Geology and Mineral Resources of York Ranch SE Quadrangle, Cibola and Catron Counties, New Mexico

by

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Open-File 220-A

Abstract

The York Ranch SE 7-1/2 min. quadrangle is located in west-central New Mexico near the intersection of three structural or physiographic elements; it lies where the southeastward projection of the Zuni Basin intersects the Hickman fault zone, as both these features lose expression southward into the Mogollon Slope. The Quaternary-age North Plains basalt flow covers the northwestern third of the quadrangle, with a broad alluvial valley adjacent to the eastern margin of the flow.

Major geologic features in the area consist of (1) the North Plains basalt flow, (2) the Hickman fault zone which passes along the eastern edge of the quadrangle, and (3) a northwest-trending basaltic dike of Oligocene age which enters the south-central part of the quadrangle.

In the eastern half of the quadrangle upper Cretaceous rocks are either at or very near the surface, with a thin veneer of eolian and alluvial sediments masking outcrops, especially to the north. In addition, an isolated outcrop of upper Cretaceous rocks is present in the southwest corner of the quadrangle. Though small, the outcrop provides another structural control point along the paleoescarpment that confined the basalt flow, and is significant because it illustrates how structural dips reverse along strike of this paleoescarp. This dip reversal, plus the highly fractured nature of the rocks and the presence of horizontal slickensides, indicates some strike-slip movement occurred along NE trends.

The Cretaceous rocks are, with one small exception, limited to the nonmarine sandstone, shale, mudstone, carbonaceous shale,

and minor coal of the Crevasse Canyon Formation (mostly Coniacian). The exception is in the north-central part of the quadrangle where a small outcrop of Gallup Sandstone (late Turonian) was found. Immediately to the north, just inside the south-central part of the adjacent York Ranch quadrangle, the underlying D-Cross Tongue of the Mancos Shale was also recognized (in E 1/2 NE 1/4 sec. 25 T5N R12W).

Tertiary rocks may be represented by a 30-ft-thick sandstone near the top of the topographic knob in the NW1/4 sec. 18 T4N R11W; a light-reddish-brown sandstone, it could be a facies of the Baca Formation (Eocene). Alternatively, they may be deeply weathered and altered Cretaeous rocks. The outcrop is overlain by a remnant of a coarse, older-alluvial unit (Plio-Mio?) that has been quarried for use as road metal. The quarry has exposed vesicular basalt and basaltic andesite cobbles that bear close resemblance to the coarse facies fo the Fence Lake Formation (Miocene) which occurs quite extensively 20 mi. to the west.

Aside from the above mentioned quarry no mineral production has been realized on the quadrangle and little mineral potential exists; coal resources are nil. The real value in mapping the quadrangle might well lie in the recognition of minor NE-trending (N56^{o}-58^{o}E) strike-slip faults (compartmental fault) which parallel those of the Zuni Basin, and which offer a way to project fracture porosity zones into the subsurface. This could be useful information in the search for a small oil play deeper in the basin in the quadrangles that lie to the west and south.

INTRODUCTION

The York Ranch SE quadrangle lies between 34°30′ and 34°37′30"N latitude and 108° and 108°7′30" west longitude (Fig. 1) near the southeast margin of the Colorado Plateau physiographic province. The rocks exposed within the quadrangle range from the upper Cretaceous Crevasse Canyon Formation (with a very small exposure of the underlying Gallup Sandstone) to the Quaternary age North Plains basalt flow (see composite stratigraphic column on map). The basalt flow covers the northwestern third of the quadrangle (Fig. 1) and consequently this portion was not looked at in detail.

Elevations range from about 7170 across the top of the basalt flow to a low of about 7150 in the north and a high of 7680 in the southeast. Generally, everything above 7300 ft has a Pinyon-Juniper cover (Pinus edulis and Juniperis monosperma, respectively), although alluvial valley floors do not tend to support such a cover at any elevation. The area receives on the average about 14 in. precipitation per year, though may vary greatly from year to year (Tuan and others, 1969).

Access is provided by an unimproved county road that leads northward from Pietown for 16 miles at which point it enters the southeast corner of the quadrangle (Fig. 1). The county road continues along the eastern edge of the quadrangle and joins NM-117 6 mi north of the boundary. The only permanent residence in the area is that of the caretaker for the Dia Art Colony and Lightning Field; the art colony is located in the NW1/4 sec. 4, T3N R12W. The nearest major highway is U.S. no. 60 which passes

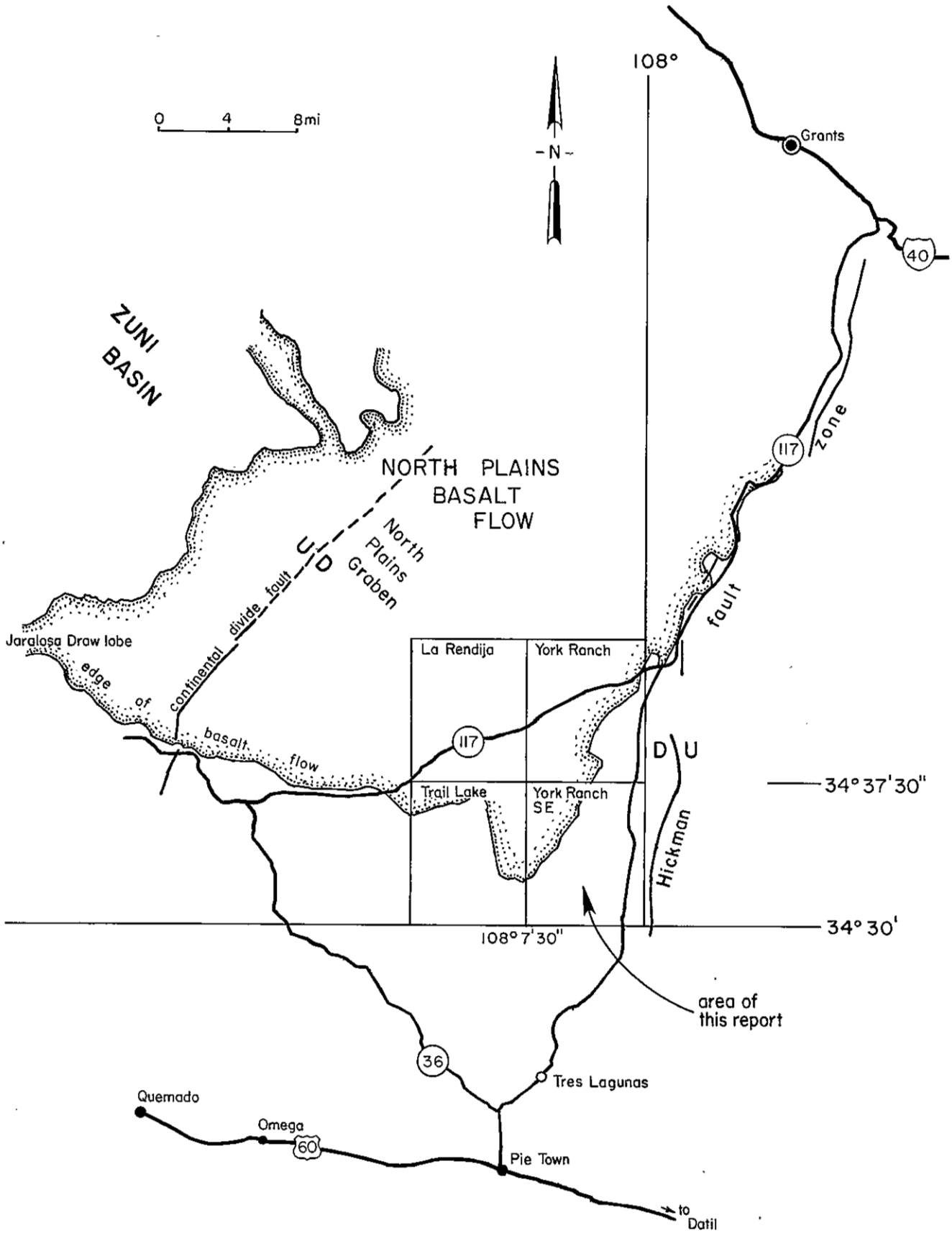

FIGURE 1—Index map showing position of York Ranch SE Quadrangle with respect to major structural elements, the North Plains basalt flow, and major transportation lines.

through Pietown 16 mi to the south. The nearest railroad is at Grants, New Mexico, 45 mi to the north.

Detailed and reconnaissance geologic mapping was carried out on the York Ranch SE 7-1/2 min. quadrangle by the New Mexico Bureau of Mines and Mineral Resources during the summer of 1986. The information so gathered was then used to complete the geologic map and coal resource assessment of the Fence Lake 1:100,000 sheet--NMBMMR Open-file 220; (York Ranch SE is the southeasternmost quadrangle of the Fence Lake Sheet).

GEOLOGY

Regional

The York Ranch SE 7-1/2 min. quadrangle lies in west-central New Mexico near the southeastern margin of the Colorado Plateau. If one accepts the concept of north-northeastward translation of the Colorado Plateau microplate with respect to the craton during the Eocene phase of Laramide Orogeny (Chapin and Cather, 1981), some of the major structural elements of the area are better explained. For instance, the series of north-northeast trending faults that are irregularly spaced across the area from Magdalena northwestward to the Defiance monocline exhibit some evidence of strike slip (Kelly, 1955; Cather and Johnson, 1984--en echelon folds associated with Red Lake fault; present writer--observation of horizontal slickensides and of flower structures along Hickman fault; Maxwell, 1981--downdropped wedge-shaped blocks along Hickman fault that suggest transtension). These faults are, from east to west, (1) the Puertecito fault zone, (2) the Red Lake fault, (3) the Hickman fault zone which passes along the eastern

margin of the York Ranch SE quadrangle,and (4) the Defiance monocline--basement fault with associated drape folding (faults shown on Fig. 2). Each of these faults may be a strand of the regional strike-slip system representing first-order shear direction at the southern edge of the northward-translated Colorado Plateau microplate. Two faults, the Hickman and the Red Lake, were considered by Chamberlin (1981) to be Laramide reverse faults. Maxwell (1981) has demonstrated in his detailed mapping for the El Malpais wilderness study that the most recent movement along the Hickman zone is up on the east or opposite in sense to that of the Laramide.

In addition to these faults, the continental divide fault has a similar trend to the other faults, but with no evidence of strike-slip movement. Its significance is that it forms the western margin of what is here termed the North Plains graben (Fig. 1), with the Hickman fault being the eastern margin of the graben. It appears likely that the North Plains basalt flow pooled behind (eastward of) the continental divide fault and filled the shallow graben before it spilled out over lows at the southwest and northwest corners and followed paleochannels graded to the Zuni River. The southwest flow, the Jaralosa Draw lobe (Fig. 1) (Anderson, 1982) has been dated at 1.41 m.y. (Laughlin, Brookins, Damon, and Shafiqullah, 1979).

Other, smaller, basinal features (not necessarily grabens) are present in the area. These are located at (1) the York Ranch, currently the King Ranch, in T5N R11W, (2) at the southwest corner of the York Ranch SE quadrangle (the area of

this report) and (3) in the Mangas Creek-Omega area (Fig. 1). Although their orientation is unclear, these small basins may represent tectonically soft spots (pull-apart basins, or half grabens) developed near the trailing edge of the Colorado Plateau microplate.

The distance between the Hickman fault and the Defiance monocline corresponds rather closely to the length of the Zuni uplift (Fig. 2). It can be hypothesized that this large block behaved as a singular, coherent structural unit buttressed on the northeast by the ancestral Zuni Mountains. This buttressing prevented intrablock strike-slip movement and thus late Laramide northeast-directed compressive stresses could find no differential expression across it.

Local geology - structure

On a more local scale, the quadrangle lies at the southeast corner of the North Plains graben. The Hickman fault zone, or at least one strand of it, passes less than a mile to the east of the quadrangle boundary, striking nearly due north at this latitude (Fig. 1). No direct expression of this fault zone is seen in the quadrangle; however, a number of minor strike-slip faults (compartmental faults) trending N56°-N58°E, are hypothesized to exist and possibly intersect the Hickman fault zone. Evidence for them consists of (1) alignment of topographic highs containing exposures of highly fractured Cretaceous sandstone, (2) horizontal slickensides trending N57°E in the Gallup Sandstone, (3) termination or offsetting of northwest-trending dikes (Oligocene age), and (4) straight drainages

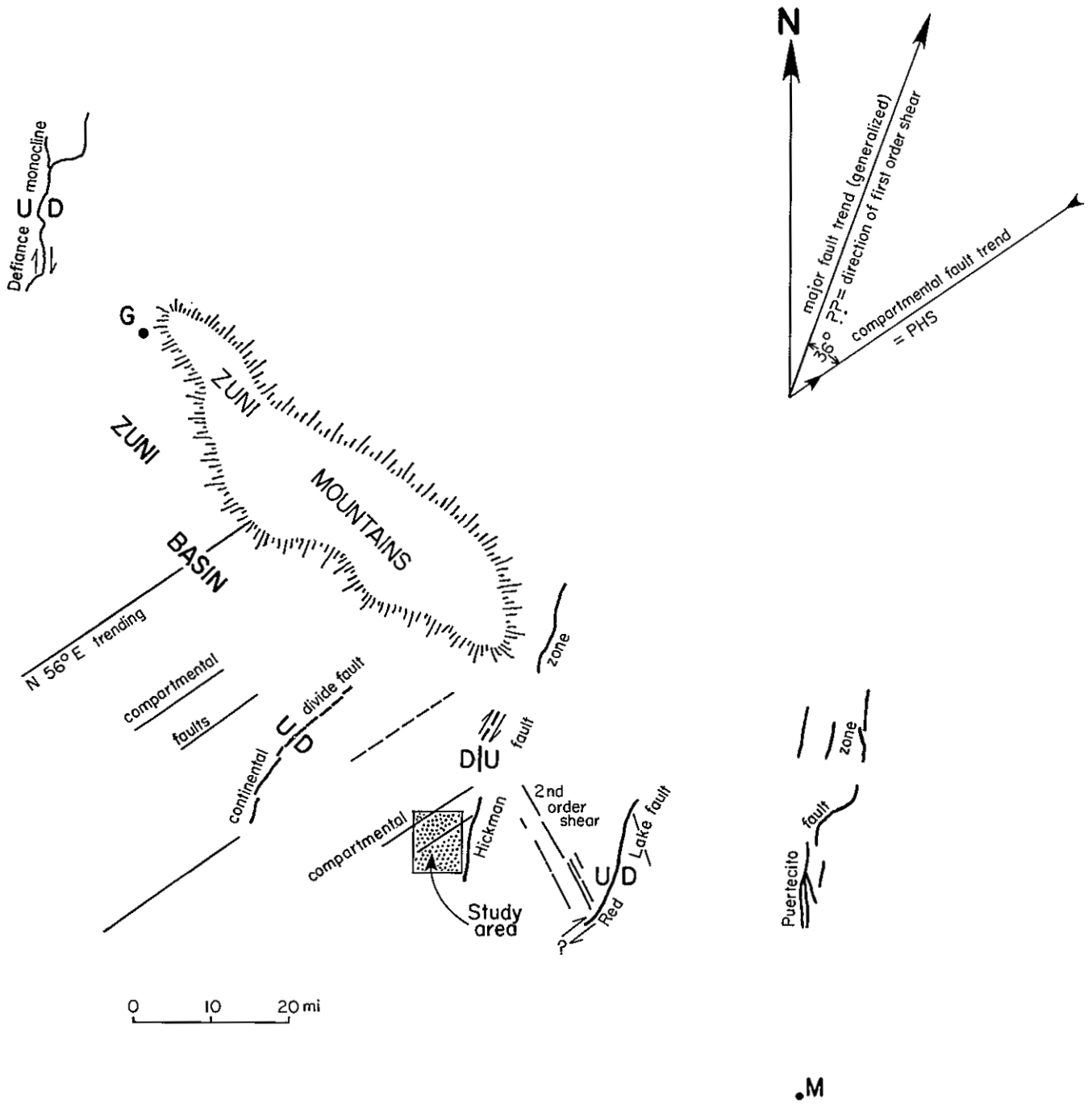

FIGURE 2— Distribution of major faults with probable strike–slip motion between Magdalena (M) and Gallup vicinity (G) and relationship to compartmental faults of Zuni Basin; inset at upper right shows how two trends might be related and principle horizontal stress axis PHS. Study area shaded.

developed perpendicular to a dike at its terminus. This is not to suggest that Oligocene dikes were truncated by strike-slip movements, but rather that fracture systems--later intruded by dikes--were limited in lateral extent by older stike-slip faults. The dike terminations and offsets are well illustrated on the State Geological Map (Dane and Bachman, 1965) in T4N, R12W; in T4N, R15W; and in T3N, R14W.

The N56°-N58°E trending compartmental faults may predate the development of the Hickman fault zone and may owe their origin to an earlier episode of compressive deformation--pre-Laramide (~90 m.y. ago) and/or early Laramide (80-60 m.y. ago). They are parallel in trend to the compartmental faults of the Zuni Basin which are thought to have been activated about 90 m.y. ago (Anderson, 1986; Stricker and Anderson, 1985). Equally likely is the explanation that the compartmental faults and the regional faults are contemporaneous but the regional, more northerly trending, faults represent a first order shear direction as their trends are about 35° apart; N21°E (generalized) for the larger faults vs. N56° for the compartmental faults. The latter direction would reflect the axis of regional horizontal compression or PHS (Fig. 2).

Compartmental deformation (Brown, 1984) apparently characterizes the entire area from Zuni Pueblo to the York Ranch SE quadrangle. Each compartment is envisioned as being underlain by a discrete, fault-bounded basement block. Early Laramide east-northeast-directed compression produced slight differential movement of adjacent blocks, which resulted in minor wrench faults of finite length--not the through-going, more northerly

trending, regional strike-slip faults that dominated late Laramide deformation. Accompanying this compartmental faulting, but trending normal to it were reverse or thrust faults which resolved the northeast-southwest crustal shortening within compartments and produced drape folding in the overlying sedimentary sequence. The attitude and kinematics of this reverse/thrust faulting are not well constrained or understood as yet, but may have been high-angle reverse movement along crustal flaws, or thrusting with the attendent steps or ramps producing fault-bend or fault propagation folds (Suppe, 1983). No matter how formed, these NW-trending folds appear as monoclines on the present landscape and are segmented because they terminate at compartmental faults.

Monoclines are common in the Zuni Basin but are not present on the York Ranch SE quadrangle. A sharp break from the monocline area on the northwest to the NW-trending dike area around York Ranch SE quadrangle takes place near Fence Lake, probably along one or more compartmental faults. It is likely that the northwestward termination of the dike system reflects the northward extent of the area directly effected by mid- to late-Tertiary crustal extension (Chamberlin, 1981), which in turn may reflect the southern extent of the Colorado Plateau--a relatively cold, thick crustal slab less amenable to deformation than the surrounding area. Aldrich and Laughlin (1984) on the basis of their own data and that summarized from other workers have concluded that the southeastern boundary of the Colorado Plateau is coincident with the Jemez lineament. They further

stated that a compressive stress field exists within the Plateau province and an extensional stress field exists within the Basin and Range province. A boundary zone between the two stress provinces contains stress fields that are transitional between compressive and extensional. The York Ranch SE area lies in this transitional zone of Aldrich and Laughlin (1984).

The N56°-N58° trending compartmental faults identified in the York Ranch SE area (see map) offer a way to project fracture porosity zones into the subsurface and for that reason may have some significance in petroleum exploration (small play) deeper in the basin to the south and west. The horizontal slickensides trending N57°E were noted in the NW1/4 SW1/4 sec. 36, T5N, R12 W. Locations of dike terminations are recounted above. Drainages developed perpendicular to those terminations may be seen locally, and straight drainages developed perpendicular to monocline terminations are particularly well illustrated at the southeast end of the Atarque and Gallestina monoclines 35 mi to the west (Anderson, 1986, in press).

Even smaller-scale compartmental faulting may be suggested by dip reversals that were observed in isolated outcrops of Cretaceous rocks in the paleoescarpment that confined the North Plains basalt flow on the southeast. (This small scale faulting is not indicated on the map.) Measured structural dips in the W1/2 sec. 33, T4N, R12W are 5°-7° in a southeast direction; in SE1/4 sec. 2, T4N, R12W, 5 mi to the north, the dip direction has changed to N75°W; about 2 mi to the north of this locality in sec. 25 (T5N, R12W) on the adjacent quadrangle the dip has reversed again,and is 6°-8° in a southeast direction. The

horizontal slickenside occurrence lies between these latter two localities.

Stratigraphy

Cretaceous Rocks

The Upper Cretaceous rocks exposed on the quadrangle consist of the Gallup Sandstone and the nonmarine Crevasse Canyon Formation. Just one-half mi north of the quadrangle boundary in the E 1/2 sec. 25, the upper part of the D-Cross Tongue of the Mancos Shale is exposed. The D-Cross is a mottled gray and brown offshore mudstone unit that underlies the Gallup; identification of it as a marine mudstone was possible because it contains inoceramid debris. Perhaps because of scale limitations, neither the D-Cross nor the Gallup Sandstone occurrences are shown on the State Geologic Map of Dane and Bachman (1965).

The Gallup Sandstone is exposed over a very small area of the quadrangle, limitd to a narrow northeastward-trending band in the W 1/2, SW 1/4 sec. 36, T5N, R12 W. The upper 6 to 8 ft are exposed and reveal a very fine-grained quartzose sandstone containing Ophiomorpha. It apparently represents the upper portion of a shoreface sandstone.

An interesting aspect of this small outcrop is the horizontal slickensides exposed along a vertical face. The fault trends N57^{o}E and is parallel to the compartmental faults in the Zuni Basin described by Anderson (1986). While slickensides do not require much strike-slip movement, the surface also shows development of low-amplitude mullions which does suggest the possibility of appreciable strike slip. This N57^{o}E direction is

close to what has been suggested as the principle horizontal stress direction during the early Laramide orogeny (Chapin and Cather, 1981).

The Crevasse Canyon Formation conformably overlies the Gallup Sandstone. The contact in this area, where there is no Torrivio Member of the Gallup, is taken as the top of the last sandstone having marine affinities, or at the base of the first coastal plain mudstone sequence. Typically thin carbonaceous shale beds in the mudstone assist in picking the contact. From a distance the weathering profile can be used to pick the contact.

Crevasse Canyon rocks are essentially at the surface throughout the eastern half of the quadrangle. However, in the northeast they are masked by a thin veneer of eolian sediment and in the extreme northeast by an alluvial valley floor. The good outcrops are limited to the southeast corner. The exposure in secs. 5, 6, 7, and 8, T3N, R11W reveal a sandstone-mudstone system with substantial fluvial channel sandstone buildups locally. The mudstones represent deposition in the backswamp area and contain thin, very-fine-grained splay and overbank sandstones. They also contain carbonaceous zones up to 3 ft thick and even thinner coaly-carbonaceous zones (several inches). The lack of coal suggests that the environment of deposition was a quite rapidly aggrading fluvial system higher up in the coastal plain, but coastal plain, nevertheless, because of the relatively thick backswamp/splay sequences.

The channel sandstones are quartzose, ranging from lower fine to medium grained, are poorly sorted, and tend to fine

upward. A stacked fluvial channel system may be present in the NE 1/4 sec. 6 T3N R11W, where the total sand thickness may approach 50 ft, but is not well exposed. Jointing was also noted here and in adjacent sec. 36, with trends of N50°-55°E and another set with N80° trend.

Crossbed dip direction taken on the better developed channel sandstone in the E 1/2 sec. 33, T4N, R12 W, in secs. 5 and 6, T3N, R11W, and in the NW 1/4 SE 1/2 sec. 12, T4N, R12 W, range from S80°E to nearly due north. The total of about 20 measurements tend to cluster about an ENE direction, and the pronounced northward or even northwestward paleoflow directions noted by Osburn (1983, 1985) some 10 mi to the east are not evident here. Further to the east the streams were apparently seeing some influence of local (early Laramide?) structure such as the southeastward continuation of the ancestral Zuni Mountains. Also, as this area was nearer than the York Ranch area to the shoreline of the upper Cretaceous Seaway, subtle topographic relief due to abandoned beach ridges may have influenced drainage patterns.

Tertiary Rocks

A light-reddish-brown to pale-red, fine-grained sandstone was found near the top of a topographic high in the NW1/4 sec. 18, T4N, R11W. The poor degree of cementation and the color are not characteristic of Cretaceous sands in the area and this unit is probably a facies of the Eocene Baca Formation, although no deep weathering profile is developed beneath it. No crossbedding or secondary sedimentary structures were noted in the sandstone.

This unit is overlain by a remnant of a gravelly-bouldery unit that has been quarried at this locality for use as road metal. The boulders are vesicular basalts and basaltic andesites and are very reminescent of the coarse facies in the Fence Lake Formation (Miocene) which occurs extensively some 20 mi to the west. It is possible that this outcrop is an outlier of the Fence Lake Formation, although the Fence Lake has not previously been recognized east of the Techado-Veteado Mountain area. Whether or not the unit is the time or stratigraphic equivalent of the Fence Lake, there are several common traits and similarities between the units: (1) they both have very coarse volcaniclastic facies; (2) they occupy the higher or highest points on the local landscape; (3) proximity to mid-Tertiary volcanic source areas--in the present case the source area, the Datil and Gallinas Mountains, is only 18-20 miles to the south; and (4) pedogenic carbonate development. Pedogenic carbonate is perhaps more likely to have formed during late Tertiary time than during the more moist Pleistocene and thus the unit is considered to be of Tertiary age (it is shown on the map as Tertiary gravels, Tg).

A small percentage of the pebble and cobble size clasts are granitic or intermediate plutonic rocks, and they perhaps indicate reworking of the Spears or Baca Formations.

The paleosurface upon which these gravels were deposited had a very substantial northward slope. As mapped, it shows a drop in elevation at its base of 100 ft in 2 mi. Osburn (1984) also noted northward paleoslopes at the base of Tertiary gravel deposits 20 mi to the east on the Pueblo Viejo Mesa quadrangle.

Intrusive Rocks

A northwest-trending dike enters the south-central part of the quadrangle in sec. 11 and continues on the next 2-1/2 mi in an arcuate trend before it terminates. Locally, it stands out knifelike in bold relief as it is more resistant than the upper Cretaceous rocks it has intruded. The dike is composed of diabase and is similar in trend and composition to the dikes in the Pietown-Techado area which have been dated at about 28 m.y. by Laughlin, Damon, Brookins, and Shafiqullah (1979). Apparently, it is associated with the mid-Tertiary extensional event that affected this region.

The trend of the dike as it enters the quadrangle is N32°W, but at its terminus it has gradually shifted to N20°W, with a very short segment trending east of N.

MINERAL RESOURCES

The mineral resource potential of this quadrangle is thought to be very low (oil and natural gas here excluded). Coal resources are nil based on outcrop information, however, the possibility of some deeper coals developed in a back barrier environment on top of the marine Gallup Sandstone must be considered. Back barrier coals do not generally attain significant thicknesses and furthermore this stratigraphic horizon is at a minimum depth of 100 ft, and very likely as much as 800-1000 ft, across most of the quadrangle. A test hole drilled to a T.D. of 280 ft by the NMBMMR in sec. 19 (T4N R11W) did not reach the Gallup Sandstone (NMBMMR coal data file). Even

deeper possibilities lie in the middle part of the Tres Hermanos Formation, and deeper yet in the Dakota Sandstone. An outcrop of Dakota Sandstone 3 mi north of the quadrangle boundary, in the NE 1/4 sec. 13, T5N, R12 W exposes a 1-ft-thick coaly bed. Dakota Sandstone coals show some development in the Gallup, New Mexico area (Sears, 1925) but they are of poor quality, highly lenticular, and have not been mined.

Some humate potential may exist in the Crevasse Canyon Formation locally, but should a market for this material ever develop there are deposits in the San Juan Basin much more favorably located with respect to transportation facilities and consumers.

Road metal has been quarried on the quadrangle (NW 1/4 sec. 18, T4N, R11W) as previously mentioned, but this is a very small deposit of a very low value item. Furthermore, road development in the area is minimal due to the sparse population.

A note on oil and gas potential--Perhaps the most significant geological information generated in this study is the evidence for northeast-trending strike-slip faults in the area. This allows speculation that the northeast-trending compartmental faults recognized in the Zuni Basin continue in parallel fashion southeastward across the North Plains basalt flow, into the Pietown-York Ranch area.

The entire area is underlain by potential source rocks, the Mancos Shale, but existing data indicate that it is immature. Several sandstones, particularly marine sandstones such as the Twowells Tongue of the Dakota Sandstone (encased in marine shale)

and the Tres Hermanos Formation, are excellent reservoir rocks. However, Cretaceous sandstones in this area may be water flushed. Structural traps may be provided by the small but pervasive northeast-trending compartmental faults. Also fracture-controlled porosity zones may be associated with these faults. In either case, they offer some hope of projecting structural traps or fracture porosity into the subsurface locally. The usual trap in a strike-slip system of small displacement is the en echelon anticline (Harding, 1974), but these are not in evidence here. Better prospects would lie to the west and south of the York Ranch SE quadrangle where the target horizons are at somewhat greater depths. In these areas, any evidence of faulting, particularly wrench faulting should be considered as an exploration target.

Acknowledgments

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(Author's note: Map updated 6/29/87 in sec. 30, T4N, R11W; Kcc contact moved lower.)

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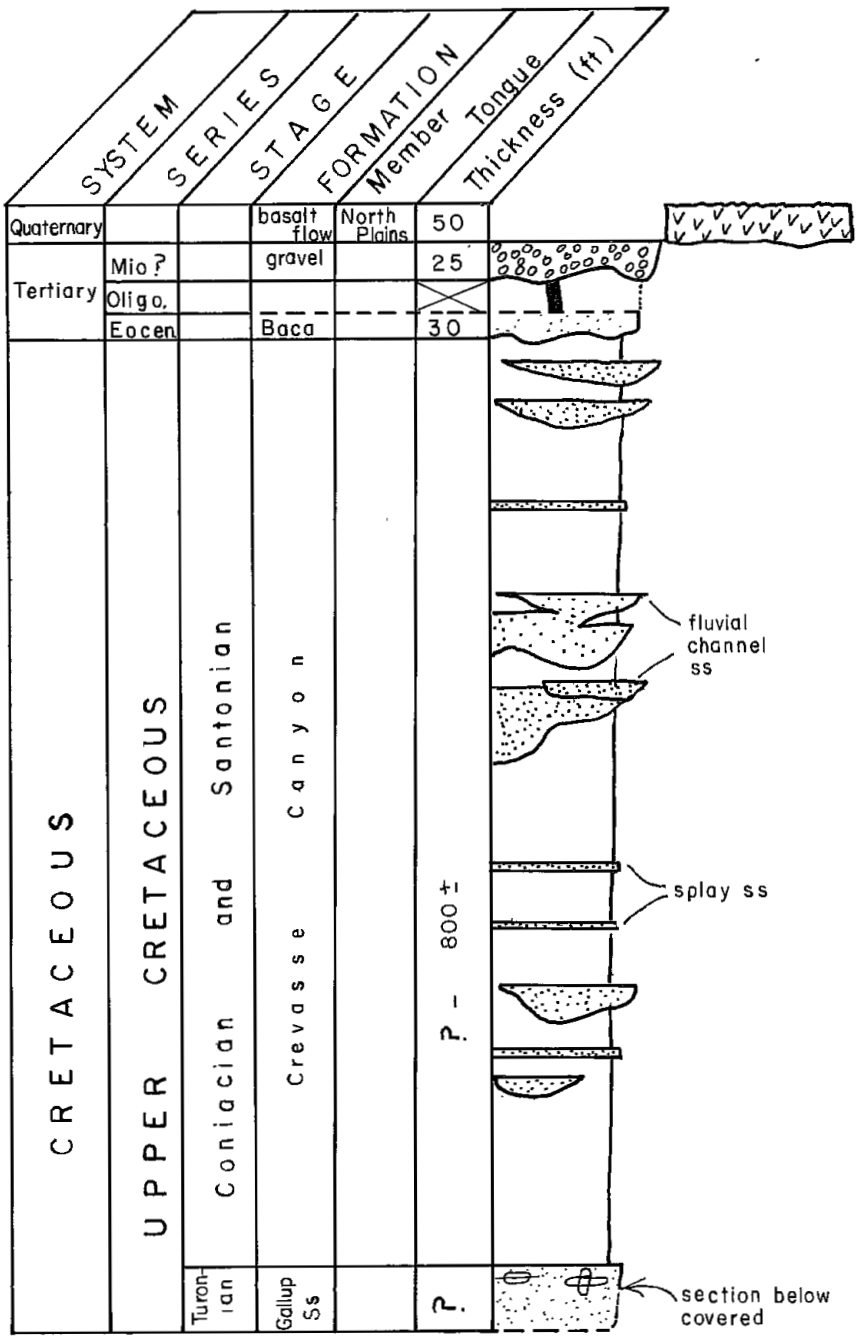
COMPOSITE STRATIGRAPHIC SECTION
YORK RANCH SE QUADRANGLE

Plate 1a



Description of map units

Qae — Alluvial and eolian deposits (Holocene); windblown sand and silt in thin sheet accumulations (no dune field development).

Qal — Alluvium (Holocene and Pleistocene); sand, silt, and clay, up to 50' thick, generally thinner; may include colluvial deposits.

Qb — Basalt flows, undifferentiated (Pleistocene); originating from numerous lava cones in North Plains basalt flow.

Tg — Conglomerate, sandstone, and residual gravels (Tertiary); occupies higher levels; coarser fraction mainly volcaniclastics; some pedogenic carbonate development.

Tbd — Basaltic diabase dike (Oligocene); 40' - 60' in width; near vertical.

Tbc — Baca Formation (Eocene); reddish brown, fine grained-poorly sorted sandstone; 30' thick.

Kcc — Crevasse Canyon Formation, undifferentiated (Upper Cretaceous); nonmarine sandstone, mudstone, carbonaceous mudstone, and very minor coal; may approach 800' in thickness.

Kg — Gallup Sandstone, undifferentiated (Upper Cretaceous - late Turonian); fine grained, well sorted quartzose sandstone, marine, burrowed (including Ophiomorpha) and bioturbated.

Paleoflow direction

Fault; dashed where inferred

NMBMMR Open file 220-A
(sheet 2 of 2)

109° 108° 30' 108°

35°

Ojo Caliente Reservoir Stricker (in preparation)	Plumasano Basin Stricker (in preparation)	Upper Galestina Canyon Stricker (in preparation)	Shoemaker Canyon Stricker Mapel & Anderson (in preparation)	Nicoll Lake Mapel 1985	Goat Hill Mapel 1985	Cerro Hueco Maxwell 1981	Ice Caves Budding et al
Venadito Camp Anderson 1982	Atarque Lake Anderson 1982	Mesita de Yeso Anderson 1982	Shoemaker Canyon SE Anderson Mapel 1983	Red Lake Mission Mapel 1985	Cerro Alto X	Cerro Brillante Maxwell 1981	Ice Caves SE Maxwell 1981
Cantaralo Spring Anderson 1981	Rincon Hondo McLellan et al 1983	Fence Lake McLellan et al 1983	The Dyke Campbell 1981	Chimney Hill Anderson Campbell Arkell	Cerro Pomo X	La Rendija Maxwell 1981	York Ranch Anderson
Twentytwo Spring Frost & Anderson 1982	Moreno Hill McLellan et al 1983	Fence Lake SW Landis & Haschke 1983	Cerro Prieto Campbell 1981	Techado Arkell 1984	Veteado Mtn. Arkell 1984	Trail Lake Anderson	York Ranch SE Anderson 1986

34° 45'

34° 30'

109° 108°

Areas of mapping responsibility, either detailed mapping (date following author(s)) or reconnaissance mapping (no date); large X indicates no reconnaissance.

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