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THE PINEDALE OIL SEEP—AN EXHUMED STRATIGRAPHIC TRAP IN THE SOUTHWESTERN SAN JUAN BASIN

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Oil staining in the uppermost part of the Gallup Sandstone of Late Cretaceous age is common in a belt of outcrops several miles wide in the southwestern San Juan Basin (fig. 1). At one location a 28-foot (8.5-m) thick sandstone bed is completely stained or saturated, and during hot weather the oil becomes mobile enough to drip. A small pool of tar has collected in a small adit dug into the base of the sandstone (fig. 2). This seep is herein referred to as the Pinedale oil seep, named after the Pinedale Trading Post about 3 miles (5 km) to the southeast. The purpose of this paper is to show the extent of the oil staining in relation to the local stratigraphy and structure, and to offer an explanation for the presence of the staining and the seep.

The Pinedale oil seep is located in the southwestern San Juan Basin on the east side of a small canyon at the east end of Ram Mesa in the NE¼ sec. 11, T. 16 N., R. 16 W. (fig. 3). This falls in the Oak Springs 7½-minute quadrangle. The seep and oil staining occur in the Torrivio Sandstone Member of the Gallup as defined by Molenaar (1973, p. 98). This is a fluvial-channel sandstone complex at the top of the Gallup in this area. In addition to the seep, discontinuous live oil staining is common in outcrops in the upper few feet of the Torrivio for about 2 miles (3 km) on either side of the seep, and spotty dead oil staining is scattered in outcrops as far as 9 miles (14 km) from the seep. (Dead oil is here defined as that which gives no visible cut-fluorescence in trichlorethane, as contrasted to the visible cut observable from live oil. The cut from dead oil is detectable, however, using a sensitive fluorometer.) No staining was observed in any of the underlying marine sandstones.

Figure 4 is a detailed map of the Torrivio Sandstone for several miles on either side of the seep, accompanied by a stratigraphic cross section across the same area. The map shows the general distribution of the observed oil staining and the general direction of the depositing currents, based on many crossbed attitudes. Because the Torrivio Sandstone forms steep resistant outcrops in most of the area, the width

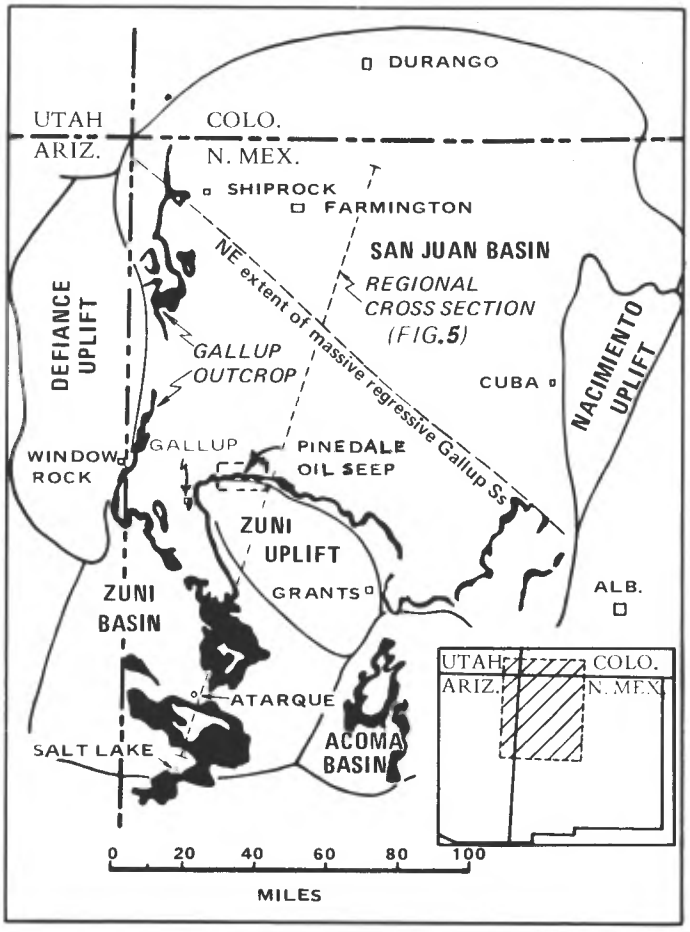


Figure 1. Index map showing Gallup outcrops, cross section location and Pinedale oil seep area.



Figure 2. Pinedale oil seep. Small adit is at base of oil-saturated fluvial sandstone in the Gallup Sandstone.

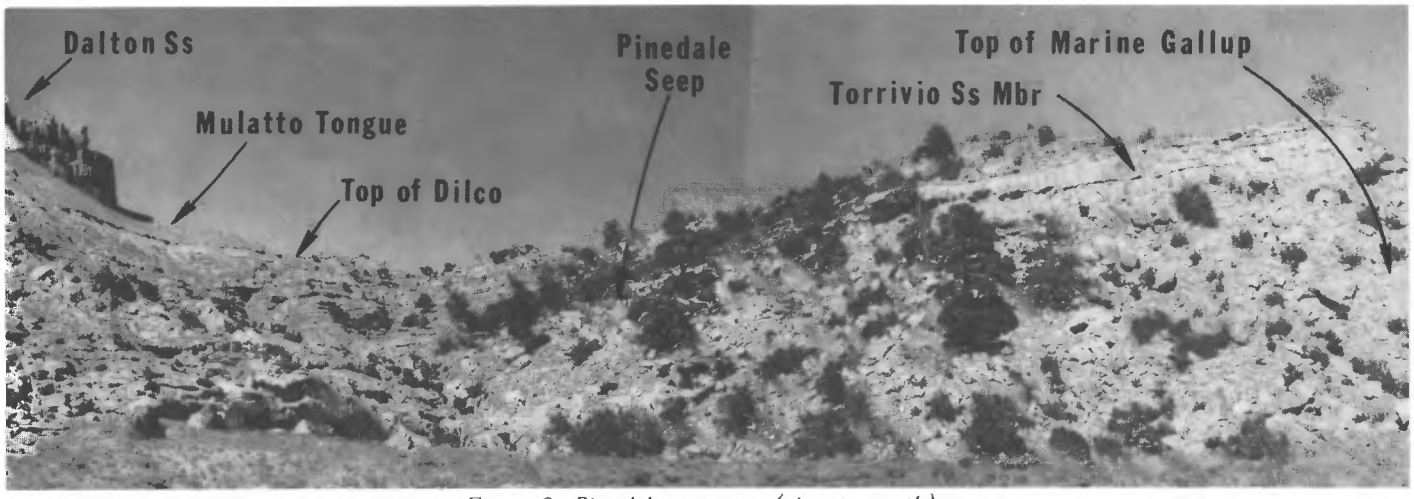


Figure 3. Pinedale seep area (view to north).

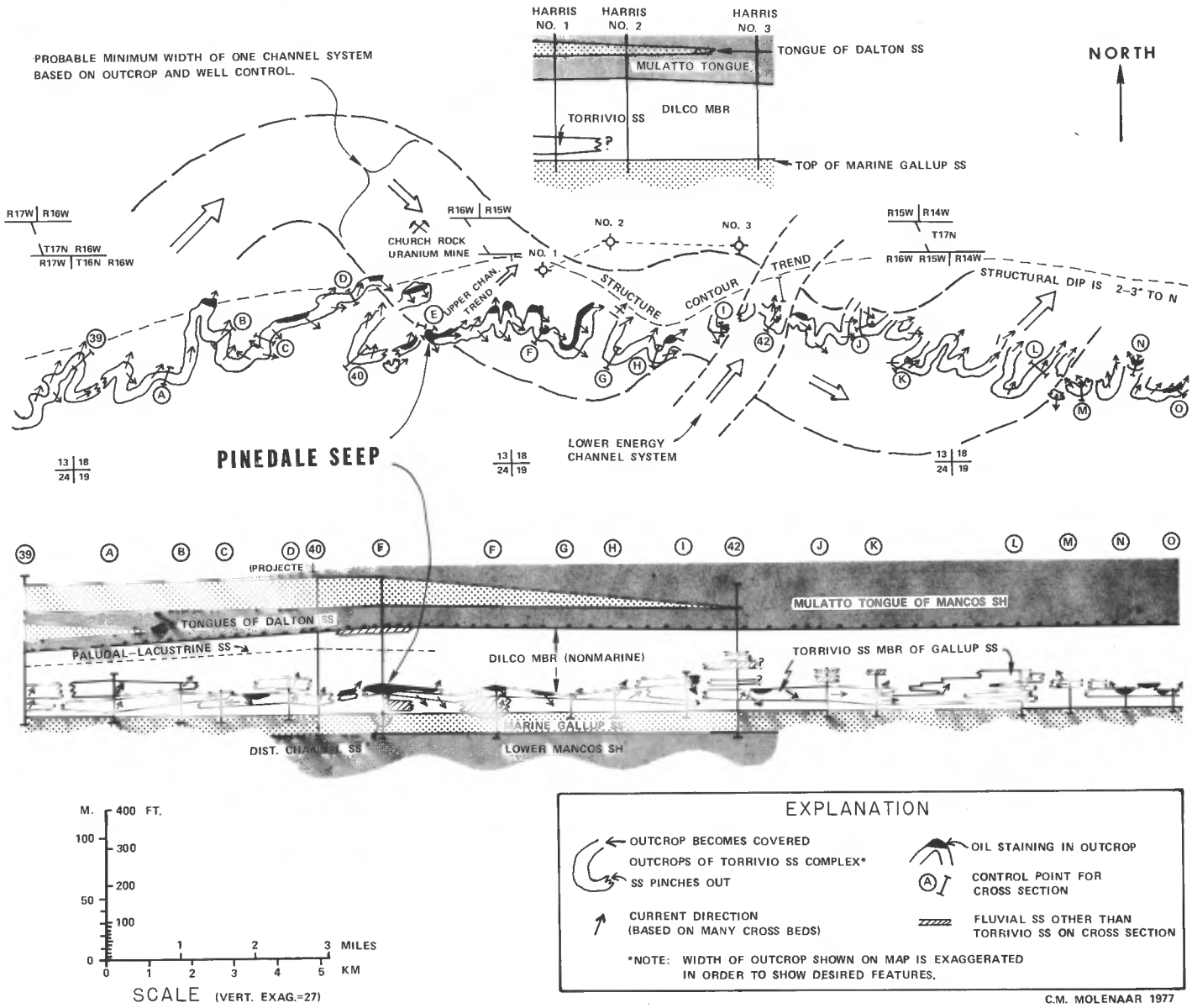


Figure 4. Map and cross section of Torrivio Sandstone Member of the Gallup Sandstone showing oil staining, channel trends and stratigraphic relationships; Pinedale seep area, southwestern San Juan Basin.

of the outcrop belt is greatly exaggerated on the map in order to show the desired features. The cross section shows the stratigraphic relationships and lateral continuity of the Torrivio and underlying and overlying units, as well as the observed oil staining and crossbed dip directions in the Torrivio.

Crossbed dip direction data in the vicinity of the seep indicate that the channel complex makes an anomalous, large bend or loop to the southeast, or obliquely up to the present structural dip for a short distance before turning down dip or to the northeast toward the seaway. The large looping course should not be mistaken for meander loop, which would be of much smaller radius in relation to the postulated size of the rivers. In this area the Torrivio is thought to have been deposited by a low-gradient, braided river. It should also be noted that, at the Pinedale seep, the Torrivio is made up of two channel systems, both of which trend northeast; the upper channel, however, turns northeast sooner than the lower channel. In any event, with the present structural configuration as indicated by the structure-contour trend on the map, the large bend of the channel would create a stratigraphic trap if the up dip curve was sealed by laterally adjacent paludal shales. However, this part of the trap, if it existed, has been removed by late Tertiary or Quaternary erosion. This type of trap is particularly anomalous because the Torrivio Sandstone in this area consists of many intersecting channel systems which result in a blanket-like deposit. However, as shown in Figure 4, there are gaps in the system, which support a postulation that the Pinedale seep is the remnant of a small, exhumed, stratigraphically trapped oil accumulation.

The source for the oil is considered to be mature organic source-rock shales in the deeper parts of the San Juan Basin. This is the same source that charged the "transgressive" Gallup oil fields such as Bisti. As these reservoirs were filled, the oil probably leaked into distal fringe sands of the regressive Gallup Sandstone, which underlie Bisti field. The migration path would then be up dip into the massive coastal-barrier sand of the Gallup and thence into the Torrivio channel-sand complex, which merges with this seawardmost massive coastal-barrier sand (Molenaar, 1973, p. 98). Figure 5 shows these regional relationships of the Gallup and associated units with respect to the Pinedale oil seep, which is projected into the line of section. The structural configuration of the south flank of the San Juan Basin indicates that a migration path for oil would be broadly focused toward the general area of the Pinedale seep. Aside from the small accumulation at Pinedale seep, the other staining noted in the upper few feet of the Torrivio is thought

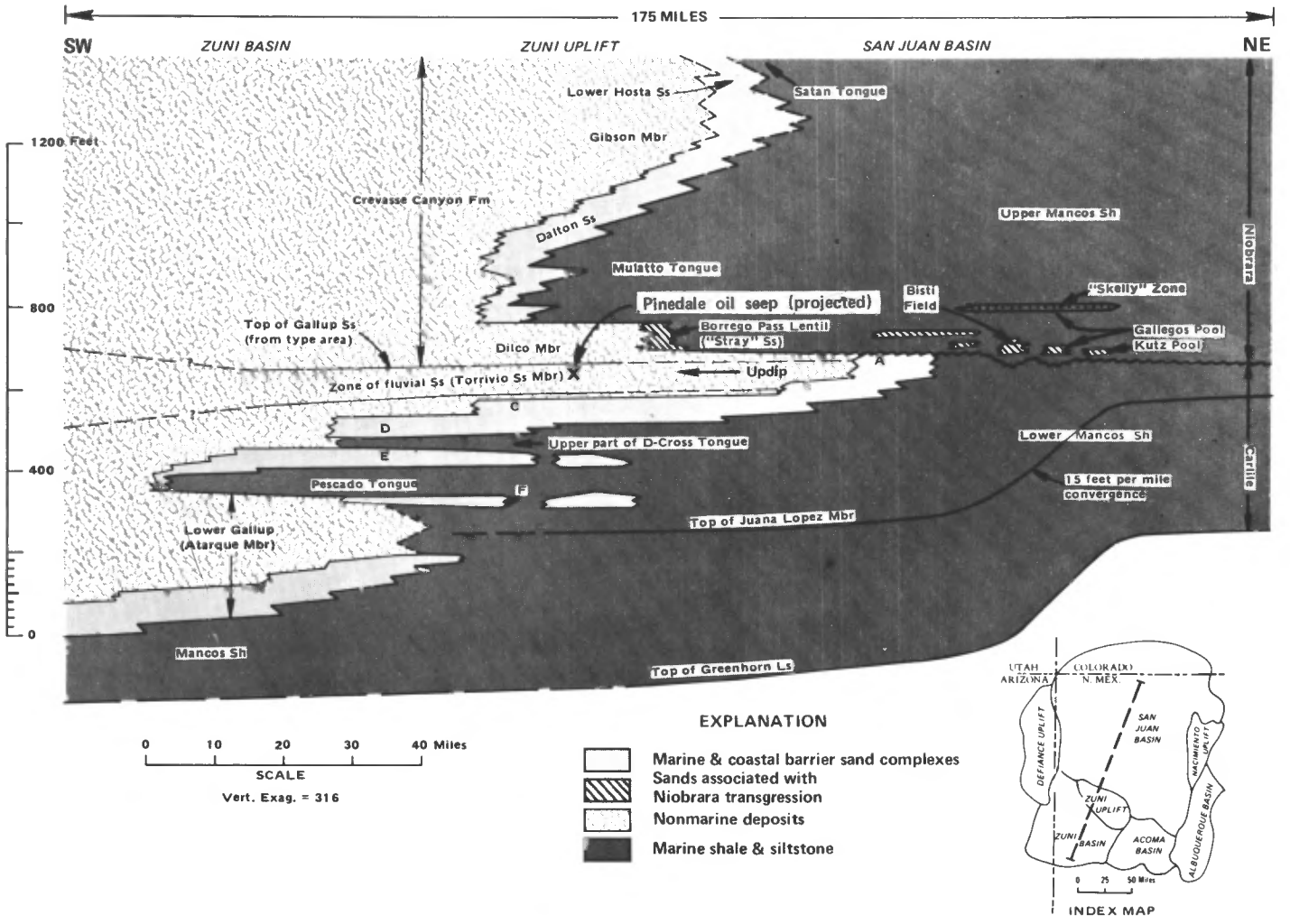


Figure 5. Regional cross section of the Gallup Sandstone and associated strata showing relationship of Pinedale oil seep to down dip oil fields (modified from Molenaar, 1973).

to be residual oil along the migration path that has been modified by stratigraphic variations of the Torrivio channel systems. In the geologic past, a large amount of oil must have been accumulated and/or lost on the Zuni uplift.

REFERENCES

Molenaar, C. M., 1973, Sedimentary facies and correlation of the Gallup Sandstone and associated formations, northwestern New Mexico, *in* Fassett, J. E., ed. Cretaceous and Tertiary rocks of the southern Colorado Plateau: Four Corners Geol. Soc. Mem., p. 85-110.

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