

EEG-50



**IMPLICATIONS OF OIL AND GAS LEASES
AT THE WIPP ON COMPLIANCE WITH
EPA TRU WASTE DISPOSAL STANDARDS**

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**Environmental Evaluation Group
New Mexico**

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Environmental Evaluation Group Reports

- EEG-1 Goad, Donna, A Compilation of Site Selection Criteria Considerations and Concerns Appearing in the Literature on the Deep Disposal of Radioactive Wastes, June 1979.
- EEG-2 Review Comments on Geological Characterization Report, Waste Isolation Pilot Plant (WIPP) Site, Southeastern New Mexico SAND 78-1595, Volume I and II, December 1978.
- EEG-3 Neill, Robert H., et al., (eds.) Radiological Health Review of the Draft Environmental Impact Statement (DOE/EIS-0026-D) Waste Isolation Pilot Plant, U.S. Department of Energy, August 1978.
- EEG-4 Little, Marshall S., Review Comments on the Report of the Steering Committee on Waste Acceptance Criteria for the Waste Isolation Pilot Plant, February 1980.
- EEG-5 Channell, James K., Calculated Radiation Doses From Deposition of Material Released in Hypothetical Transportation Accidents Involving WIPP-Related Radioactive Wastes, October 1980.
- EEG-6 Geotechnical Considerations for Radiological Hazard Assessment of WIPP. A Report of a Meeting Held on January 17-18, 1980, April 1980.
- EEG-7 Chaturvedi, Lokesh, WIPP Site and Vicinity Geological Field Trip. A Report of a Field Trip to the Proposed Waste Isolation Pilot Plant Project in Southeastern New Mexico, June 16 to 18, 1980, October 1980.
- EEG-8 Wofsy, Carla, The Significance of Certain Rustler Aquifer Parameters for Predicting Long-Term Radiation Doses from WIPP, September 1980.
- EEG-9 Spiegler, Peter, An Approach to Calculating Upper Bounds on Maximum Individual Doses From the Use of Contaminated Well Water Following a WIPP Repository Breach, September 1981.
- EEG-10 Radiological Health Review of the Final Environmental Impact Statement (DOE/EIS-0026) Waste Isolation Pilot Plant, U. S. Department of Energy, January 1981.
- EEG-11 Channell, James K., Calculated Radiation Doses From Radionuclides Brought to the Surface if Future Drilling Intercepts the WIPP Repository and Pressurized Brine, January 1982.
- EEG-12 Little, Marshall S., Potential Release Scenario and Radiological Consequence Evaluation of Mineral Resources at WIPP, May 1982.
- EEG-13 Spiegler, Peter, Analysis of the Potential Formation of a Breccia Chimney Beneath the WIPP Repository, May, 1982.
- EEG-14 Not published.
- EEG-15 Bard, Stephen T., Estimated Radiation Doses Resulting if an Exploratory Borehole Penetrates a Pressurized Brine Reservoir Assumed to Exist Below the WIPP Repository Horizon - A Single Hole Scenario, March 1982.
- EEG-16 Radionuclide Release, Transport and Consequence Modeling for WIPP. A Report of a Workshop Held on September 16-17, 1981, February 1982.
- EEG-17 Spiegler, Peter, Hydrologic Analyses of Two Brine Encounters in the Vicinity of the Waste Isolation Pilot Plant (WIPP) Site, December 1982.
- EEG-18 Spiegler, Peter and Dave Updegraff, Origin of the Brines Near WIPP from the Drill Holes ERDA-6 and WIPP-12 Based on Stable Isotopes Concentration of Hydrogen and Oxygen, March 1983.
- EEG-19 Channell, James K., Review Comments on Environmental Analysis Cost Reduction Proposals (WIPP/DOE-136) July 1982, November 1982.
- EEG-20 Baca, Thomas E., An Evaluation of the Non-Radiological Environmental Problems Relating to the WIPP, February 1983.
- EEG-21 Faith, Stuart, et al., The Geochemistry of Two Pressurized Brines From the Castile Formation in the Vicinity of the Waste Isolation Pilot Plant (WIPP) Site, April 1983.
- EEG-22 EEG Review Comments on the Geotechnical Reports Provided by DOE to EEG Under the Stipulated Agreement Through March 1, 1983, April 1983.
- EEG-23 Neill, Robert H., et al., Evaluation of the Suitability of the WIPP Site, May 1983.
- EEG-24 Neill, Robert H. and James K. Channell, Potential Problems From Shipment of High-Curie Content Contact-Handled Transuranic (CH-TRU) Waste to WIPP, August 1983.
- EEG-25 Chaturvedi, Lokesh, Occurrence of Gases in the Salado Formation, March 1984.
- EEG-26 Spiegler, Peter, Proposed Preoperational Environmental Monitoring Program for WIPP, November 1984.
- EEG-27 Rehfeldt, Kenneth, Sensitivity Analysis of Solute Transport in Fractures and Determination of Anisotropy Within the Culebra Dolomite, September 1984.
- EEG-28 Knowles, H. B., Radiation Shielding in the Hot Cell Facility at the Waste Isolation Pilot Plant: A Review, November 1984.

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FOREWORD

The purpose of the Environmental Evaluation Group (EEG) is to conduct an independent technical evaluation of the Waste Isolation Pilot Plant (WIPP) Project to ensure the protection of the public health, safety, and environment. The WIPP Project, located in southeastern New Mexico, is being constructed as a repository for permanent disposal of transuranic (TRU) radioactive wastes generated by the national defense programs. The EEG was established in 1973 with funds provided by the U.S. Department of Energy (DOE) to the State of New Mexico. Public Law 100-456, the National Defense Authorization Act, Fiscal Year 1989, Section 1433, assigned EEG to the New Mexico Institute of Mining and Technology and continued the funding from DOE under contract DE-AC04-79AL10752 as DE-AC04-89AL58309.

EEG performs independent technical analyses of the suitability of the proposed site; the design of the repository, its planned operation, and its long-term integrity; suitability and safety of the transportation systems; suitability of the Waste Acceptance Criteria and the generator sites' compliance with them; and related subjects. These analyses include assessments of reports issued by the DOE and its contractors, other federal agencies and organizations, as they relate to the potential health, safety and environmental impacts from WIPP. Another important function of EEG is independent environmental monitoring of background radioactivity in air, water, and soil, both on-site and in surrounding communities.



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EXECUTIVE SUMMARY

A decision by the U.S. Department of Energy (DOE) to proceed with the disposal of transuranic waste at the Waste Isolation Pilot Plant will require the DOE to determine compliance with Standards (40 CFR 191) issued by the Environmental Protection Agency (U.S. EPA, 1985).¹ The Standards recognize that future exploration for natural resources sometime during the next 10,000 years could disrupt the integrity of the repository and release radionuclides to the biosphere and require consideration of inadvertent human intrusion. The Standards appear to allow the assumption that active institutional control will completely deter human intrusion for 100 years. At the WIPP, the DOE has assumed active control will prevent any human intrusion during this period. After 100 years, the Standards allow credit for passive institutional controls such as public records and markers to reduce the risk of human intrusion.

The U.S. Department of Energy (DOE) documentation overlooked two active oil and gas leases and a gas well within the WIPP Site Boundary in spite of lease, drilling, and production records filed by the oil company with the federal government; a condemnation suit filed in civil court by the federal government in 1977; a Consultation and Cooperation Agreement between the State of New Mexico and the federal government; a Memorandum of Understanding between agencies of the federal government recognizing the existence of these leases; technical reports funded by the federal government on area oil and gas resources; and the visible existence of a producible gas well from the south access highway to the WIPP facility.

¹The DOE has sole regulatory authority to make a determination of compliance of the WIPP facility with Environmental Protection Agency (EPA) Standards and proceed with the WIPP as a repository. Legislation pending before Congress would transfer that authority to another agency.

Several important DOE documents are either incorrect, silent, or inconsistent on the existence of these leases. For example, the Final Environmental Impact Statement (FEIS, U.S. DOE, 1980, pp. 8-8—8-10) identifies the oil and gas leases held by ten companies in March 1979, yet the 1952 Conoco and 1957 Bass leases in the southwest corner of the WIPP Site on Section 31 are not mentioned. The WIPP Final Safety Analysis Report (WIPP FSAR, U.S. DOE, 1990a, Section 2.1.1.1), incorrectly states that there are no active oil and gas leases within the WIPP Site Boundary and fails to chart the intruding well on its map of producible oil and gas wells. The DOE No-Migration Variance Petition to the EPA incorrectly states that the DOE has purchased all oil and gas leases in the area of the WIPP site to prevent any exploration now and in the future (U.S. DOE, 1990b). The Secretary of Energy's Decision Plan monitored the status of an active potash lease until it was purchased by the DOE but remained silent on the active oil and gas lease issue even after an article in the Albuquerque Journal raised the issue (McCutcheon, 1990). The recently published DOE Implementation of the Resource Disincentive document, (U.S. DOE, 1991) is inconsistent on the number of active oil and gas leases within the WIPP Site Boundary and on the production status of the forgotten gas well.

The actual experience of forgotten oil and gas leases at the WIPP strongly suggests that the U.S. Environmental Protection Agency and the U.S. Department of Energy need to reexamine the assumption that active institutional control will be completely effective for 100 years after disposal and how much credit should be taken for passive institutional control between 100 and 10,000 years. The EPA Standards should require the implementing agency to publish specific plans on how the agency intends to maintain active institutional control. Even in the absence of such a requirement, the DOE should publish plans now that specify in detail how the Department intends to maintain control at the site for 100 years after decommissioning and describe how that control will completely deter human intrusion. Finally the DOE needs to describe in detail their passive institutional control system and show how it will provide a deterrence to inadvertent human intrusion after 100 years.

1.0 STATEMENT OF PROBLEM

Most analyses of the safety of a nuclear repository identify scenarios of inadvertent human intrusion for natural resource exploration as the most likely mechanism to return unwanted radioactive residuals to the biosphere. The question arises as to how long our institutions would maintain knowledge of the repository as a deterrent to an unplanned release. The U.S. Environmental Protection Agency (EPA) has issued Standards (U.S. EPA, 1985) which allow the implementing agency to take credit for active institutional control, for up to 100 years after decommissioning. Beyond 100 years, the EPA Standards allow credit only for passive institutional controls such as markers, public records and archives, government ownership and regulations regarding resource use and other methods of preserving knowledge.

On November 3, 1990, the Albuquerque Journal reported the rediscovery of a natural gas well that had been completed beneath the WIPP Site Boundary.

[Department of Energy] Officials had previously believed that they had acquired all existing mineral leases at the site as part of their push to open WIPP for testing.... officials had known of the well years ago but rediscovered its existence only recently.... Department records indicate the well was drilled in about 1981 or 1982 after its owners obtained permission from the federal Bureau of Land Management, the current owner of WIPP's land.... After the well was first drilled, its owners decided to slant it underground, still keeping it off the site, officials said. When WIPP's geographic configurations were later remapped, the bottom of the well wound up appearing inside the underground boundary of WIPP lands.... (McCutcheon, 1990).

This report focuses on the history of two oil and gas leases and one well completed within the WIPP Site Boundary that were overlooked by the DOE for several years. The incident is important because it indicates that active institutional control and passive institutional control, such as markers and records, do not always deter

unwanted drilling activity or effectively convey necessary information to decision makers. The report addresses the question of whether the EPA and the DOE are assuming more credit for the deterrent value of institutional controls than is warranted.

The decision by the DOE to use the WIPP as a repository for defense transuranic waste will depend in part on results of performance assessment analyses required by the EPA Standards (40 CFR 191). The performance assessment analyses calculate the probability and quantities of radionuclides released into the accessible environment for different breach scenarios within the first 10,000 years after disposal. The Standards for disposal of radioactive waste were issued by EPA in November 1985. Subpart B was vacated by the First Circuit Court of Boston in June 1987. EPA is not expected to promulgate the revised Standards before mid-1993 (SNL, 1991). Until the revised Standards are available, the State of New Mexico and the U.S Department of Energy have agreed to use the 1985 Standards as a basis for performance assessment planning (U.S. DOE, 1981). At the present time, the Department of Energy has the sole authority to use the analyses to determine if the DOE WIPP facility complies with the Standards yet to be repromulgated by the EPA. The remanded Standards required the consequences of inadvertent human intrusion to be calculated because such an event could significantly disrupt the integrity of a repository.

Guidance to the Environmental Protection Agency's *Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes, 40 CFR 191* (U.S. EPA, 1985) allows credit to be taken for active institutional control when making assumptions about the frequency and severity of human intrusion into the repository. Specifically, the Guidance states "... the implementing agency will assume that none of the active institutional controls prevent or reduce radionuclide release for more than 100 years after disposal" (U.S. EPA, 1985, p. 38088). The statement in the latest working draft of the Guidance remains

unchanged (U.S. EPA, 1992, p. 30). This Guidance appears to allow the repository operator to assume that active institutional control will deter all inadvertent human intrusion. In the WIPP performance assessment calculations, Sandia National Laboratories (SNL) has assumed active institutional control will be maintained for 100 years and this control will be 100 percent effective in deterring human intrusion (Sandia National Laboratories, 1991, p. 2-5) even though the DOE has made no commitment to maintain active control at the WIPP for any specific length of time.

This report does not address the issue of whether the "forgotten" gas well, which is completed within the WIPP Site Boundary, is a hazard to the long-term safety of the repository. Only the implication of the effectiveness of institutional controls is being addressed.

2.0 INTRODUCTION

The Waste Isolation Pilot Plant (WIPP) is ultimately intended to serve as a repository for the safe disposal of transuranic waste generated by the defense activities of the United States Government. The anticipated inventory includes a maximum of 176 000 cubic meters (6.2 million cubic feet or 850,000 drum equivalents) of contact-handled transuranic (CH-TRU) waste and about 7100 cubic meters (250,000 cubic feet or 8,000 canisters) of remote-handled transuranic (RH-TRU) waste. The CH-TRU waste is estimated to contain 9 million curies of activity. The activity of the RH-TRU waste is limited to 5.1 million curies.

The repository is located in the Los Medaños area in southeastern New Mexico, 17 miles (28 kilometers) east-northeast of the city of Loving and 25 miles (40 kilometers) east of the city of Carlsbad and the repository is sited at a depth of 2,150 feet (655 meters) in the lower part of a 1,970-foot (600 meters) thick salt formation.

The area of land that lies within the WIPP Site Boundary is a square four miles (6.44 kilometers) on a side. It contains 10,240 acres (4144 hectares) including Sections 15, 16, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 31, 32, 33, and 34 in T22S, R31E, NMPM in Southeastern New Mexico (U.S. DOE, 1990a, Section 2.1.1.1)

Figure 1 illustrates the WIPP boundary and the areas of Zone I and Zone II. Zone I contains the WIPP facility surface structures, is surrounded by a chain link fence, and covers about 35 acres (14 hectares) in Sections 20 and 21. Zone II defines the maximum extent of the area for underground development. The WIPP Site Boundary provides a minimum one mile (1.6 kilometers) buffer area of intact salt around Zone II (U.S. DOE, 1990a, Section 2.1.1.1).



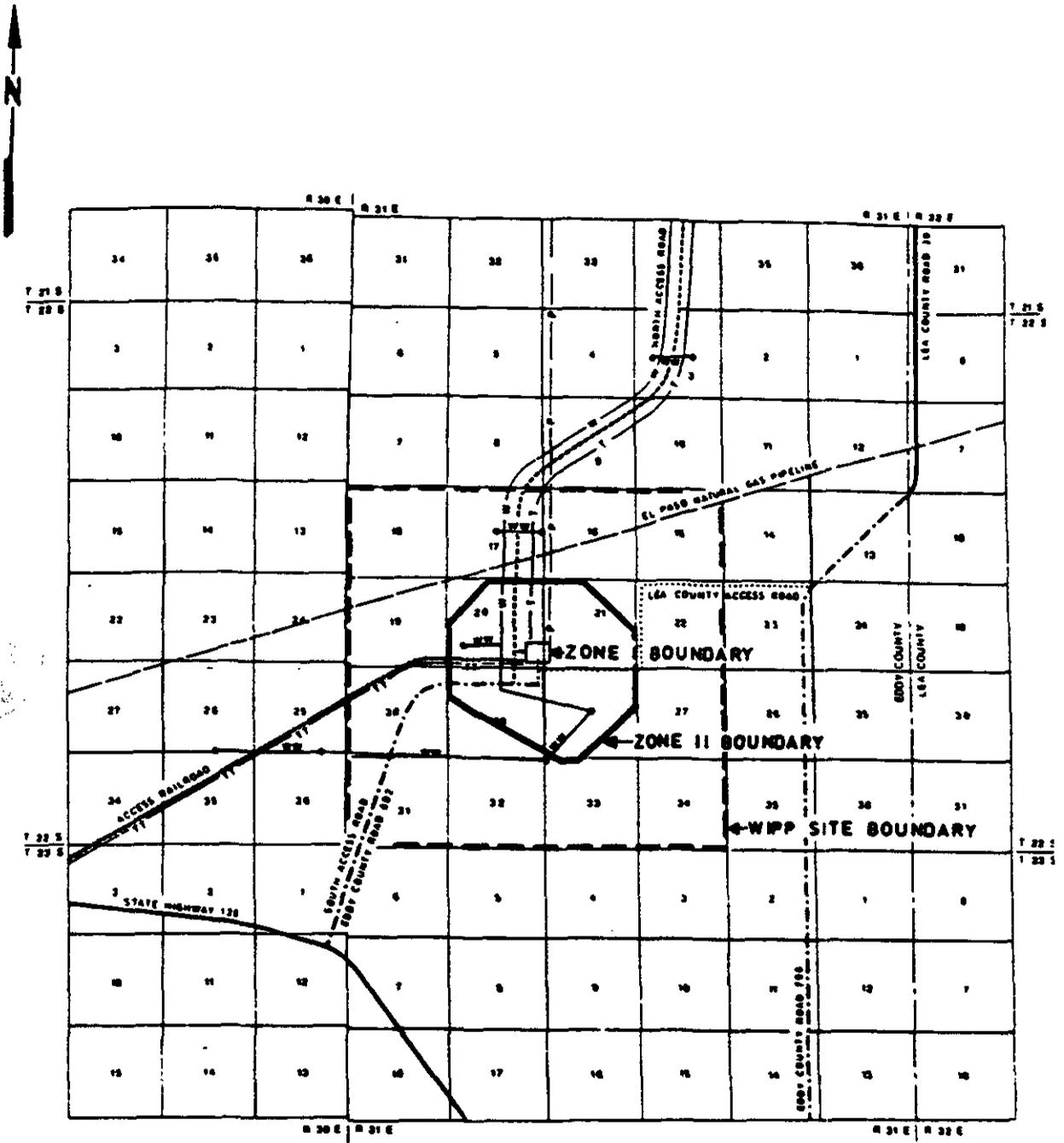


Figure 1. 1990 Zone I, Zone II, and WIPP Site Boundaries. From Figure 2.1-3, WIPP FSAR. (U.S. DOE, 1990a, reproduced with permission).

Although the designations of Zone III and Zone IV are no longer used, they merit a brief description because much of the initial WIPP documentation refers to these zones. The location of Zones III and IV are shown in Figure 2.

Zone III essentially provided a one-mile (1.6 kilometer) buffer around Zone II. In Zone III, all mining, other than for the repository, and deep drill holes penetrating through the evaporites were prohibited (U.S. DOE, 1980, p. 8-4).

Zone IV provided a one-mile (1.6 kilometer) buffer around Zone III. Within Zone IV, conventional potash mining would be permitted but solution mining was prohibited. Deep drill holes were also allowed but water flooding and massive hydrofracture for hydrocarbon recovery would not be permitted. The Final Environmental Impact Statement also noted existing oil and gas wells producing in this zone will be permitted to continue through their useful lives. To protect the repository, they will be sealed as prescribed by the DOE when abandoned. New wells for oil and gas production may be drilled in conformance with DOE standards to facilitate eventual plugging (U.S. DOE, 1980, p. 8-4).

When Zone IV was relinquished by DOE as being unnecessary, the Zone III boundary was "squared off" and the new site boundary extended into the former Zone IV at the four corners (Weart, 1990). Hence, the current four mile (6.44 kilometers) by four mile WIPP Site Boundary² also provides the one-mile buffer originally established as Zone III.

²Throughout this report, the term "WIPP Site Boundary" refers to the four mile by four mile area described above and the term "WIPP Site Area" refers to the approximately thirty-two square mile area that includes all of Zone IV.

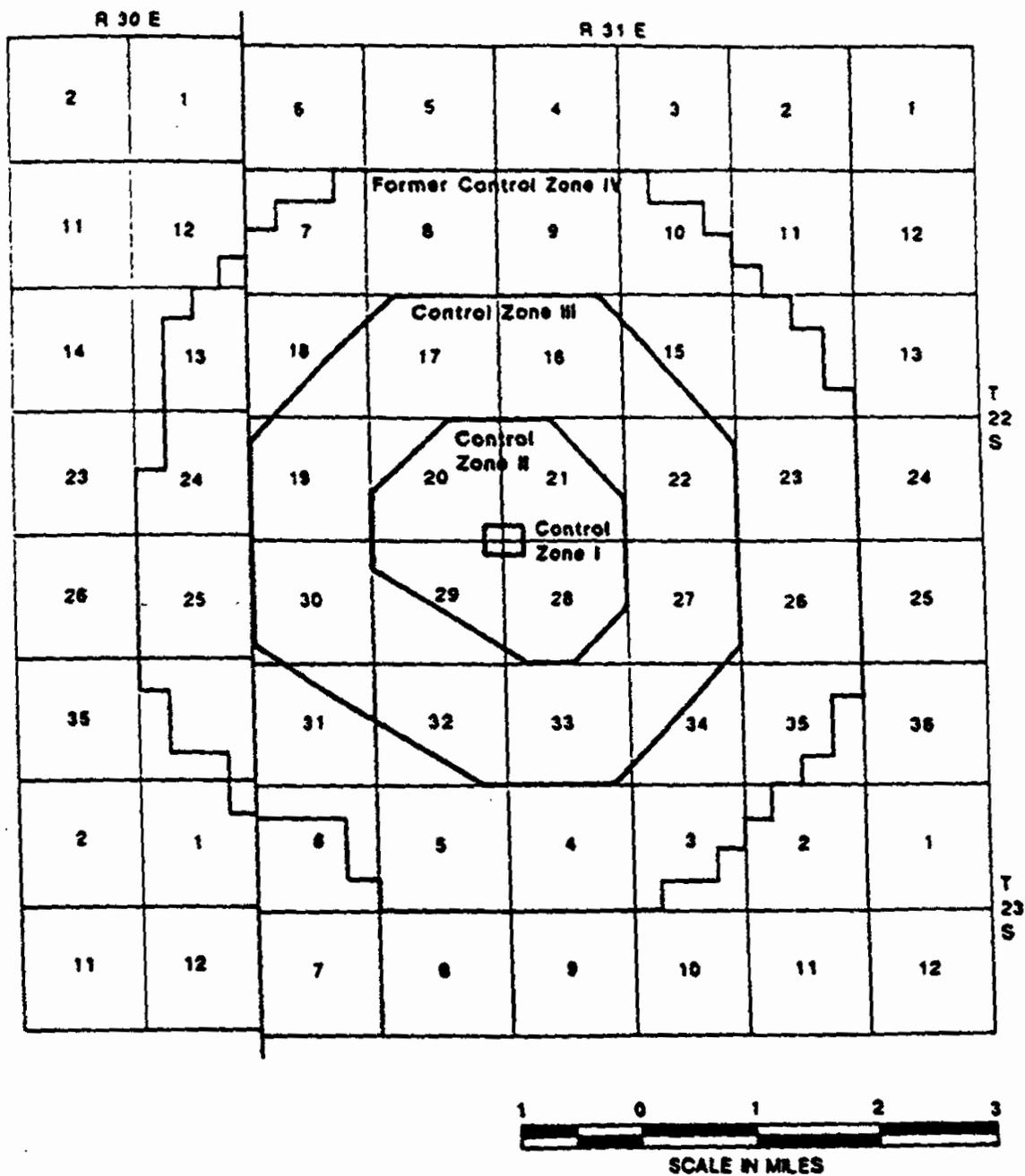


Figure 2. 1980 Control Zones at the WIPP Site. (FSEIS, U.S. DOE, 1990d, reproduced with permission).

3.0 REPORTS ON PETROLEUM RESOURCES AND LEASES

EPA's requirements for establishing a repository in a resource rich area were clearly stated in 40 CFR 191.14(e):

Places where there has been mining for resources, or where there is a reasonable expectation of exploration for scarce or easily accessible resources, or where there is a significant concentration of any material that is not widely available from other sources, should be avoided in selecting disposal sites. Resources to be considered shall include minerals, petroleum or natural gas.... Such place shall not be used for disposal of the wastes covered by this part unless the favorable characteristics of such places compensate for their greater likelihood of being disturbed in the future (U.S EPA, 1985).

From 1976 through 1980, SNL published several reports on the mineral resources in the Los Medaños area. Each discussed oil and gas resources.

A report by the petroleum consulting firm of Sipes, Williamson, and Aycock, Inc. (Keeseey, 1976) focused on estimating the remaining economically recoverable oil and gas reserves underlying the proposed disposal site. The evaluation was intended to serve as a guideline to SNL in determining the acceptability of the "site area" and the potential value to the owners of the hydrocarbon rights.

Griswold's (1977) subsequent evaluation of site selection and mineral resources incorporated the information provided by Keeseey (1976).

Powers, et al. (1978) prepared the geological characterization report for the WIPP citing the work of Keeseey (1976) and Griswold (1977) as well as earlier work by Foster (1974).

Keesey (1977) provided a more detailed analysis of the hydrocarbon resources including those in Section 31, T22S, R31E, the section containing the active gas leases in the southwest corner of the current WIPP Site Boundary. The study was limited to surface and subsurface rights to 6,000 feet (1829 meters), which were eventually condemned and purchased by the federal government in 1979. The evaluation did not include the deeper resources.

Keesey (1979a) evaluated the feasibility of directionally drilling for oil and gas reserves under the WIPP Site Area, which, by previous definition, included Zone IV. It was technologically feasible to drill into gas and condensate reserves underlying the WIPP Site Area from outside the WIPP Site Area.

Keesey (1979b) updated the estimated potential hydrocarbon reserves and associated costs and incomes for oil and gas underlying the WIPP. The estimates were intended for use in the Environmental Impact Statement for the WIPP being prepared by Westinghouse Electric Corporation. The estimates were not intended to represent future net revenue values normally used by the petroleum industry to determine the fair market value of oil and gas producing properties. The undiscounted value of the gas and condensate reserves underlying the WIPP Site Area (including Zone IV) was determined to be \$287,502,346 (Keesey, 1979b, p. 6; U.S. DOE, 1980, p. 7-72).



4.0 HISTORY OF NATURAL GAS EXPLORATION AND PRODUCTION

The WIPP site is situated in the northern portion of the Delaware Basin. While there were no oil or gas wells within the 32 square miles (8288 hectares) of Zone IV in 1976, oil and gas were being produced from 60 wells in a 368 square-mile (95 312 hectares) area surrounding the site. Although the area was considered to be potentially rich in hydrocarbon reserves, extensive deep drilling had not been ventured in the New Mexico portion of the Delaware Basin. Only 10 to 15 percent of the available acreage had been investigated. The lack of more complete drilling and development was attributed to several factors including historically restrained gas prices, a higher exploration risk due to the varying depositional environment, a lack of readily available pipelines during earlier periods, and moratoriums on drilling in the potash areas to prevent methane gas from entering potash mines (Keeseey, 1976; Powers et al., 1978).

As noted by Griswold (1977), the energy crisis of the mid-1970's had driven up the price of natural gas at least fourfold in just two years, prompting a renewed interest in previously unattractive areas. In 1977, deep exploratory drilling for natural gas was underway throughout the Delaware Basin. Just prior to the publication of Griswold's report, three different companies applied for drilling permits in the Los Medaños site area.

Known petroleum production in the area extended from the Delaware Formation (mean depth 4,200 feet; 1280 meters) down to the Morrow Formation (mean depth 13,400 feet; 4084 meters). The deeper Morrow sandstones and the overlying Atoka sandstones of the Pennsylvanian series held the best promise for commercial natural gas production (Griswold, 1977).



In addition to several single well fields, there were two major producing fields in the Los Medaños area. Five wells were producing gas from the Morrow Formation in the Cabin Lake field just northwest of the WIPP site. A five-well field, the Los Medaños Field, was producing gas from both the Morrow and the Atoka Formations just southwest of the WIPP site.

4.1 Shell James Ranch Unit No. 1 - A Prolific Gas Well

A very productive gas well is located two thousand feet (610 meters) west of the WIPP site in the southwest corner of Section 36, T22S, R30E. The location is shown in Figure 3. Known as the Shell James Ranch Unit No. 1, the well was drilled, in 1957, to a total depth of 17,555 feet. The well was completed in the 12,920 to 12,929 foot (3938 to 3940 meters) interval for production of gas and oil condensate from the Los Medaños-Atoka Formation and has been producing since 1958.

The well has been prolific throughout its production history. Initial twenty-four hour production was 9,000 MCF gas and 104 BBLs condensate.³ As of mid-1976 cumulative production exceeded 17,000,000 MCF (481 000 000 cubic meters) of gas and 200,000 barrels (32 000 cubic meters) of condensate. The gas production rate from that single well in 1976, was over 100,000 MCF (2 800 000 cubic meters) per month. Keesey (1976) calculated the James Ranch Unit No. 1 would ultimately recover 35,900,000 MCF (1 billion cubic meters) of gas and 425,000 barrels (68 000 cubic meters) of condensate.⁴ The history of gas and condensate production since 1970 is shown in Figure 4.

³An MCF is equal to one thousand standard cubic feet (28.32 cubic meters) of gas. A BBL is equal to one barrel (0.159 cubic meters) of oil or condensate.

⁴As of August 1, 1991, production records filed with the U.S. BLM for the James Ranch Unit No. 1 show that cumulative gas production has exceeded 25,000,000 MCF and condensate oil production has exceeded 270,000 BBLs.

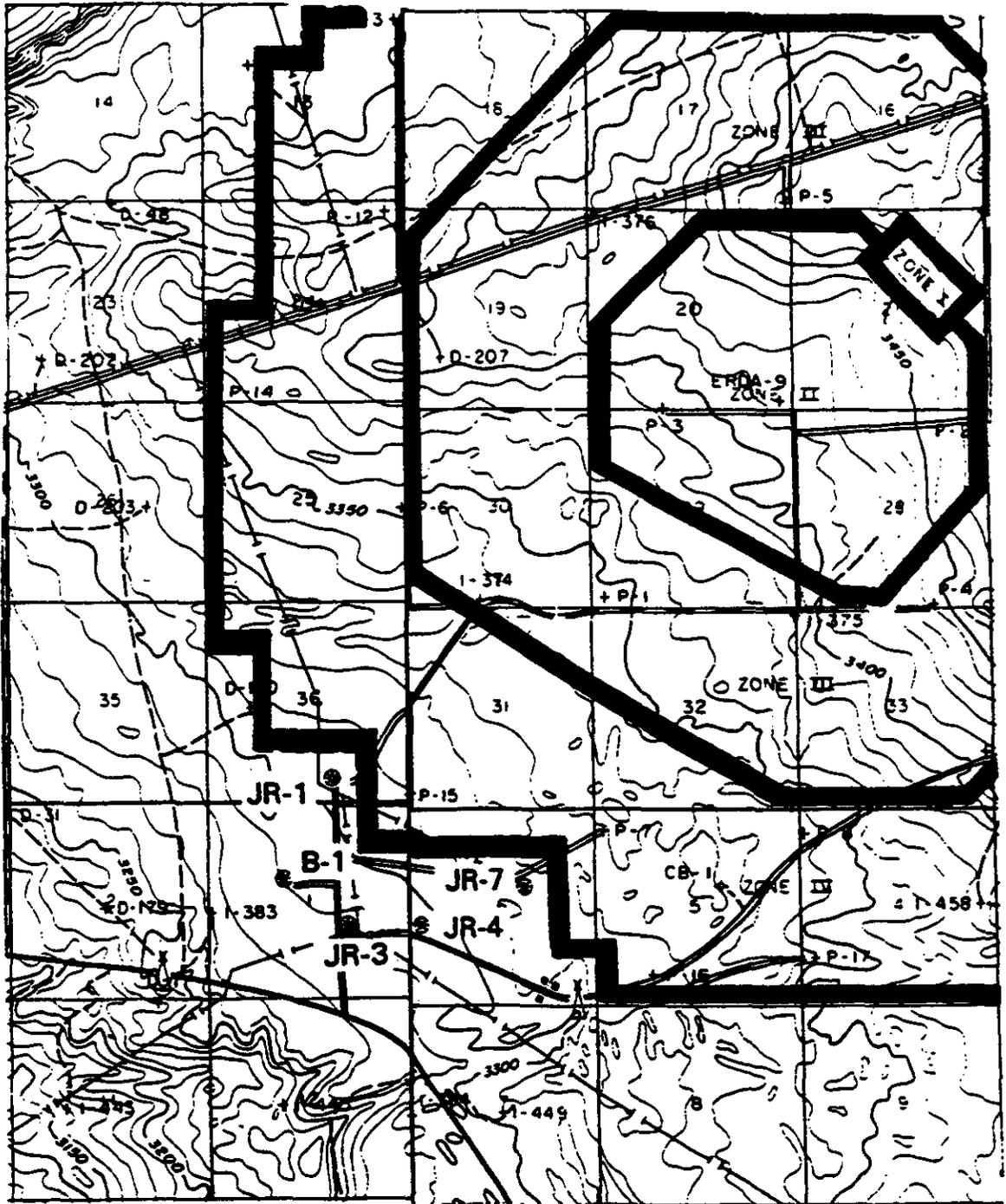


Figure 3. Five Gas Wells Outside Southwest Corner of WIPP Site in 1977. James Ranch Unit No's 1, 3, 4, 7 and Hudson Federal No. 1 (B-1). (after Griswold, 1977, Figure 4, highlighted and reproduced with permission.)

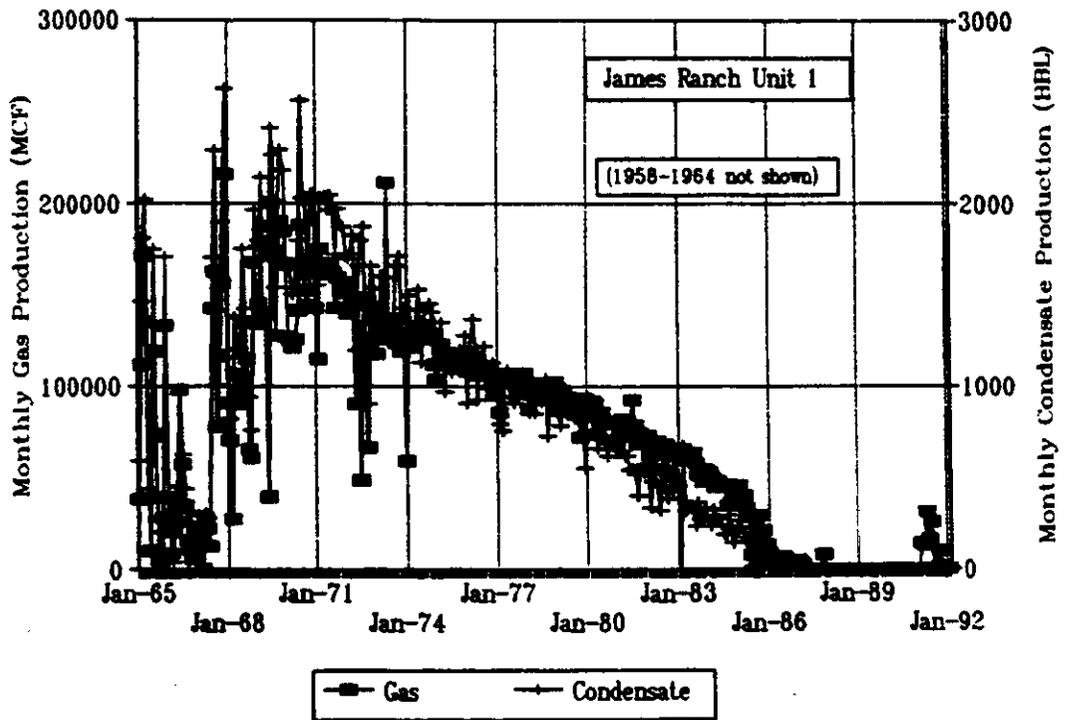
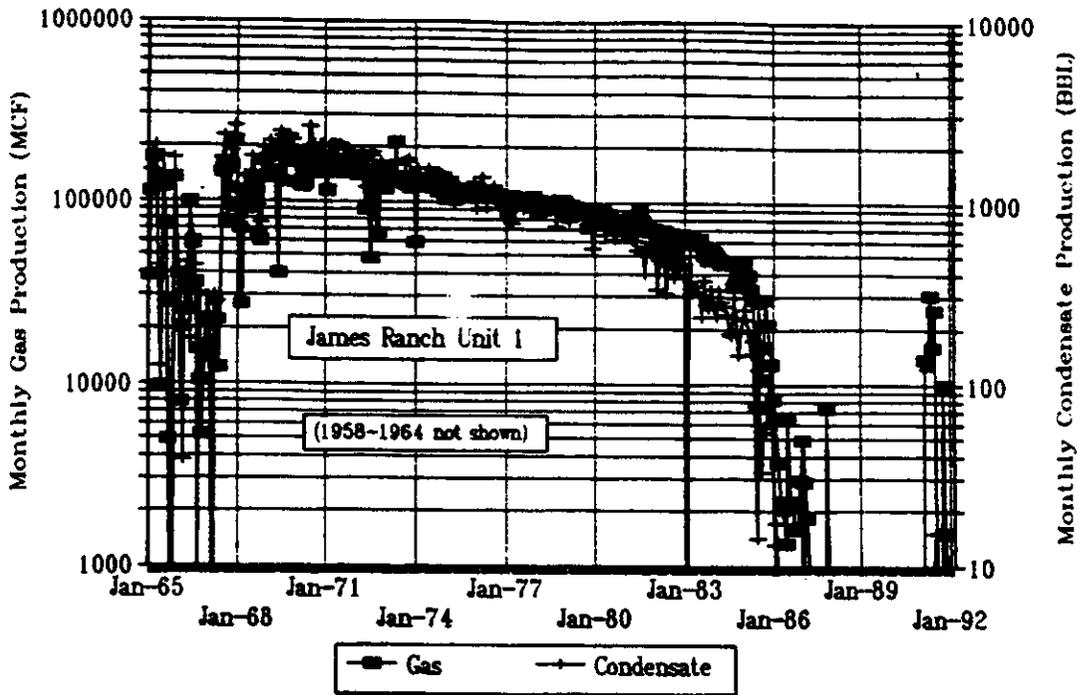


Figure 4. Gas and Oil Production from 1965 - 1991; James Ranch Unit No. 1. Data provided by Roswell District Office, U.S. BLM, 1992.

By 1977, the Shell James Ranch Unit No. 1 was flanked by an arc of four other wells on the south and west that essentially failed to tap the Atoka reservoir. The four wells were initially completed in the deeper Morrow Formation (Griswold, 1977). Figure 3 shows these wells included the Hudson Federal No. 1, Belco's James Ranch Unit No. 3, Belco's James Ranch Unit No. 4, and Conoco's James Ranch Unit No. 7.

4.2 Natural Gas Beneath the WIPP Site

A faulted anticline controls the Morrow reservoir in the Los Medaños field, southwest of the WIPP site. This same structure probably persists up into the Atoka and both reservoirs probably extend toward the northeast (Griswold, 1977).

Analysis of production decline curves through 1976 for the James Ranch No. 1 well indicated the well was probably draining at least five square miles (1300 hectares). That observation, coupled with the favorable geologic structure and the failure of wells drilled to the west and south, further suggested that wells drilled to the northeast would have a high chance of success (Keeseey, 1976; Griswold, 1977; U.S. DOE, 1980).

As part of the hydrocarbon resource evaluation, potential drilling sites were selected based on the structure contours of the Morrow Formation. Depending on the geologic structure and distance from producing wells, the potential drilling sites were ranked as either 1) proved undeveloped, 2) probable, or 3) possible. Proved undeveloped reserves identified commercially recoverable hydrocarbons to be recovered from new wells on undrilled acreage or from existing wells requiring a major expenditure for recompletion or new facilities for fluid injection. (Keeseey, 1976; Griswold, 1977, U.S. DOE, 1980).

The two locations ranked as "proven undeveloped" were north and east of the Shell James Ranch No. 1, as shown in Figure 5. The production data and geologic information available in 1976 indicated that much of the natural gas being produced from the Atoka Formation came from beneath the defined WIPP Site Boundary and the best place to drill a well would be in Section 31, T22S, R31E, which is precisely where the two active gas leases beneath the WIPP site are located.

Keeseey (1976) noted that the drilling and completion of additional wells northeast of the Shell James Ranch No. 1 would only enhance the rate of recovery of the Atoka reservoir now being drained by the one well. Ultimate recovery would remain about the same.

4.3 Early History of Leases

In May 1952, Continental Oil Inc. (Conoco) obtained an oil and gas lease (NMPM Lease # NM 02953) that included all 640 acres (259 hectares) of Section 31, T22S, R31E. In June 1953, the area was approved by the U.S. Geological Survey (U.S.G.S.) as the James Ranch Unit. Sid Richardson and Perry R. Bass were designated Unit Operators.⁵

As discussed above, Shell Oil Company drilled the James Ranch Unit No. 1 in 1957, on Section 36 just west of the Conoco lease. Shell began prolific production of gas and condensate from the newly discovered resources in the Atoka Formation in March 1958.

⁵Information about drilling applications, completion records, pipeline connections, production records, and official memoranda concerning these leases was obtained from U.S. Bureau of Land Management Offices in Roswell, New Mexico and Santa Fe, New Mexico.

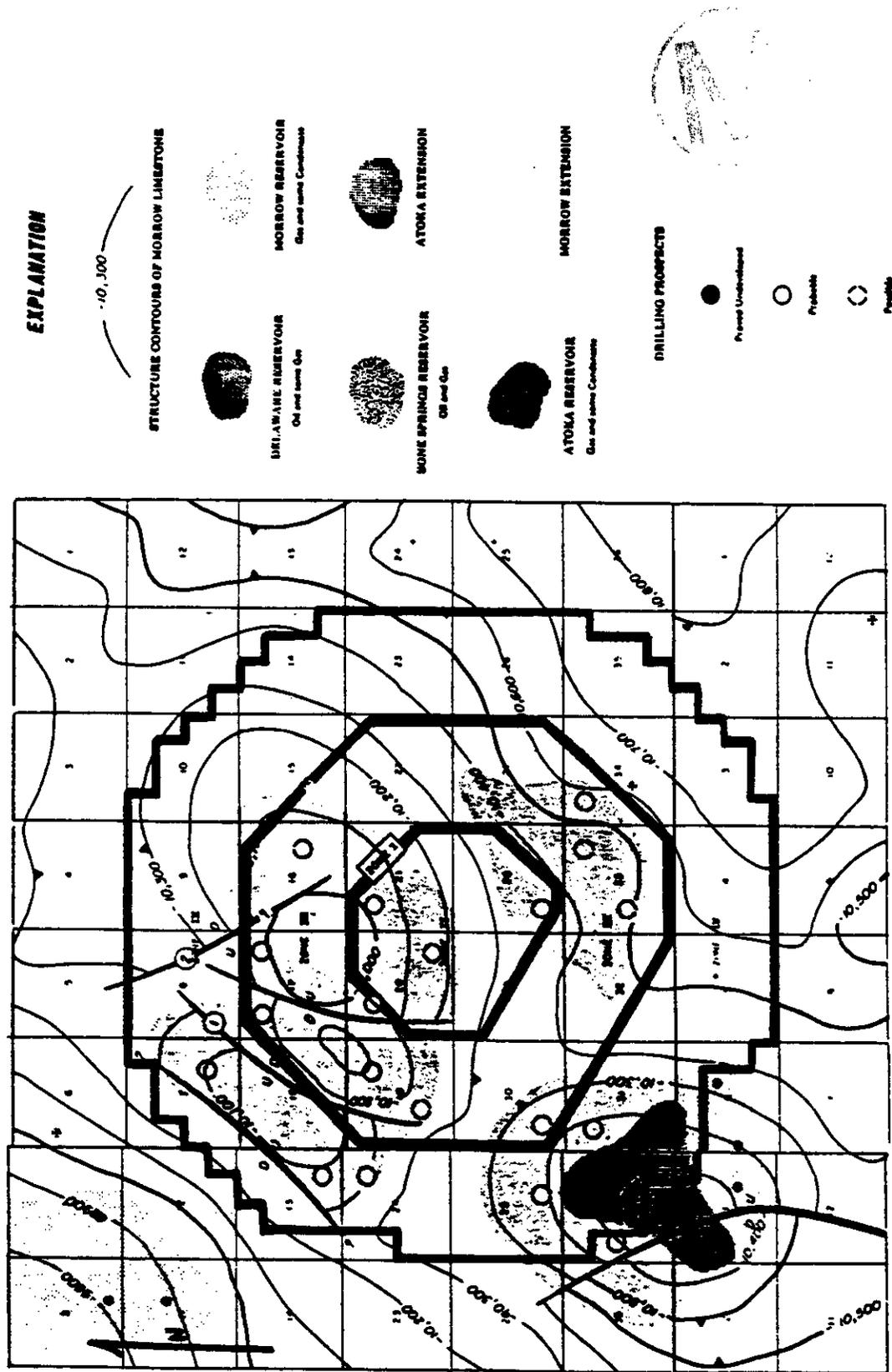


Figure 5. Hydrocarbon Resources and Possible Extensions (Griswold, 1977, Figure 32, reproduced with permission).

In February 1959 the Conoco lease on Section 31 was divided. The north half of the section remained with Conoco and the south half was assigned to Richardson and Bass under lease NM 02953-C. Perry R. Bass was designated the Unit Operator, in March 1961.

Keesey (1976) completed the analysis of hydrocarbon reserves for SNL, effective September 1, 1976, in which he concluded:

that the Los Medaños (Atoka) reservoir extends north and northeast underneath the 'site area' in section 31-22S-31E [Conoco's and Bass's undeveloped leases] and 36-22S-30E [Shell's producing lease] (Keesey, 1976, p. 16).

4.4 1976 Application to Drill For Natural Gas Beneath the WIPP Site

On November 7, 1976, Bass formally filed for a permit with the U.S. Geological Survey to drill a well on Section 31. Three days later, November 10, 1976, Conoco was designated as the operator and local agent for Bass "with full authority to act in his behalf in complying with the terms of the lease and regulations...." (Bass, 1976).

On November 11, 1976, the District Engineer for the U.S.G.S., routinely notified the New Mexico Division of Lands and Minerals Program and Land Office in Santa Fe, New Mexico, of the intent of Bass Enterprises Production company to commence drilling operations.

On December 10, 1976, a withdrawal notice appeared in the *Federal Register*. The Energy Research and Development Administration (ERDA, precursor of the DOE) applied for withdrawal of 17,000 acres (6880 hectares) of public lands in New Mexico for a nuclear waste disposal site including the land containing the Bass lease.

On January 20, 1977, the U.S.G.S Area Oil and Gas Supervisor, James W. Sutherland, approved the Bass application to drill for oil and gas .

4.5 Court Condemnation of Oil and Gas Leases at the WIPP Site

On February 9, 1977, the U.S. Government, at the request of the Acting Administrator for the ERDA, filed a complaint in civil court (Case # CIV 77-071 B) against Bass Enterprises et al. condemning their oil and gas lease from the surface to a depth of 6,000 feet (1829 meters) for the southern half of section 31.

On April 4, 1977, the U.S. BLM Assistant Solicitor of Lands, John J. McHale, informed the Director of the U.S. BLM that an attorney for the U.S. ERDA in New Mexico had inquired by telephone about the impact of the Federal Land Policy and Management Act (FLPMA) on the land status because the issue had been raised in litigation. The lessee (Bass) was contending in court that the condemnation of oil and gas leases by the Government was illegal, arguing that the Government can only terminate the lease through the lease provisions. The Assistant Solicitor had advised the ERDA attorney, that in BLM's judgment, the land should never have been taken (McHale, 1977).

On December 7, 1977, an additional complaint was filed in civil court (Case # CIV 77-776 B) by the U.S. Government against Conoco Inc. condemning their oil and gas lease from the surface to a depth of 6,000 feet (1829 meters) for the northern half of Section 31.

On February 12, 1979, both cases were settled jointly. The court condemned the oil and gas lease from the surface to 6,000 feet (1829 meters) and assigned \$1,350,000 to Conoco, Bass Enterprises, and other defendants as just compensation for these leases.



4.6 1981 Application to Drill Natural Gas Well Beneath the WIPP Site

On December 11, 1981, Bass Enterprises filed a formal application to drill a wildcat well, James Ranch Unit No. 13, on Section 6, T-23-S, R-31-E (#NM 02887-D) with the intent to deviate north into Section 31, T-22-S, R-31-E. This section, would fall entirely within the defined WIPP Site Boundary fourteen months later.

On December 14, 1981, James Pettengill, geologist with the U.S.G.S. Office in Roswell, filed a review of the drilling application with the U.S.G.S. District Engineer in Artesia. The review noted that the "completion location is within the boundaries of the Department of Energy's proposed Waste Isolation Pilot Project (WIPP)" (Pettengill, 1981).

On December 16, 1981, the U.S.G.S. District Supervisor in Roswell, James Gillham, issued a memo to the U.S.G.S. Deputy Conservation Manager of Oil and Gas transmitting the request to drill and commenting that the "drillsite is not considered to be in a politically sensitive area" (Gillham, 1981).

On December 18, 1981, the U.S.G.S Area Manager for the Carlsbad Resource Area notified the DOE WIPP Project Manager of Bass's application to drill and requested advice on any special stipulations or concerns by December 28, 1981 (Koski, 1981).

The DOE December 30, 1981, response noted that the Department had obtained exclusive use of the surface and uppermost 6,000 feet (1829 meters) of subsurface for the specific purpose of preventing any drilling activity in Section 6, N $\frac{1}{2}$,NW $\frac{1}{4}$, T23S, R31E and Section 31, T22S, R31E. The letter cautioned the BLM that "the approval to drill must include the stipulation that Perry R. Bass is not permitted to drill into the areas described above" (McGough, 1981) .

Following the January 11, 1982, approval by the U.S.G.S. (Reitz, 1982) to drill, drilling started on February 6, 1982. On September 13, 1982, the well was tested and produced 141 MCF of gas for an eight hour period. On September 21, 1982, drilling was completed. On February 14, 1983, the Natural Gas Pipeline Company of America connected to the well, James Ranch Unit No. 13, for the purpose of purchasing gas. The wellhead is shown in Figure 6 with the WIPP Waste Handling Building in the background.

4.7 Zone Designation and Resource Recovery Control

On February 17, 1983, the DOE WIPP Project Manager notified the Director of the Environmental Evaluation Group (EEG) that:

the configuration of WIPP surface control zones has changed as a result of the cost reduction program, the DOE resource management policy and Bureau of Land Management land withdrawal action.... Descriptions of the new control zones are also enclosed (McGough, 1983a).

On February 24, 1983, the DOE WIPP Project Manager further informed the EEG Director that:

the DOE does not plan to exercise any control over resource recovery activities outside the Site boundary and will rely, primarily, on other Federal and State regulatory agencies to assure that the WIPP boundaries are not violated (McGough, 1983b).

On October 28, 1983, the EEG requested a clarification on the DOE's conflicting descriptions of the Zone III boundaries and a clarification on the interim controls on resource recovery. The EEG was puzzled by the DOE's reference to the new WIPP site boundary as Zone III. The EEG was also concerned the restriction against drilling into the first 6,000 feet (1829 meters) was not included in the BLM/DOE

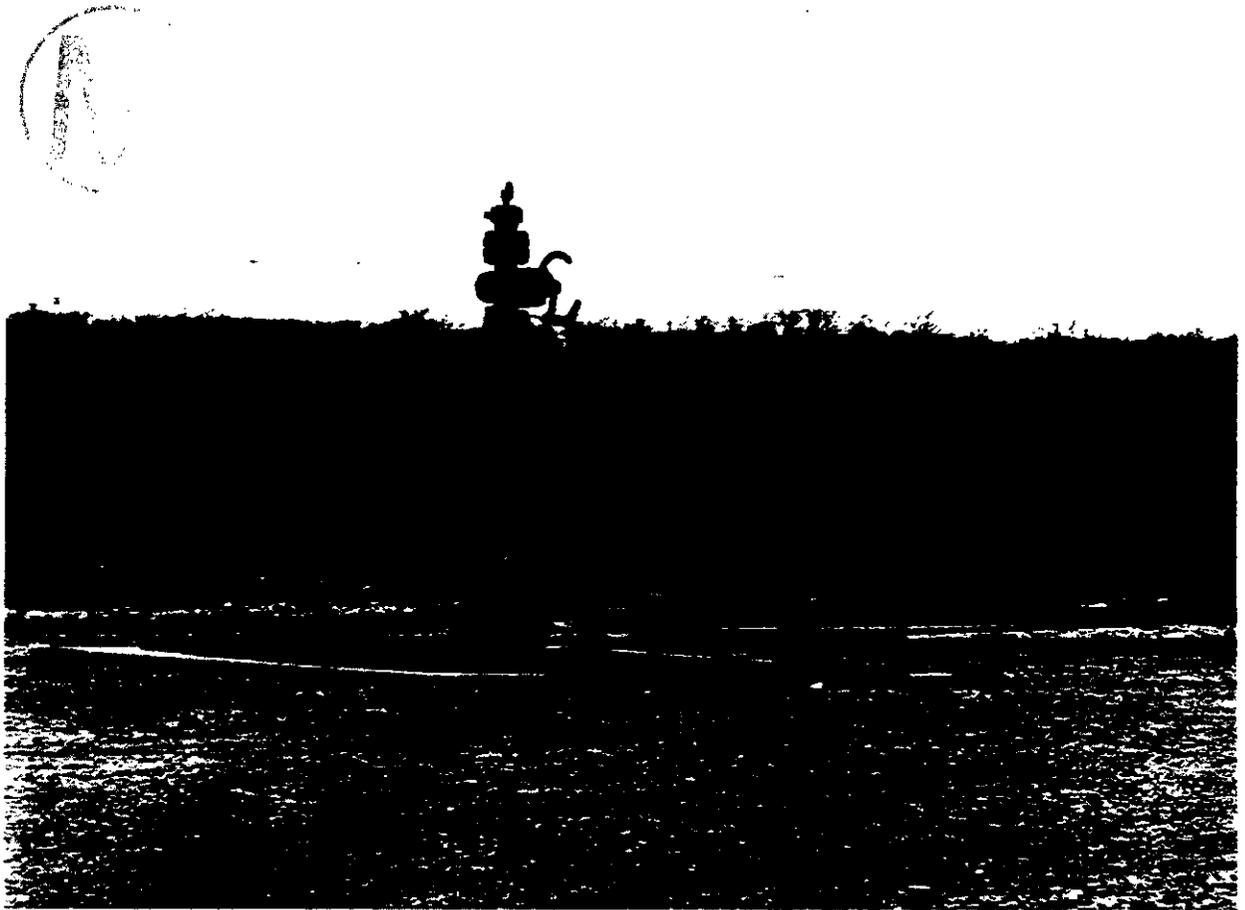


Figure 6. James Ranch Unit No. 13 with WIPP Waste Handling Building in Background.

Memorandum of Understanding or in the Resource Management Plan. Hence, EEG suggested that there was no apparent reason for the BLM to enforce the restriction (Neill, 1983a).

On December 7, 1983, the DOE WIPP Project Manager acknowledged that:

1. Our February 24, 1983 letter incorrectly identified the WIPP Site boundary as being the Zone III when in fact the Zone III boundary has not changed from that shown in the FEIS. The zone being controlled as regards mineral extraction, is the 16 full sections of land as shown in the sketch enclosed in our February 17, 1983 letter. These 16 sections comprise the area identified in the June 29, 1983 administrative land withdrawal.

2. All lease rights which have been purchased by the DOE within the site boundary have been purchased in their entirety or alternatively we acquired only the upper 6,000 feet of the leases to reduce the acquisition cost to the DOE and to allow access to potential hydrocarbon resources below the WIPP Site. It was not considered necessary to detail this information in the DOE/BLM Memorandum of Understanding (MOU) or Resource Management Plan because the BLM is required to enforce mineral leasing laws which prohibit violation of adjacent (in this case, DOE's) lease boundaries (McGough, 1983c).

In evaluating the suitability of the WIPP Site, the EEG (Neill et al., 1983, p. iii) recommended that

no potash mining will be allowed in Zones I, II, and III of the WIPP site. Deviated drilling for oil and gas from outside the WIPP site to reach under the WIPP site at depths greater than 6,000 feet may be allowed. The federal government shall exercise active institutional control at the site for this purpose for at least 100 years after repository decommissioning.

The recommendation was reiterated on December 6, 1983, in a letter from the EEG Director (Neill, 1983b) to the WIPP Project Manager on the suggested wording for the First Modification to the Consultation and Cooperation (C&C) Agreement between the U.S. Department of Energy and the State of New Mexico. On November 14, 1984, the State of New Mexico and the U.S. Department of Energy agreed that:

During facility construction and operation the DOE will not allow subsurface mining, drilling or resource exploration from within the WIPP site. The 'WIPP site' as used here means the 4 x 4 mile (10,240 acres) area consisting of sections 15, 16, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 31, 32, 33, and 34 of Township 22 South, Range 31 East, NMPM, in Southeastern New Mexico.

Deviated drilling for oil and gas from outside the WIPP may be allowed so long as the subsurface of the WIPP site is not penetrated above a depth of 6,000 feet from the surface.

EEG's recommendation to include a statement that the federal government shall exercise active institutional control at the site for at least 100 years after repository decommissioning was not included in the modification. Rather, the First Modification to the C&C agreement stated that:

the consultation process concerning the length and extent of the post-closure institutional control, shall be negotiated and resolved by the parties in the future, and at least one year prior to the start of the decontamination and decommissioning of WIPP.

5.0 THE FORGOTTEN GAS LEASES AND WELL BENEATH THE WIPP SITE

The 1984 agreement between the U.S. Department of Energy and the State of New Mexico to allow slant drilling under the WIPP Site changed on August 4, 1987, in the second modification to the C&C agreement (U.S. DOE and NM, 1987), which states:

The DOE will not permit subsurface mining, drilling, or resource exploration unrelated to the WIPP Project on the WIPP site during facility construction, operation, or after decommissioning. This prohibition also precludes slant drilling⁶ under the site from within or from outside the site.

Several important DOE documents are either incorrect, silent, or inconsistent on the existence of the two oil and gas leases and the gas well. For example, the Final Environmental Impact Statement (FEIS, U.S. DOE, 1980, pp. 8-8—8-10) identifies the oil and gas leases held by ten companies in March 1979, yet the 1952 Conoco and 1957 Bass leases in the southwest corner of the WIPP Site on Section 31 are not mentioned. The WIPP Final Safety Analysis Report (WIPP FSAR, U.S. DOE, 1990a, Section 2.1.1.1), incorrectly states that there are no active oil and gas leases within the WIPP Site Boundary. Moreover, the WIPP FSAR (U.S. DOE, 1990a, Figure 2.2-1) fails to chart the intruding well on its map of producible oil and gas wells. The DOE No-Migration Variance Petition to EPA incorrectly states that the DOE has purchased all oil and gas leases in the area of the WIPP site to prevent any exploration now and in the future (U.S. DOE, 1990b). Revisions 1 through 5 of the Secretary of Energy's Decision Plan were monitoring the status of an active potash lease until it was purchased by the DOE. Yet Revisions 6 through 10 remained silent on the active oil and gas lease issue even after the article in the Albuquerque Journal raised the issue (McCutcheon, 1990). The recently published DOE Implementation

⁶Emphasis added.

of the Resource Disincentive document, (U.S. DOE, 1991) is inconsistent on the number of active oil and gas leases within the WIPP Site Boundary and on the production status of the forgotten gas well.

5.1 1980 WIPP Final Environmental Impact Statement

The WIPP Final Environmental Impact Statement (U.S. DOE, 1980) identifies the gas and oil leases held by ten companies in March 1979 at the WIPP Site. Figure 7 (reproduced from the 1980 WIPP FEIS) does not show the Bass and Conoco leases on Section 31. While those two leases were condemned in February 1979 from the surface to 6,000 feet (1829 meters), the oil and gas leases below 6,000 feet (1829 meters) did remain valid.

5.2 1990 WIPP Final Safety Analysis Report

The DOE's stated commitment to prohibit slant drilling and the loss of knowledge is also documented in the WIPP Final Safety Analysis Report (U.S. DOE, 1990a) which the DOE describes as the top level document in the hierarchy of the WIPP safety documents. The WIPP FSAR states:

The area of land that lies within the WIPP Site Boundary and committed to the WIPP facility is a square four miles on a side. It contains 10,240 acres (16 mi²) including Sections 15-22 and 27-34 in township T22S, R31E....

The DOE will not permit subsurface mining, drilling, or resource exploration unrelated to the WIPP Project within the WIPP Site Boundary during facility operation or after decommissioning. This prohibition precludes **slant drilling**⁷ under the WIPP facility from within or outside the WIPP facility. (U.S. DOE, 1990a, Section 2.1.1.1).

⁷Emphasis added.

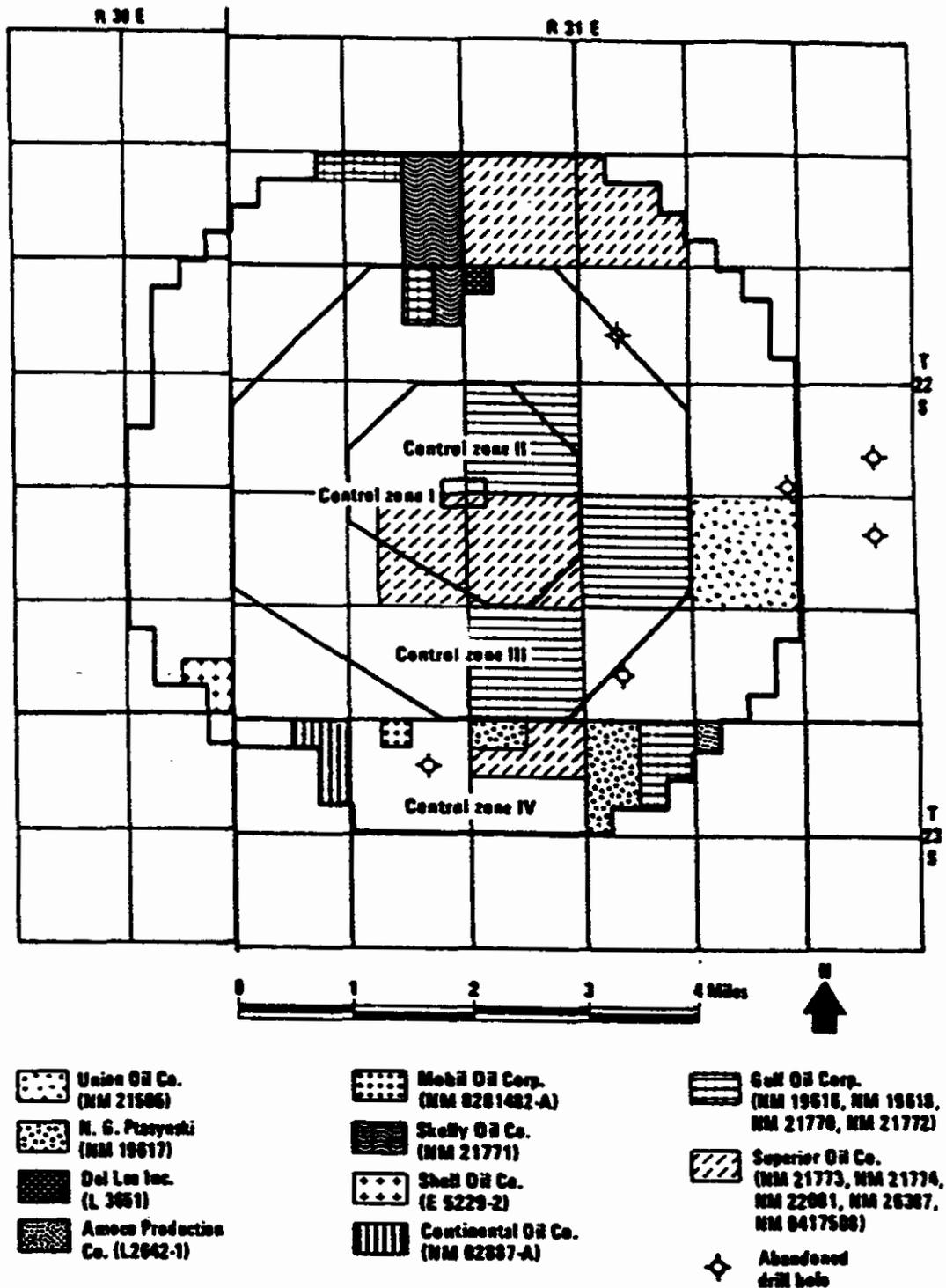


Figure 7. Oil and Gas Leases Within the WIPP Site according to the DOE FEIS, (U.S. DOE, 1980, Figure 8-6, reproduced with permission).

The WIPP Final Safety Analysis Report also incorrectly states:

... all oil and gas leases within the WIPP Site Boundary have expired (U.S. DOE, 1990a, Section 2.1.2.1.3).

Furthermore, Figure 2.2-1 (Figure 8 in this report) of the WIPP FSAR fails to show all of the 1986 operable natural gas and oil wells within a ten mile (16.1 kilometers) radius. This figure shows seven wells just outside the southwest corner of the site - James Ranch Unit Nos. 1, 3, 4, 7, 10, 11 and Hudson Federal No. 1. James Ranch Unit No. 3 appears to be plotted in the wrong location. At least two wells, James Ranch Unit Nos. 13 and 14 shown in Figure 9, both slant drilled wells, are not shown in the WIPP FSAR. James Ranch Unit No. 13 and James Ranch Unit No. 14 were not only operable, but each was producing through the entire year of 1986, as shown in Figures 10 and 11.

Table 1 (prepared from data provided by the Roswell District Office of the U.S. BLM) lists the gas and condensate production from the James Ranch Unit No. 13. Production was stopped for one month in July 1985 and again for three extended periods of several months beginning in April 1987. Nonetheless, gas and condensate were produced for several months in 1987, 1988, and again in 1991. To date this well has produced over 3,000,000 MCF gas. The latest available production records in the Roswell District Office of the U.S. BLM show production of 27,618 MCF gas and 164 BBLs condensate for February 1992 (U.S. BLM, 1992).

James Ranch Unit No. 14 was slant drilled in 1983. The top of the well is located in Section 6, T23S, R31E and completed in the Los Medaños-Morrow Formation in Section 7, T23S, R31E. Since production began in December 1983 records through February 1992 show this well has produced gas every month except for a two month period in 1987.

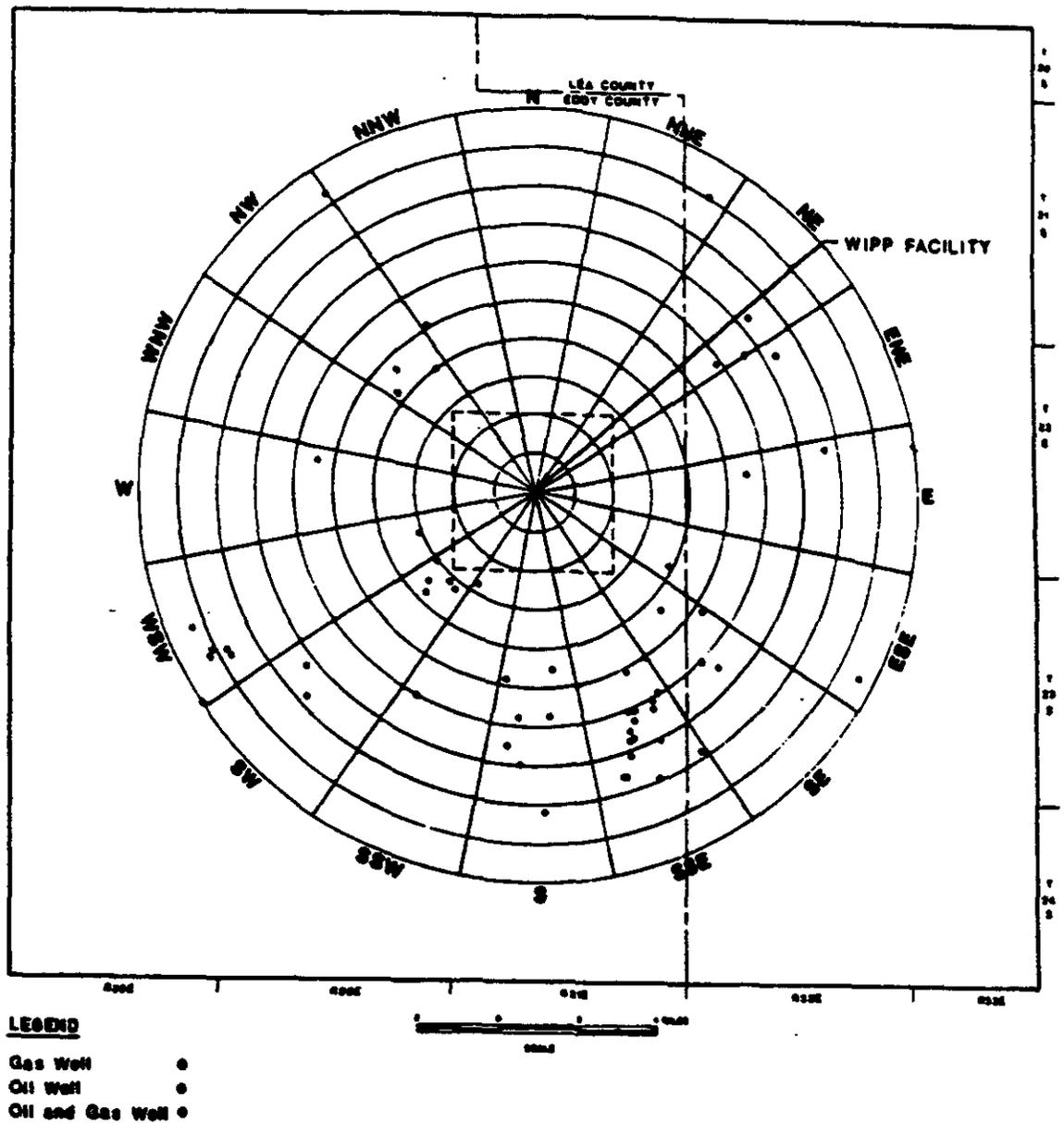


Figure 8. 1986 Operable Natural Gas and Oil Wells, within 10 Mile Radius (WIPP FSAR, U.S. DOE, 1990a, Figure 2.2-1, reproduced with permission).

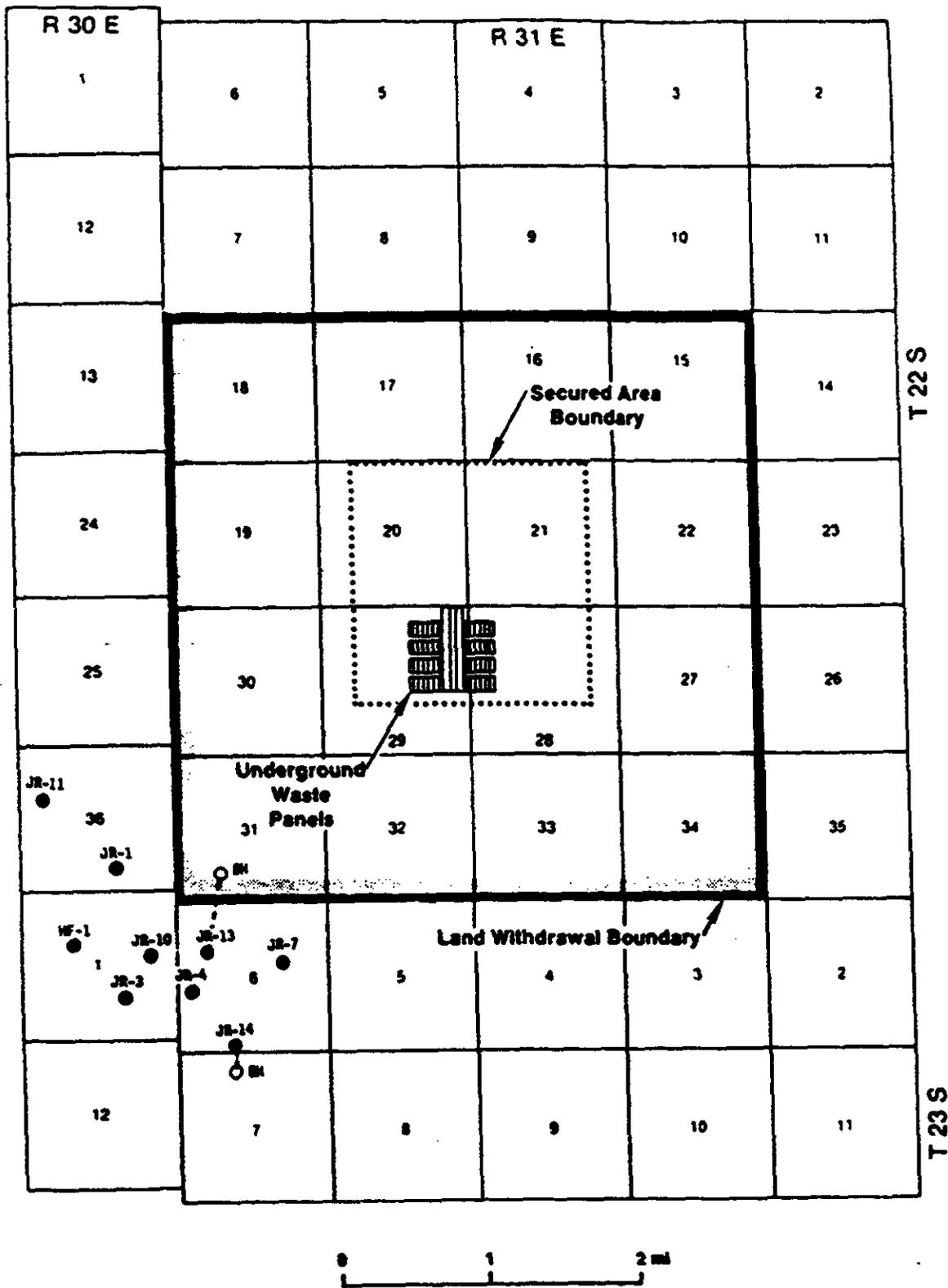


Figure 9. Gas and Condensate Wells at Southwest Corner of WIPP Site. Well locations plotted from U.S. BLM records.

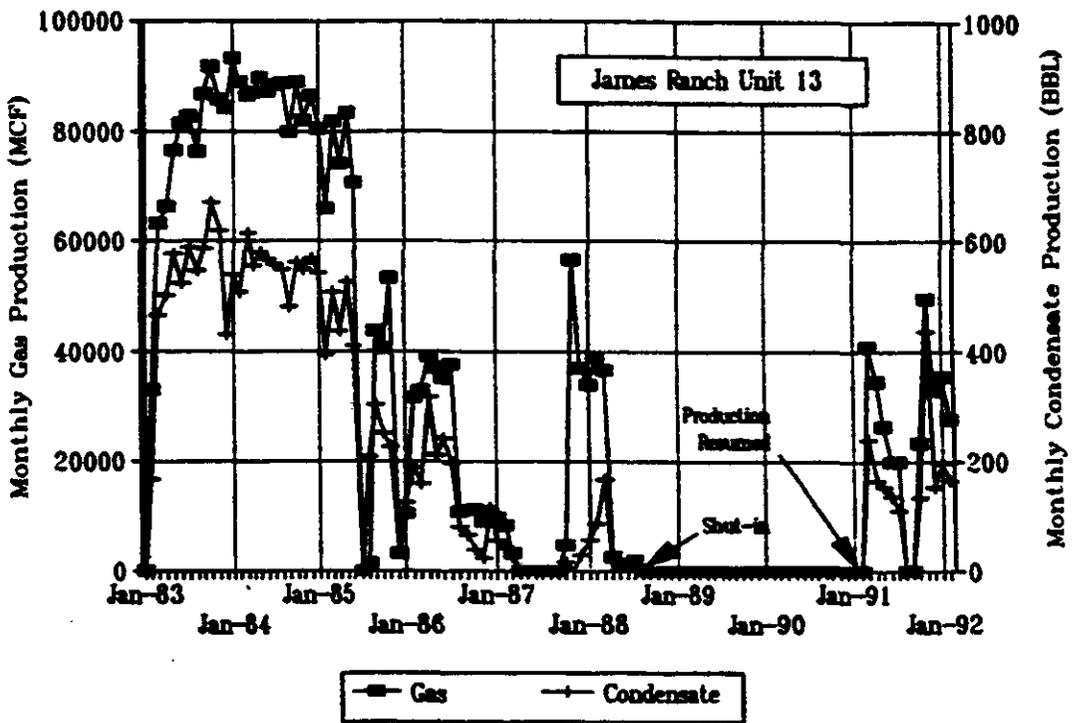
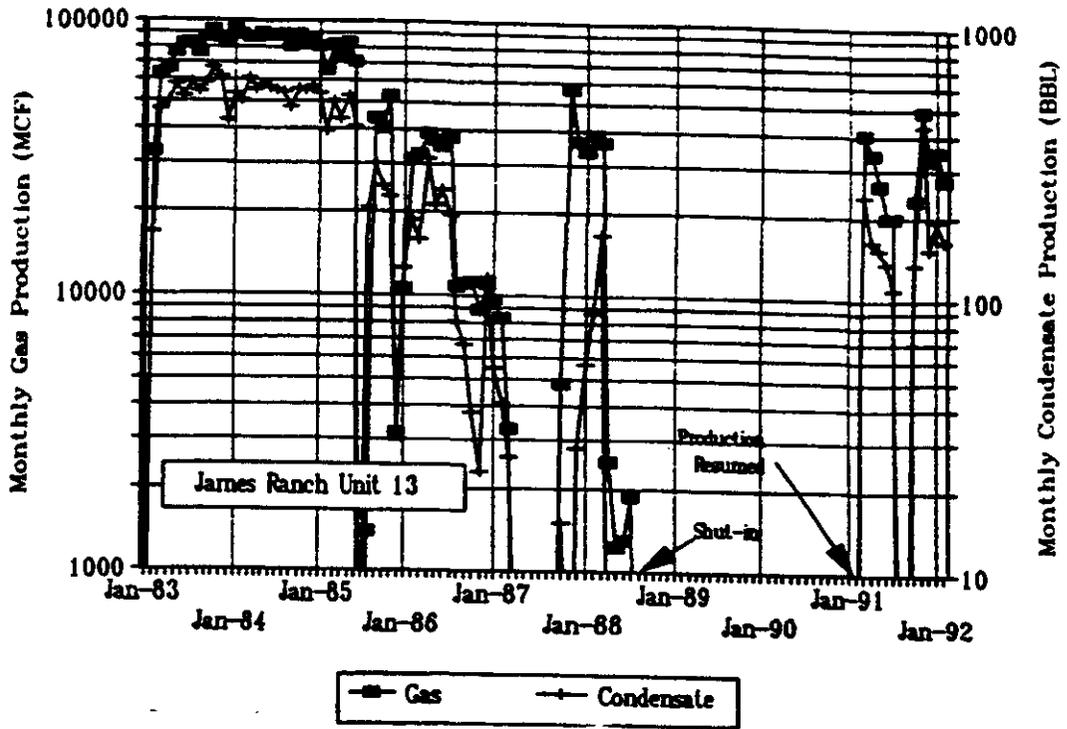


Figure 10. Production History of James Ranch Unit No. 13. Data provided by Roswell District Office, U.S. BLM, 1992.

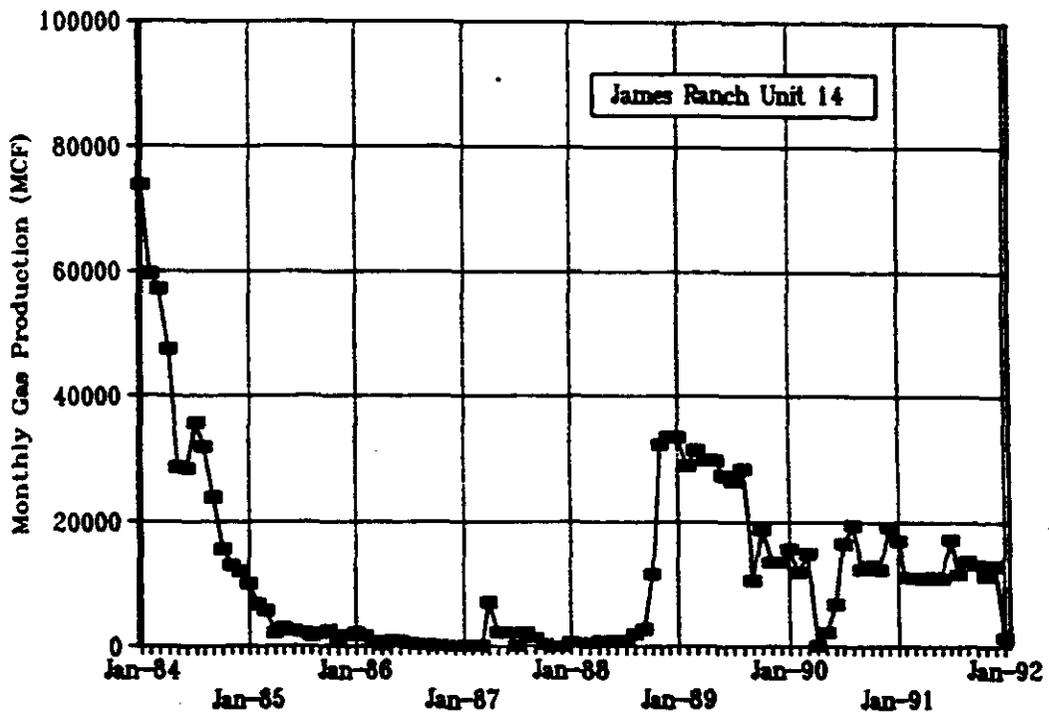
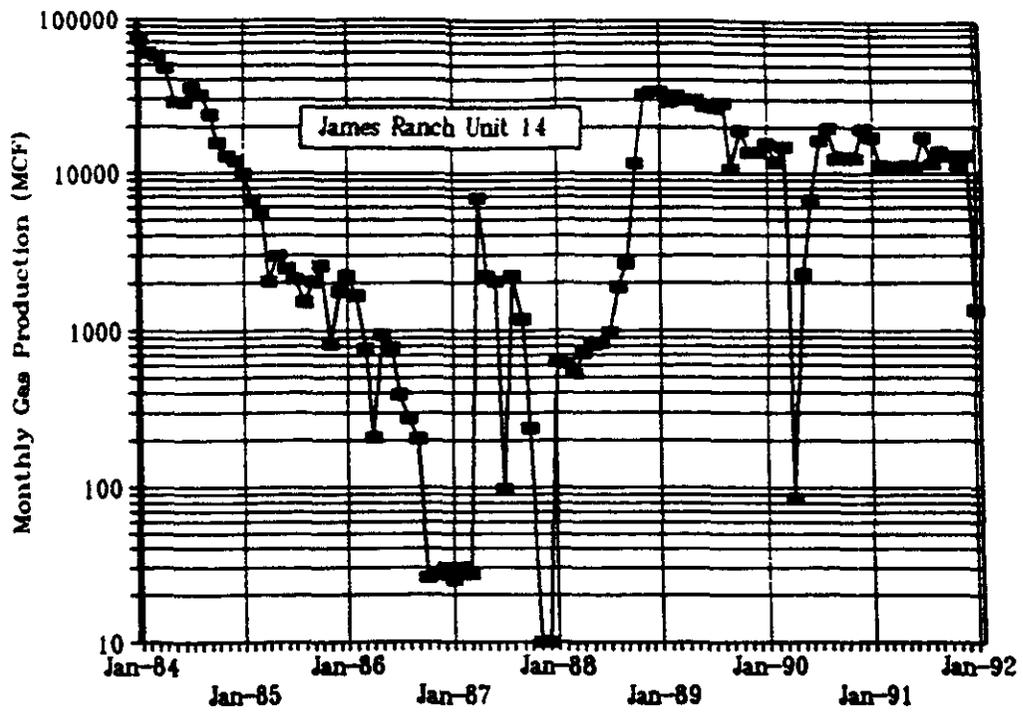


Figure 11. Production History of James Ranch Unit No. 14. Data provided by Roswell District Office, U.S. BLM, 1992.

TABLE 1: PRODUCTION HISTORY OF JAMES RANCH UNIT NO. 13

DATE	OIL (BBL)	GAS (MCF)	WATER (BBL)
01/31/83	0	0	0
02/28/83	167	32970	17
03/31/83	467	63373	31
04/30/83	501	66425	27
05/31/83	579	76613	30
06/30/83	524	81409	30
07/31/83	589	82734	31
08/31/83	546	76421	31
09/30/83	588	86647	30
10/31/83	672	91799	31
11/30/83	619	85720	30
12/31/83	431	84334	29
01/31/84	539	93266	31
02/29/84	508	88828	29
03/31/84	615	86519	30
04/30/84	555	86971	30
05/31/84	580	89612	31
06/30/84	567	87216	30
07/31/84	557	88357	31
08/31/84	548	88778	31
09/30/84	481	80027	29
10/31/84	562	89005	31
11/30/84	549	82072	30
12/31/84	569	86411	31
01/31/85	543	80505	30
02/28/85	393	65972	26
03/31/85	507	81783	31
04/30/85	437	74131	58
05/31/85	526	83292	31
06/30/85	410	70727	28
07/31/85	0	0	0
08/31/85	207	1391	16
09/30/85	302	43919	17
10/31/85	250	40550	17
11/30/85	227	53275	21
12/31/85	33	3112	14
01/31/86	126	10583	4
02/28/86	189	31505	10
03/31/86	160	32865	13
04/30/86	316	38991	17
05/31/86	212	36926	30
06/30/86	241	35085	16

TABLE 1 (continued)

07/31/86	196	37753	16
08/31/86	81	10837	5
09/30/86	67	11113	5
10/31/86	38	11235	5
11/30/86	23	8979	5
12/31/86	117	10951	6
01/31/87	55	9701	7
02/28/87	41	8374	24
03/31/87	26	3305	3
04/30/87	0	0	0
05/31/87	0	0	0
06/30/87	0	0	0
07/31/87	0	0	0
08/31/87	0	0	0
09/30/87	0	0	0
10/31/87	15	4824	4
11/30/87	0	56786	22
12/31/87	28	36952	36
01/31/88	57	33926	30
02/29/88	87	38970	32
03/31/88	167	36552	28
04/30/88		2518	4
05/31/88		1219	2
06/30/88		1297	4
07/31/88		1872	
08/31/88	0	0	0
09/30/88	0	0	0
10/31/88	0	0	0
11/30/88	0	0	0
12/31/88	0	0	0
01/31/91	0	0	0
02/28/91	0	0	0
03/31/91	240	40888	0
04/30/91	164	34513	30
05/31/91	153	26441	0
06/30/91	136	20034	26
07/31/91	110	20043	31
08/31/91	0	0	
09/30/91	0	0	
10/31/91	135	23393	
11/30/91	436	49658	29
12/31/91	153	32782	31
01/31/92	196	35364	
02/29/92	164	27618	

5.3 No-Migration Variance Petition to EPA

The DOE No-Migration Variance Petition (U.S. DOE, 1990b) to the EPA states in the section on human intrusion:

Oil and gas exploration has been and continues to occur around the WIPP site. The target horizons for this type of exploration are below the Castile. Oil and gas exploratory drilling requires permits from the state, and it is unlikely that prospective future well drillers would not be informed about the existence of WIPP. As an additional protective measure, **the DOE has purchased all oil and gas leases in the area of the WIPP site⁸** to prevent any exploration now and in the future (U.S. DOE, 1990b, Section 6.3.2).

With respect to petroleum exploration and the human intrusion issue, the last sentence in this paragraph provided incorrect information to the EPA. The EPA subsequently granted a variance to the DOE in November 1990 (U.S. EPA, 1990).

5.4 New Mexico Energy and Minerals Department Report

The 1984 report published by the New Mexico Energy and Minerals Department (NMEMD) Task Force on Natural Resources (NMEMD, 1984) stated that the DOE had acquired several oil and gas leases at a cost of over \$19.6 million dollars. The report stated that "As a result of these lease acquisitions, only one hydrocarbon lease remains within the WIPP Site Boundary... an 80-acre tract held by Skelly Oil Company...." (NMEMD, 1984, p. 27). The report did not identify the active gas and oil leases in Section 31, deeper than 6,000 feet (1829 meters).

⁸Emphasis added.

5.5 1990 Memorandum of Understanding between BLM and DOE

The U.S. Department of Energy and the U.S. Department of Interior's BLM signed the Memorandum of Understanding on October 26, 1990, recognizing that:

BLM will prohibit directional drilling underneath the WIPP site boundary, except as may be required for the development of the two leases located under Section 31;⁹ drilling may be allowed below 6,000 feet of the surface.

Hence, it appears the DOE entered into an agreement in 1990 to honor these leases despite commitments to preclude slant drilling in the 1987 C&C Agreement with New Mexico and the 1990 WIPP FSAR.¹⁰ Apparently, the DOE accepted the *fait accompli* without considering the commitments in the C&C Agreement and the WIPP FSAR.

5.6 Department of Energy Position

On November 3, 1990, the Albuquerque Journal reported the discovery of the forgotten natural gas well completed within the WIPP Site Boundary. (McCutcheon, 1990).

On November 15, 1990, the Assistant Manager for Energy and Special Programs of the Albuquerque Operations Office of the Department of Energy sent a letter to the

⁹Emphasis added.

¹⁰On January 22, 1991, the Assistant Secretary of the Interior signed 43 CFR Public Lands Order 6826 (Administrative Land Withdrawal). That Administrative Land Withdrawal Order cites the October 26, 1990 Memorandum of Understanding between the U.S. Department of Energy and the U.S. Department of the Interior BLM as the guiding document regarding resource management.

Chairman of the New Mexico Radioactive Waste Consultation Task Force. The letter maintained:

...at the time this deviated well was drilled, the section 31 bottom hole was within what was formerly termed "zone IV" of the WIPP site. A 1980 report prepared by Sandia National Laboratories (SNL) concluded that extraction from within zone IV would have no technical impact on repository performance. The 1980 Environmental Impact Statement for the WIPP stated that the DOE would permit drilling for natural gas in zone IV. Accordingly, in 1981 when Bass Enterprises filed an application to drill the well, the DOE stated it had no objection, so long as the operator did not encroach upon the surface or the first 6,000 feet condemned by the United States. Recent review by SNL confirms that the existence of this bottom hole more than 14,000 feet below section 31 does not affect the performance of the repository.

We do not believe that the existence of this 1982 well contravenes the August 4, 1987 Second Modification to our Agreement for Consultation and Cooperation in which we previously agreed to prospectively preclude "subsurface mining, drilling, or resource exploration unrelated to the WIPP Project on the WIPP site" [including "slant drilling under the site from within or from outside the site"].... (Bickel, 1990a).



The DOE response requires further explanation because it cited a "1980 report" from Sandia National Laboratories and a "recent review by SNL." The "1980 report" was a draft of a position paper on Zone IV. The 1980 memo of transmittal accompanying those draft pages also recommended that:

well selected, realistic scenarios addressing the consequences of mining and drilling in Zone IV should be a part of the Zone IV position paper (Weart, 1980).

The cited "recent review by SNL" described in the November 15, 1990, DOE letter was a November 5, 1990, memo (Weart, 1990) prepared at the DOE's request. The one and one-half page memo reexamined the reasoning from the 1980 draft in light of the new dilemma and current regulatory requirements. The memo correctly stated:

the portion of the hole that penetrates the salt is outside the site boundary and thus beyond the boundary at which compliance with the standards will be evaluated (Weart, 1990).

and concluded that:

even though the Bass drill hole is bottomed within the site boundary, it is much more than a mile from the waste zone and therefore exceeds the technical safety requirements (Weart, 1990).¹¹

The DOE Albuquerque Operations Office November 16, 1990, letter to the Coordinator of the New Mexico Radioactive Waste Task Force stated:

there is one producing well allowed in each 320-acre production unit. The south half of Section 31 has its one well, James Ranch Unit No. 13 (Bickel, 1990b).

However, the letter failed to note current drilling practices in New Mexico would allow additional deep gas wells to be drilled into Section 31 including the south half

¹¹Initially, the selection of a site required that the repository be located at least two miles from a borehole penetrating the Salado formation. The two mile requirement was believed to be conservative but was also arbitrary (Schueler, 1980). The two mile requirement was reduced to one mile after the site at the ERDA 6 borehole was found to be unacceptable (Neill et al., 1979, Appendix III, p. 6). The Geologic Characterization Report (Powers et al., 1979, p.2-12) stated that justification for a one mile criteria was based on reports by Snow and Chang (1975), Walters (1975), Fader (1973), and Griswold (1977). However, EEG questioned the pertinence of these studies and, hence, questioned the justification for the reduction to a one mile criteria (Neill et al., 1979, Appendix III, pp. 6,7).

of that section. The lessee can request permission to drill on tighter spacing by demonstrating to the New Mexico Oil Conservation Division that the tighter spacing is required to efficiently produce the gas from the formation. For example, if a reservoir exhibits retrograde condensate behavior, the buildup of liquid around the well bore can reduce, sometimes seriously, the flow rate as the pressure declines below the dew point (Craft and Hawkins, 1959, p. 73). Hence, efficient production may require more wells on a tighter spacing.

Also, the existing well in Section 31 could be deepened. That activity would constitute exploratory drilling.

Furthermore, the lessee is still entitled to slant drill an exploratory hole into the north half of Section 31, which has yet to be developed. In summary, as long as the lessee maintains the leases, the U.S. BLM can not deny them access to their oil and gas in Section 31, the southwestern section of the WIPP Site.

5.7 SNL WIPP Performance Assessment Division

The SNL WIPP Performance Assessment Division issues an annual report on the status of the demonstration of the extent of compliance with 40 CFR Part 191. The December 1990 annual report stated:

About 56 oil and gas wells are within a radius of 16 km (10 mi); the wells generally tap Pennsylvanian strata, about 4,200 m (14,000 ft) deep. The nearest well is about 3 km (2 mi) to the south-southwest of the waste panels (Bertram-Howery, 1990, p. I-20).

There was no discussion on the status of that well. For 1991, the SNL WIPP Performance Assessment Division added:

The surface location of the well, which is capable of producing gas, is outside the proposed land-withdrawal boundary, but the borehole is slanted to withdraw gas from rocks within the boundary. Except for this well, resource extraction is not allowed within the proposed land-withdrawal boundary (Sandia National Laboratory, 1991, p. 1-15).

The 1991 document also stated in the discussion on natural resources:

In order to gain control over the development of hydrocarbons at the WIPP, the DOE acquired the oil and gas leases within all the WIPP control zones. The only leases that are still intact are in Section 31. These leases only allow resource production by entry of the proposed land withdrawal area below 6000 feet. **One of these leases is currently in production.**¹² The upper 6000 feet of the leases was taken by the DOE in 1979. Current policy does not allow any further resource development inside the proposed land withdrawal boundary (Sandia National Laboratory, 1991, p. 8-7).

5.8 The Secretary of Energy's Decision Plan

While the Secretary of Energy's Decision Plan for the WIPP had carefully tracked an active potash lease until it was purchased, successive Revisions 6 through 10 did not document the existence of the active oil and gas leases even after the issue had been raised. The potash lease purchase was noted in Revision 5 (U.S. DOE, August 15, 1990). The failure of subsequent revisions to mention the rediscovered gas leases incorrectly suggests that there were no outstanding leases in the WIPP Site Boundary other than the one potash lease.

¹²Emphasis added.

5.9 DOE Implementation of the Resource Disincentive Plan

The *DOE Implementation of the Resource Disincentive Plan in 40 CFR 191.14(e) at the Waste Isolation Pilot Plant* (U.S. DOE, 1991) is inconsistent in reporting the number of oil and gas leases within the WIPP Site Boundary and the production status of those leases. First it incorrectly states that:

Only one lease currently exists within the WIPP site boundary (U.S. DOE, 1991, p.32).

However, there are two active gas and oil leases within the WIPP site boundary — the Conoco lease on the north half of Section 31 and the Bass lease on the south half of Section 31.

The Resource Disincentive Plan then states:

This lease, currently shut in for production of oil and gas,¹³ is being exploited by a well that was initiated outside the WIPP site boundary and was deviated to under the site only after the depth was below 6000 feet (U.S. DOE, 1991, p.32).

The document then reverses its position on the number of leases and their production status:

In order to gain control over the development of hydrocarbons within the WIPP site area, the DOE acquired the oil and gas leases within all the WIPP control zones. These acquisitions were necessary to keep the salt beds intact. The only leases that are still intact are in section 31. These leases only allow

¹³Emphasis added.

the production of resources by entry below 6000 feet. **One of these leases is currently in production¹⁴** (U.S. DOE, 1991, p.50).

The U.S. Bureau of Land Management (U.S. BLM, 1992) records show the well produced 141,919 MCF of natural gas from March 1991 through July 1991 as shown in Table 1, and was shut-in effective August 1991 - coincidentally, the issue date of the Disincentive Plan. The latest available records from the Roswell District Office of the U.S. BLM indicate production resumed in October 1991.

5.10 Comments on Credit for Active and Passive Institutional Control

In terms of active institutional control, the leases were forgotten by the DOE in spite of the lease, drilling, and production records filed with the federal government, a condemnation suit filed in civil court by the federal government, agreements between the State of New Mexico and the federal government, technical reports to the federal government on area oil and gas resources, and the existence of a producible gas well visible from the south access highway into the WIPP facility.

The loss of knowledge in just a short few years is cause for concern. There were no major changes in society, government, language, culture, or technology. Yet the WIPP project lost knowledge of this gas well and the active oil and gas leases. The current wording in the EPA Standards permits the assumption that active institutional control can completely deter inadvertent human intrusion for up to 100 years.

We believe that present assumptions about the effectiveness of active institutional control needs to be reconsidered because of this experience of the forgotten oil and gas leases and a forgotten gas well. First, the EPA should reexamine whether full credit for 100 years active institutional control is reasonable given the actual experience of inaccurate record keeping. Second, the DOE should examine the basis

¹⁴Emphasis added.

for assuming full credit for 100 years control and consider using a lesser value to reflect the actual experience of the WIPP project. Third, the EPA Standards should require the implementing agency to publish specific plans on how the agency intends to maintain active institutional control. Fourth, even in the absence of such a requirement, the DOE should publish plans now that specify in detail how the Department intends to maintain full control of activities in the area of the repository for 100 years after decontamination and decommissioning and how that control will completely deter human intrusion.

At this time the DOE commitment is effectively limited to a statement in the First Modification to the C&C Agreement which states:

the post-closure institutional control, shall be negotiated and resolved by the parties in the future, and at least one year prior to the start of the decontamination and decommissioning of WIPP (U.S. DOE, 1981).

In the Second Modification to the C&C Agreement, the DOE agreed to provide a plan by February 1, 1988, which would:

contain an estimated schedule and a description of the process DOE will use to: identify needed active institutional controls, gather data for the implementation of such controls, develop and implement a monitoring plan for passive institutional controls, determine the barriers to be used, assess the selection of the WIPP site in view of the resources at the site, and review the recoverability of the waste for a reasonable period after disposal.



However, the DOE Plan:

merely describes the steps that the DOE will undertake to implement compliance to one portion of the Standard [40 CFR 191 Subpart B]. For most of the Assurance Requirements, the information needed to specify detailed plans and activities for implementation is not yet available.... Other

information will not be available until close to the time that the Project has completed its mission and the WIPP is closed (U.S. DOE, 1987, p.1).

Furthermore, the remanded EPA Standards allow credit for the use of passive institutional controls to deter inadvertent human intrusion (U.S. EPA, 1985, p. 38080). However, excessive credit for passive controls, such as markers and public records, could reduce the estimated probability of inadvertent human intrusion in the performance assessment calculations and underestimate the actual risk. As discussed above, there is inaccurate information in key DOE documents which can be considered public records. There was the presence of a gas wellhead, visible from the south access highway and availability of lease and production records in the Roswell District Office of the U.S. BLM. Yet that marker and these public records were not effective in notifying the preparers of the DOE documentation of the gas and condensate production activity beneath the WIPP site and the existence of active leases with the WIPP Site Boundary.

6.0 PROPOSED CONGRESSIONAL LEGISLATION

The issue of allowing the existing oil and gas leases and a well to produce hydrocarbons from beneath the WIPP Site has been addressed by the U.S. Congress in the various bills for the WIPP land withdrawal.

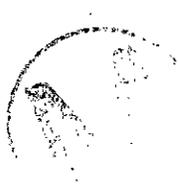
The bill passed by the Senate (S. 1671) would:

- ◆ prohibit slant drilling from within or without the site
- ◆ require the Department of the Interior, in consultation with the Department of Energy, to determine the effects of the oil and gas leases on the activities at the WIPP and to recommend as to the advisability of trading or cancelling the leases.
- ◆ authorize funds to be appropriated to the Department of Energy for the cancellation of the leases.

The House Armed Services Committee Bill (H.R. 2637) is identical to S. 1671 except that it does not authorize funds to cancel the lease.

The bills passed by the House Committee on Interior and Insular Affairs (H.R. 2637) and the House Committee on Energy and Commerce (H.R. 2637) would both:

- ◆ prohibit slant drilling from outside the WIPP boundary,
- ◆ provide funds for the DOE to acquire the leases.



7.0 CONCLUSIONS

Several U.S. Department of Energy documents failed to record the existence of two active oil and gas leases and a producible gas well within the WIPP Site Boundary. In its performance assessment calculations, the WIPP project has assumed that active institutional control would deter human intrusion for 100 years after decommissioning. The EPA should reexamine whether full credit for 100 years active institutional control is reasonable given the actual experience of inaccurate record keeping. The DOE should also examine the basis for assuming full credit for 100 years control and consider using a lesser amount to reflect the actual experience of the WIPP Project. The EPA Standards should require the implementing agency to publish specific plans on how the agency intends to maintain active institutional control. Even in the absence of such a requirement, the DOE should publish plans now that specify in detail how the Department intends to maintain full control of activities in the area of the repository for 100 years after decontamination and decommissioning and describe how that control will completely deter human intrusion. Finally the DOE needs to describe in detail their passive institutional control system and describe how it will provide a deterrence to inadvertent human intrusion after 100 years.



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9.0 LIST OF ACRONYMS

BBL	Barrels
BLM	Bureau of Land Management
C&C	Consultation and Cooperation
CFR	Code of Federal Regulations
CH-TRU	Contact-Handled TRU (waste)
DOE	U.S. Department of Energy
EEG	Environmental Evaluation Group
EPA	U.S. Environmental Protection Agency
ERDA	Energy Research and Development Administration
FEIS	Final Environmental Impact Statement
FSAR	Final Safety Analysis Report
MCF	Thousand standard cubic feet
MOU	Memorandum of Understanding
NMEMD	New Mexico Energy and Minerals Department
RH-TRU	Remote-Handled TRU (waste)
SNL	Sandia National Laboratories
TRU	Transuranic
U.S.G.S	U.S. Geological Survey
WIPP	Waste Isolation Pilot Plant