UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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FCUP:SDW
40-8027
SUB-1010, Amendment No. 22

Kerr-McGee Nuclear Corporation
ATTN: Mr. W. J. Shelley, Vice-President
Nuclear Licensing and Regulations
Kerr-McGee Center
Oklahoma City, Oklahoma 73125

1983

W. J. Ganus

Gentlemen:

In accordance with your application dated July 29, 1982 and supplements dated August 26 and 31, September 17, October 12 and 21, and December 6 and 21, 1982 and pursuant to Title 10 Code of Federal Regulations, Part 40, Source Material License No. SUB-1010 is hereby amended to authorize the injection of treated liquid raffinate in the Sequoyah waste disposal well subject to the following conditions:

1. Use of the No. 1 Sequoyah deep disposal well shall be limited to the injection of 5 million gallons of treated liquid raffinate. Following injection of this initial volume, Kerr-McGee shall submit to the NRC all monitoring results obtained from the injection program and all reports and conclusions regarding the nature of the disposal formation and any impacts resulting from the injection. This information shall be submitted in support of an application to dispose of additional volumes by deep well injection.

2. The well-head injection pressure shall not exceed 250 psi.

All other conditions of this license shall remain the same.

The above conditions were discussed with your Mr. Shelley and Mr. S. D. Wyngarden of my staff on April 28, 1983.

For your information, a copy of the safety evaluation report prepared in support of this amendment is enclosed.

FOR THE NUCLEAR REGULATORY COMMISSION

R G Page

R. G. Page, Chief
Uranium Fuel Licensing Branch
Division of Fuel Cycle and
Material Safety, NMSS

Enclosure: Safety Evaluation Report

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAY 18 1983

DOCKET NO: 40-8027

LICENSEE: Kerr-McGee Nuclear Corporation

FACILITY: Sequoyah $UF_6$ Production Plant

SUBJECT: REQUEST TO DISPOSE OF TREATED LIQUID RAFFINATE BY DEEP WELL INJECTION

## I. Background

By letter dated July 29, 1982, the Kerr-McGee Nuclear Corporation (K-M) requested an amendment to its Source Material License No. SUB-1010 to permit disposal of treated liquid raffinate in the Sequoyah deep injection well. The Sequoyah facility produces approximately 5.6 million gallons of treated raffinate each year which has a neutral pH and contains mainly ammonium nitrate, heavy metals, and small concentrations of uranium and its decay products. K-M currently stores this solution in onsite lagoons and uses an estimated 2.5 million gallons per year as fertilizer on K-M owned land. Since the land application accounts for less than half of the volume generated annually and since annual rainfall exceeds evaporation from the ponds, K-M has been forced to construct additional ponds for raffinate storage. In this amendment request, K-M proposes the deep well injection of 5 million gallons each year for 5 years as an alternative disposal mechanism for the treated raffinate.

In May 1970, K-M submitted a similar request to amend SUB-1010 to permit the discharge of low level liquid waste in the same deep disposal well. The Atomic Energy Commission (AEC) staff denied the request in October 1970, but permitted K-M to reapply. Following several ensuing K-M applications requesting use of the well and subsequent denials by the AEC, K-M in April 1973 requested a hearing on the matter. In January 1974, the Atomic Safety and Licensing Board (ASLB) also denied authorization to use the well. Significant changes since 1974 in the raffinate composition, K-M's monitoring capabilities, and other conditions of the proposed injection well program distinguish the current amendment request from ones previously reviewed.

Prior to submitting the current amendment request in July 1982, K-M applied to the Oklahoma State Department of Health, Industrial

Waste Division, for a permit to operate the deep well. The State, which has an EPA approved underground injection control program with primary enforcement responsibility under the Safe Drinking Water Act, issued the permit on October 19, 1982. The NRC has conducted an independent environmental review to assure that all potential impacts associated with use of the well have been adequately considered. In order to obtain technical support for this review, the NRC awarded a contract to Dr. Don L. Warner, Consulting Geological Engineer. Dr. Warner assisted the AEC/NRC in its environmental reviews of the injection well in the early 1970's and was therefore uniquely qualified to assess the impacts associated with K-M's current request to use the same well. In his assessment, Dr. Warner analyzed engineering reports and other information available from previous reviews of the injection well in addition to K-M's current application material to the State of Oklahoma and the NRC.

II. Discussion

A. Radiological Safety

The quantities of radionuclides in the treated raffinate are well below the present maximum permissible concentrations (MPC's) for unrestricted release as specified in 10 CFR Part 20, Appendix B, Table 2. Assuming the soluble fraction of each nuclide is 100% (even though Ra-226 is only partially soluble in the raffinate), the average raffinate concentrations are 3.5% MPC for Ra-226, 0.1% MPC for natural uranium, and less than .01% MPC for Th-230.

B. Environmental Concerns

K-M proposes to inject treated raffinate between 1,619 and 3,122 feet below land surface into the Arbuckle Formation. Naturally occurring water within the Arbuckle typically contains around 142,000 mg/l total dissolved solids; 88,300 mg/l chloride; and 1,400 pCi/l Ra-226. This poor background quality of the natural formation water disqualifies the Arbuckle as an underground source of drinking water according to EPA regulations and makes it essentially useless for almost all purposes. Comparison of the chemical and radiological content of the treated raffinate and the natural formation water indicates that the proposed deep well injection would not significantly degrade the quality of the Arbuckle Reservoir or restrict its potential uses.

Overlying the Arbuckle in the vicinity of the Sequoyah facility is the Atoka Formation. The Atoka occurs at the land surface

to a depth of about 400 feet (1200 feet above the proposed injection zone). Engineering and geologic studies indicate that vertical migration of raffinate or Arbuckle formation water into the Atoka is an unlikely result of the injection program; however, if such migration did occur, the hydrologic impacts would be small. Well water samples taken near the bottom of the Atoka contain approximately 17,000 mg/l total dissolved solids and 10,000 mg/l chloride. In addition to this generally poor water quality, yields from the Atoka average only 0.5 GPM making it a useful aquifer in only a few isolated spots. The only local area capable of supporting a marginal water well is adjacent to the Carlisle School fault, approximately 5000 feet from the injection well.

Although the local groundwater quality is well understood, there is considerable uncertainty regarding the nature of the injection reservoir. More extensive testing of the Arbuckle is needed to clarify the existence and hydrologic nature of nearby faults, the migration patterns of wastewater and natural formation water, and other pertinent hydrogeologic characteristics The properties of the Arbuckle are well-enough known to conclude that the formation can probably accept the first year injection of 5 million gallons of treated raffinate without significant environmental hazard. Approval of subsequent injections based upon analyses of the first year results will provide more certainty and better control of future injection impacts. Accordingly, it is recommended that use of the injection well be subject to the following condition:

> Use of the No. 1 Sequoyah deep disposal well shall be limited to the injection of 5 million gallons of treated liquid raffinate. Following injection of this initial volume, K-M shall submit to the NRC all monitoring results obtained from the injection program and all reports and conclusions regarding the nature of the disposal formation and any impacts resulting from the injection. This information shall be submitted in support of an application to dispose of additional volumes by deep well injection.

Additional discussion of the geologic and hydrologic impacts of the proposed injection is provided in "Environmental Assessment Related to Proposed Deep Well Injection of Liquid Raffinate at

the Kerr-McGee Sequoyah Facility, Oklahoma," prepared by Don L. Warner (copy enclosed). In this assessment, Dr. Warner determined that the well-head injection pressure of 300 psi allowed in the state permit is equal to the minimum hydraulic fracturing pressure for the receiving formation. Dr. Warner recommends the well-head injection pressure be limited to 250 psi to allow a factor for safety. Therefore, the following condition for use of the injection well is also recommended:

> The well-head injection pressure shall not exceed 250 psi.

C. Legal Issues

Although the ASLB denied authorization to use the deep well in 1974, changes in factual circumstances in K-M's current amendment request are adequate to allow the staff to reconsider the injection well program. These views and more complete discussions of the legal issues associated with this case are presented in the enclosed memo from the Office of the Executive Legal Director.

## III. Conclusions and Recommendations

Based upon the information presented herein, I conclude that the proposed deep well injection of treated raffinate does not constitute an undue risk to public health or threat to environmental quality. I therefore recommend that License No. SUB-1010 be amended to permit use of the injection well subject to the aforementioned conditions.

for Stephen D. Wyngarden
Uranium Process Licensing Section
Uranium Fuel Licensing Branch
Division of Fuel Cycle and
Material Safety, NMSS

Approved by: for W. T. Crow, Section Leader

Enclosures: As stated

# ENVIRONMENTAL ASSESSMENT RELATED TO PROPOSED DEEP WELL INJECTION OF LIQUID RAFFINATE AT THE KERR-MCGEE SEQUOYAH FACILITY, OKLAHOMA

Prepared for the Division of Fuel Cycle and Material Safety
U. S. Nuclear Regulatory Commission
Washington, D.C.

by

Don L. Warner
Consulting Geological Engineer
Rolla, Missouri

March 1983

## INTRODUCTION

On July 29, 1982, the Kerr-McGee Corporation requested an amendment to the Source Material Licence for its Sequoyah facility to permit subsurface injection of treated raffinate through a well originally constructed in 1969 for that purpose. Prior to making a decision regarding the requested amendment, the NRC contracted with me to analyze existing data and to acquire additional information to assess the geologic and hydrologic impacts associated with the proposed deep well injection. The assessment was required to address the following concerns:

1. Whether or not the injection of raffinate poses a significant threat to public health and environmental quality.

2. What environmental impacts are likely to occur and what understanding of the Arbuckle Formation can be gained from the injection of 5 million gallons of raffinate for 1 year as opposed to 5 million gallons each year for 5 years?

3. What faults exist within the disposal formation and what boundaries do they impose on the well reservoir?

4. What is the current level of understanding regarding the uniformity in thickness, porosity, and permeability of the Arbuckle's five disposal zones, and with what certainty are waste flow characteristics understood?

5. How adequate is the applicant's proposed monitoring program to detect groundwater and seismic problems?

In documenting my findings and opinions, I have first briefly reviewed the most important data relating to the five points of concern in the section entitled "Data Concerning Geologic and Hydrologic Impacts." I have then analyzed the data in the section "Analysis of Geologic and Hydrologic Impacts." Finally, I have summarized my conclusions and made a few recommendations.

## DATA CONCERNING GEOLOGIC AND HYDROLOGIC IMPACTS

### Injection Impacts

Environmental impacts of wastewater injection through the Kerr-McGee deep well would result from the emplacement of the wastewater in the subsurface and from the pressurization of the receiving reservoir.

The principal chemical and physical characteristics of the wastewater stream are given in Table 3 of the Kerr-McGee July 17, 1981, state application and in Table 3a of the December 22, 1981, supplement of the application. These tables are included here for reference.

Table 3a. Treated Raffinate Analysis-Additional Parameters

| Parameter | 1973-1975 Analysis | Average 1980 |
|---|---|---|
| mg/ℓ | | |
| Ag | <.001 | |
| As | .54 | |
| Ba | 3.0 | |
| B | 23. | |
| Cd | <.001 | |
| Co | .5 | |
| Cr | .04 | |
| Cu | 50. | 5.4 |
| Fe | 1. | |
| Hg | <.001 | |
| Mg | 310. | |
| Mo | 260. | 9.65 |
| Ni | 16. | 12.0 |
| Pb | .004 | |
| Se | <.005 | |
| V | .8 | |
| Zn | 1.4 | |
| U | .80 | .045 |
| pCi/ℓ | | |
| Ra-226 | .55 | 1.07 |
| Th-230 | .89 | .065 |
| gms/ℓ | | |
| Total Nitrogen, ($NH_3$, $NO_3$) | 28.7 | 36.5 |

TABLE 3. Average Composition of Treated Raffinate - 1980.

| Sample Type | pH | Ra-226 pCi/ℓ | Th-230 pCi/ℓ | U mg/ℓ | Cu mg/ℓ | Mo mg/ℓ | Ni mg/ℓ | Ave. N Conc. gms N/ℓ |
|---|---|---|---|---|---|---|---|---|
| Treated Raffinate | 7.65 | 1.07 | .065 | .045 | 5.4 | 9.65 | 12.0 | 36.5 |

TABLE 1

| Time (day) | West fault pressure increase (Psi) | Monitoring well pressure increase (Psi) | East fault pressure increase (Psi) | Injection well (1 ft) pressure increase | Distance fluid/ dispersion travel (ft.) |
|---|---|---|---|---|---|
| 60 | 3.429 | 9.18 | 6.33 | 16.49 | 166/406' |
| 365 | 0.3422 | 0.34 | 0.34 | 0.34 | 166/406' |
| 425 | - | - | - | 16.78 | - |
| 730 | - | - | - | 0.51 | - |
| 1885 | 4.11 | 9.90 | 7.01 | 17.17 | 373/731' |
| 2190 | 0.81 | 0.81 | 0.81 | 0.81 | 373/731' |
| 3345 | 4.28 | - | 7.18 | 17.34 | 498/911' |
| 3650 | 0.96 | - | 0.96 | 0.97 | 498/911' |

## Faults Within Disposal Formation

The applicant originally showed two major faults in the vicinity of the well site as described in the applicants letter of December 22, 1981, and as shown on the map entitled "SE Gore Area Regional Structural Map Sequoyah Co., Oklahoma," which is dated 2-70 and noted to have been prepared by T. West. According to those sources, the nearest fault (Carlisle School fault) is located about 5,000 feet east southeast of the injection well with a second fault (South fault of the Warner uplift) located about five miles north northwest of the well. However, the H. J. Gruy and Associates, Inc. report entitled "Engineering Study of the Arbuckle Reservoir communicated to the Kerr-McGee Corproation No. 1 Sequoyah Waste Storage Well Sequoyah County, Oklahoma," dated May 1, 1972, shows and describes a "boundary" at 1,164 feet northeast of the well and another at 29,578 feet southwest of the well. These boundaries were also shown as faults on the SE Gore Area Regional Structural Map as revised in November, 1972. Considerable effort was made by Kerr-McGee and its consultants to demonstrate the probable existence of the nearest fault, which was named the Webers Falls fault, in their various submissions and in the Atomic Safety and Licensing Board hearings of October 15-16, 1973. The most distant fault, referred to as the South fault, was also supported by the applicants consultants but with less convincing arguments. Discussions with Dr. William Ganus of Kerr-McGee Corporation have established that the company is now showing only the two faults because it is intended that the proposed injection operations will serve to better confirm or deny the existence of any others.

## Nature of Disposal Zones

The various geologic and engineering data available for the Kerr-McGee well led H. J. Gruy and Associates, Inc. to the conclusion that the Arbuckle Group has a total thickness of about 1,765 feet (from 1,337 feet to 3,102 feet) within which are five major permeable and porous zones with a combined thickness of 116 feet. The vertical location, thickness, permeability, porosity and area of the five layers, as reported by H. J. Gruy and Associates, Inc. (1972) is shown below:

SUMMARY OF RESERVOIR LAYER PROPERTIES KERR-MCGEE NO. 1
SEQUOYAH WASTE STORAGE WELL - SEQUOYAH COUNTY, OKLAHOMA

| Layer Number | Depth Interval (feet) | Net Thickness (feet) | Porosity (dec. frac.) | Effective Permeability (md) | Area (acres) |
|---|---|---|---|---|---|
| 1 | 1,762-1,786 | 24 | 0.064 | 2,469 | 8,804 |
| 2 | 2,416-2,424 | 8 | 0.060 | 2,279 | 8,804 |
| 3 | 2,620-2,646 | 26 | 0.089 | 964 | ≥19,580* |
| 4 | 2,711-2,774 | 24 | 0.099 | 1,709 | ≥19,580* |
| 5 | 2,800-2,860 | 34 | 0.058 | 2,480 | 645 |

*Minimum area proved by test program

H. J. Gruy and Associates, Inc. (1972) considers three of the five layers (1, 2, and 5) to definitely be bounded on four sides with boundary locations as shown in Figure 1 of that report. The other two layers (3 and 4) are considered to be definitely bounded on three sides and possibly on a fourth side. The H. J. Gruy report further concludes that "Our analysis indicates that there are no significant boundary leakages, no vertical interconnecitons between layers ... and no significant horizontal heterogeneities within each layer."

Kerr-McGee Corporation is taking the approach of reexamining the Gruy interpretation through more extensive injection during the first year of operation.

## Monitoring Program

Monitoring of Injection Well-

Injection is limited to treated raffinate, which implies, at least, neutralization with ammonia, precipitation of radioactive and other elements with barium nitrate or barium chlorideand decantation. The applicant proposes to monitor the injection waste stream by obtaining a grab sample from the surge tank once each shift. Limitations on injection fluid chemistry are 60 gms/ℓ total nitrogen and 10 pCi/ℓ radium. It is further required that "the levels of the injected raffinate shall not exceed 20% of the level of activity naturally occuring in the receiving formation." This later requirement is not explained.

The applicant proposes to continuously monitor and record the well-head and annulus pressure. It is stated that "records will be maintained to reflect the volume of fluid injected on any given day." The measurement method is not specified. However, condition 10 of the Oklahoma state permit requires continuous monitoring of flow rates and temperatures and the state regulations specify either circular or strip chart recorders. Monthly reports, including copies of well head, annulus pressure, flow rate and temperature charts are to be submitted to the state.

In the permit application, the applicant states that a high and low pressure alarm will be provided. Elsewhere,(K-M letter of July 16, 1982), it is stated that company personnel will be present on-site during well operation so that automatic shut-off provisions are not needed.

Monitor Wells-

There are two principal monitor wells. One is located about 300 feet north of the injection well and is about 400 feet deep. The second is about 5,000 feet east-southeast of the injection well, is about 100 feet deep[1] and is located within the Carlisle School fault zone. About 80 other shallow (6 to 210 feet deep) monitoring wells are located on the site principally to detect leakage from raffinate holding ponds.

[1]The well, K-M No. 2307, was originally drilled to 250 feet but was completed at from about 100 feet to the surface according to the State.

The state permit dated October 1982 only includes the requirement for reporting the results of monthly sampling of the two principal wells. While not specified in the permit, other documentation indicates that the monitoring parameters are nitrogen, calcium, sodium, chloride and bicarbonate. These parameters were selected as indicators of the presence of waste fluids or natural formation waters.

Surface Water Monitoring-

A number of streams and ponds were proposed to be sampled monthly as shown in Table 2 of the Kerr-McGee permit application of July 17, 1981. Parameters to be analyzed included the same ones listed above. No surface water monitoring requirement was apparently adopted by the State.

Seismic Monitoring-

The applicant proposed and the state has required that seismic monitoring will be performed. In an attachment to a letter of December 22, 1982, from W. J. Shelley to W. T. Crow, it is stated that "Kerr-McGee has installed three seismographs at the site, in a cooperative program with the University of Oklahoma, to monitor any seismic activity which could be related to the injection program."

## ANALYSIS OF GEOLOGIC AND HYDROLOGIC IMPACTS

In view of the data previously presented and other available information, an analysis is made in the following section of the concerns listed in the Introduction.

### Injection Impacts

The Kerr-McGee Corporation is seeking an ammendment to the current NRC license to permit injection to five million gallons of treated raffinate each year for five years. The proposed injection schedule is 60 gpm for 60 days each year with no injection during the remaining part of the year.

The certain results of the proposed injection will be emplacement of 25 million gallons of treated raffinate into the subsurface at the Sequoyah site and temporary increase in the fluid pressure in the receiving reservoir. These effects could, in turn, possibly result in:

1. Contamination of usable groundwater or surface water with the attendant implications to public health.

2. Stimulation of seismic events through movement along nearby faults.

Groundwater contamination could result from the direct escape of the injected raffinate into shallow geologic units at the site through failure of the well casing, or upward movement outside of the well casing. Neither of these contamination routes is considered to be likely because of the well

construction and with the proper monitoring and operating restrictions. Direct contamination of surface water by injected raffinate is considered to be a practical impossibility.

Groundwater and possibly surface water contamination could result from pressurization of the Arbuckle and displacement of natural formation waters upward along faults, joints or other permeability paths. While the recent pressure buildup estimates by the State and Kerr-McGee are undoubtedly too low, more likely buildups, in the order of 100 to 150 psi at the wellhead, are still small enough and will be short enough in duration so that any such movement of natural groundwater should be so minor as to be undetectable.

Stimulation of seismic events has been observed in conjunction with fluid injection in at least three instances nationally; however, it is still a very unusal occurrence and limited to locations where active earth stresses are present. Because of the geologic region in which the Sequoyah site occurs and because of the relatively low injection pressures involved, stimulation of seismic events at the Sequoyah site is very unlikely and, should it occur, would be detected at an early stage through the required seismic monitoring program.

Most of what can be learned about the nature of the injection reservoir and any impacts resulting from injection should be learned during the first year of injection. Subsequent years should be merely a repetition of the first year's experience.

## Faults Within the Disposal Formation

It is generally agreed that two major faults, as previously discussed, cut and displace the injection formation. It seems very likely that other faults exist, but their location and nature ~~has~~ have not been established. Whereas, Kerr-McGee presently prefers not to show the Webers Falls fault and the State apparently concurs, the Atomic Safety and Licensing Board heard sufficient evidence to conclude that there was a high probability of its existence. It would appear necessary for there to be a flow barrier fairly near the injection well according to H. J. Gruy and Associates reservoir analysis. A fault, such as the Webers Falls fault, could provide such a barrier. There is little good evidence to allow a conclusion concerning the existence or non-existence of the so-called South fault. It would make little difference, however, because of its distance from the injection well.

The principal issue regarding the faults is whether they act as barriers or, conversely, as conduits to flow. While faults can act as either, the only presently available evidence indicates that the nearest fault, if it exists, is a barrier. Other known faults, including the Carlisle School and South fault of the Warner uplift, are sufficiently far from the well so that pressures exerted upon them by injection should be much less than that at the well and insufficient to cause major displacement of formation water, even if they should be permeability paths rather than barriers. This conclusion is predicated on the presently proposed injection program of

five years duration and 25 million gallons cumulative injection.

## Nature of Disposal Zones

The nature of the disposal zones, within the Arbuckle Group, as interpreted by Gruy and Associates has been documented previously. Based upon personal experience and upon the generally observed nature of porosity and permeability in carbonate strata I consider the Gruy model to be overly simplistic. I believe that it is likely that there are more or less than five zones and that, whatever the number, the zones are, at least partially, interconnected and certainly do not have uniform properties over their extent. Nevertheless, it is reasonable to accept the Gruy disposal zone model for working pruposes as has been done. The deficiencies of the model do not, for the purposes of the analysis, seriously impair the results which indicate a small distance of travel of the injected wastewater and a moderate pressure buildup. The distance of travel calculation is not a highly sensitive one, since the wastewater is now relatively innocuous and since there are no nearby resources to be impacted by lateral travel in the disposal formation. The Gruy and Associates pressure calculation is quite reasonable, based on the injection test results and need not be precisely reliable, in this case, because there is considerable margin for error without cause for concern. Furthermore, if injection pressure buildup should be more rapid than expected, the injection rate can be reduced or injection terminated, if necessary.

## Monitoring Program

I consider the monitoring program, as required by the State, to be adequate. Monitoring of the injection well is more important, in this case, than the monitoring wells. Seismic monitoring is probably not necessary but is a prudent precaution in view of the known and potential faults in the area.

## CONCLUSIONS

Based on the information and interpretations presented herein, the following conclusions are offered:

1. The injection of 25 millions of treated raffinate through the deep well at the Kerr-McGee Sequoyah facility will result in the emplacement of that wastewater in the subsurface and in temporary pressure increases in the receiving formation but no significant impacts to public health or enviromental quality are believed to be posed by the action.

2. Most of what can be learned about the nature of the injection reservoir and any impacts resulting from injection should be learned during the first year of injection. Subsequent years should be merely a repetition of the first year's experience.

3. Two major faults are generally agreed to displace the disposal formation. The hydrologic nature of those boundaries is not known. It is probable that other faults exist within the vicinity of the

injection well but their location and hydrologic nature is not known. It is also probable that at least one impermeable boundary terminates the injection formation relatively close to the well. That boundary could be a fault. It is not believed that the faults, whether known or unknown will be pathways for escape of the injected raffinate or for observable leakage of formation water from the Arbuckle.

4. The geologic and engineering properties of the Arbuckle at the Sequoyah site are well enough known to conclude that the unit is probably capable of accepting 25 million gallons of treated raffinate with no significant environmental threat. However, those formation properties are not sufficiently known to allow accurate prediction of the location of the injected raffinate. The raffinate will, however, be contained within the Arbuckle and should not travel more than a few hundred feet laterally from the well.

5. The applicant's proposed monitoring program is considered adequate.

## RECOMMENDATIONS

After review of the available data and state permit requirements, I recommend that, if the requested license ammendment is granted, ~~that~~ the ammended license require that:

1. Well-head injection pressure be limited to 250 psi, rather than the 300 psi allowed in the state permit. The state requirement is apparently based on the minimum possible hydraulic fracturing pressure and allows no factor of safety.

2. Reports required by the state permit be submitted to the NRC as well.

3. An analysis of the first and each subsequent year's operations be submitted and the second and subsequent years operating restrictions be based on those analyses.