WIPP File

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June 20, 1995

TO: Mr. Kent Hunter, Team Leader, DOE/CAO

FROM: Keith E. McKamey, Geol. III

SUBJECT: Comments on EEG Workshop - "Potential Effects of Oil and Gas Activities on WIPP"

Introduction and Observations:

This workshop was organized to determine if there are any detrimental effects on WIPP from the oil and gas wells surrounding WIPP. The general consensus was that the boundary of WIPP did contain oil and gas reserves and that ground water at WIPP is affected by oil and gas activity. The question was debated by DOE as to whether this will have any effect on the WIPP repository horizon and whether it has any bearing on certification.

The Oil and Gas Industry has always supported that there are reserves underlying WIPP. This contradicts the opinions stated in the Project Technical Baseline Report. Now it has been confirmed by an independent source (ref. New Mexico Bureau of Mines and Mineral Resources, Report on Oil and Gas Reserves at WIPP) that reserves are present. Mr. Broadhead's presentation of this report does reflect a pessimistic view of the amount of oil and gas reserves present under WIPP, since no value was given for projecting trends across WIPP (ex. Cabin Lake, Los Medanos, and Sand Dunes field across Southwest Land Withdrawal Area). There is not a recent dry hole separating any of these fields and if the Sand Dunes Field is analogous to the Cabin Lake and Los Medanos Field, then the entire eastern flank (which encompasses the majority of the Land Withdrawal Area) of this trend could be productive.

DOE stated at the workshop that even if increses in ground water elevations are proven to result from oil and gas activity, it will be of no consequence to WIPP certification. Mr. Lokesh Chaturvedi reflected the concerns of many participants by stating that it seems natural to assume that EPA will require DOE to have a good handle on ground water flow and the external effects before it will grant a permit for disposal.

Scenarios:

Discussion continued listing the attenuating effects of water injection and disposal on the WIPP repository. DOE suggested that operators do not normally exceed frac pressure while disposing and water volumes were said to decrease with distance and vertical zone separation. NMED/WIPP identified the Yates AIT Ross Fed. #1 (located NE/4 Section 35 and within one mile of Land Withdrawal Area) as an example of a well that fractured the zones prior to disposal. This well fractured the Bell Canyon zone (base of the Castile), did not

establish the necessary disposal rate, and fractured additional perforations so the operator could dispose of 67,000 - 104,000 BWPM (ref. OCD records 1991-1995). Since the majority of wells surrounding WIPP do not have good cement seals in the Castile and Salado (of the bond logs run through this interval only 40% have a good bonds) and the well with the most affected water level is less than 2000' feet from this disposal well (P-18), it is logical to assume that there is potential for hydraulic connection between the salt formation and higher and lower aquifer systems. It is also logical to assume that a frac job on the boundary can go vertical and then horizontal (since there is a high probability of poor cement seals) which was the reason for control zones in the past. The potential release and dispersion of radioactive elements would then be exponentially multiplied by the wellbores and groundwater aquifers surrounding WIPP since there is an 60% likelihood of bad cement seals in all wells. It is also reasonable to assume that the natural migration of radioactive elements along Marker Bed 39 would hit a wellbore and then be dispersed to the surface or to the boundary of WIPP through higher and lower aquifers sooner than the calculated time via the Culebra.

Illustrated Scenario #1: A fracture created by the disposal well goes through perforations then vertical until it hits the first cement seal just above MB-139. The fracture turns horizontal toward the repository horizon. Waste is transported along disposal well fracture (now abandoned) to the surface via the disposal well or to the groundwater zone if there is one seal between the groundwater zone and the surface.

Illustrated Scenario #2: A fracture created by the disposal well goes through perforations then vertical until it hits the first cement seal such as the zone above the ground water aquifer. The fracture turns horizontal toward the repository and speeds flow through the groundwater zone. Waste leaks along MB-139 to the nearest wellbore and goes vertical along pipe with no seals until it reaches the groundwater zone where it mixes with the groundwater and the disposal water. Waste is then transported to the WIPP boundary faster than usual due to the pressure from the disposal well.

Note: Deviated wells also pose the same or greater threat as vertical wells of vertical communication if bad cement seals exist, especially if the wellbores are oriented along the fracture plane (ref. Halliburton-Midland Office).

Groundwater chemistry seems to be changing in the Southwest portion of the Land Withdrawal Area. At this time the only well with a chemistry analysis history is the H-11b3. The chlorides in this well gradually decreased from 65,000 PPM in 1986 to 56,000 PPM in 1990. Disposal of produced water began in 1991 in the AIT #1 Ross Fed. (sec. 35) and analysis from 1992 to 1994 indicated an increase in chlorides from 61,300 to 65,500 PPM. If this well is being affected by disposal of produced water you would expect a gradual increase in chlorides, since the produced water has 200,000 PPM.

Recommendations:

1) NMED/WIPP would like to recommend that DOE re-institute the restrictions for control zones surrounding WIPP, to prevent detrimental effects of drilling wells, from jeopardizing the repository
2) Restrict the drilling of deviated wells within section 31
3) Require cement seal integrity tests, and require re-drilling and re-plugging in all necessary wells within the Land Withdrawal Area that have penetrated the Salado formation (ie. DOE 1, DOE 2, WIPP 12, WIPP 13, ERDA 9, Cotton Baby #1, Cabin Baby #1,

and Badger #1)

4) Increase the groundwater sampling program to include wells bordering oil and gas production (ie. east, southeast, south, southwest, and west areas of the Land Withdrawal Area).

Summary:

In conclussion, potash exploration, WIPP exploration, and oil and gas exploration have created a pincushion of boreholes, in the vicinity of WIPP, all with the potential of hydraulically connecting aquifers above and below the repository horizon which could provide a possible conduit to the environment. In order for waste to reach the WIPP boundary it only needs to reach the nearest wellbore with a poor cement seal or a hydraulic fracture created by an oil or gas well.

The technical safety requirement of WIPP is that DOE provide a minimum one-mile buffer in the salt beds around the waste disposal area. Given the above-described scenarios of wellbores with poor cement seals or hydraulically fracturing zones in the Rustler, Salado, and Castile within one-mile of WIPP, along with radioactive elements potentially reaching the boundary sooner than calculated through hydraulic connection, I suggest that DOE reconsider the possible effects of the Oil and Gas Industry on WIPP.

If there are any questions concerning these observations and recommendations, please call Keith E. McKamey at NMED/WIPP (505-234-8984).

KEM:kem

Enclosures: Diagram of scenarios
Map of oil and gas wells within one mile of Land Withdrawal Area

cc: Mr. Ed Kelley, NMED Division Manager, Water & Waste Management Division
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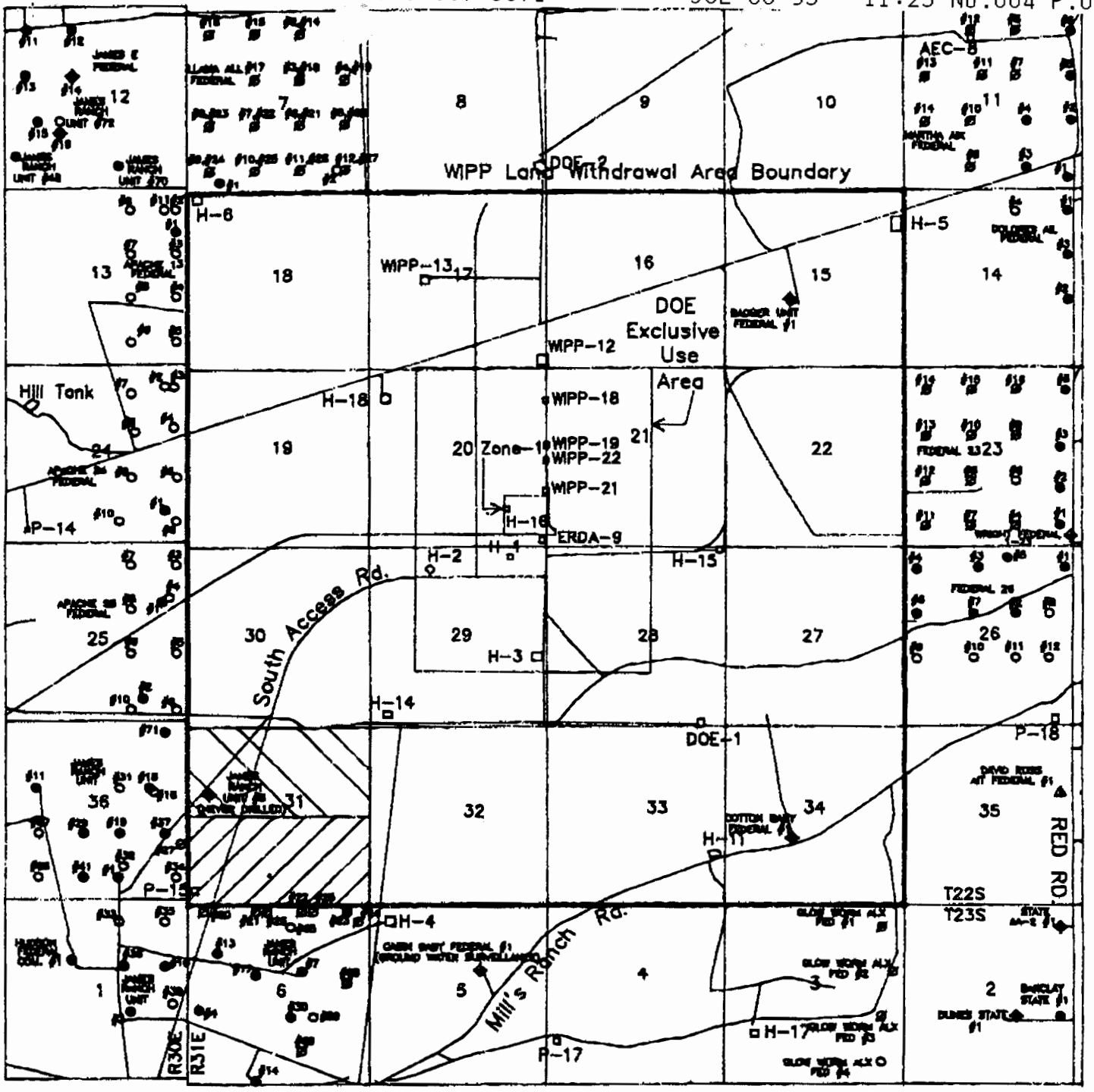


OIL AND GAS WELLS WITHIN ONE MILE OF THE WIPP LAND WITHDRAWAL AREA

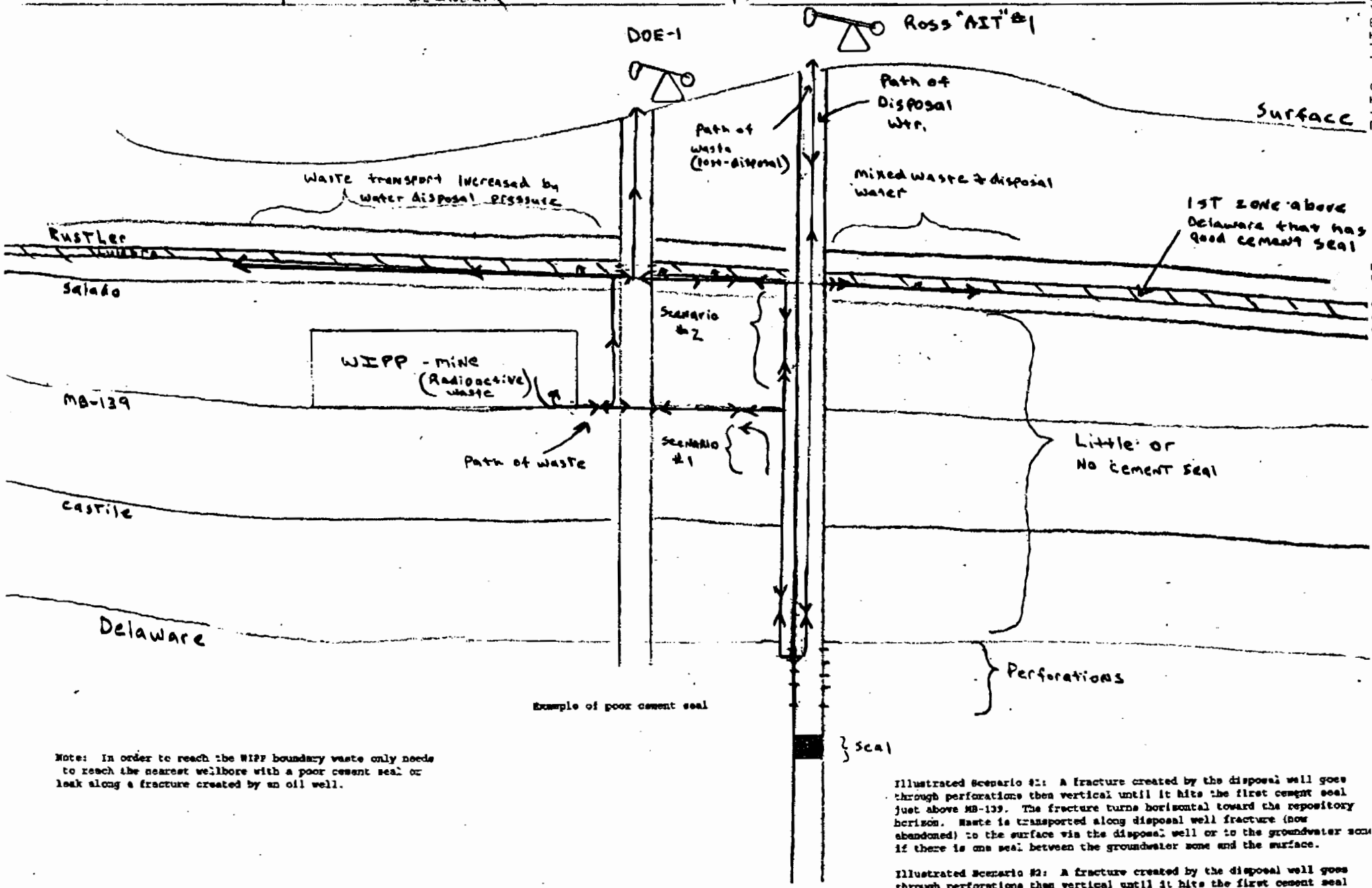
(AS OF 12/05/94)

N

- APPLICATION DENIED
- ABANDONED (PERMANENT OR TEMPORARY)
- SALT WATER DISPOSAL WELL
- PRODUCING OIL AND/OR GAS WELL
- LOCATION (SURVEYED, APPLICATION PENDING OR APPROVED)

FEDERAL LEASE NM-02593

FEDERAL LEASE NM-02593-C



Note: In order to reach the WIPP boundary waste only needs to reach the nearest wellbore with a poor cement seal or leak along a fracture created by an oil well.

Illustrated Scenario #1: A fracture created by the disposal well goes through perforations then vertical until it hits the first cement seal just above MB-139. The fracture turns horizontal toward the repository horizon. Waste is transported along disposal well fracture (now abandoned) to the surface via the disposal well or to the groundwater zone if there is one seal between the groundwater zone and the surface.

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