance or alternatives to any required standards or operational parameters.

9. Written Comments

A copy of the application, draft permit, comments, and other public information are available for review and copying at the Department's office, Suite 400, The Atrium, 1200 N Street, Lincoln, Nebraska 68509-8922 between 8:00 a.m. and 5:00 p.m., weekdays.

The public may comment upon or object to the proposed bond release, in writing, prior to October 13, 2000. All substantive comments and/or objections shall be considered prior to making the final decision regarding this permit modification. Any interested person may request a public hearing, if no hearing has already been scheduled. A request for a public hearing shall be in writing and shall state the nature of the issues proposed to be raised at the hearing.

All comments and requests for information should be sent to Marty Link, Department of Environmental Quality, P.O. Box 98922, Lincoln, Nebraska 68509-8922, (402) 471-0096.

Crow Butte Resources (CBR) Class I Non-Hazardous Permit Modification

Q: Why do we have a Class I non-hazardous well?

A: We have a Class I non-hazardous well to dispose of non-hazardous mining wastes that would normally be disposed of on the surface. Disposal takes place safely in an unusable aquifer that is adequately confined from the people of Nebraska by impermeable stratigraphic units and great depth.

Q: Why do we write permits?

A: We write permits to protect the environment and health and safety of the people of Nebraska.

Q: What part of the Class I permit accomplishes these goals, and why?

A:

Injection Pressure	Ensures that the formation is not fractured causing preferential flow paths that may direct the waste out of the disposal zone and into an <u>Underground Source of Drinking Water (USDW)</u> or to the surface.
Annulus Pressure	Ensures early detection in the event of a well failure so that injectate would not migrate to an USDW or the surface.

Q: Why should other limitations be placed on the waste stream?

A: In order to keep the well classified as a non-hazardous disposal well, arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, and pH must have the hazardous waste limits placed on them.

Q: What is the purpose of the remaining limitations (Chloride, Sulfate, Sodium, Alkalinity, Radium, Uranium, and Vanadium)?

A: The current limitations are based on the operational capabilities of CBR's processing plant. There isn't a regulatory basis for the limits placed on chloride, sulfate, sodium, alkalinity, radium, uranium, and vanadium. However, we now have precedence for these limits.

Q: What consequences are outlined in the permit for exceeding any limit?

A: Any permit noncompliance constitutes a violation of the appropriate act or regulations, and is grounds for enforcement actions or for permit termination, revocation and reissuance, modification, or denial of a permit renewal application.

Q: What has been done in the past when there was a violation?

A: The only violations of the Class I permit conditions in the past 5 years have been on parameters such as radium, sulfate, and uranium that are affected by the operation capabilities of the plant. In each case, the permit was modified to better reflect the operational capabilities of the facility (radium from 1,000 pCi/l to 5,000 pCi/l, sulfate from 5,000 mg/l to 10,000 mg/l, and uranium from 10 mg/l to 25 mg/l) after it was determined by the Department these changes would not be a threat to the environment. The Uranium limit has most recently been exceeded two times since March

1999. In both cases, the Department determined that the concentration injected was not a threat to the environment or did not affect the mechanical integrity of the injection well.

Q: What should happen if one of the hazardous waste limits or pressure limits were exceeded?

A: If one of the hazardous waste limits was exceeded, CBR would not only be in violation of a permit condition, but the well would then be classified as a Class I hazardous waste injection well and it would have to be properly abandoned. If one of the pressure limits were to be exceeded, again not only would CBR be in violation of a permit condition, but the well would have to be shut-in (not used) until CBR could prove to the Department that no damage had been done to the well and that the formation had not been fractured. If CBR were unable to prove this to the Department, the well would have to be properly abandoned.

Q: What is a Class I well?

A: A Class I well injects waste fluids below an USDW. In Nebraska, only non-hazardous fluids are allowed to be injected via a Class I well. Only one Class I well is permitted at this time, and it is located at the CBR facility.

Q: What regulations cover Class I well permits?

A: Nebraska Department of Environmental Quality Title 122 – Rules and Regulations for Underground Injection and Mineral Production Wells. The Department has been authorized by the United States Environmental Protection Agency (USEPA) to administer the Underground Injection Control Program under the authority of the Federal Safe Drinking Water Act.

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**NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY
PERMIT FOR CLASS 1 NON-HAZARDOUS WASTE INJECTION WELL**

In compliance with the Nebraska Environmental Protection Act, Neb. Rev. Stat. Secs. 81-1501, 81-1502, 81-1504 through 81-1510 and 81-1527 (Reissue 1994), the Nebraska Administrative Procedure Act (Reissue 1987, cum. supp. 1992), and the Nebraska Department of Environmental Quality Title 122, Rules and Regulations for Underground Injection and Mineral Production Wells,

**Crow Butte Resources, Inc.
1670 Broadway, Suite 3450
Denver, Colorado 80202
(303) 830-3549**

is authorized to operate a Class 1 non-hazardous waste injection well associated with an in-situ uranium mining operation. The formation receiving injected waste fluids shall be restricted to the Morrison and Sundance Formations, Jurassic Age Formations, which have been demonstrated to be located below the lowermost underground source of drinking water. In addition, the Morrison and Sundance Formations exhibit water quality that is not considered under State and Federal Regulations to be underground sources of drinking water due to measured concentrations of their total dissolved solids.

Crow Butte Resources, Inc. currently operates the in-situ commercial uranium facility (Crow Butte facility) near Crawford, Nebraska. The mailing address and telephone number for the facility is P.O. Box 169, Crawford, Nebraska 69339, (308) 665-2215.

The injection well is located in the Northwest Quarter of Section 19, Township 31 North, Range 51 West, Dawes County, Nebraska. All injection, testing, monitoring, and reclamation activities will be conducted in accordance with requirements and conditions set forth in parts herein.

Financial surety has been established to cover costs associated with administration, operation, abandonment, and reclamation of the well as required in Nebraska Title 122, Rules and Regulations for Underground Injection and Mineral Production Wells, Chapter 37.

The permittee shall comply with all conditions in this permit, State and Federal regulations governing Class 1 non-hazardous waste injection wells, and the requirements of the Nebraska Department of Environmental Quality.

This Revised permit became effective on October __, 2000 and shall remain effective through September 29, 2004, unless it is revoked and reissued, or terminated. This permit is hereby modified to include adjustments to parameter limitations reflective of current and anticipated operations at the facility.

Signed this ___ day of _____

Michael J. Linder
Director

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Part I. SPECIFIC PERMIT CONDITIONS

A. General Description of Permitted Activity

1. This permit is for a Class 1 non-hazardous waste injection well located in the SE¼, NW¼, Section 19, Township 31 North, Range 51 West, Dawes County, Nebraska.
2. This permit is for a Class 1 non-hazardous waste injection well associated with an in-situ uranium facility. The uranium facility produces a volume of wastewater in excess of what can be re-introduced to the ore zone as part of the mining and restoration activities. The operation of the injection well allows for disposal of excess wastewater and may eliminate the need for additional evaporation ponds. The rate of injection will generally be constant on a daily basis, but may vary depending on processing operations at the Crow Butte facility. The wastewater will be pumped into the injection well, and introduced into the Morrison and Sundance Formations at depths approximately 3,528 to 3,855 feet below Kelly Bushing (12 feet above ground elevation). Continuous recording devices will be installed to monitor injection pressure, flow rate and volume, and the pressure on the annulus between the tubing and the long string casing. The injection pressure at the wellhead plus the hydrostatic pressure will not exceed the fracture pressure of the injection zones. The Mechanical Integrity of the injection well will be demonstrated at least once every two years during the life of the well as required in Nebraska Title 122, Chapter 16.
3. This permit does not authorize any wastewater discharge to the land surface or to surface waters of the State of Nebraska. Wastewater that is to be discharged to the surface will be regulated under a separate permit.

B. Notice of Intent to Operate

Prior to operation of the injection well the permittee must submit a notice of completion of construction to the Director containing the following information:

1. A well completion report for the injection well.
2. A diagram of the as-built construction of the injection well.
3. Physical and Chemical data needed to calculate or demonstrate the integrity and validity of the injection well operation. Such data include but may not be limited to:
 - a. The physically determined values for Transmissivity and Hydraulic Conductivity of the Morrison and Sundance Formations.
 - b. The physical determination of the Total Dissolved Solids (TDS) content of the Morrison and Sundance Formations.
 - c. The physically measured values for the temperature and formation pressure of the Morrison and Sundance Formations.
 - d. Delineation of the actual confinement interval established from designation of recognized formation log tops.

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4. Calculations for: Pressure Increase Due to Injection, Theis Equation Calculations, Radius of Fluid Displacement, Maximum Surface Injection Pressure, Morrison and Sundance Formation Fracture Pressure, Anticipated Surface Injection Pressure, and Radius of Pressure Response for the injection well and receiving formations utilizing the physically measured and determined values in parts (B) (1.), (2.), and (3.) above.
5. A precalculated amount of cement necessary to complete the well along with well records demonstrating the presence of adequate cement to prevent fluid migration behind casing.
6. The results of testing which demonstrate the mechanical integrity for the injection well by:
 - a. Setting a packer immediately above the completion interval and a packer or well head at ground surface. The space between the two will then be pressurized to at least 125% of maximum operating pressure specified in Part II, C of this permit. The pressure must be held for a period of at least 20 minutes maintaining 90% of the original pressure to pass the test.
 - OR
 - b. Putting on an air tight well head and pressurizing the well with air to force the water column down the casing to a level where the air pressure is equal to 125% of the maximum operating pressure. The air pressure will be maintained and observed for a period of 20 minutes. The pressure must be held for a period of 20 minutes maintaining 90% of the pressure to pass the test.
7. An evaluation of the compatibility of the proposed injection fluids with fluids in the proposed injection horizons (under prevailing physical conditions).
8. In addition the permittee shall have available on site for review upon request any other pertinent information which they have compiled, such as:
 - a. All available geological and geophysical logging and testing on the well.
 - b. The results of the formation testing program.
 - c. Compatibility of injected materials with fluids in the injection zones and the minerals in both the injection zones and the confining zone; or,
 - d. Information that the Director may require in consultation with the permittee.

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Part II. INJECTION LIMITATIONS, MONITORING, REPORTING, AND TESTING REQUIREMENTS

- A. The permittee is authorized to inject non-hazardous liquid waste consisting of process wastewater and restoration water generated in Nebraska at a Crow Butte Uranium facility. Injection of wastes generated at other facilities is prohibited.
- B. Such injection shall be controlled, limited, and monitored by the permittee as specified in this permit. All monitoring reports are to be submitted to the Nebraska Department of Environmental Quality no later than 28 days after the last day of the month for which the monitoring data are being reported. Monitoring reports and other information required by this permit shall be directed to:

Nebraska Department of Environmental Quality
UIC Program, Ground Water Unit
Suite 400, The Atrium
1200 "N" Street
P.O. Box 98922
Lincoln, Nebraska 68509-8922

C. Operational Parameters and Limitations

Injection and Operational Parameters	Injection or Parameter Limitation	Measurement or Sample Frequency	Reporting Requirements	Analysis or Measurement Type
Injection Pressure (pounds per square inch gauge)	650 psig	N/A	Monthly	Continuous Recording Device
Maximum Daily Injection Volume (gallons per day)	Report	N/A	Monthly	Continuous Recording Device
Maximum Daily Injection Rate (gallons per minute)	Report	N/A	Monthly	Continuous Recording Device
Average Daily Injection Rate (Annualized) (gallons per minute)	Report	N/A	Monthly	Continuous Recording Device
Minimum Allowable Operating Annulus Pressure (pounds per square inch gauge)	150 psig Above Injection Pressure	Daily	Monthly	Gauge or Continuous Recording Device
Calcium	Report	Weekly	Monthly	Monthly Composite
Chloride	40,000 mg/l	Weekly	Monthly	Monthly Composite
Sulfate	10,000 mg/l	Weekly	Monthly	Monthly Composite
Sodium	40,000 mg/l	Weekly	Monthly	Monthly Composite
Alkalinity	4,100 mg/l	Weekly	Monthly	Monthly Composite
pH (Standard Units)	5.0 – 9.5	Weekly	Monthly	Monthly Average
Radium	5,000 pCi/l	Weekly	Monthly	Monthly Composite
Uranium	25 mg/l	Weekly	Monthly	Monthly Composite
Vanadium	50 mg/l	Weekly	Monthly	Monthly Composite
Arsenic	5 mg/l	Weekly	Monthly	Monthly Composite
Barium	100 mg/l	Weekly	Monthly	Monthly Composite
Cadmium	1 mg/l	Weekly	Monthly	Monthly Composite
Chromium	5 mg/l	Weekly	Monthly	Monthly Composite
Lead	5 mg/l	Weekly	Monthly	Monthly Composite
Mercury	0.2 mg/l	Weekly	Monthly	Monthly Composite
Selenium	1 mg/l	Weekly	Monthly	Monthly Composite
Silver	5 mg/l	Weekly	Monthly	Monthly Composite

- The injection of wastewater may be accompanied with the addition of an anti-scalant and/or biocide to inhibit precipitates and scale from developing in the injection well.
 - ** Sampling should take place during the month of May, with results submitted with the June report.
- Samples taken in compliance with the injection requirements specified above shall be taken at the following locations:
- Injection fluid; at a sampling outfall between the processing plant and the injection well.
- Samples shall be analyzed in accordance with Part IX. Y. of this permit.

- D.** The monthly average, maximum and minimum values taken from the continuous recordings for the month for injection flow rate and volume, wellhead annulus pressure and wellhead injection pressure shall be reported in the monthly monitoring report submitted to the NDEQ.
- E.** The monitoring of the pressure buildup in the injection zones and the static fluid level shall be conducted annually including, at a minimum, a shut down of the well for a time sufficient to record the formation pressure in the injection interval, and conduct a valid observation of the pressure fall-off curve for the injection interval. A plan for this test shall be submitted to the NDEQ for review and approval prior to conducting the test. The test shall not commence until approval of the test plan has been obtained from the NDEQ. The test results and interpretation of this test shall be submitted to the NDEQ within thirty (30) days of completion of the test.
- F.** The following shall also be reported to the NDEQ by the permittee:
- 1.** Any well treatment procedures used, including those associated with normal maintenance and malfunction correction, and all well workovers shall be reported to the NDEQ within thirty (30) days of completion. A well treatment plan or workover plan shall be submitted to the NDEQ for review and approval prior to commencement of a well treatment or workover. No well treatment or workover shall commence until the permittee has obtained approval for the well treatment or workover plan from the NDEQ.
 - 2.** Immediate notification to the NDEQ of all spills associated with the operation of the injection well or its appurtenances.
 - 3.** The results and interpretation of mechanical integrity tests and any other tests or logs of the injection well or injection zones within thirty (30) days of completion.
 - 4.** A written description and explanation of any noncompliance with operating limitations as specified by this permit for wellhead injection pressure, injection flow volume, or injection limits occurring during the month being reported shall be submitted with the monthly monitoring report.
 - 5.** When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the NDEQ, the permittee shall submit such facts or corrected information to the NDEQ within five (5) days of becoming aware of the circumstances.

Part III. MECHANICAL INTEGRITY TESTING

A mechanical integrity test (MIT) to check for internal mechanical integrity shall be conducted at least once every two (2) years. The internal MIT is to check for significant leakage in the casing, tubing, and packer. Whenever the NDEQ believes that because of a downhole problem the continued use of the well constitutes a threat to human health, or the fresh and/or usable waters or the soils of the State, or the release of injected fluid into an unauthorized zone is occurring, the permittee shall be required to immediately cease injection and conduct a MIT. If determined necessary by the NDEQ, a MIT shall be conducted when there has been a well workover. A MIT plan shall be submitted to the NDEQ for review and approval prior to conducting any MIT. No MIT work shall commence until approval of the MIT has been obtained from the NDEQ. The internal MIT shall be witnessed by the NDEQ. If the well fails an MIT, the requirements of Section IV. Part B. of this permit shall be implemented by the permittee. The results and interpretation of a MIT shall be submitted to the NDEQ within thirty (30) days of test completion.

Part IV. ANNULUS PRESSURE DECLINE, ANNULUS LIQUID LOSS, ANOMALOUS OPERATIONAL DATA, LOSS OF MECHANICAL INTEGRITY

- A. If the annulus pressure declines 20% or more below normal operating pressure, or loss of annulus liquid indicating a loss of mechanical integrity occurs, or anomalous operational data indicating a loss of mechanical integrity occurs, the permittee shall notify the NDEQ within twenty-four (24) hours of becoming aware of the circumstances, and the permittee shall immediately investigate and identify the cause of the annulus pressure decline, annulus liquid loss or anomalous operational data. The results of this investigation shall be reported to the NDEQ within twenty-four (24) hours of completion. If the well appears to be lacking mechanical integrity, the permittee shall:
1. Immediately cease injection of waste fluids;
 2. Take all steps required by the NDEQ to determine the presence or absence of mechanical integrity. If the well is determined to have mechanical integrity, injection may resume after the permittee has obtained authorization from the NDEQ to resume injection.
- B. If a loss of mechanical integrity is determined pursuant to Part III of this permit, the permittee shall:
1. Immediately cease injection of waste fluids;
 2. Notify the NDEQ within twenty-four (24) hours of the determination;
 3. Take all steps determined necessary by the NDEQ to determine whether there may have been a release of injection fluids into any unauthorized zone. This may include the need for an external MIT to check for significant fluid movement through vertical channels adjacent to the wellbore. If there is evidence there may have been a release into an unauthorized zone, the permittee shall verbally notify the NDEQ within twenty-four (24) hours of determination. A written notice shall also be provided to the NDEQ within five (5) days of the determination including a report describing all aspects of the release;

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4. Comply with any immediate corrective or remedial action specified by the NDEQ. If it is determined necessary by the NDEQ, the permittee shall submit to the NDEQ a remediation and corrective action plan and implementation schedule for review and approval. Work shall not commence until approval of the remediation and corrective action plan has been obtained from the NDEQ;
5. Restore and demonstrate mechanical integrity to the NDEQ. A plan for any well workover or mechanical integrity test shall be submitted to the NDEQ.
6. Resume injection only upon authorization from the NDEQ.

Part V. PLUGGING, ABANDONMENT

- A. The well shall be plugged and abandoned upon reaching the end of its useful life or when determined necessary by the NDEQ to protect human health, or the fresh and/or usable waters or soils of the State. The permittee shall notify the NDEQ at least sixty (60) days prior to plugging and abandonment of the well. In addition to the notice, the permittee shall submit a plugging and abandonment plan to the NDEQ for review and approval. The permittee shall conform to all plugging and abandonment requirements of State and Federal regulations and the NDEQ. The well shall be plugged in a manner that will not allow the movement of fluids into or between sources of fresh and/or usable water or allow the movement of injected fluids out of the injection zones. Plugging and abandonment work shall not commence until approval of the plugging and abandonment plan has been obtained from the NDEQ. The report of plugging and abandonment and related information shall be submitted to the NDEQ within thirty (30) days after completion of the plugging operation.
- B. The permittee shall reclaim all disturbed land surfaces to conserve the soil and water resources in the affected area of the injection well. The USDA Soil Conservation Service shall be consulted for technical assistance in reclaiming the land surface. Topsoil shall be reapplied to the natural contoured surface of the land, and the soils re-seeded with an appropriate seed mixture.

Part VI. FINANCIAL RESPONSIBILITY FOR PLUGGING AND ABANDONMENT

The permittee shall maintain financial responsibility and financial resources to close, plug, and abandon the injection well and appurtenances in a manner required by the NDEQ. This requirement includes the costs for reclaiming disturbed land surfaces associated with the injection well. The permittee currently demonstrates financial assurance through the use of an irrevocable standby letter of credit. Financial assurance documents shall be revised and updated when required by the NDEQ.

Part VII. CONSTRUCTION REQUIREMENTS

- A. The well shall be cased and cemented such that: 1) injected fluids and fluids in the injection zones or other formation fluids do not cause deterioration of the water quality of fresh and/or usable water zones, 2) the loss of fresh and/or usable water due to downward migration is prevented, 3) the release of injected fluids into an unauthorized zone is prevented, and 4) corrosion will be prevented from compromising these measures.
- B. Borehole, casing, tubing and cement specifications for injection well:

Bore Hole Size	Casing or Tubing Size & Material	Weight lbs/ft	Casing Seat Depth	Type of Cement & Additives	Minimum Number of Sacks of Cement*
14 3/4"	10 3/4"	40.5	824'	Lite + 50/50 Pozmix	382
9 7/8"	7"	23.0	3925'	Lite + 50/50 Pozmix	719
N/A	2 3/8" to 5 1/2"	as appropriate	N/A	N/A	N/A

Packer Type: Baker Model A-3, AL-2 or equivalent
 Packer Seating Depth: 3450 to 3510 feet
 *May be converted to barrels.
 N/A = Not Applicable

- C. Type of Annulus Fluid: Brule or Chadron Formation water containing scaling and corrosion inhibitors. Minimum Operation Annulus Pressure: 150 PSIG above injection pressure.
- D. Injection fluids will be introduced into the Morrison and Sundance Formations through perforations in the casing from 3528 to 3855 feet. All depths indicated have been measured below the land surface from 12 feet above ground elevation (Kelly bushing) at the injection well.

Part VIII. SPILL PREVENTION AND CONTAINMENT

The injection well will be equipped with high level sensing instruments as a means of spill prevention. Lined ponds will be used for spill containment. The lined ponds must be constructed as per the requirements of the NDEQ, and must be approved prior to construction and operation.

Part IX. STANDARD PERMIT CONDITIONS

- A. **Duty to Comply:** The permittee shall comply with all conditions of this permit, Federal and State laws and regulations. Any permit noncompliance constitutes a violation of the appropriate act or regulations, and is grounds for enforcement actions or for permit termination, revocation and reissuance, modification, or denial of a permit renewal application.
- B. **Duty to reapply:** If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. An application to renew this permit shall be filed with the NDEQ at least one hundred eighty (180) days prior to its expiration date.
- C. **Duty to Cease or Reduce Activity:** It shall not be an acceptable defense for a permittee in an enforcement action to declare or claim that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
- D. **Duty to Mitigate:** The permittee shall take all reasonable steps to minimize or correct any adverse impact to the environment resulting from noncompliance with this permit, including additional monitoring as necessary to determine the nature and impact of a noncomplying discharge or injection, and the necessary actions to be taken based on monitoring.
- E. **Proper Operation and Maintenance:** The permittee shall at all times properly operate and maintain all facilities and systems of monitoring, treatment, and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems when necessary to maintain compliance with the conditions of the permit.
- F. **Property Rights:** This permit does not convey any property rights of any sort, or any exclusive privilege.
- G. **Duty to Provide Information:** The permittee shall furnish to the NDEQ within a reasonable time, any information which the NDEQ may request to determine whether cause exists for modifying, revoking, reissuing or terminating the permit, or to determine compliance with this permit. The permittee shall also furnish to the NDEQ, upon request, copies of reports and information required to be kept by this permit.
- H. **Inspection and Right of Entry:** The permittee shall allow the Director, or any authorized representative, upon the presentation of credentials and other documents as may be required by law, to:
1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this permit;
 2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
 3. Inspect any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit;

4. Sample or monitor for the purpose of assuring permit compliance or as otherwise authorized by appropriate Rules and Regulations, any substances or parameters at any location.

I. Samples, Measurements, and Records:

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
2. The permittee shall retain records of all monitoring information, including calibration and maintenance records, and all continuous monitoring instrumentation records, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least five (5) years from the date of sample, measurement, report, or application. This period may be extended by request of the NDEQ at any time.
3. The permittee shall retain records concerning the nature and composition of all injected fluids until five (5) years after the completion of any plugging and abandonment procedures. The NDEQ may require the owner or operator to deliver the records to the NDEQ at the conclusion of the retention period.
4. Records of monitoring information shall include:
 - a. The date, exact place, and time of sampling or measurements;
 - b. The individual(s) who performed the sampling or measurements;
 - c. The date(s) analyses were performed;
 - d. The individual(s) who performed the analyses;
 - e. The analytical sampling and preservation techniques or methods used; and
 - f. The results of such analyses.

J. Signatory Requirements: All permit applications, reports required by this permit, or other information requested by the NDEQ shall be signed and certified in accordance with the requirements of Nebraska Title 122 Rules and Regulations for Underground Injection and Mineral Production Wells, Chapter 24.

K. Monitoring and Records: All monitoring requirements shall be in accordance with those stated in Nebraska Title 122, Rules and Regulations for Underground Injection and Mineral Production Wells, Chapter 18.

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of all the volume and nature of the monitored discharge or injection. All samples shall be taken at the monitoring points specified in this permit unless otherwise specified. Monitoring points shall not be changed without notification to and the approval of the NDEQ.

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2. Mechanical Integrity

The permittee shall demonstrate mechanical integrity at least once every two years during the life of the well as required herein and in Nebraska Title 122, Chapters 16 and 18. The NDEQ shall be notified at least five days prior to any mechanical integrity testing.

- L. Transfer of Permit: This permit is not transferable to any person except after notice and approval by the NDEQ. The NDEQ may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the appropriate Rules and Regulations. In some cases, modification and reissuance is mandatory. The existing permittee shall notify the NDEQ at least ninety (90) days in advance of the proposed transfer date. The notice shall include a written agreement between the existing and new permittee containing a specific date for transfer of permit responsibility, coverage and liability between them, and demonstrate that financial requirements will be met by the new permittee. The new permittee shall submit to the NDEQ at least ninety (90) days prior to the proposed transfer date a new permit application including the financial assurance documents guaranteeing that resources are available to properly plug, abandon, and reclaim the well and surrounding affected lands.
- M. Emergency Reporting: The permittee shall verbally report to the NDEQ any noncompliance which may endanger human health or the environment within twenty-four (24) hours of becoming aware of the circumstances. A written submission shall also be provided within five (5) days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, corrective action taken, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. The permittee shall comply with any corrective or remedial action required by the NDEQ.
- N. Operation Requirements:
1. The operator of the well shall not allow the movement of fluid containing any contaminant into any formation or aquifer not permitted to receive fluid by this permit. The operator shall have the burden of showing that the requirements of this paragraph are met.
 2. If any water quality monitoring of an aquifer indicates the movement of any contaminant into any formation or aquifer not permitted to receive fluids by this permit, the operator shall take such action as required by the NDEQ, including taking the well out of service, closure of the well, or plugging and abandonment of the well.
- O. Permit Modifications and Terminations: After notice and opportunity for a hearing, this permit may be modified, revoked and reissued, or terminated in whole or in part during its term for cause as provided, but not limited to those set forth in Nebraska Title 122, Chapter 27. The permittee shall furnish to the NDEQ, within a reasonable amount of time, any information which the NDEQ may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish, upon request, copies of all records required to be kept by this permit.

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- P. **Severability:** The provisions of this permit are severable, and if any provision of this permit and any circumstance is held invalid, the application of such provision to other circumstances and the remainder of the permit shall not be affected as stated in Nebraska Title 122, Chapter 40.
- Q. **Change in Wastestreams:** Any facility changes or process modifications which may result in new, different or altered wastestreams or an increase in wastestream volumes or an increase in concentration of pollutants shall be reported to the NDEQ at least one hundred eighty (180) days before such changes.
- R. **Anticipated Noncompliance:** If for any reason, the permittee will be unable to comply with permit requirements, the permittee shall give advance notice to the NDEQ. The notice shall include the reason for the anticipated noncompliance and a description of steps taken to reduce, eliminate, and prevent reoccurrence of the noncompliance. Upon receiving proper notice from the permittee, the NDEQ may grant for a specified time a temporary waiver to a permit requirement for the purpose of testing and treating the well, or for conducting a well workover, or to protect human health or the environment.
- S. **Plugging and Abandonment:** Plugging and abandonment shall be done in accordance with Nebraska Title 122, Chapter 36. Prior to abandonment the permittee shall notify the Director seven days before commencing plugging and abandonment. Plugging shall conform to the following standards:
1. A plugging and abandonment plan shall be submitted to the NDEQ for approval. The permittee shall follow the plugging and abandonment plan as approved by the Director.
 2. Prior to abandoning the injection well, the well shall be plugged with cement or other approved plugging material in a manner which will prohibit the movement of fluids out of the injection zones into or between underground sources of drinking water.
- T. **Financial Responsibility:** The permittee shall secure and maintain in full force and effect at all times a performance bond or other form of financial security in a form acceptable to the Director. This bond or financial security will provide for proper plugging and abandonment of the injection well, and surface reclamation. This permit shall not become effective until the permittee secures a performance bond or other form of financial security acceptable to the Director in the appropriate amount.
- U. **Permit changes:** This permit may be modified, revoked and reissued, or terminated for cause by the NDEQ (Nebraska Title 122, Chapters 27 and 28) or upon filing of a request by the permittee. The permittee shall furnish to the Director any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit. Such information may also be requested by the Director to determine compliance with the permit. Upon request by the Director, the permittee shall also furnish copies of records required to be kept by the permit.
- V. **Property Rights:** The issuance of this permit does not convey any property right of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of a person's rights, nor any infringement of Federal, State, or local laws or regulations.
- W. **Confidential Information:** Information determined by the Director to be confidential shall be managed in accordance with Nebraska Title 122, Chapter 25.

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- X. Averaging of Measurements: Calculations for all limitations which require averaging, shall utilize an arithmetic mean unless otherwise specified by the Director in this permit.
- Y. Test Procedures: Test procedures for the analysis of pollutants which are required to be monitored by this permit, unless otherwise specified by the Director, shall conform to the latest edition of the following references:
1. Standard Methods for the Examination of Water and Wastewaters, 19th Edition, 1995, American Public Health Association. New York, NY 10019
 2. A.S.T.M. Standards, Part 11, American Society for Testing and Materials, Philadelphia, PA 19103
 3. Methods for Chemical Analysis of Water and Wastes, March 1979, Environmental Protection Agency Water Quality Office, Analytical Quality Control Laboratory NERC, Cincinnati, Ohio 45268