GEOLOGIC AND DRAFTING SERVICES
4409 San Andres Avenue N.E.
Albuquerque, New Mexico 87110
Phone: (505) 883-6246

July 6, 1987

GEOLOGICAL AND GEOPHYSICAL APPRAISAL
NORTHEAST PLAYAS VALLEY AREA
Hidalgo and Grant Counties, New Mexico

Introduction - The Playas Valley, located in Hidalgo and Grant Counties of southwestern New Mexico, has been examined for petroleum exploration potential, using selected existing geological publications, confidential gravity data provided by a major oil company and published aeromagnetic data.

Stratigraphy - Rocks of Quaternary, Tertiary, Mesozoic, Paleozoic and Precambrian age are known to exist in the region and can be presumed to be present under the valley. Quaternary rocks are largely alluvial sands and gravels probably generally less than 200 feet thick. Beneath these are the alluvial beds (probably also mainly sands and gravels) of the Gila formation of late Tertiary age. The Gila fm may range from a few hundred to a few thousands of feet in thickness under the valley. Below the Gila, thick volcanics of early Tertiary (mainly Oligocene) age may be present. Early Tertiary (probably mostly Eocene) conglomerates, sandstones and mudstones of the continental Ringbone formation are likely to be present beneath the volcanics.

The youngest strata to be expected under the Tertiary rocks are the sandstones and shales of the early Cretaceous Mojado formation. This unit is largely marine and can be over 5,000 ft thick where not thinned by erosion or faulting. Thompson (1981) found the sandstones of the Mojado to have good reservoir characteristics and the shales of the formation to have poor to fair oil and gas source rock characteristics. He found, however, that the source rocks become over-mature in the southern part of the valley, possibly partly because of a major thrust fault thrusting older rocks from the southwest over Cretaceous. The U-Bar formation, which underlies the Mojado and is also a marine unit of early Cretaceous age, is made up largely of limestone and shale. Reefs are known to be present in the U-Bar. It also is judged by Thompson to be a poor to fair gas and oil source rock growing over-mature in the southern part of the valley. The limestones, and perhaps especially the reefs, might provide good reservoir rocks. The Hell-to-finish formation, which underlies the U-Bar and is also of early Cretaceous age, is made up of redbed conglomerates, sandstones and siltstones and appears to have little petroleum promise.

Rocks which are still older (Paleozoic) may be metamorphosed under the valley and will not be discussed here.

Geologic History - The structure of the area has been shaped by a complex sequence of geologic events. During the Paleozoic era, the area was part of a deep geosyncline in which more than 10,000 ft of marine limestones, dolomites, shales and sandstones accumulated. If Triassic and Jurassic rocks were deposited, they were removed by erosion before as much as 10,000 ft of mostly marine beds were laid down during the early Cretaceous.

In latest Cretaceous time the great Laramide orogeny began. Very strong southwest-northeast compression produced fold belts and major thrust faulting. The predominant structural grain of the region was northwest-southeast. The folding and thrusting continued into the early Tertiary. Igneous intrusion and great outpourings of explosive volcanics occurred, and lasted until late Oligocene time.

About the beginning of the Miocene, Basin and Range structural development began, with alternating mountain ranges and valleys bounded by normal faults. As the valleys sank, detritus from the adjacent mountains washed into the valleys and kept them mostly filled with sand, silt, gravel and sometimes lacustrine clays. The structural grain of the Basin and Range here is north-south.

Structure - The enclosed map summarizes the principal elements of the structure of the northeastern part of Playas Valley, mainly from the evidence of gravity and aeromagnetics. The gravity data were made available for use but not release by a major oil company, and the aeromagnetic data are from a published source (Cordell, 1983).

The east side of the valley is bounded by the frontal fault zone of the Little Hatchet Mountains, which is well displayed by a gravity fault of 10-15 milligals. This fault zone may in fact be a single curving fault or a set of intersecting faults. The gravity minimum representing the deepest part of the basin (valley fault block) approaches the east bounding fault near the north and south ends of the map area, but swings widely to the west through the central part of the area. This wide swing to the west suggests the presence on the east side of the valley of a large area where the Tertiary and Quaternary rocks are relatively thin (and hence the pre-Tertiary rocks are closer to the surface, or structurally higher). The approximate outline of this possible high area is shown on the map. The pre-Tertiary rocks might be some thousands of feet higher structurally here than in the lowest part of the valley basin to the west.

To the north, the gravity suggests that the Coyote Hills trend crosses the valley, and that a northwest-striking graben cuts off and possibly closes the indicated high area in that direction. A similar situation appears to be present at the south end of the area, where another northwest-striking gravity minimum trend is indicated.

The gravity also suggests a northwest-striking arch crossing the basin in the northeast quarter of T27S, R17W. This feature may be a Laramide sructural high or anticline, part of which has been downfaulted and preserved under the east side of the valley.

Near the southern edge of the map is a large, almost circular magnetic anomaly which probably represents the downfaulted part of a large Tertiary igneous intrusive exposed immediately to the east in the Little Hatchet Mountains. No other such anomalies are indicated in or adjacent to the apparently high area against the mountains, which suggests that there is little risk of major igneous intrusion in the high area.

Petroleum Potential - Clearly, Thompson's work indicates that the best petroleum possibilities in the valley are in the northern part, because of the over-mature source rocks to the south. His work also suggests that the best possibilities are in the Lower Cretaceous Mojado and possibly U-Bar formations. The structural evidence drawn from the gravity further suggests that the best possibilities for accumulation and preservation of commercial oil and gas may be on the northeast side of the valley, where a Basin and Range high trend may cross an older Laramide anticline.

Only two serious petroleum tests have been drilled in the mapped part of the valley. Both penetrated thick Mojado, and one, the KCM No. 1 Cochise St A, had several shows of gas from the Mojado.

This prospective area appears to be a close analogy to the Shell Oil Company's Eagle Springs oil field in Railroad Valley, Nevada. The Eagle Springs field, which is said to have been the first commercial oil field in the Basin and Range province, is located in a very similar setting on the east side of the valley. Here also the gravity indicates a westward swing of the deepest part of the valley basin, away from the frontal fault bounding the mountains to the east. The field proved to be an elongate "half-dome" against the frontal fault.

Respectfully submitted,

Charles B. Reynolds

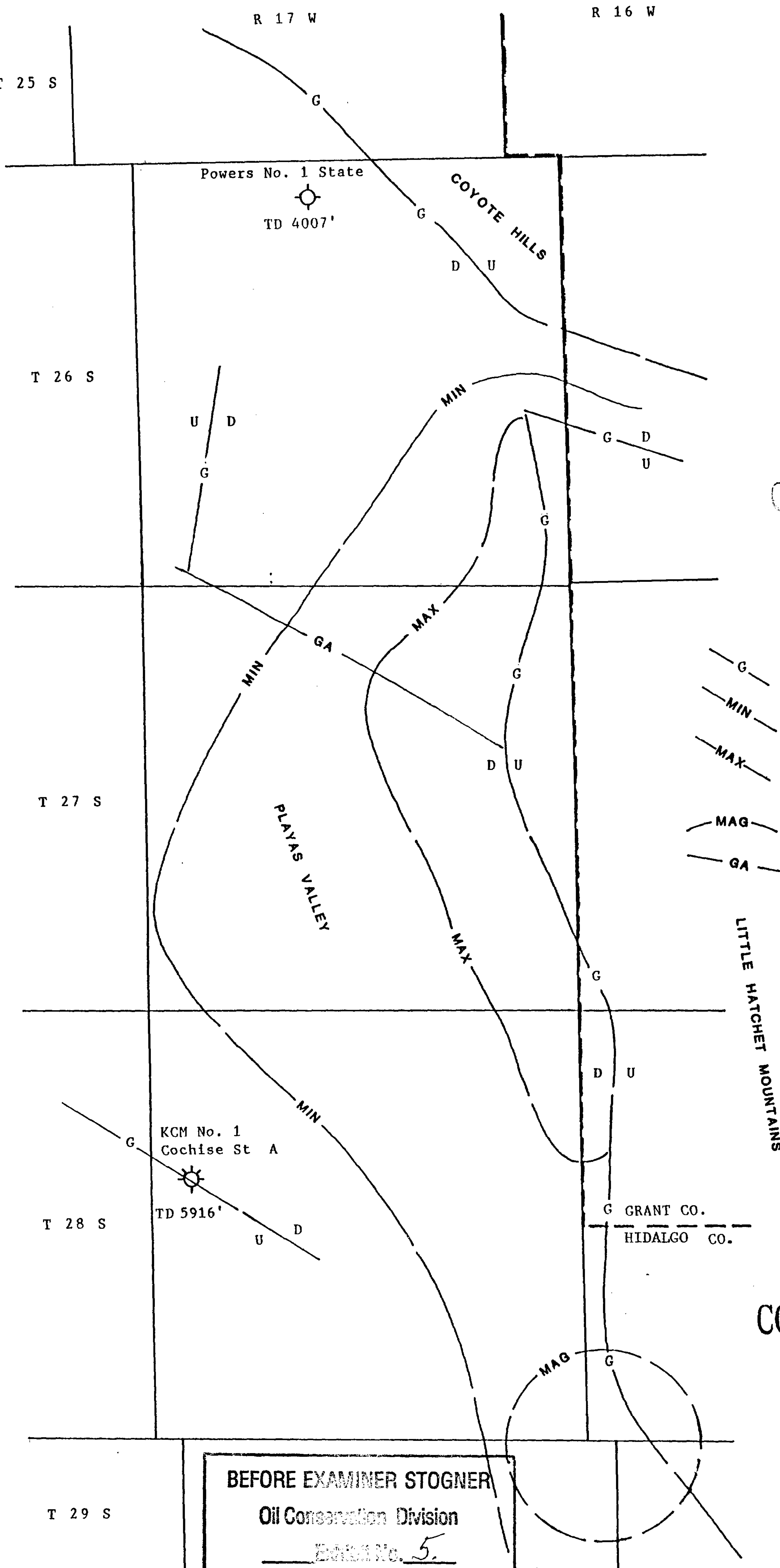
Charles B. Reynolds
Certified Professional Geologist
Registered Geophysicist (Calif.)

1 Enclosure

References:

Cordell, L., 1983, Composite residual total intensity aeromagnetic map of New Mexico: Geothermal Resources of New Mexico Scientific Map Series, New Mexico State University Energy Institute, Las Cruces, New Mexico.

Thompson, S., III, 1981, Analysis of petroleum source and reservoir rocks in southwestern New Mexico: New Mexico Energy Research and Development Program, Santa Fe, New Mexico.



EXPLANATION

- G — Fault indicated by gravity
- MIN — Gravity minimum trend
- MAX — Area of maximum gravity on east side of valley
- MAG — Area of igneous intrusive indicated by aeromagnetics
- GA — Cross-valley gravity arch

CONFIDENTIAL

BEFORE EXAMINER STOGNER
Oil Conservation Division
Exhibit No. 5
Case No. 9160

RAMSEY PETROLEUM COMPANY

NORTHEAST PLAYAS VALLEY AREA
Hidalgo and Grant Counties, New Mexico

PRINCIPAL GRAVITY ELEMENTS

Scale: one inch equals 1.5 miles

July 6, 1987 Geologic & Drafting Services