

STATE OF NEBRASKA

40-8943



DEPARTMENT OF ENVIRONMENTAL QUALITY

Randolph Wood

Director

Suite 400, The Atrium

1200 'N' Street

P.O. Box 98922

Lincoln, Nebraska 68509-8922

Phone (402) 471-2186

April 9, 1997

E. Benjamin Nelson

Governor

Mr. Joseph J. Holonich, Chief
U. S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD. 20850

Dear Mr Morby,

Please find enclosed a copy of Underground Injection Control permit No. NE0122611 which has been modified as requested from Crow Butte Resources, Inc., and in accordance with the requirements set forth in Nebraska Title 122 "Rules and Regulations for Underground Injection and Mineral Production Wells".

Included in these requirements was a public notice and opportunity for public comment at a public hearing which was held on October 8, 1996. The public comment period for the proposed permit modifications extended to November 1, 1996 in order to provide the public with an adequate opportunity to comment on the permit modifications and relevant issues after the public hearing. I have also enclosed a copy of the hearing comments and the Department's responses for your convenience.

Please feel free to contact me at (402) 471-4982 if you have any questions or concerns.

Sincerely,

Franklin L. Mills

Franklin L. Mills

UIC Coordinator

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STATE OF NEBRASKA



E. Benjamin Nelson
Governor

Mr. Steve Collings, President
Crow Butte Resources, Inc.
216 Sixteenth St. Mall, suite 810
Denver, Co. 80202

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Included in these requirements was the public notice and opportunity for public comment at a public hearing which was held on October 8, 1996. The public comment period for the proposed permit modifications was extended to November 1, 1996 in order to provide the public with an adequate opportunity to comment on the proposed permit modifications and relevant issues after the public hearing.

The Department has prepared responses to comments received during the public participation process which will be sent to those persons who submitted comments or requested copies of the Department's responses.

Please contact Frank Mills of my staff at (402) 471-4982 if you have any questions or comments concerning the enclosed modified permit. Thank-you for your cooperation.

enclosure

Sincerely,

A handwritten signature in dark ink, appearing to read "Randolph Wood".

Randolph Wood, P. E.

Director

DEPARTMENT OF ENVIRONMENTAL QUALITY
AUTHORIZATION FOR UNDERGROUND INJECTION AND MINERAL
PRODUCTION WELLS

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) and the Nebraska Administrative Procedure Act, Neb. Rev. Stat. Secs. 84-901 through 84-903, 84-905 through 84-920 (Reissue 1995) and the Rules and Regulations pursuant thereto,

Crow Butte Resources, Inc.

is authorized to conduct a Class III uranium mining operation consisting of underground injection and mineral production wells. The injection and production shall be limited to the basal sandstone portion of the Chadron Formation using wells arranged in injection well patterns located in:

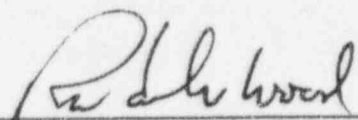
Township 31 North, Range 52 West, Section 11; S $\frac{1}{2}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$, SE $\frac{1}{4}$ SE $\frac{1}{4}$: Section 12; SW $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$: Section 13; E $\frac{1}{2}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$: Township 31 North, Range 51 West, Section 18; SW $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$: Section 19 all, Section 20; SW $\frac{1}{4}$: Section 30; NE $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$, NE $\frac{1}{4}$ NW $\frac{1}{4}$: and Section 29; W $\frac{1}{2}$, Dawes County, Nebraska. These wells shall be located in a portion of the approximately 2800 acre Nebraska Department of Environmental Quality permit area boundary. The location of these wells shall be limited to the area shown on Figure 1 and shall not extend beyond that area. The permit also includes the area required for all monitor wells.

All mining, stabilization, restoration, and reclamation activities will be conducted in accordance with the monitoring requirements and other conditions set forth in parts hereof.

Financial Surety amounts for the commercial operation have been established to account for costs associated with the operation and decommissioning of the existing ponds, buildings, equipment, and wellfields.

This permit became effective on April 23, 1990 and is hereby modified. This permit shall remain effective through the life of the facility, unless it is revoked and reissued, or terminated. The Director shall review the permit at least once every five years to determine whether it should be modified, revoked and reissued, terminated, or a minor modification made.

Signed this 3 day of April.



Randolph Wood, P.E.
Director

Part I. SPECIFIC PERMIT CONDITIONS

A. General Description of Permitted Activity

1. This permit is for a mining operation located in Township 31 North, Range 52 West, Section 11; S $\frac{1}{2}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$, SE $\frac{1}{4}$ SE $\frac{1}{4}$; Section 12; SW $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$; Section 13; E $\frac{1}{2}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$; Township 31 North, Range 51 West, Section 18; SW $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$; Section 19 all, Section 20; SW $\frac{1}{4}$; Section 30: NE $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$, NE $\frac{1}{4}$ NW $\frac{1}{4}$; Section 29: W $\frac{1}{2}$, Dawes County, Nebraska.
2. This permit is for an in situ uranium mine comprised of approximately 2800 acres consisting of contiguous injection well patterns within the permit boundary. The production zone is the basal sandstone unit of the Chadron Formation. The top of this unit of the Chadron Formation ranges from an approximate depth of 800 feet at the southern permit boundary to 250 feet at the northern permit boundary. Elevations range from approximately 3040 feet to 3570 feet above mean sea level. Excess water withdrawal (lixiviant bleed) will provide control of leachate movement. Monitor wells will provide horizontal and vertical surveillance of ground water quality thereby demonstrating confinement. The mining consists of injection of a sodium carbonate/bicarbonate solution along with an oxidant (oxygen or hydrogen peroxide) to the uranium-bearing formation through a pattern of injection wells. The uranium is solubilized by the lixiviant and this solution is pumped from the recovery wells to the processing plant where the uranium is extracted by ion exchange. The lixiviant is then reconstituted with leaching agents and recycled to the wellfield for reinjection. Ion exchange will be used in the processing plant and the yellow cake will be shipped from the facility.

B. Notice of Intent to Operate

Prior to operation of each mine unit or any part thereof the permittee must submit a notice of completion of construction to the Director with the following information:

1. A well completion report for all injection and/or production well(s).
2. A statement that each Class III well or group of wells utilizing a positive displacement pump shall be equipped with both high and low pressure safety switches which will shut down the pump in case of pressure increase over the authorized pressure or sudden pressure loss.
3. A well completion report for all monitor well(s).

4. The baseline sampling data used to determine the Upper Control Limits (UCLs) and the designation of these limits.
5. The baseline sampling data used to determine the restoration values and the permittee's recommendation for wells to be designated as restoration wells in that mine unit.
6. The results of testing which demonstrates the mechanical integrity for all wells 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, A, 1 of this permit. The pressure must be held for a period of 20 minutes maintaining 90% of the original pressure to pass the test.

OR

- b. The use of the casing cementing pressure/single point resistivity method of MIT for Class III uranium wells.

In addition to either a or b the permittee shall also provide:

- c. A precalculated amount of cement/bentonite grout or bentonite grout to fill the annular space of the well along with well records demonstrating the presence of adequate grouting material to prevent fluid migration.

AND

- d. Any other data gathered for the injection and production wells.
7. 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(s).
 - b. The results of the formation testing program.
 - c. Compatibility of injected materials with fluids in the injection zone and the minerals in both the injection zone and the confining zone.

Or so much of said information as the director may require in consultation with the permittee. The Notice of Intent to Operate for each mine unit or partial mine unit shall be submitted at least thirty days prior to any injection. Within thirty days from the receipt of the Notice of Intent to Operate the Director shall give written approval or state such steps necessary to receive approval.

C. Liquid Waste Streams Resulting from the Permitted Activity Include:

1. **Lixiviant Bleed** - excess fluid pumped from the well field to control lixiviant movement.
2. **Precipitation circuit bleed** - excess from ion exchange, elution, and precipitation.
3. **Filter backwash** - water used to remove solids from filters.
4. **Waste treatment brine** - reverse osmosis or other conventional waste water treatment processing wastes.
5. **Laboratory waste** - waste from routine chemical laboratory procedures and processes.
6. **Process building sump waste** - waste generated by general clean up of facilities, pump leakage, or washdown.

D. Disposal of Waste

1. All of the liquid waste streams shall be collected and retained in the lined evaporation ponds, or disposed of in a permitted deep disposal well as approved by the Department. This permit does not authorize any wastewater discharge to the land surface or surface water of the State of Nebraska. Land application or surface discharges of wastewater must be regulated through a separate permit.
2. Radioactive solids will be disposed of as per NRC License SUA-1534.
3. Nonradioactive solids - solid and semisolid wastes will be disposed of at a licensed landfill site in accordance with Neb. Rev. Stat. 81-1516 (Reissue 1994).

E. Development Drilling

This permit allows development drilling within the permit area for the purpose of determining new mine unit locations. The permittee shall notify the Department at least ten (10) days prior to any development drilling within the permit area.

1. Upon completion of a hole an approved abandonment mud shall be mixed to a viscosity of at least 20 seconds/qt. above the Total Depth (T.D.) viscosity to exceed 60 seconds/qt. (using a Marsh funnel). For Bentonite muds, the specific gravity of the abandonment mixture shall be a minimum of 9.2. The abandonment mud shall be circulated through the hole until it is returning to the mud pit.
2. An approved hole plug shall be placed six feet below the land surface followed by cement which has been mixed with water to within two feet of the land surface. The top two feet of the hole shall be filled with dirt into which a hole marker, showing section, township, and range shall be placed.
3. The topsoil will be removed and stockpiled separately from the rest of the pit material. Upon completion of the hole the pit will be filled and the dirt mounded to allow for subsidence. The pit will then be leveled, topsoil replaced and the entire site reseeded with an approved seed mixture.
4. A hole abandonment report shall be included with the quarterly report. It shall include the T.D. viscosity, the abandonment viscosity, the specific gravity, and the amount and kind of approved abandonment product used to plug each hole.

Part II. INJECTION LIMITATIONS MONITORING REQUIREMENTS AND DETERMINATION OF RESTORATION

A. 1. Injection Well Limitations

Commencing on the date of approval of the Notice of Intent to Operate and lasting through the permit expiration date the permittee is authorized to inject sodium carbonate/bicarbonate and an oxidant or a restoration reductant to the wells designated as injection wells. (See Notice of Intent to Operate.) Such injection shall be limited as specified below:

<u>INJECTION CHARACTERISTICS</u>	<u>INJECTION LIMITATIONS</u> <u>Maximum</u>	<u>MONITORING REQUIREMENTS</u>	
		<u>Measurement</u> <u>Frequency</u>	<u>Sample</u> <u>Type</u>
Well Head	100 PSIG	Once/day	Manifold Gauge
Injection Rate	5000 GPM	Once/day	Totalizer Meter
Injection Fluid			
Chloride	≤ 5000 mg/l	Once/day	24 Hr. Composite
Sulfate	≤ 5000 mg/l	Once/day	24 Hr. Composite
Sodium	≤ 6000 mg/l	Once/day	24 Hr. Composite
Alkalinity	≤ 4100 mg/l	Once/day	24 Hr. Composite
pH	6 ≤ pH ≤ 10.5	Once/day	Grab
Bleed Rate		Once/day	Totalizer Meter

Sample(s) taken in compliance with the injection requirements specified above shall be taken at the following location(s):

- Injection pressure; from a gauge on manifold
- Injection totalizer; from flow meter downstream of filters after chemicals are added but before oxidant addition
- Injection fluid; downstream from filter after chemicals are added but before oxidant addition

2. Mine Unit Limitations

The permittee shall have no more than five mine units in the mining stage at any given time.

The permittee shall not have more than five mine units in restoration (excluding those units in stabilization) at any given time.

The permittee shall not have more than three mine units constructed in advance of the active mining.

3. Archaeological and Historical Limitations

The permittee shall not conduct mining activities or cause other modifications within a 100 foot radius of the six archaeological or architectural sites that could qualify for the national register without written approval from the Nebraska State Historical Society. This written approval must be supplied to the Department thirty days prior to any development or construction activity within the area. The permittee is responsible for any additional field investigations which may be required for Historical Society approval. These six sites are listed on page 4.8 (97) of

Crow Butte Uranium Project
Application and Supporting Environmental
Report for State of Nebraska
Underground Injection Control Program
Commercial Permit
November 1987

as: 25DW112, 25DW114, 25DW192, 25DW194, 25DW198, and
25DW00-25

4. Pump Test Limitations

The permittee shall not construct any mine units outside the area of influence of the pump tests shown in Figure 2 of this permit. If mine units are required outside this area the permittee must conduct another pump test to demonstrate continued confinement and hydrologic conditions. The data from this test shall be submitted to the Department and receive approval prior to any construction.

B. MONITORING REQUIREMENTS

1. During the period beginning with approval of Notice of Intent to Operate and lasting through restoration and stabilization of a mine unit, the permittee shall monitor all wells designated as monitor wells as specified below:

MONITORING REQUIREMENTS
Upper Control Limit¹

<u>MONITORING CHARACTERISTICS</u>	<u>Sampling Frequency</u>	<u>Single Parameter²</u>	<u>Multiple² Parameter</u>	<u>Sample Type</u>
Chloride	Biweekly	mg/l	mg/l	Grab
Sulfate	Biweekly	mg/l	mg/l	Grab
Sodium	Biweekly	mg/l	mg/l	Grab
Conductivity	Biweekly	umhos/cm	umhos	Grab
Alkalinity (as CaCO ₃)	Biweekly	mg/l	mg/l	Grab
Water Level	Biweekly	Reported to nearest 0.1 ft. from land surface.		
Barometric Pressure	Biweekly			

Sample(s) taken in compliance with the monitoring requirements specified above shall be taken at the well head.

Footnote(s) in reference to Part II, C.; page 10.

2. Upon initial pond operation and until approval of the Director to cease, the permittee shall monitor the evaporation pond leak detection systems and the evaporation pond freeboards as specified below:

MONITORING CHARACTERISTICS

SAMPLING FREQUENCY

Fluid Level
Freeboard

Weekly*
Weekly

Measurements taken in compliance with the monitoring requirements specified above shall be taken from the detection system and at the pond.

With the exception of specific monitoring requirements in this permit, all monitoring of the ponds and the detection systems shall be in accordance with the NRC License SUA - 1534.

3. Upon initial pond operation and until approval of the Director to cease the permittee shall monitor the evaporation pond monitor well(s) as specified below:

MONITORING CHARACTERISTIC

SAMPLE FREQUENCY

SAMPLE TYPE

Conductivity	umhos	Quarterly	Grab
Chloride	mg/l	Quarterly	Grab
Alkalinity (as CaCO ₃)	mg/l	Quarterly	Grab
Sodium	mg/l	Quarterly	Grab
Sulfate	mg/l	Quarterly	Grab

Sample(s) taken in compliance with the monitoring requirements specified above shall be taken at the well head.

*Upon determination of elevated fluid levels or other conditions indicative of a leak into the underdrain system, the permittee shall notify the Department immediately and conduct daily monitoring until occurrences causing the leaks into the underdrain system have been corrected, and the results from daily monitoring or sample analyses substantiate the corrective actions. Such information shall be reported to the Department. If corrective actions require the pumping of the contents of one evaporation pond into another, the minimum freeboard levels are waived until such time as the corrective actions have succeeded, and the evaporation pond can be placed back into service.

C. Footnotes

1. If a single parameter Upper Control Limit (UCL) is exceeded or if two or more multiple parameter UCLs are exceeded for a particular well, the permittee shall collect a verification sample within 24 hours from the time the first analysis is available. If the second sample does not indicate exceeded UCLs, a third sample shall be taken within 48 hours of the time the first sample was taken.

If the second or third samples indicate an exceeded UCL, the well in question shall be placed on excursion status and monitored on a weekly basis. The permittee shall notify the Department by telephone within 24 hours from the time the confirmation sample was taken. The permittee shall mail to the Department the laboratory data from all the samples and a plan of corrective action. This data shall be postmarked within five days from the time the confirmation sample was taken. In the event neither the second nor third samples indicate exceeded UCLs then the well shall be returned to its regular sampling frequency.

At such time as three consecutive one-week samples are below the exceeded UCL, the excursion status shall be removed from the well. Weekly sampling shall continue for an additional three weeks. If the UCL is not exceeded then biweekly sampling shall resume. Should an excursion occur, a formal report shall be submitted with the quarterly report containing all lab data and the results of the corrective actions taken. If corrective actions have not been effective within 90 days of the excursion confirmation, the injection of fluid shall be terminated in the affected area. Resumption of injection shall require a written approval by the Director.

2. Upon receipt of pertinent data and prior to operation, the UCLs for the monitor wells shall be calculated using the following method:
 - a. Determine the maximum recorded value from preoperational sampling.
 - b. Multiply the maximum recorded value by 1.20 to calculate the multiple parameter value.
 - c. Multiply the multiple parameter value by 1.20 to calculate the single parameter value.
 - D. These values will be rounded off to the nearest unit.

D. Restoration Determination

Upon construction of a new mine unit the permittee shall designate and sample one baseline restoration well per four acres within the mine unit for all the parameters listed on the restoration table (Table 1, Part II, D, 2, c). All the

premining sampling must be at least 300 ft. from any active mine unit (not to include the R&D well field).

1. Designation of Restoration Wells

Within each mine unit a minimum of one injection or production well per acre shall be designated as a restoration well. There shall be a minimum of ten restoration wells per mine unit. The production well of each standard injection well pattern shall be designated as the restoration well. If there is more than one standard injection well pattern per acre, the production or injection well which is centrally located shall be designated as the restoration well. Any monitor well which has an excursion will automatically become an additional restoration well. The designation of the baseline restoration wells must be included with the Notice of Intent to Operate for the mine unit. The designation of the remaining restoration wells shall be included in the restoration plan submitted for that mine unit.

2. Establishment of Restoration Parameters

- a. Those parameters which have numerical ground water standards established in Title 118 or other established documents must be restored to the standard value unless the standard is exceeded by the mean of the preoperational sampling values (baseline mean). The restoration value for parameters whose baseline mean exceeds the standard shall be equal to the mine unit mean plus two standard deviations (see Table 1, Part D, 2, c).
- b. If no standard exists for a parameter listed on the restoration table (Table 1), a wellfield average of the preoperational sampling data shall be assigned. Normal statistical procedures will be used to obtain this average. All three values obtained from Part D. above shall be averaged to obtain the assigned restoration value (see Table 1).
- c. Prior to any mining in the mine unit the permittee must submit these values to the Department for approval. All data to verify the selection of these wells shall be submitted.

TABLE 1: RESTORATION TABLE

PARAMETERS WITH GROUND WATER STANDARDS		PARAMETERS SET ON WELLFIELD AVERAGES	
<u>Element</u>	<u>Standard (mg/l)</u>	<u>Element</u>	<u>Wellfield Average</u>
Ammonia (NH ₄ as N)	10	Calcium (Ca)**	
Arsenic (As)	0.05	Total Carbonate*	
Barium (Ba)	1.00	Potassium (K)**	
Cadmium (Cd)	0.01	Magnesium (Mg)**	
Chloride (Cl)	250	Sodium (Na)**	
Copper (Cu)	1.70	Total Dissolved Solids(TDS) ***	
Fluoride (F)	4.00		
Iron (Fe)	0.30		
Mercury (Hg)	0.002		
Manganese (Mn)	0.05		
Molybdenum (Mo)	1.00		
Nickel (Ni)	0.15		
Nitrate as N(NO ₃)	10.0		
Lead (Pb)	0.05		
Radium (Ra)	5.0 pCi/l		
Selenium (Se)	0.01		
Sulfate (SO ₄)	250		
Uranium (U)	5.00		
Vanadium (V)	0.20		
Zinc (Zn)	5.00		
pH	6.5-8.5		

All parameters listed as parameters with numerical ground water standards (Title 118 or other sources) are subject to change based on the procedure outlined in Part II, D, 2 of this permit.

* Total carbonate shall not exceed 50% of the total dissolved solids value.

** One order of magnitude above baseline mean shall be used as a restoration value for some parameters due to the ability of some major ions to vary one order of magnitude depending on pH.

*** The restoration value for Total Dissolved Solids shall be the baseline mean plus one standard deviation.

3. Restoration Procedure

At the cessation of mining in each mine unit the permittee shall notify the Department in writing, and shall proceed to establish the post-mining water quality for all the parameters listed on the restoration table (Table 1) of this permit for the designated restoration wells. The permittee may accomplish this by collecting a sample of the lixiviant injected into the mine unit to be representative of the post mining water quality. These samples may be split between a lab of the permittee's choice and a lab of the Department's choice.

The permittee shall submit in writing a restoration plan including a stabilization period of at least six months for that mine unit, and after Department approval shall commence restoration. Prior to approval of the restoration plan, the Department may require the installation of additional wells to evaluate the success of the restoration efforts. When the permittee determines that restoration is complete they shall sample and complete an analysis of all designated restoration wells for all the parameters listed in the restoration table. These samples must be split between a lab of the permittee's choice and a lab of the Department's choice. Results of these samples shall be submitted to the Department.

4. Restoration Determination and Stabilization

a. Restoration Parameters Achieved

If the restoration procedure has returned the wellfield average of the restoration parameters to concentrations at or below the parameters approved by the Department, the permittee shall notify the Department that they are initiating stabilization. This notification shall include data supporting the fact that the restoration parameters have been achieved. The Director shall respond in writing by either accepting or denying the initiation of stabilization. If at any time during stabilization the Director deems it necessary, he or she may extend the stabilization period by notifying the permittee in writing. During stabilization, the permittee will monitor all designated restoration wells on a monthly basis for all the parameters listed on the restoration table. At the end of the stabilization period, the permittee shall submit this data and may request that the wellfield be considered restored. The Director shall, in writing, extend the stabilization or, require further restoration, or accept the restoration of the mine unit.

b. Restoration Parameters Not Achieved

If the restoration parameters are not met after application of best available technology, the permittee shall provide for the Department's approval a written justification for alternate values.

This justification shall include all available water quality data for the mine unit in question, a narrative discussing the restoration techniques including demonstration of best available technology and a justification of the need to alter the parameter(s). The adoption of an alternate value shall not in and of itself indicate a failure to successfully restore the mine unit.

In determining whether the restoration table (Table 1) should be altered the Department shall consider the following:

- (1) Uses for which the ground water was suitable at baseline quality levels;
- (2) actual existing use of the ground water in the area prior to and during the mining;
- (3) potential for future use of the ground water at baseline quality and at proposed restoration parameters;
- (4) the effort made by the permittee to restore the ground water to the restoration parameters;
- (5) the availability of existing technology to restore the ground water to the restoration parameters; and
- (6) the potential harmful effects of levels of particular parameters.

If the Department determines that:

- (a) Reasonable efforts have been made giving consideration to (1) through (6) above; and
- (b) the formation water present in the aquifer would be suitable for any use for which it was reasonably suited to prior to mining; or
- (c) further restoration efforts would consume energy, water, or other natural resources of the State without providing a corresponding benefit to the State,

the Department may adopt the alternate value(s) and inform the permittee in writing.

If the Department determines, with cause, that alternate values are not justified, then written denial of alternate values shall be sent to the permittee. The permittee shall then submit a second restoration plan detailing further restoration and after approval, shall commence restoration.

When the permittee determines that subsequent restoration is complete the permittee shall sample and complete an analysis of all designated restoration wells for all the parameters listed in the restoration table. These samples shall be split between a lab of the permittee's choice and a lab of the Department's choice. Results of these samples shall be submitted to the Department. Restoration determination shall begin again as outlined in Part II. D. above.

PART III. WELL CONSTRUCTION, SPACING, SAMPLING AND REPORTING

A. Well Construction Requirements

All wells shall be constructed in accordance with Section 10.2 of:

Crow Butte Uranium Project
Application and Supporting Environmental
Report for State of Nebraska
Underground Injection Control Program
Commercial Permit
November 1987

or subsequent submittals. Wells which are completed using bentonite grout as a sealing material must utilize a cement basket at or near the base of the casing to help support the column of grout. The casing shall extend as close to the bottom of the hole as possible before emplacement of the bentonite grout. In addition, placement of the bentonite grout must be accomplished through the use of a tremie pipe.

1. Production zone monitor wells shall be screened through the entire aquifer thickness with a screen-to-blank ratio of at least 1.

Shallow monitor wells shall be screened through the entire sand unit. The permittee shall notify the Department at least five days prior to well construction. The Notice of Intent to Operate shall include well completion reports for these wells. Approval of the initial well construction shall be given with the Notice of Intent to Operate. All wells must be shown to be functionally operational prior to initiation of the mining.

2. Production zone monitor wells shall be spaced no greater than 300 feet from a mine unit and no greater than 400 feet between the wells and located so as to detect excursions.

Shallow monitor wells shall be completed in the first continuous and water-bearing sandstone unit overlying the production zone. These wells shall be equally distributed throughout the mine unit, with one well for every four acres included in the mine unit.

3. Injection/Production wells shall be constructed in accordance with Part III A. above. The permittee shall notify the Department at least five days prior to well construction. The Notice of Intent to Operate shall include well completion reports for these wells. Each well must be shown to be functionally operational prior to its use. Any Injection/Production well which is completed or intended to be completed by underreaming the casing must use cement or cement/bentonite grout as a sealing material.

All wells constructed are subject to the mechanical integrity requirements contained in sections I and IX of this permit. In addition to these requirements, any well which has had a rig workover performed on it must pass a mechanical integrity test prior to being placed back into service. Workovers performed with a smear are exempt from this requirement.

B. Monitor Well Sampling Procedures

1. Mine Unit

- a. Measure water level.
- b. Pump or airlift to evacuate at least one casing volume and allow pH and conductivity to stabilize prior to sampling;
- c. Samples shall be held field filtered and preserved in accordance with the U.S. Environmental Protection Agency's Approved Methods for Sampling and Sample Preservation of Water and Wastewater.

2. Evaporation Pond Monitoring Wells

- a. Measure water level.
- b. Pump, airlift or bail to evacuate at least one casing volume and allow pH and conductivity to stabilize prior to sampling.
- c. Samples shall be held and preserved in accordance with the U.S. Environmental Protection Agency's Approved Methods for Sampling and Sample Preservation of Water and Wastewater.

C. Preoperational Sampling of Newly Constructed Wells

1. Restoration Wells

A minimum of one baseline restoration well per four acres will be sampled for all the parameters listed on the restoration table (Table 1, Part II, D, 2, c). All premining sampling must be done at least 300 feet from any active mine unit (not to include R&D well field). Each well must be sampled a minimum of one time in a manner and at a depth representative of the aquifer to be affected by mining fluids in that area of the mine unit. If there are anomalous sample analyses within a mine unit the Department may require additional sampling prior to any mining in that particular mine unit.

2. Monitor Wells

All monitor wells shall be sampled for all the parameters listed on the restoration table (Table 1). All premining sampling must be done at least 300 feet from any active mine unit (not to include R&D wellfield). If there is a significant variability between samples the Department may require additional sampling prior to any mining in that particular mine unit.

D. Reporting Requirements

1. Reporting shall be done quarterly unless otherwise specified. Reporting periods shall be January-March, April- June, July-September, and October-December.
2. Reporting of monitoring results gathered during reporting periods shall be summarized and reported to the Department no later than the 28th day of the month following the end of the reporting period. Copies of the results shall be kept on site for inspection by the Department.
3. Quarterly reporting must be submitted on or before April 28, July 28, October 28, and January 28.

Signed copies of these reports shall be submitted to the Department at the following address:

Nebraska Department of Environmental Quality
P.O. Box 98922
Lincoln, NE 68509

IV. PLUGGING AND ABANDONMENT

A. Plugging of wells shall be as follows:

1. The proposed plugging and abandonment plan shall be submitted to the Department for approval. The Director will review any revised, updated, or additional plugging and abandonment plans.

2. Plugging and abandonment shall be done in accordance with Title 122 Chapter 36. Prior to abandonment the permittee shall notify the Director seven days before commencing plugging and abandonment.
3. Prior to abandonment, all wells shall be plugged with cement or other approved plugging material in a manner which will prohibit the movement of fluids out of the injection zone into or between underground sources of drinking water.

B. Cement Specifications

A cement or grouting material meeting the following specifications shall be used in all well completion procedures conducted under this permit:

All cement will be ASTM Type 'I, II or API Class B or G. All Bentonite grout will have a Marsh funnel viscosity which exceeds sixty seconds per quart, and a minimum specific gravity of 9.2.

C. Plugging of boreholes shall be as follows:

Boreholes shall be plugged with an approved abandonment mud. The product sheet must state the product is abandonment mud. The mud shall be mixed through a hopper to exceed sixty seconds per quart Marsh funnel viscosity. The ten minute gel strength of the product shall be at least 20 lbs./100 sq.ft., and the filtrate volume shall not exceed 13.5 cc. For Bentonite muds, the specific gravity shall be a minimum of 9.2. It shall be circulated through the hole until the abandonment mud is returning to the mud pit.

D. Surface Reclamation

The permittee shall reclaim all disturbed land surfaces to conserve the soil and water resources in the affected areas. The Natural Resources Conservation Service shall be consulted for technical assistance in reclaiming the land surface including appropriate seed mixtures. Topsoil from the ponds and building areas shall be removed, stockpiled, and seeded during the operation, and reapplied to the contoured surface. A total reclamation plan including the seed mixture will be submitted to the Department for approval at least 60 days prior to commencement of reclamation. Pond reclamation and decommissioning/decontamination shall be in accordance with NRC License SUA - 1534.

PART V. OTHER PERMITS AND LICENSES

The permittee shall have all other permits and licenses as required by the Department and other state, federal, or local agencies.

PART VI. CORRECTIVE ACTION

A. Corrective Action

Corrective action is excerpted and modified from the permit application and herein becomes part of the permit as Appendix A.

B. Remediation of Affected Areas

This permit is hereby modified to include the remediation of a portion of the Brule Formation located in Mine Unit #2 which has been contaminated with mining fluids during injection operations. The affected area has been delineated and a plan for remedial actions was submitted to the Department on May 31, 1996. The remediation plan is hereby excerpted and incorporated into the requirements of this permit. If additional measures or alternative technologies are needed to complete the remediation they will be implemented. The incorporation necessitates requirements for financial surety contained in Title 122 to be applied to the area affected by the mining fluids.

PART VII. PERMIT DEFINITIONS

A. Permit Area

The area as shown in Figure 1.

B. Mine Unit

The area identified as a mine unit at the time of submittal of the Notice of Intent to Operate as approved by the Department.

C. Application

The document entitled, Crow Butte Uranium Project, Dawes County, Nebraska, certified November 9, 1987, meets the conditions of Chapter 11, Title 122, Rules and Regulations for Underground Injection and Mineral Production Wells.

D. Zone of Endangering Influence

That zone described in Title 122, Chapter 10, Part 001.02.

E. Area of Review

That area as shown in Figure 4.2-1 of the application as identified in Part VII. C..

PART VIII. FINANCIAL STATEMENT

Evidence of financial responsibility in the form of a letter of credit or other form satisfactory to the Department in accordance with Chapter 37, Title 122, Rules and Regulations for Underground Injection and Mineral Production Wells, shall be provided to the Department in an amount which is equal to or greater than the total costs indicated in the Surety Cost Estimate document submitted by

the permittee. The Department shall review the financial responsibility annually to ensure its adequacy.

PART IX. STANDARD PERMIT CONDITIONS

A. Monitoring and Records

All monitoring requirements shall be in accordance with those stated in Title 122, 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 Department.

2. Mechanical Integrity

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

3. 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:

Standard Methods for the Examination of Water and Wastewaters, 18th Edition, 1992, American Public Health Association. New York, NY 10019

A.S.T.M. Standards, Part 11, American Society for Testing and Materials, Philadelphia, PA 19103

Methods for Chemical Analysis of Water and Wastes, March 1979, Environmental Protection Agency Water Quality Office, Analytical Quality Control Laboratory NERC, Cincinnati, Ohio 45268

4. Additional Monitoring by the Permittee

If the permittee monitors any parameter more frequently than required using approved testing procedures or procedures specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Mining Monitoring Report. Such increased frequency shall also be indicated.

5. Averaging of Measurements

Calculations for all limitations which require averaging shall utilize an arithmetic mean unless otherwise specified by the Director in this permit.

6. Retention of Records

The permittee shall retain all records in accordance with Title 122, Chapter 18.

B. Plugging and Abandonment

Plugging and abandonment shall be done in accordance with Title 122, Chapter 36. Prior to abandonment the permittee shall notify the director seven days before commencing plugging and abandonment activities. Plugging shall conform to the following standards:

1. A plugging and abandonment plan shall be submitted to the Department for approval.
2. Prior to abandonment of boreholes and wells, the boreholes and wells shall be plugged with cement or other approved plugging material in a manner which will prohibit the movement of fluids out of the injection zone into or between underground sources of drinking water.

C. 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 permitted wells, restoration of the aquifer, and surface reclamation. This permit shall become invalid if the permittee does not maintain a performance bond or other form of financial security acceptable to the Director in the appropriate amount.

D. Reporting Requirements

1. Evaporation Pond Operation

A minimum of five feet of freeboard shall be maintained in the commercial evaporation ponds during normal operations. A minimum of three feet of freeboard shall be maintained in the R & D ponds during normal operations. The permittee shall immediately notify the Department when the freeboard decreases to less than the specifications.

Should any abrupt change in the water depth occur or a leak be detected in the evaporation pond liner, the Department will be immediately notified. The pond fluids will be evacuated as soon as practicable to another location approved by the Director, and the pond seal repaired. A determination of the extent of any subsurface contamination shall be made and a report

submitted to the Director within 30 days after the leak is detected. The report shall also contain the permittee's plan for corrective action.

All other reporting requirements shall be in accordance with Title 122, Chapter 19.

2. Signatory Requirements

All signatory requirements shall be in accordance with Title 122, Chapter 24.

3. Modification, Revocation, and Reissuance of Permit

Administer as required by Title 122, Chapter 27.

4. Permit Transfer

Administer as required by Title 122, Chapter 26.

5. Confidential Information

Address as required by Title 122, Chapter 25.

E. General Conditions

1. Compliance

Administer as required by Title 122, Chapter 39. It shall not be a defense for a permittee in an administrative enforcement action to claim that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit.

2. 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 accelerated or additional monitoring as necessary to determine the nature and impact of the noncompliance.

3. 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.

4. Severability

Administer as required by Title 122, Chapter 40.

5. Right of Entry

Inspection and Right of Entry shall be in accordance with Title 122, Chapter 14.

6. Maintenance

The permittee shall at all times properly install, operate and maintain all facilities and systems of treatment and control (and related appurtenances) to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance.

7. Permit Changes

This permit may be modified, revoked and reissued, or terminated for cause by the Department (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.

F. General Definitions

All definitions except those listed below shall be those in Title 122, Chapter 1.

Bentonite Grout - a "mud", "abandonment mud", or slurry mixture comprised primarily of water and Bentonite (Montmorillonite) which is emplaced into the void space of boreholes, or annular space of wells, or internal volume of cased wells for purposes of consolidation and elimination of permeability.

Bimonthly - Once every other month.

Biweekly - Once every other week.

Cement - A slurry mixture comprised primarily of water and Portland Cement which is emplaced into the void space of boreholes, or annular space of wells, or internal volume of cased wells for purposes of consolidation and elimination of permeability.

Cement/Bentonite Grout - A combination of Cement and Bentonite Grout.

Composite Sample - A combination of individual samples obtained at regular intervals over a period of time. Examples include the volume of an individual sample proportional to a flow rate during a sample period (flow composite), or a constant volume sample collected at equal time intervals during a composite period (time composite).

Discharge - When used without qualification, means a discharge of a pollutant(s).

Excursion - The presence of an exceeded upper control limit contained in this permit.

Freeboard - The vertical distance between the normal operational level of the surface of a liquid and the top of the side walls in a conduit, lagoon cell, tank, or evaporation pond.

Lixiviant - Leach solution injected into the ore body which is used to oxidize, complex, and solubilize the uranium ore.

Mining Monitoring Report - The forms approved by the Director and used to report the monitoring results by the permittee.

Waters of the State - All waters within the jurisdiction of this state including streams, lakes, ponds, impounding reservoirs, marshes, wetlands, water courses, 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.

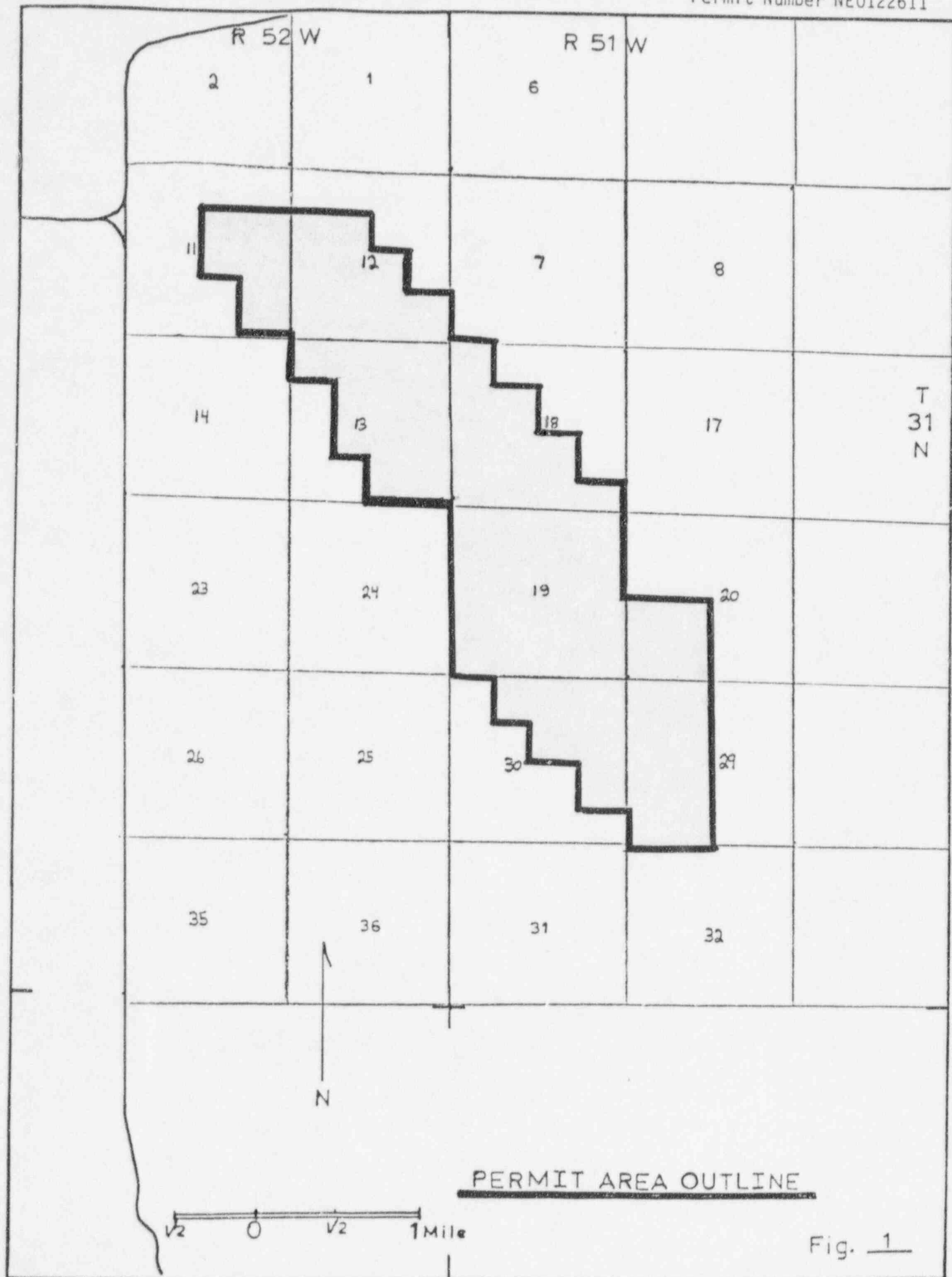
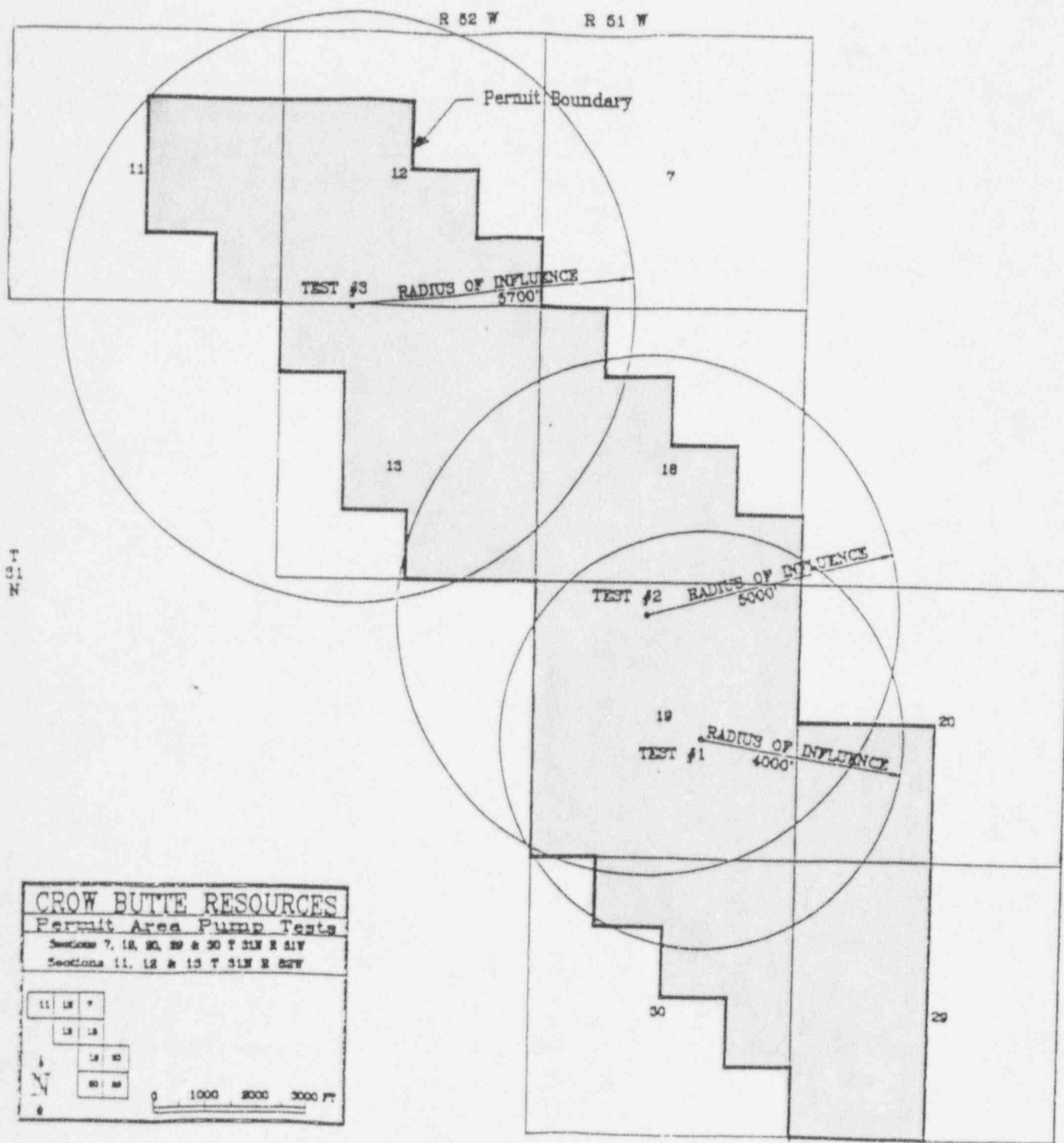


Figure 2



CROW BUTTE RESOURCES
 Permit Area Pump Tests
 Sections 7, 18, 20, 29 & 30 T 31N R 21W
 Sections 11, 12 & 13 T 31N R 22W

11	12	7
12	13	
18	20	
29	30	

0 1000 2000 3000 FT

STATE OF NEBRASKA



E. Benjamin Nelson
Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

Randolph Wood

Director

Suite 400, The Atrium

1200 'N' Street

P.O. Box 98922

Lincoln, Nebraska 68509-8922

Phone (402) 471-2186

Public Comment Responses Crow Butte Resources, Inc. Permit Modifications

The following is a response to relevant comments received by the Nebraska Department of Environmental Quality with regard to a public notice, public hearing, and public comment period concerning proposed permit modifications to Crow Butte Resources, Inc.'s operating permit No. NE0122611. Public information sessions were conducted by the Department on July 31, 1996 and on October 8, 1996. A public hearing was held on October 8, 1996 to allow opportunity for persons from the public to provide testimony for the public record concerning the proposed permit modifications.

Some of the relevant public comments have been summarized to prevent duplication of responses. It is the Department's intent in this document to include a response for all of the relevant comments received. This includes responses to comments received during both of the public notice periods, including the public comments period for the public hearing, which was extended to November 1, 1996.

Comment: The Department is encouraged to maintain the existing standards for sampling of baseline restoration wells at a minimum of three sampling events no less than two weeks apart.

Response: The Department has reviewed many years worth of sample analyses from the Crow Butte project and is convinced that the repeatability of sample analyses is very high. This is a result of the regional consistency and extent of the Chadron aquifer. Restoration values, therefore, should be able to be reasonably established utilizing one sample per restoration well and then averaging the values throughout a mine unit. The Department has reserved the privilege of requiring additional sampling if anomalous analyses are discovered as a result of unforeseen circumstances.

Comment: There should be an increase in the frequency of sampling from designated restoration wells during establishment of post-mining water quality.

Response: The sampling of restoration wells once mining has ceased in a particular mine unit is not a particularly helpful event. What Crow Butte Resources, Inc. has proposed to do is to sample the injection lixiviant to be used in the wellfields, and to have the analysis of that sample be representative of the water quality present in the mine unit once mining has been completed in that unit. Since the injection lixiviant is a common solution formulated at the plant and dispersed to the wellfields through

trunklines and manifolds, sampling of the lixiviant as it is leaving the plant should be representative of the fluids injected throughout all the Mine units. Once restoration procedures have been implemented, sample results from the restoration wells should show indications over time that the water quality is being restored towards desired levels. The only applicable characteristic initial sampling and analysis of the injection lixiviant reflects is a starting point for the water quality which the restoration process is designed to purify. An increase of frequency of this sampling, therefore, would serve no purpose since the water quality can be assessed by taking one, collective sample. The response on page seven of this document also helps justify this assertion.

Comment: The original reason for limiting the number of mining units in the production phase and restoration phase was to protect against the possibility that there would be many units in production or post production without a good handle on restoration costs and methods.

Response: The costs associated with restoration are actually estimated and accounted for in the surety cost estimate document. These costs include the methods utilized during the restoration process, and the costs associated with these methods given the physical parameters of the mining zone and the equipment utilized. Staff members from the Department who review these costs include geologists and agronomists with extensive professional experience. In addition, these costs are also reviewed by professional engineers in management within the Department prior to approval. The Department has reviewed the financial surety cost estimate document and determined that the projected costs associated with restoration are reasonable and acceptable. Any changes in costs associated with restoration will be reflected in the surety cost estimate document. The Department also has the capability of revising the surety cost estimate document at any time, if determined necessary.

With regard to the amount of financial surety required, Crow Butte Resources, Inc. is required to submit a revised surety cost estimate document to the Department for review on an annual basis. The revised document reflects the total costs associated with restoration, reclamation, and decommissioning of all the affected lands, mine units, and associated equipment and appurtenances. If something like an electrical utility rate is increased, then Crow Butte Resources, Inc. must account for that increase. If more pumping and treatment of water is needed to restore the mine units, then the appropriate associated costs will be attributed in the financial surety cost estimate. This document is updated and amended annually at a minimum in order to be reflective of the actual operations. The Department intends to continue reviewing and amending this document and the associated financial requirements as conditions warrant.

It should also be mentioned that Crow Butte Resources, Inc. operated a pilot project which was required by the State of Nebraska and EPA to demonstrate that a mine unit could be restored. Restoration of the pilot project was accomplished prior to commercial mining. The only difference between the pilot project and the commercial operation is the size of the mine units. Restoration can be accomplished in the commercial mine units, but it will take longer because of their inherent differences in size.

Comment: The Department should not allow expansion of mining operations until the Brule Formation area affected by mining fluids has been remediated. The remediation should be conducted until all parameters have been returned to background levels.

Response. The shallow area of the Brule Formation affected by mining fluids is currently being contained, controlled, and remediated by withdrawal and monitoring of ground water through strategically placed shallow wells. Current records indicate that substantial progress has already been made, as evidenced by continuous reduction of contaminant levels in the remediation wells. The Department will ensure that this cleanup progresses until the contaminants are returned to Drinking Water Quality Standards, or until the affected area can be returned to a use consistent with uses prior to the contamination event.

The Department believes that Crow Butte Resources, Inc. is capable of remediating the affected area while conducting concurrent mining operations. The Department has found no evidence of gross negligence or serious impending health risks occurring as a result of the leak. The absence of these factors adds justification to proceed as proposed.

The proposed permit modifications are not considered to be "expansion". The company currently has a permit boundary within which they operate. The size of this permit boundary is not being enlarged. What Crow Butte Resources, Inc. is trying to achieve through the permit modifications is to add flexibility and ensure progressive implementation with respect to the mining and restoration activities. This involves increasing the number of mine units that can be in operation and restoration at any one time. In order to maintain sufficient head grades at the processing plant, Crow Butte Resources, Inc. must have areas ready and available to be put into production. These areas become the next Mine Units, and can vary in size depending on the amount of production that is anticipated. The existing permit conditions restrict the number of Mine Units that can be in construction, operation, and restoration, but do not restrict their size. The Department believes it would be better to have more mine units which are smaller in size rather than a few mine units which are enormous. The ability to conduct restoration within several small units concurrently will lend itself to more progressive restoration than trying to restore one large Mine Unit which may or may not be as responsive to such efforts. Geology and topography also play an important part in determining some logical boundaries. Combining these natural boundaries with the smaller sized Mine Units will help ensure progressive restoration activities. The Department is convinced that these activities can be achieved in a manner which is protective of the environment.

With regard to comments concerning the cleanup levels for the contaminated area of the Brule Formation, the Department has requirements and goals for remedial actions which are contained in Title 118 "Ground Water Quality Standards and Use Classification", Appendix A "Ground Water Remedial Action Protocol", Part II which base preliminary cleanup levels for contaminated aquifers on the level necessary to maintain a drinking water use. For some parameters, this level may be at the background level. For parameters which cannot be returned to background levels, the

level of remediation may be based on the State Drinking Water Standards, or the appropriate Federal Drinking Water Standards if a State standard is not assigned to a particular parameter. For parameters with no State or Federal Standard, a level for remediation may be assigned based on the most recent health advisories. If for some unforeseen reason the permittee cannot return a parameter to the desired level of restoration, the Department may consider the technical feasibility of continuing remediation efforts, and may consider alternative cleanup levels for parameters, if determined appropriate. The Department will review the progress of the remediation activities with respect to these goals. The progress shown in the initial remediation of the Brule has been substantial. The levels of contaminants are declining rapidly using the simplest pumping and recovery techniques. In consideration of the magnitude of the leak into the Brule Formation and the aforementioned requirements that can be implemented by the Department, the imposition of additional restrictions to Crow Butte Resources, Inc. is not warranted at this time.

Comment: The DEQ should increase the number of monitoring wells within a mine unit and increase the frequency of sampling within a mine unit in order to more readily detect excursions.

Response: The Department believes that the magnitude of the leak in conjunction with the nature of the Brule Formation deposits does not justify additional ground water monitoring requirements. The issue of protection against future excursions with regard to the leak into the Brule Formation centers around mechanical integrity. In this instance, Crow Butte Resources, Inc. has identified a potential cause for the leak that has occurred. The Department also agrees that the leak probably resulted from workover operations performed inside the casing of the leaking well. As a result the company has implemented a program to re-test for mechanical integrity any well which has had rig workover operations or a resistivity log run on it after workover operations to demonstrate mechanical integrity. The Department has reviewed these procedures and determined that they are appropriate. Installation of additional monitor wells with more frequent analyses is not warranted with respect to this particular case since the existing monitor wells near the plume were never impacted by the leak. The plume in this case was simply too small to be detected in the shallow monitor well system. Minor leaks of this magnitude do not warrant reconfiguration of the monitor well system or increases in the number of monitor wells. The mechanical integrity test which discovered the problem is a good indication of the ability to detect problems before they become unmanageable.

The Department will, however, require Crow Butte Resources, Inc. to continue to perform the mechanical integrity tests on all wells which have had a rig workover performed on them. This has been incorporated into their operating permit as a minor permit modification, in accordance with Nebraska Title 122, Chapter 27, part 003.

Comment: The Crow Butte Uranium Facility is a foreign owned enterprise structured to get around state requirements. It is a fully automated facility without human oversight to assure that everything is operating properly. In addition, the NDEQ's oversight is not adequate.

Response: The issue of foreign ownership has been challenged in various state courts and has not resulted in any legal opinions against Crow Butte Resources, Inc. Crow Butte Resources, Inc. employs processing plant operators who are on-site 24 hours a day, and any incident or spill of significance or magnitude can be detected immediately at the processing plant. In fact, response times to previous incidents have been immediate and thorough. The incidence of contamination to the Brule Formation originated from an extremely small leak that would have been very difficult to detect without the implementation of a mechanical integrity test, which is how this leak was discovered. The fact that the leak was discovered by mechanical integrity tests required by the Department is demonstrative that these types of mechanical tests play an important role in the regulatory process. Human oversight, however, by both the Department and the company also plays a critical role.

The Crow Butte Uranium Facility employs over 40 people, many of whom work within the processing plant as operators, geologists, engineers, and lab technicians. The plant has a computerized operating system which maintains desired operating efficiencies, but is controlled and monitored by several different operators during each shift of a 24 hour day. The on-going operations at the plant and the continuous construction activities in the wellfields are primarily manual in nature and labor intensive.

The Department has personnel on-site daily who average witnessing over 50% of all mechanical integrity tests, well constructions, and hole abandonment procedures. In addition, sampling procedures conducted by the Department at the facility are done in a random, unannounced manner so that preferential results are not obtained in the corresponding analyses. Specific Quality Control measures are also utilized with regard to the analyses to provide adequate data control checks on both the lab utilized by the Department and the lab utilized by Crow Butte Resources, Inc.

Comment: A statistical analysis should be performed to demonstrate that the change in restoration sampling won't change the restoration parameters.

Response: A statistical analysis has been performed on the sampling data for each Mine unit to be mined prior to Department approval for operation. In fact, it is that very data which convinces the Department that the request made by Crow Butte Resources, Inc. to reduce the frequency of sampling is acceptable. In addition, the Department independently analyzes the ionic balances within the mine units for consistency. The Department contends that the aforementioned analyses support the request to reduce the frequency of sampling in designated restoration wells prior to mining within a new mine unit.

Comment: An increase in the amount of financial surety should be required to account for the remediation of the Brule Formation area affected by mining fluids.

Response: The Department has already received the updated financial surety document which includes costs associated with remediation of the Brule Formation area affected by mining fluids. The Department has reviewed the document for sufficiency, and will ensure that the revised amount of financial surety in the amount of \$6,161,448.00 is obtained.

Comment: Independent monitoring of the Crow Butte Uranium Facility should be established.

Response: It is the responsibility of the Department through the Underground Injection Control regulations contained in Nebraska Title 122 to regulate the Crow Butte Uranium Facility. The operating permit issued under the authority of the aforementioned regulations requires operational conditions and monitoring requirements that must be performed by the operator. The Department conducts oversight of these activities, including random, unannounced inspections and collection and analyses of samples to ensure compliance with all of the requirements of the operating permit. The Department is not authorized to create an independent monitoring unit. An independent monitoring unit would have to be established by Crow Butte Resources, Inc.

Comment: Increased monitoring systems within the Brule Formation should be established.

Response: The Department believes that the existing monitoring system within the Brule Formation is adequate considering the geologic nature of the Formation, and its limited ability to yield useable amounts of ground water. The Brule Formation in the area of the Crow Butte mine consists primarily of siltstone with low permeability and limited ability to yield ground water. Isolated areas within the Brule Formation consist of low yielding channel sands at various depths. Some of these channel sands are used as a ground water supply for private wells. The closest private well in the Brule Formation belongs to Crow Butte Resources, Inc.. Any current potential health risks would therefore be in consideration of the ability of the plume of contamination somehow intercepting this well. Since the plume is being contained and remediated, the potential to intercept any private well has been essentially eliminated. There is therefore no risk to human health as long as the plume can be contained and simultaneously remediated.

In general geologic terms, the Brule Formation in the area of the Crow Butte mine can best be categorized as an aquitard, meaning that it has the characteristics of a leaky confining bed that retards, but does not prevent the flow of water to or from an adjacent aquifer. It does not readily yield water to wells or springs, but may serve as a storage unit for ground water. This is much different than an aquifer, which is best characterized as a body of rock that is sufficiently permeable to conduct ground water and to yield economically significant quantities of water to wells and springs.

The difficulty with monitoring the Brule Formation at the Crow Butte site is dependent on the variable nature of the channel sands which yield the groundwater. Crow Butte Resources, Inc. currently installs shallow monitor wells in the first developed sand (channel sand) below land surface in order to protect its potential use as a ground water source. In order to monitor each channel sand separately, numerous wells would have to be drilled on very close spacing in order to ensure complete coverage. Such monitoring is unreasonable.

In addition, Please read the enclosed letter from the University of Nebraska, Conservation and Survey Division which was submitted to the Department during the comment period for the public hearing held on October 8, 1996.

Comment: Why was there no annular seal in the top 30 feet of the well which had the leak, and how does the Department know that all of the other wells are not leaking also?

Response: Review of the well construction records indicate that the well which had the leak was constructed in accordance with Department requirements, and that the material utilized to provide the annular seal was circulated to surface from total depth as required. This indicates that there is an adequate seal in the annular space of the well. The Department has no records which indicate that there was a potential problem with the annular seal.

To ensure that an annular seal is adequately present in all wells constructed by Crow Butte Resources, Inc., the Department requires the operator to pump the sealant material down through the casing and up the annular space until it is returning to the surface. In some cases, the sealant does not return all the way to the surface, and the well must be "topped off" from the surface utilizing a tremie pipe. Both of these procedures are the recommended methods for emplacing an optimum annular seal. The sealant material is usually cement-bentonite grout, which is the preferred material for grouting wells, and top-jobs are most often completed utilizing cement to prevent the possibility of hydration of bentonite near the surface as is possible in arid environments. Similar well construction details are available for all wells constructed at the facility.

Comment: The proposed procedure of analyzing the injected lixiviant is not representative of the conditions in the mined zone as the fluids have been modified by treatment to remove uranium (and possibly other heavy metals). Therefore, a better choice for collection of a representative composite sample is to obtain one of the common produced "pregnant" fluids.

Response: The sampling of the mine units after mining and prior to restoration serves no other purpose than to verify that the water in the mine unit has been affected by the mining process. The restoration parameters established in the mine unit prior to mining are the numerical goal for the restoration procedures, and are logically given the most importance. The mining company is obligated to conduct the restoration process. At the cessation of mining in a mine unit, the "pregnant" lixiviant is actually quite similar in chemical composition to the barren lixiviant since most of the uranium has already been extracted. Given the fact that all of the restoration wells and numerous other wells will be sampled several times to gauge progress during the restoration process, the knowledge of the starting point for the restoration parameters becomes moot once the restoration process has been implemented. The burden for the company during restoration is to meet the restoration parameter numerical goal, not to necessarily demonstrate the difference in those parameter levels at the beginning and the end of the restoration process.

Comment: Will there be changes in the methods of mining in the expanded facility with regard to the capacity of the plant and the ability of the plant to "overproduce" from the well fields to control excursions?

Response: The processing plant currently has the capacity to accommodate the expected flows from additional wellfields. The Department believes Crow Butte Resources, Inc. will continue to operate those portions of the mine units which produce the highest percentage of yields possible. This means that some portions of some mine units may be shut-in, or not operating at various times. In this manner the company can maintain optimum production, optimum efficiency, and effectuate hydrologic controls on the mine units as needed.

Mine units will most likely be restored sequentially although the company has the capacity to conduct various types of restoration activities at the same time in different units. Included in this capacity is the ability to overproduce from various wellfields in order to prevent excursions. There will be no passive leaching at the facility due to hydrologic conditions and technologies already implemented which are much more efficient. In addition, with the upgraded capabilities of the Class I disposal well, the company should not have problems with additional anticipated waste water from the combination of the increased restoration flow and potential simultaneous addition of more units in restoration. There is no reason for mine units which have been mined to sit idle prior to the implementation of restoration activities.

Comment: Sample analyses data for restoration wells are pooled to obtain the means and standard deviation utilized to calculate the restoration parameters. Sample analyses data for the monitor wells is not pooled, and should therefore be required to conduct the current multiple sampling required in order to provide a statistical basis for baseline averages or upper control limits.

Response: The statistical consistency of the Chadron aquifer suggests that such data is not necessary. One sampling event from the commercial monitor wells could be combined with the restoration wells analyses of a mine unit to obtain a statistical analysis for a particular group of wells if such an event as an excursion was to occur. The commercial monitor wells are located no more than 300 feet from a mine unit, so the standard deviations for most parameters in the analyses should be small, as demonstrated in previous sampling events. The continuation of repeated sampling of the commercial monitor wells, therefore, is not necessary to establish the required baseline averages or upper control limits.

A similar argument can be made for the Brule Formation shallow monitor wells located inside the mine unit. In the event of an excursion, site specific water quality data could be pooled to obtain an average and standard deviation, if needed. Such an event would require the drilling of additional wells for purposes of delineation and remediation. Unimpacted delineation wells in this situation could be used to help determine the background water quality.

Comment: The company should be fined for the unauthorized release of contaminants into the Brule Formation.

Response. The Department does not assess fines to violators. The Department forwards enforcement requests to the Attorney General's office with recommendations for penalties, but actual penalties are assessed by the courts and are a function of the legal system.

* * * *

In summary, the Department believes approval of the proposed permit modifications are reasonable in consideration of existing and projected operations at the Crow Butte Uranium Facility. The reduction in the amount of restoration sampling required is a reasonable adjustment given the regional extent of the Chadron Aquifer, its consistency, and the indications of such as evidenced through many years of repeated sampling and analyses. The analysis of one sample of injection lixiviant at the end of mining in a mine unit to be representative of the water quality in a mine unit prior to restoration (i.e. a starting point for the restoration process) is also a reasonable request. The issue of the number of mine units in operation and restoration is a need reflective of changes Crow Butte Resources, Inc. is proposing as necessary for the logical progression of mining and restoration activities. This involves increasing the number of mine units which can be in operation and restoration at any time. It does not increase the size of the permitted area.

The remediation of the portion of the Brule Formation affected by mining fluids is also an important addition to the requirements set forth in Crow Butte's operating permit. In addition to remediating the affected area, Crow Butte Resources, Inc. has implemented a program of conducting mechanical integrity tests on any well which has had a rig workover or resistivity log run for mechanical integrity performed on it. The Department interprets this program to be an important step in preventing similar occurrences, and is incorporating this procedure into the operating permit for the company as a requirement. Installation of additional monitor wells with more frequent analyses is not warranted with respect to this particular event since the existing monitor wells near the plume were never impacted by the leak. The plume in this case was simply too small to be detected in the shallow monitor well system. The mechanical integrity test which discovered the problem is a good indication of the ability to detect problems before they become unmanageable. The Department believes that the magnitude of the leak in conjunction with the physical characteristics of the Brule Formation deposits does not justify additional monitoring requirements.

Several references have been made to "surface or subsurface contamination" of western Nebraska's waters. The assumption made in order to justify these comments is that since Crow Butte Resources, Inc. has had instances of spills to the surface, that these spills have somehow permanently contaminated soils or surface waters. These assumptions are completely without foundation and do not reflect actual occurrences or the efforts required by the Department of Crow Butte Resources, Inc. to mitigate and eliminate surface releases.

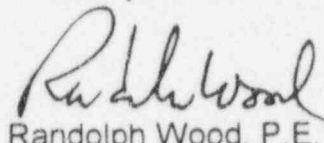
The facts are that the surface releases predominantly impact soils in the area of a release, and as such, Crow Butte Resources, Inc. has properly removed and properly disposed of any soils impacted by a surface release. Surface water monitoring of Squaw Creek prior to and after surface releases has documented that there has been no measurable impact to surface water quality as a result of these releases.

The issue of subsurface contamination is much more complex. In reference to the Chadron aquifer and the nature of in-situ uranium mining, degradation or "contamination" of subsurface water quality is inherent to the process of solubilizing and extracting the uranium. The restoration process, however, is dedicated to restoring the aquifer to a use consistent with uses prior to when the mining process began. Crow Butte Resources, Inc. has demonstrated previously in a pilot project that restoration of the aquifer can be achieved. Restoration activities at the commercial mine have just been implemented within the last two years. Mine Unit #1 is approximately 50% restored. Added treatment capacities and wastewater disposal capacities brought on-line this year will help to increase the rate of restoration.

In reference to the recent contamination of a small portion of the Brule Formation, the Department can verify that there has been an impact to a small portion of the Brule Formation as a result of a shallow leak from an injection well. The Department is taking all reasonable steps to ensure that the contaminated area remains captured and is remediated to acceptable levels. Current sampling data indicate that remediation efforts conducted for several months have already reduced the contamination over 30%. The Department will continue to monitor this progress as we would for any site conducting ground water remediation efforts. Our goal is to see parameters in the Brule Formation water returned to drinking water quality levels.

The Department agrees that protection of underground aquifers is important, and will continue to ensure that the uranium mining industry utilizes the best available technology and processes which protect these useable resources.

Sincerely,

A handwritten signature in dark ink, appearing to read "Randolph Wood", written in a cursive style.

Randolph Wood, P.E.
Director

RW/FM/rd

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Enclosure:



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Geological and Natural Resources Surveys



Date: October 24, 1996

To: Perry Wigley
Director, Conservation & Survey Division

From: Steven Sibray
Scottsbluff Office, C.S.D.

Topic: DEQ Public Hearing, Crawford, NE., October 8, 1996

We have reviewed all of the technical documents available from DEQ concerning the contaminated area of the Brule Formation associated with the leak from Crow Butte Resources injector well. We have concluded that DEQ's and Crow Butte Resources response to this situation is appropriate and consistent with what we know about the general hydrogeologic nature of this formation. The Brule Formation, which consists primarily of siltstone, is an aquitard with relatively low hydraulic conductivity in most areas. Although the Brule Formation can have localized zones of higher hydraulic conductivity (channel sands and fracture zones), none of the data that we have reviewed from the contaminated area suggests that higher conductivity type material is present at this site.

We were disappointed that no one from the public attended the informational part of the meeting when we could have discussed the hydrogeology of the Brule Formation in greater detail. We would have been able to inform the public about our research on the Brule Formation at other sites where we have noted that vertical hydraulic conductivity (kv) can be much less than horizontal hydraulic conductivity (kh). As a consequence, migration of fluid through the Brule Formation is even slower in the vertical direction. This would require a monitoring well network to be a three dimensional network of closely spaced wells throughout the entire thickness of the Brule Formation. We have to conclude that the concept of a network of monitoring wells in the Brule Formation at the Crow Butte site for detecting potential leaks is impractical and would be ineffective. A much more effective method of detecting leaks in this situation is the mechanical integrity test which was successful in detecting this leak. We plan to assist DEQ in the further evaluation of the remediation efforts at this site and will keep you informed if there are any further developments.

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